

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

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I. INTRODUCTION

Definition

Skull-base surgery is a subspecialty of neurosurgery that deals with complex skull-base lesions. It includes, but is not limited to, surgical treatment, radiation treatment, and medical treatment of congenital, vascular, traumatic, inflammatory, and neoplastic disorders of the base of the skull.

History and Rationale

Skull-base surgery is relatively new and becoming widely accepted as a subspecialty in neurosurgery that requires special training¹. The complexity of the skull-base region that is crowded with critical structures demands advanced knowledge of the surgical anatomy and surgical skills that are not usually acquired during residency training programs.

The treatment of skull-base lesions is rapidly developing with emerging new surgical techniques and treatment modalities. Knowledge of all available treatment modalities and mastering the surgical options will improve the quality of care and subsequently the outcome for skull-base diseases. The Kingdom is becoming a pioneer in the Middle East region in neurosurgery, which requires the presence of well-trained neurosurgeons in all sub-specialties including skull-base surgery. Currently, tertiary care centers in major cities are undertaking more than 100 cases every year (personal communication between participating centers). Skull-base cases are complex and require prolonged admissions and special care. Improving the care and clinical outcomes of these cases will be beneficial for patients, health providers, and to our health care system.

Vision

The program vision is establishing a skull-base training program that will help develop the skull-base program in the Kingdom, train neurosurgeons, and improve patient care. Graduates of this program should be able to perform complex skull-base procedures, have complete knowledge of the latest treatment guidelines, and possess detailed knowledge of all treatment modalities for skull-base pathologies.

Educational goals

- Offer the highest quality of modern training and ensure that trainees completing the training have achieved the required level of skills and competencies.
- Focus on the outcomes of training. The program graduates must perform the achieved competencies in the essential domains of skull-base surgery and demonstrate capability to transform their knowledge easily into independent practice.
- Accelerate the process of learning and skill attainment through focused and up-to-date teaching methods and high volume exposure to cases with balanced supervision and independency.
- Provide pathology-oriented rather than specialty-oriented training in emphasizing the role of all modalities (surgical and non-surgical) and emphasize the multidisciplinary approach.

Scope of skull-base neurosurgery practice

Skull-base neurosurgeons attend to diseases and conditions related to the skull-base and cranium. Similar to most other specialties, the related diseases and conditions are categorized as follows:

- Neoplastic
- Congenital/developmental
- Trauma
- Vascular
- Infection and inflammatory

Skull-base neurosurgeons should also be familiar and capable of dealing with neurosurgical conditions that could be encountered in general neurosurgery practice. The knowledge and skills needed for this are acquired during the residency training program (see admission requirements).

II. GENERAL PROGRAM OBJECTIVES

The aim of the Skull-base Neurosurgery Fellowship Program is to foster a well-qualified skull-base neurosurgeon, who is capable of handling complex skull-base pathologies. The Fellow will gain the required expertise in this field by spending adequate time in multiple, well-staffed and equipped centers that will allow him/her to develop appropriate competence during the suggested period. The training will be pathology-oriented rather than specialty-oriented, emphasizing the role of all modalities (surgical and non-surgical) and the importance of the multidisciplinary approach.

The trainee is expected to:

- To acquire the required knowledge, skills, professional judgment, and attitudes needed to practice and teach skull-base neurosurgery, and to participate in the progress of knowledge on skull-base neurosurgery through research and publication
- To familiarize himself/herself thoroughly with the clinical recognition, natural history, and embryology of all conditions relevant to skull-base pathologies
- To understand the pathophysiology of these conditions and the physiological response to skull-base surgery
- To undertake comprehensive supportive care of skull-base neurosurgical patients
- To be able to perform independently all surgical procedures in the field of skull-base neurosurgery
- To acquire the appropriate attitudes required to deal with specific personal stress that emerges in the practice of skull-base neurosurgery and the stress experienced by patients and their families
- To reinforce the principles of previously acquired ethical behavior and familiarize himself/herself with ethical issues of particular relevance to skull-base neurosurgery
- To develop an awareness of quality assurance issues specifically related to the specialty
- To be familiar with the principles of research and publications in the field of skull-base neurosurgery
- To be familiar with current radiation options
 - To acquire the knowledge required to discuss the radiation option in contrast to other surgical and medical options
 - To be familiar with radiation techniques, radiation modalities, and ongoing medical trials
- To be familiar with current medical treatment options
 - To acquire the knowledge required to discuss all medical treatment options in contrast to other radiation treatments and medical treatments options
 - To be familiar with current medications and current ongoing medical trials

III. PROGRAM FRAMEWORK

Duration of the program

This fellowship program consists of two years of full-time structured supervised training in skull-base neurosurgery. The candidate rotates in accredited centers only.

Structure and rotations

Structure of the program is 24-months (periods)

The rotations are divided as follows:

1. Fourteen months of Neurosurgery (3 months/center)
2. Two months of Radiation Oncology
3. One month of Rhinology (ENT)
4. One month of Otolaryngology (ENT)
5. One month of Head and Neck (ENT)
6. Two months of Research
7. Three months of Electives (in any of the accredited centers/sub-specialties)
8. Over the next two years, the program will establish and recognize anatomical labs that will participate in the program. Once established, the trainee will undergo 1-2 months' rotation in the recognized sites to help improve surgical anatomy knowledge during his/her training.
9. **Practical skills training (simulation and workshops). Please see below for more information.**

Participating Centers

Skull-base neurosurgery

1. King Khalid University Hospital, King Saud University
2. King Fahad Medical City, National Neurological Institute
3. King Abdulaziz Medical City
4. Dammam University
5. King Faisal Specialist Hospital (Riyadh)
6. King Faisal Specialist Hospital (Jeddah)

ENT Rhinology

1. King Saud University
2. King Fahad Medical City
3. King Abdullah Medical City

ENT Head and Neck

1. King Saud University
2. King Abdulaziz University

ENT Otolaryngology

King Fahad Medical City

Radiation Oncology

King Faisal Specialist Hospital

Neuro-Pathology (elective)

King Faisal Specialist Hospital

Duties of the Trainee

1. In patient care

As a general principle, continuity of care should be emphasized. Ideally, the Fellow should attempt to follow patients from the time of pre-admission evaluation (consultation) or the admission history/physical, throughout the in-hospital phase of treatment, including surgery and follow-up visits. It is particularly important that he/she remain intimately involved with the daily care of neurosurgical patients in the ICU, and attend all major skull-base neurosurgical cases.

2. Ambulatory care

The Fellow is highly encouraged to attend outpatient clinics to observe as many new patients as possible, and to follow up on all patients who he/she has treated at the hospital or in outpatient surgery. The Fellow is also encouraged to attend all surgical procedures of interest in other disciplines when relevant to the secondary objectives of training.

3. Research

The Fellow is expected to undertake one or more clinical or basic science research projects.

4. Academic activity

The Fellow should attend and actively participate in Neurosurgery Club meetings, and be responsible for organizing all academic activities within the department.

5. Scholar

The Fellow must play a major role in the teaching and supervision of junior residents in their daily clinical work.

6. Simulation activity

The Fellow should help conduct two skull-base cadaveric dissection workshops every year.

Vacation and Holidays

The candidate will be granted four weeks of holiday per year, as well as one Eid holiday per year, as determined by the concerned training Hospital.

Admission Requirements

The prospective Fellow must meet the following requirements:

1. Have successfully completed a formal residency training program in neurological surgery and be certified in the specialty by the appropriate board such as the Saudi Fellowship in Neurological Surgery or its equivalent.
2. Must be registered and licensed by the Saudi Commission for Health Specialties (SCHS). Admission criteria for fellowship programs requires a minimum rank of senior registrar
3. Three confidential letters of reference

4. The candidate must have successfully passed a personal interview held by members of the Skull-Base Neurosurgery Scientific Committee
5. Sponsorship for the complete training period.
6. Upon admission, the Fellow must sign a statement to abide by the rules and regulations of the SCHS.

Selection of the Candidate

1. The Fellowship Committee will interview the candidates and select the best candidate.
2. One fellow will be selected every year (The number will be evaluated every year by the SCFHS accreditation program.).

Certification

The Fellow will be evaluated according to the regulations of the Saudi Council for Health Specialties.

- The promotion of the candidate from one level to another (first year to second year) will be determined by the following:
 - Passing the in-training assessment at the end of the year (60% passing mark)
 - Passing the continuous assessment (evaluation) during rotations (60% passing mark)
 - Approval of the Supervisory Committee.
- Upon completion of the second year of fellowship, the fellow will receive a certificate of completion of training.
- Fellowship certificate will be awarded upon passing the promotion at the end of the second year (50% to pass the promotion) and passing final training exam (50% to pass the final exam). The total passing mark is 60%, which the promotion exam, final exam, and continuous assessment. (please see details below).
- Unsuccessful candidates will be allowed to make two further attempts over a period of three years from the date of completion of their training.

Accreditation of Training Centers

The program is a national joint program. The hospital (s), which will be accredited for training, must fulfill the accreditation criteria set by the Supervisory Committee to ensure a high standard of training. The above named criteria include the following:

- The general accreditation rules of the Saudi Council must apply.
- A minimum of two full-time qualified consultant skull-base neurosurgeons, with experience in teaching and commitment, to carry out the training program as stipulated by the Saudi Council for Health Specialties.
- The centers should have full clinical services for supporting specialties including neurology, radiology, pathology, radiation oncology, and ENT.
- The skull-base service should fulfill the following
 - Inpatient skull-base neurosurgery service
 - Outpatient service-minimum two per week
 - Properly equipped OR which can cater to complex neurosurgical care
 - Minimum number of 80 cases of skull-base surgeries per year

- Curriculum-based teaching activities as approved by the Saudi Council for Health Specialties should be designed, so that each trainee will develop high-quality practical and academic expertise. This should include the following:
 - Daily Ward Rounds
 - Weekly Grand Rounds
 - Monthly Journal Club
 - Monthly Combined Rounds (Surgery-Radiology Rounds, skull-base rounds, and neuro-oncology rounds)
 - Monthly Morbidity & Mortality Rounds.
- Research-Oriented Activities that provide the fellow sufficient exposure and participation in research.
- The accredited hospital (s) will be reviewed regularly as per the Saudi Council for Health Specialties.

IV. CURRICULUM DEVELOPMENT/UPDATE

The skull-base fellowship training program will adopt competency-centered training within the confines of time-based training. The competencies are best categorized by the CanMEDS Framework. The CanMEDS Framework is recognized in many training programs worldwide because it is comprehensive and most relevant to the aspirations of contemporary training programs. The roles of the CanMEDS Framework are generic and lend themselves to refinement and improvement.

The move in the direction to emphasize competencies will have a beneficial impact on the quality and products of training, the wellbeing of the patients, and the health care system in general. Structured, competency-based skull-base surgery curriculum could better prepare trainees for independent practice and protect patients from unnecessary complications.

A team of neurosurgery and skull-base surgeon educators was assembled to create and examine a curriculum for the skull-base surgery training program that is centered upon the seven CanMEDS roles of a physician: Medical Expert, Communicator, Collaborator, Manager, Health Advocate, Scholar, and Professional. The team took roles and responsibilities to define these competencies and explore approaches for their teaching and learning. Mechanisms for appropriate assessment and list of policies and procedures have been created.

The curriculum is placed to detail the required basic sciences and clinical knowledge and to apply methods to achieve the objectives of different training levels. It will serve as a road map for Program Directors, Training Staff, and Residents to guide the academic, clinical, technical, and professional experience. With such structured curriculum, the competency milestones can be monitored closely, and the promotion to the next level of training will depend on fulfilling the required competencies.

The implementation of the curriculum within a competency framework requires that it should be incorporated in teaching and assessing the residents and to be part of the examination blueprint. It should be used in the accreditation standards of the program. The curriculum should be readily available to all health stakeholders. Faculty development, through workshops, seminars or CanMEDS educators, is essential to ensure the assimilation and implementation of the roles throughout the residency training.

According to the curriculum, skull-base surgery trainees will undergo a gradual increase in responsibilities during their training. The trainees are supervised by staff skull-base surgeons who will simultaneously impart to them a certain degree of autonomy to allow for preparing themselves for independent practice upon completion of the training program.

The competency-centered curriculum of the Saudi Skull-Base Surgery Training Program (Fellowship) is expected to enhance skull-base surgery training in KSA.

V. COMPETENCIES & OUTCOMES

Rationale

The focus on competency rather than the length of training is the most significant factor in determining the favorable outcome of training. The role of knowledge, skills, and attitude through a documented clear path is emphasized in constructing the different competencies.

Overall goals

To educate and train fellows to become competent in the main domains of skull-base surgery and to ensure that they are prepared to practice without guidance. The graduates will be equipped with the fundamentals that enable them to have a career in academic or non-academic centers.

Curriculum Objectives

Knowledge

- Upon completion of the training program, the fellow should be able to diagnose, manage, and prognosticate on the full spectrum of medical and surgical problems in the field of skull-base neurosurgery.
- Should have both the technical expertise and intellectual maturity necessary for the practice of skull-base neurosurgery.
- Should demonstrate teaching abilities.
- Should be familiar with the principles of research.

Competencies

The following competencies are expected by the end of each training year according to level (please see below):

- 1) Medical Expert
- 2) Communicator
- 3) Collaborator
- 4) Manager
- 5) Health Advocate
- 6) Scholar
- 7) Professional

Medical Expert

Definition

As Medical Experts, skull-base surgeons integrate all the CanMEDS Roles, applying medical knowledge and clinical skills in their provision of patient-centered care.

By the end of the first year, the trainee should be able to perform the following:

1. Function effectively as skull-base surgeon in Category 1 and some of Category 2 procedures. All CanMEDS roles must be integrated to provide optimal, ethical, and patient-centered medical care.

2. Establish and maintain clinical knowledge, skills, and attitudes appropriate to skull-base.
3. Perform a complete and appropriate assessment of a patient with skull-base tumor.
4. Use preventive and therapeutic interventions effectively.
5. Appropriately use and interpret diagnostic tests relevant to skull-base lesions.
6. Demonstrate proficient and appropriate use of procedural skills.
7. Seek appropriate consultation from other health professionals, recognizing the limits of their expertise.

Communicator

Definition

As Communicators, skull-base surgeons should effectively facilitate the doctor-patient relationship and the exchanges that occur before, during, and after the medical encounter.

By the end of the first year, the trainee should be able to perform the following:

1. Develop rapport, trust, and ethical therapeutic relationships with patients and families.
2. Accurately elicit and synthesize relevant information and perspectives of patients and families, colleagues, and other professionals.
3. Convey relevant information and explanations accurately to patients and families, colleagues, and other professionals.
4. Develop a common understanding of issues, problems, and plans with patients, families, and other professionals to develop a shared plan of care.
5. Convey effective oral and written information about a medical encounter.
 - Maintain clear, accurate, and appropriate records (e.g., written or electronic) of clinical encounters and plans

Collaborator

Definition

As Collaborators, the trainee should be able to work effectively within a healthcare team to achieve optimal patient care.

By the end of the first year, the trainee should be able to perform the following:

1. Participate effectively and appropriately in an interprofessional healthcare team.
2. Work effectively with other health professionals to prevent, negotiate, and resolve interprofessional conflict.

Manager

Definition

As Managers, skull-base surgeons are integral participants in healthcare organizations, organizing sustainable practices, making decisions about allocating resources, and contributing to the effectiveness of the healthcare system.

By the end of the first year, the trainee should be able to perform the following:

1. Participate in activities that contribute to the effectiveness of healthcare organizations and systems.
2. Manage their practice and career effectively.
3. Allocate finite healthcare resources appropriately.
4. Serve in administration and leadership roles.

Health Advocate

Definition

As Health Advocates, skull-base surgeons responsibly use their expertise and influence to advance the health and well-being of individual patients, communities, and populations.

By the end of the first-year, the trainee should be able to perform the following:

1. Respond to individual patient health needs and issues as part of patient care.
2. Respond to the health needs of the communities that they serve.
3. Identify the determinants of health for the populations served.
4. Promote the health of individual patients, communities, and populations.

Scholar

Definition

Skull-base surgeons demonstrate a lifelong commitment to reflective learning, as well as the creation, dissemination, application, and translation of medical knowledge.

By the end of the first year, the trainee should be able to perform the following:

1. Maintain and enhance professional activities through ongoing learning.
2. Critically evaluate medical information and its sources, and apply this appropriately to practice decisions.
3. Facilitate the learning of patients, families, students, residents, other health professionals, the public, and others.
4. Contribute to the development, dissemination, and translation of new knowledge and practices.
5. Complete at least one scholarly project under the mentorship of an attending surgeon or another faculty supervisor. The project should be presented at either a national or an international scientific event or published in a peer-reviewed journal. Residents are encouraged to complete the project or make significant progress toward the completion of training before their final examination.

Professional

Definition

As Professionals, skull-base surgeons are committed to the health and well-being of individuals and society through ethical practice, profession-led regulation, and high personal standards of behavior.

By the end of the first year, the trainee should be able to perform the following:

1. Demonstrate a commitment to their patients, profession, and society through ethical practice.
2. Demonstrate a commitment to patients, profession, and society through participation in profession-led regulation.
3. Demonstrate a commitment to physician health and sustainable practice.

The second year is utilized to solidify the above competencies and finish surgical requirements. (For information on Category 3 and 4 procedures that are included in the second year, please see below.)

Clinical Skills

By the end of training, the fellow should have acquired skills appropriate to those of a junior consultant in the following areas:

- Pre-operative care, which includes the following:
 - History and physical examination skills specific to skull-base pathologies; the skills necessary to interview patients and families to explain the diagnosis, the proposed treatment, and the prognosis; and to obtain informed consent.
 - Appropriate use and interpretation of diagnostic aids
 - Preparation of the patient for surgery, including assessment of anesthetic risk.
- Operative care: This includes both minor and major surgery, with emphasis on index cases. The fellow must demonstrate an ability to exercise judgment and control in unexpected situations, and ingenuity in dealing with complex problems. He/she should demonstrate an ability to assist more junior colleagues in the performance of procedures, and should be able to operate independently.
- Postoperative care: The main emphasis here is on maintenance of homeostasis (fluids and electrolytes, temperature control, monitoring, etc.) and on early recognition of complications.
- Assessment of Clinical Progress: This will be evaluated by direct supervision and reviewed at the time of ward rounds, clinical meetings, operative room, on calls, and formally reported on the evaluation form.
 - Log Book: All surgical cases must be documented in a log book related to the program at the end of each rotation period and should include the evaluation of the supervisor of the named period.
- Number of cases required: 120 cases per year. 60% skull-base procedures.
- Type of procedures to be mastered by the end of the fellowship: Skull-base approaches to treat neoplastic, traumatic, and congenital lesions. Craniofacial surgery, standard trans-nasal, extended trans-nasal approaches, trans-oral approaches, standard pterional craniotomy, extended pterional craniotomy, Frontal trans-basal approach, standard retrosigmoid craniotomy, extended trans-temporal craniotomy, trans-jugular approaches, and middle fossa craniotomy.
- The candidate is expected to have updated knowledge about the following pathologies and all available treatment options: Sellar tumors, vestibular schwannomas, meningiomas, congenital skull base lesions, traumatic skull base lesion, inflammatory skull-base lesions, paraganglioma, sinonasal tumors, dermoid tumors, C1/2 lesions, orbital tumors, temporal bone tumors, skull tumors, and foramen magnum tumors.

Attitude

The fellow will be expected to develop and demonstrate appropriate attitude and communication skills relative to the patient and his/her family in the clinical context, and similar interpersonal skills when interacting with other caregivers and hospital staff.

Generic universal competencies

Generic universal competencies are high-value, interdisciplinary topics of outmost importance to the trainee. They are delivered centrally by the SCFHS through an e-learning portal. The duration of each topic is 1.5 hours. At the end of each topic, an online formative assessment is performed. After completion of all topics, there will be a combined summative assessment in the form of a context-rich MCQ.

All the 16 topics should be completed within the junior level of training i.e., the initial year.

These topics are as follows:

- Hospital acquired infection (*Module 1*)
- Sepsis, SIRS, DIVC (*Module 1*)
- Blood transfusion (*Module 1*)
- Side effects of chemotherapy and radiation therapy (*Module 2*)
- Management of hypotension and hypertension (*Module 4*)
- Management of fluid in the hospitalized patient (*Module 5*)
- Management of electrolytes imbalances (*Module 5*)
- Pre-operative assessment (*Module 5*)
- Post-operative assessment (*Module 5*)
- Acute pain management (*Module 5*)
- Chronic pain management (*Module 5*)
- Occupation hazards of Health care workers (*Module 7*)
- Patient advocacy (*Module 7*)
- Ethical issues: transplantation/organ harvesting, withdrawal of care (*Module 7*)
- Ethical issues: treatment refusal, patient autonomy (*Module 7*)
- Role of doctors in death and dying (*Module 7*)

Curriculum

Knowledge

1. Neuroanatomy

1.1 Embryology

- 1.1.1. Cranial
- 1.1.2. Cerebrum
- 1.1.3. Cerebellum
- 1.1.4. Brainstem
- 1.1.5. Cranial nerves
- 1.1.6. Ventricles
- 1.1.7. Skull and fontanelles

1.2. Histology

- 1.2.1. Neuron
- 1.2.2. Types
- 1.2.3. Microanatomy
- 1.2.4. Cell body
- 1.2.5. Dendritic process
- 1.2.6. Axonal process
- 1.2.7. Microglial elements
- 1.2.8. Astrocytes
- 1.2.9. Oligodendrocytes
- 1.2.10. Microglia
- 1.2.11. Ependyma
- 1.2.12. Choroid epithelium

1.3. Vascular Anatomy

- 1.3.1. Carotid and vertebral arteries
- 1.3.2. Course
- 1.3.3. Branches
- 1.3.4. Target structures
- 1.3.5. Concept of “watershed” ischemia
- 1.3.6. The venous drainage system
- 1.3.7. Cerebral
- 1.3.8. Cerebellum

1.4. Osteology

- 1.4.1. Skull
- 1.4.2. Bones
- 1.4.3. Foramina and their contents
- 1.4.4. Scalp
- 1.4.5. Layers
- 1.4.6. Blood supply
- 1.4.7. Innervation
- 1.4.8. Atlas and axis
- 1.4.9. Sub-axial cervical vertebrae

1.5. Myology

- 1.5.1. Gross
- 1.5.2. Muscles of the skull
- 1.5.3. Muscles of the face

1.6. Ventricles

- 1.6.1. Compartments
- 1.6.2. Boundaries
- 1.6.3. Fourth ventricle
- 1.6.4. External topography
- 1.6.5. Anatomical landmarks

1.7. Meninges and CSF

- 1.7.1. Dura mater
- 1.7.2. Falx cerebri
- 1.7.3. Tentorium
- 1.7.4. Incisura
- 1.7.5. Blood supply
- 1.7.6. Pia mater
- 1.7.7. Arachnoid
- 1.7.8. Major cisterns
- 1.7.9. Cerebrospinal fluid (CSF)
- 1.7.10. Chemical content
- 1.7.11. Functions
- 1.7.12. Production
- 1.7.13. Circulation and flow

- 1.7.14. Reabsorption
- 1.7.15. Blood-brain barrier (BBB)
- 1.7.16. Structural components
- 1.7.17. Functions
- 1.7.18. Circumventricular organs

1.8. Central Nervous System

- 1.8.1. Topographical anatomy
- 1.8.2. Cerebrum
- 1.8.3. Cerebellum
- 1.8.4. Brainstem
- 1.8.5. Cerebral cortex
- 1.8.6. Cortical layers
- 1.8.7. Sensory areas
- 1.8.8. Motor areas
- 1.8.9. Fiber tracts
- 1.8.10. Temporal lobe
- 1.8.11. Olfactory pathways
- 1.8.12. Afferent and efferent connections of structures
- 1.8.13. Pituitary and hypothalamus
- 1.8.14. Hypophysial portal system
- 1.8.15. Pituitary stalk
- 1.8.16. Anterior lobe
- 1.8.17. Posterior lobe
- 1.8.18. Hormonally active cells of the hypothalamus and pituitary
- 1.8.19. Internal capsule
- 1.8.20. Visual pathways
- 1.8.21. Cerebellum
- 1.8.22. Cerebellar organization
- 1.8.23. Deep cerebellar nuclei
- 1.8.24. Cerebellar connections
- 1.8.25. Cerebellar peduncles
- 1.8.26. Superior and inferior colliculus (tectum)
- 1.8.27. Crus cerebri
- 1.8.28. Ascending and descending tracts
- 1.8.29. Pons and medulla
- 1.8.30. Medullary reticular formation
- 1.8.31. Cranial nerves of the pons
- 1.8.32. Cranial nerves of the medulla
- 1.8.33. Ascending and descending tracts
- 1.8.34. Cranial nerves
- 1.8.35. Nuclei location and connections
- 1.8.36. Course of each cranial nerve from nucleus to end organ
- 1.8.37. Blood supply
- 1.8.38. Posterior fossa and its relationship with cranial nerves
- 1.8.39. Relationship of the facial, vestibular, and cochlear nerves with internal auditory meatus
- 1.8.40. Syndromes produced by mass lesions affecting the cranial nerves in the following:

- 1.8.40.1. Suprasellar
- 1.8.40.2. Jugular foramen
- 1.8.40.3. Internal auditory canal
- 1.8.40.4. Incisura

1.9. Autonomic Nervous System

- 1.9.1. Pre- and postganglionic neurons
- 1.9.2. Visceral afferent fibers
- 1.9.3. Structure of the autonomic ganglia
- 1.9.4. Central autonomic pathways
- 1.9.5. Functions of sympathetic system
- 1.9.6. Functions of parasympathetic system

1.10. Peripheral Nervous System

- 1.10.1. Anatomy
- 1.10.2. Nerve root
- 1.10.3. Myelinated nerves
- 1.10.4. Unmyelinated nerves
- 1.10.5. Schwann cell
- 1.10.6. The plexi
- 1.10.7. Cervical
- 1.10.8. Brachial

2. Neurophysiology

2.1. Synaptic Transmission

- 2.1.1. Types of synaptic transmission
- 2.1.2. Transmitter release
- 2.1.3. Nerve-muscle transmission
- 2.1.4. Chemical messengers
- 2.1.5. Direct gated receptors
- 2.1.6. Second messenger linked receptors

2.2. Sensory Systems

- 2.2.1. Sensory receptor physiology
- 2.2.2. Coding of modality specific sensory information
- 2.2.3. Pain and analgesia
- 2.2.4. Cortical integration of sensory perception
- 2.2.6. Visual system
 - 2.2.6.1. Processing in the retina
 - 2.2.6.2. Processing in central visual pathways
 - 2.2.6.3. Columnar units of visual cortex
 - 2.2.6.4. Processing in the geniculate nucleus
 - 2.2.6.5. Visual perception of motion and form

2.3. Motor System

- 2.3.1. Mechanisms of muscle contraction
- 2.3.2. Muscle receptors, spinal reflexes

- 2.3.3. Spinal reflexes concerned with position
- 2.3.4. Brainstem reflexes controlling motion
- 2.3.5. Vestibular nuclei control of movement and posture
- 2.3.6. Red nucleus control of movement
- 2.3.7. Cortical control of movement
- 2.3.8. Cerebellar control of movement
 - 2.3.8.1. Regional and cellular organization of the cerebellum
 - 2.3.8.2. Functional divisions of the cerebellum
 - 2.3.8.3. The role of the cerebellum in planning movement
- 2.3.9. Pathways and circuits of the basal ganglia

2.4. Physiological Basis of Arousal and Emotion

- 2.4.1. Noradrenergic systems
- 2.4.2. Limbic system
- 2.4.3. Memory
- 2.4.4. Sleeping and sleep states
- 2.4.5. Reticular activating system

2.5. Higher Cortical Functions

- 2.5.1. Anatomy of language
- 2.5.2. Function of the association cortex

3. Fluid & Electrolytes

3.1. Intracellular and Extracellular Fluid

- 3.1.1. Sodium and water distribution and metabolism
- 3.1.2. Clinical assessment of water and sodium balance
- 3.1.3. Concept of osmolality

3.2. Management of Pathologic Conditions

- 3.2.1. Diabetes insipidus (DI)
- 3.2.2. Syndrome of inappropriate antidiuretic hormone secretion (SIADH)
- 3.2.3. Cerebral salt wasting (CSW)

3.3. Clinical Implications and Treatment of Excesses and Deficiencies for the Following:

- 3.3.1. Calcium
- 3.3.2. Phosphorus
- 3.3.3. Magnesium

3.4. Neurosurgical Diseases as they relate to Nutritional Deficiencies

- 3.4.1. Metabolism and nutritional requirements of trauma patients and their evaluation
- 3.4.2. Swallowing disorders

4. Infections

4.1. Antimicrobial Drugs

- 4.1.1. Classification
- 4.1.2. Indications in CNS infections

- 4.1.3. Potential complications
- 4.1.4. Traversing the blood-brain barrier

4.2. Corticosteroids: Advantages and Disadvantages in CNS Infections

4.3. Role of anticonvulsants in the Management of CNS Infections

4.4. Cranial

- 4.4.1. Meningitis
- 4.4.2. Tuberculosis
- 4.4.3. Abscess
- 4.4.4. Fungal and Parasitic
- 4.4.5. Postoperative infections
- 4.4.6. Dural space infections
- 4.4.7. Pituitary abscess
- 4.4.8. Encephalitis
- 4.4.9. Neurosyphilis
- 4.4.10. HIV

4.5. Management of non-CNS Infections that may Arise in Neurosurgical Patients

- 4.5.1. Respiratory infections
- 4.5.2. Urinary tract infections
- 4.5.3. Wound infections

4.6. Fever

- 4.6.1. Workup for a febrile patient
- 4.6.2. Sources of postoperative fever
- 4.6.3. Diagnosis and management of sepsis
- 4.6.4. Use of prophylactic antibiotics

5. Neuropathology

5.1. General

- 5.1.1. Techniques for examination of surgical specimens from the following:
 - 5.1.1.1. Central nervous system
 - 5.1.1.2. Peripheral nervous system
 - 5.1.1.3. Skeletal muscle
 - 5.1.1.4. Pineal and pituitary
- 5.1.2. Review the use of the following stains and their clinical correlation:
 - 5.1.2.1. Chromatic
 - 5.1.2.2. Histochemical
 - 5.1.2.3. Immunohistochemical
- 5.1.3. Techniques available for morphological examination of cerebrospinal fluid

5.2. Congenital and Prenatal Disorders

- 5.2.1. Encephaloceles
- 5.2.2. Chiari malformations

5.3. Familial Neoplastic syndromes

- 5.3.1 Neurofibromatosis
- 5.3.2 Schwannomatosis
- 5.3.3 Tuberos sclerosis

5.4. Trauma

- 5.4.1. Skull fractures
- 5.4.2. Gunshot wounds of skull and brain
- 5.4.3. Epidural hematomas
- 5.4.4. Acute and chronic subdural hematomas
- 5.4.5. Recent and remote cerebral contusions
- 5.4.6. Intracerebral hemorrhages
- 5.4.7. Diffuse axonal injury
- 5.4.8. Cerebral herniation syndromes
- 5.4.9. Fat embolization
- 5.4.10. Trauma in infancy

5.5. Infectious Diseases

- 5.5.1. Epidural abscess
- 5.5.2. Subdural abscess
- 5.5.3. Meningitis
- 5.5.4. Brain abscesses
- 5.5.5. Tuberculomas
- 5.5.6. Sarcoidosis
- 5.5.7. Cryptococcosis
- 5.5.8. Mucormycosis
- 5.5.9. Toxoplasmosis
- 5.5.10. Cysticercosis
- 5.5.11. Encephalitis
- 5.5.12. HIV infections
- 5.5.13. Cytomegalovirus

5.6. Vascular Pathology

- 5.6.1. Acute and subacute infarcts
- 5.6.2. Embolic infarcts
- 5.6.3. Vasculitis
- 5.6.4. Malformations
 - 5.6.4.1. Arteriovenous malformations
 - 5.6.4.2. Cavernous angiomas
 - 5.6.4.3. Venous angioma
 - 5.6.4.4. Capillary telangiectases
- 5.6.5. Aneurysms
 - 5.6.5.1. Saccular aneurysms
 - 5.6.5.2. Infectious (“mycotic”) aneurysms
 - 5.6.5.3. Giant aneurysms
 - 5.6.5.4. Traumatic & dissecting aneurysms
- 5.6.6. Vascular malformations

5.7. Neoplasm

5.7.1. Meningiomas

- 5.7.1.1. Meningothelial (syncytial) fibrous
- 5.7.1.2. Transitional
- 5.7.1.3. Psammomatous
- 5.7.1.4. Angiomatous
- 5.7.1.5. Papillary
- 5.7.1.6. Atypical
- 5.7.1.7. Anaplastic
- 5.7.1.8. Hemangiopericytomas

5.7.2. Pineal & Pituitary

- 5.7.2.1. Pineocytoma
- 5.7.2.2. Pineoblastoma
- 5.7.2.3. Pituitary adenoma
- 5.7.2.4. Craniopharyngiomas
- 5.7.2.5. Rathke pouch cysts
- 5.7.2.6. Lymphocytic hypophysitis
- 5.7.2.7. Pituitary “apoplexy”
- 5.7.2.8. Empty sella syndrome

5.7.3. Tumor syndromes

- 5.7.3.1. Neurofibromatosis type 1
- 5.7.3.2. Neurofibromatosis type 2
- 5.7.3.3. von Hippel-Lindau syndrome
- 5.7.3.4. Tuberous sclerosis
- 5.7.3.5. Cowden syndrome
- 5.7.3.6. Turcot syndrome

5.7.4. Peripheral Nervous System

- 5.7.4.1. Peripheral schwannoma
- 5.7.4.2. Neurofibromas
- 5.7.4.3. Malignant peripheral nerve tumors
- 5.7.4.4. Spinal root and peripheral nerve root cysts

5.7.5. Skull

- 5.7.5.1. Dermoids and epidermoids
- 5.7.5.2. Hemangiomas
- 5.7.5.3. Osteomas
- 5.7.5.4. Eosinophilic granuloma
- 5.7.5.5. Paget's disease
- 5.7.5.6. Osteosarcoma
- 5.7.5.7. Chordomas
- 5.7.5.8. Chondrosarcoma
- 5.7.5.9. Fibrous dysplasia

5.7.6. Eye and Orbit

- 5.7.6.1. Retinoblastomas
- 5.7.6.2. Ocular melanomas
- 5.7.6.3. Optic nerve gliomas
- 5.7.6.4. Optic nerve meningiomas
- 5.7.6.5. Orbital lymphomas and pseudotumors
- 5.7.6.6. Orbital metastases
- 5.7.6.7. Orbital hemangioma

6. Neuro-Radiology

6.1. General

- 6.1.1. Safety in performing radiological exam
- 6.1.2. Intravenous contrast agents
 - 6.1.2.1. Types
 - 6.1.2.2. Potential complications

6.2. Skull X-ray

- 6.2.1. Identify normal anatomical structures
 - 6.2.1.1. Anterio-posterior view
 - 6.2.1.2. Lateral view
 - 6.2.1.3. Towne view
- 6.2.2. Identify traumatic injuries on X-ray
 - 6.2.2.1. Linear fracture
 - 6.2.2.2. Decompressed fractures
 - 6.2.2.3. Pnemocephalus
 - 6.2.2.4. Foreign bodies

6.3. CT Scan

- 6.3.1. Identify normal structures
- 6.3.2. Identify traumatic injuries
 - 6.3.2.1. All types of skull fractures
 - 6.3.2.2. Intracranial hematomas
 - 6.3.2.2.1. Epidural
 - 6.3.2.2.2. Acute & chronic subdural
 - 6.3.2.2.3. Intraparenchymal
 - 6.3.2.2.4. Intraventricular
 - 6.3.2.3. Cerebral contusions
 - 6.3.2.4. Subarachnoid hemorrhage
- 6.3.3. Identify pathologic conditions
 - 6.3.3.1. Ischemic infarction
 - 6.3.3.2. Venous infarction
 - 6.3.3.3. Hydrocephalus
 - 6.3.3.4. Cysts
 - 6.3.3.5. Tumors
 - 6.3.3.6. Cerebral edema
 - 6.3.3.7. Infections

6.3.3.8. Congenital abnormalities

6.4. MRI

- 6.4.1. Concepts of magnetic resonance (MR)
- 6.4.2. MR Imaging sequences
- 6.4.3. Identify normal structures
- 6.4.4. Identify traumatic injuries
 - 6.4.4.1. Pneumocephalus
 - 6.4.4.2. Intracranial hematomas
 - 6.4.4.2.1. Epidural
 - 6.4.4.2.2. Subdural
 - 6.4.4.2.3. Intraparenchymal
 - 6.4.4.2.4. Intraventricular
 - 6.4.4.2.5. Cerebral contusions
 - 6.4.4.2.6. Diffuse axonal injury
- 6.4.5. Identify pathologic conditions
 - 6.4.5.1. Ischemic infarction
 - 6.4.5.2. Venous infarction
 - 6.4.5.3. Hydrocephalus
 - 6.4.5.4. Cysts
 - 6.4.5.5. Tumors
 - 6.4.5.6. Cerebral edema
 - 6.4.5.7. Vascular occlusions
 - 6.4.5.8. Infections
 - 6.4.5.9. Congenital abnormalities

6.5. Spine Radiology

- 6.5.1. Identify normal structures
- 6.5.2. Radiographic diagnoses of
 - 6.5.2.1. Platybasia
 - 6.5.2.2. Cranial settling
- 6.5.3. Identify traumatic injuries
 - 6.5.3.1. Craniovertebral junction
 - 6.5.3.2. Occipital condyle fractures
 - 6.5.3.3. Atlanto-occipital dislocation
 - 6.5.3.4. Posterior atlas fractures
 - 6.5.3.5. Dens fractures
 - 6.5.3.6. Axis body fractures
 - 6.5.3.7. Hangman's fracture
 - 6.5.3.8. Atlas and axis facet fractures
 - 6.5.3.9. Atlanto-axial rotatory dislocation

6.6. Angiography and Interventional Neuroradiology

Core Clinical Problem List and Representative Diseases

Subject Review	LEARNING OUTCOMES
Anterior skull base	<p><u>Management of the following:</u> Anterior skull base meningioma Sinonasal tumors Encephaloceles CSF fistulas Anterior fossa dermal tumors Anterior fossa bone pathologies</p>
Sellar and parasellar region	<p><u>Management of the following:</u> Pituitary tumors Eosinophilic Granuloma Sarcoidosis Suprasellar germline tumors Suprasellar glioma Craniopharyngiomas</p>
Middle fossa	<p><u>Management of the following:</u> Meningioma Schwannoma Chordoma Chondrosarcoma Encephalocele Dermoid tumors</p>
Posterior fossa	<p><u>Management of the following:</u> Meningioma Schwannoma Dermoid tumors Chordoma Chondrosarcoma Abscess Paraganglioma Metastatic disease Chiari malformation</p>
Adjuvant therapies	<p><u>Radiation treatment for skull-base lesions</u> Types of radiation Outcomes Side effects Modalities Indication Radiosurgery Current clinical trials for radiation treatment of skull-base lesions <u>Chemotherapies and systemic drugs</u> Current available systemic treatments for the following: Meningioma Schwannoma Chordoma Other tumors Current clinical trials for systemic treatment of skull-base lesions</p>

Surgical skills

Category 1 procedures

Common procedures
 Trainee should perform them with minimal supervision during his/her first year.
 No supervision needed during second year.

Category 2 procedures

Common procedures
 Trainee should perform them with minimal supervision during his/her second year.

Category 3 procedures

Rare and complex procedures
 Observation during first year
 Trainee should perform them under supervision during his/her second year.

Category 4 procedures

Rare and complex procedures
 Observation during first and second years

Category 1	Standard transnasal (30 cases) Standard pterional craniotomy (30 cases) Standard retrosigmoid craniotomy (40 cases) Bifrontal Craniotomies (20 cases)
Category 2	Craniofacial surgery (10 cases) Extended transnasal sellar approaches (20 cases) Extended pterional craniotomy (20 cases) Extended Bifrontal craniotomies (10 cases)
Category 3	Frontal trans-basal approach (5 cases) Extended trans-temporal craniotomy (5 cases) Middle fossa craniotomy (5 cases) Endoscopic transclival approaches (5 cases) Endoscopic transcribriform approaches (5 cases)
Category 4	Trans-oral approaches (2 cases) Trans-jugular approaches (2 cases) Endoscopic lateral transnasal approaches (2 cases) Endoscopic approach to C1-C2 (1 cases)

Practical skills training (simulation and workshops)

The candidate is expected to attend two workshops and two skull-base conferences every year.

Recommended courses

Pittsburgh Skull Base Course (Endoscopic)
New-York Skull-Base Course (Open approaches)
NASBS Meeting
NASBS Pre-Conference Courses

Assessment and Evaluation Tools

The assessment and evaluation of fellows for relevant clinical and non-clinical setting perspectives are performed in accordance with the rules and regulations of the Saudi Commission of Health Specialties. Fellows are expected to learn CanMEDS competencies during their training.

“Assessment” is the act of making a judgment about the process and the quality of knowledge gain and acquisition of competencies for each resident, whereas “Evaluation” is the act of quantifying and appraising the outcome of training for each resident. The continuous assessment:

1- Mini-Clinical Evaluation (mini-CEX)

This is an assessment tool that requiring 15–20 minutes. It describes an observed, real-life, interactive communication between a trainee and a patient and/or the health worker. The assessor provides the trainee with immediate feedback on this interaction, focusing on the clinical knowledge, examination skills, attitudes, and behaviors of the trainee toward the other party. This can be conducted in the outpatient clinic or the ward or other clinical or simulated settings. This part contributes no weightage to the total marks at the end of the year, and passing this is not mandatory for promotion. We recommend three evaluations per rotation.

2-Case based discussions (CBDs)

This is an assessment tool that would require 20 to 30 minutes. It describes an assessment based on the discussion of a clinical case scenario held between the resident and the trainer. Cases should be chosen jointly by the resident and trainer to address a range of topics that reflect individual learning needs related to the case. Feedback and actions advised for further learning are recorded mainly for the resident’s training benefit. This part contributes no weightage towards the total marks at the end of the year, and passing this is not a requirement for promotion. We recommend three evaluations per rotation.

3- 360-degree multi-source feedback evaluation (360)

The 360-degree evaluation is formulated by averaging multiple evaluations of people in a fellow's sphere of work. Evaluators completing the evaluation forms usually are superiors, peers, subordinates, as well as other health professional and patients and families. The evaluation takes into account teamwork, communication, management skills, and decision-making. It addresses most CanMEDS competencies including the communicator, professional, collaborator, manager, scholar, and patient advocate.

The validated modified Inter Professional Collaborator Assessment Rubric form is used. This should be conducted every three months (end of rotation), and the standard SCFHS evaluation approved form will be used. This evaluation contributes no weightage toward the total marks at the end of the year, and passing this is not a requirement for promotion.

4-End-of-rotation Assessment Form

25% OF THE TOTAL MARKS AT THE END OF THE YEAR

Competencies	Below expectation	Meets expectation	Exceeds expectation
Medical Expert			
1. Appropriate basic and clinical knowledge			
2. Accurate history and physical exam			
3. Appropriate clinical decisions			
4. Appropriate emergency management			
5. Appropriate indication for surgical procedures			
Procedures and clinical skills			
6. Performance during endoscopic procedures			
7. Performance during open surgical procedures			
8. Independent performance on cases appropriate to level of training			
9. Achieving the minimum number required			
Communicator			
10. Appropriate interaction with urology patients			
11. Accurate documentation			
12. Appropriate planning			
13. Clear presentation			
Collaborator			
14. Appropriate interaction with health professionals			
15. Appropriate consultations			
16. Appropriate management of conflicts			
Manager			
17. Appropriate use of information technology			
18. Appropriate understanding of resources			
19. Appropriate time management			
20. Follow policies and procedures			
21. Maximize benefits to patients			
Health advocate			
22. Appropriate responses in advocacy situations			
Scholar			
23. Understand the continuous need for education			
24. Implement an ongoing plan for self-education			

COMPETENCIES & OUTCOMES

Competencies	Below expectation	Meets expectation	Exceeds expectation
25. Analyze and integrate medical information			
26. Teach others			
27. Completion of the electronic Log-book			
Professional			
28. Appropriate professional attitude			
29. Understands medical and legal obligations			
30. Punctual			
31. Maintain ethics and morals			
32. Accepts advices			
33. Participates in professional organizations			
Final Results			
<p>Does the trainee meet his level of training?</p> <p>Comments from program director:</p> <p>Comments from trainee:</p> <p>Signature of program director:</p> <p>Signature of trainee:</p>			

5- End-of-year examination (promotion exam)

- Once at the end of the year
- 10 short essays
- 5 oral clinical situations (10 min each)
- Passing mark is 60%
- 25% of the total marks
- Passing mandatory for promotion

6- Logbook

It is a part of the portfolio. The logbook has the following purposes:

- Monitor trainees' performance on a continual basis
- Document and record the cases observed and managed by the trainees (please see previous section for number of cases needed for graduation)
- Maintain a record of procedures and technical intervention performed
- Enable trainee and supervisor to determine the learning gaps
- Provide a basis of feedback to the trainee

7-Trainee portfolio

Portfolio is an integral component of training. Each trainee will be required to maintain a logbook. The educational supervisor should be in charge of monitoring and reviewing the portfolio and providing continuous feedback to the trainee. Portfolio should include the following:

- Curriculum vita
- Professional development plan
- Records of educational training events
- Reports from the educational supervisors
- Logbook
- Case write-ups (selected)
- Reflection
- Others: patient feedback, clinical audits etc.

8-Final examination

(After completing two years of training and passing the promotion)

Passing the final examination is mandatory to obtain the final certificate of completion of training.

This can only be taken upon fulfilling all the requirements (see above for details).

- Rotation
- Promotion approved after the second year (60% total in continuous assessment and promotion exam)
- Completed required number of cases (log book)
- Followed the SCFHS requirements and paid fees for taking the final examination
- Approval by the training committee

The final examination has two parts, and both parts must be passed independently.

A-Written Final Examination (Part 1)

One paper:

1-Short Answer Questions

2-Modified Essay Question

This exam will evaluate the trainee's comprehension of the curriculum. The questions will discuss and focus on the pathophysiology, anatomy, surgical approaches, disease classification, management, epidemiology, diagnosis, and prognosis.

3-50 MCQs

B-Oral Final Examination (Part 2)

This is a multi-station Structured Oral Clinical Examination (SOE) with independent examiners. Each station has a duration of 10 minutes, and there are a total of 10 stations.

Distribution of stations:

- Station 1: Anterior skull-base pathology
- Station 2: Sellar skull-base pathology
- Station 3: Middle fossa skull-base pathology
- Station 4: Posterior fossa pathology (1)
- Station 5: Posterior fossa pathology (2)
- Station 6: Craniocervical junction pathology
- Station 7: Sphenoid bone pathology
- Station 8: Adjuvant therapy (1)
- Station 9: Adjuvant therapy (2)
- Station 10: Complications

Components of assessment and evaluation

Formative Assessment: Ongoing objective assessment and feedback

Formative assessment is a process that offers information that can help in adjusting and improving the learning and teaching process and objectives as the training is being conducted. It serves as a tool for the neurosurgical teaching staff to monitor and understand the academic and skill level of the resident as well as the effectiveness of his training. This process guides both the trainer and the trainee to accomplish the best and most effective personalized training.

Mid-rotation assessment and feedback: Before the completion of the first half of any of the resident's rotations, the trainer/mentor who is in charge of training that resident should go over the completed assessment forms at least once in the presence of the trainee. The results should guide the trainee and the trainer on formulating the rest of the rotation.

- Case based discussions (CBDs)
- Mini-Clinical Evaluation (mini-CEx)
- Global Neurosurgical Skill assessment (GNSA)

End-of-rotation assessment (CanMEDS competencies-based assessment): The resident and trainer(s) should have another set of CBDs, mini-CEx, and Neurosurgical Skill Assessment before completing the rotation, and an average should be submitted for the end-of-rotation assessment.

VI. TRAINEE SUPPORT

Our candidate can be sponsored by their respective agencies (sponsoring agency/center for his training as fellow) in which case the subsequent section would apply. This collaboration is governed by the rules and regulations of transparency and adherence to the code of ethics and mutual regulating bylaws.

Sponsors' support for research funding

If the fellow is sponsored by their respective agency, the fellow is entitled to a research funding to facilitate the performance of the mandatory research project. Such funding will vary according to the project submitted, but it should not in any way be spent on personal or logistic expenses.

VII. POLICIES AND PROCEDURES

We follow the SCFHS training bylaws. Please refer to the SCFHS website for procedures and policies.

General

1-Policy for appeal of evaluation

In case of a contested evaluation by a fellow, an ad hoc evaluation review committee is set-up. The role of the evaluation review committee is to make a judgment on the reasonableness of a fellow's evaluation.

Should the committee conclude that the evaluation under review was not reasonable, the committee will provide a "new" assessment. In other words, the modified overall evaluation may remain unchanged, be upgraded, or downgraded.

Steps to follow for the appeal:

- 1) The fellow requests a review of the evaluation in writing to the director of the fellowship at the center.
- 2) The director of the fellowship at the center asks the director of the fellowship at SCFHS to set up an ad hoc evaluation review committee. This committee will be composed of three to five members. The Chair of the committee should be from a different region/institution than the one from where the fellow's evaluation was issued. All members should have experience in the teaching and evaluation of residents and fellows. All committee members must be in a position to render an impartial judgment.
- 3) The fellow and evaluator (or center fellowship director) should provide copies of any written document to be submitted to the committee at least a week prior to the meeting.
- 4) No documents may be submitted by external bodies.
- 5) The fellow and evaluator (or center fellowship director) may have an adviser present at the review. This adviser must be a member of the neurosurgical community and not be paid for these services. The role of the adviser is to advise and help the fellow and/or evaluator to present his/her case. It is important for the committee to hear directly from the fellows and the evaluator. The committee Chair will invite the adviser(s) to make a short statement on behalf of the fellow or the evaluator before the close of the meeting.
- 6) No observers are permitted at the proceedings.
- 7) The fellow will present his/her version of the performance and the evaluation. The evaluator (or center fellowship director) will then provide a summary of the fellow's performance to the committee and an explanation for the evaluation. The Chair may invite the advisers to speak in support of either party. Both parties are present during this portion of the proceedings.
- 8) The fellow, evaluator, and advisers are then asked to leave the room while the committee deliberates.
- 9) The parties are informed verbally by the Chair as soon as the decision has been made, and in writing at the earliest.

2-Policy for harassment and intimidation and discrimination

The aim of all the centers involved in this fellowship program is to promote an equitable environment where the fundamental dignity of all of its members is respected. The objectives of this Policy on Harassment, Sexual Harassment, and Discrimination, all of which are prohibited, are to promote education and awareness about equity issues and to ensure that procedures are in place to address complaints of harassment, sexual harassment, and discrimination prohibited by law.

For the purpose of this policy, few definitions are to be considered.

Harassment and intimidation means any vexatious behavior by one Member of the training community towards another member in the form of repeated hostile or unwanted conduct, verbal comments, actions, or gestures, that affect the dignity or psychological or physical integrity of the complaining individual. Within the educational relationship, a single serious incidence of such behavior that has a lasting harmful effect on an individual may also constitute harassment.

Sexual Harassment means any conduct of a sexual nature by one member of the training community towards another Member, where sexual activity:

(a) is made an explicit or implicit term or condition of an individual's employment or status in the program, or

(b) is used as a basis for an employment or training decision affecting an individual;

or any conduct of a sexual nature by one member of the training community towards another member, the effect of which is to impair that person's work or educational performance where it is known or ought to be known that the conduct is unwelcome.

Discrimination means any action, behavior, or decision based on race, color, gender, pregnancy, civil status, age (except as provided by law), religion, political conviction, language, ethnic or national origin, social condition, or a disability; the result is exclusion or preference of an individual or group within the training community. This includes both the actions of individual members of the department and systemic institutional practices and policies of the centers involved.

The "Complainant" is the fellow initiating the complaint.

The "Assessor" is an impartial elected member of the fellowship training community who is known to all fellows and training center, whose mandate is to be the person to contact in such cases and that he/she will initiate the subsequent process.

The "Respondent" is the person or institution against who the complaint is launched

In case any of these complaints are raised, the following steps should be performed:

The Complainant must submit the complaint to the Assessor in writing in sufficient detail, within one academic year from when the incident occurred.

The Assessor will then inform the Respondent in writing about the complaint, for which the Respondent has to acknowledge the receipt of the complaint in writing.

The Assessor shall provide the Complainant and the Respondent with the following:

Copy of this Policy

Information on sources of advice and assistance; and

Information on their rights, obligations, and internal and external recourses, pursuant to the law and to applicable collective agreements, policies, and regulations.

The Assessor shall inform both the Complainant and the Respondent of their right to be accompanied by an Advisor.

3- Informal Resolution of Complaints Prior to Investigation

- a) The Assessor shall attempt an informal resolution through any means deemed appropriate in the particular situation.
- b) The names of the Complainant and the Respondent may not be divulged by the Assessor to any third party without their written consent.
- c) The parties should attempt a resolution by engaging in an open discussion conducted in a respectful manner. However, no party to a Complaint is obliged or coerced to participate in an attempt at informal resolution.
- d) If a resolution acceptable to both parties is achieved, the resolution shall be acknowledged by the Complainant and the Respondent in writing, in sufficient detail to allow for its implementation, with the Assessor signing as a witness.
- e) If the event that led to the complaint recurs, the Complainant has the right to make a subsequent complaint. Such Complaint will then be addressed by means of a formal investigation only.
- f) The Assessor has the authority to start a formal investigation if he/she deems this complaint unresolvable by informal means or in case a complainant or respondent fails to comply with the policy within 30 days of its initiation.
- g) At any point before the decision for the formal investigation begins, the complaint can be withdrawn.

4- Formal Resolution: Investigation of Complaints

- a) The Assessor shall investigate the complaint fairly and objectively, using such methods as are deemed appropriate in the circumstances, which may include the following:
 - Meeting with witnesses,
 - Reviewing files and documentation,
 - Seeking information from third parties.
- b) All members of the training community, and their respective centers, shall cooperate with the Assessor and respond in a timely fashion to requests from the Assessor for meetings or for information.
- c) The Assessor shall meet with the Complainant and the respondent individually.
- d) Once an investigation has begun, a Complaint may be withdrawn by the Complainant with the consent of the Respondent. This shall be evidenced in writing, with the Assessor signing as a witness.
- e) Once the decision is made by the assessor, he/she should report this to the fellowship director along with the recommended disciplinary actions entailed.
- f) If the fellowship director is in agreement with the Assessor's recommendation, a formal decision is issued to implement these recommendations within 15 days of the Assessor's decision.
- g) If the fellowship director disagrees with the Assessor's recommendations, he/she has to consult an opinion of another member of the training community to reach a final decision within 15 days of stating his or her objection.

5- Research and publication authorship agreement

Authorship confers credit and has important academic, social, and financial implications. Authorship also implies responsibility and accountability for published work.

We refer to the international committee of medical journal editors' criteria to define an "author:"

- a) Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work; AND
- b) Drafting the work or revising it critically for important intellectual content; AND
- c) Final approval of the version to be published; AND
- d) Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

The following are not generally considered sufficient warrants for authorship:

- a) Acquisition of funding
- b) Data collection, although qualitative data creation may constitute a warrant if it makes a significant conceptual contribution to the project;
- c) Providing feedback on a draft manuscript without contributing to conceptualization, analysis, or interpretation;
- d) Payment for services rendered as a researcher or consultant (payment does not exclude warrant, but is not sufficient for warrant)
- e) Being a supervisor of an author on the publication; or
- f) Being the Head of Department in which the author or authors are employed.

We encourage the explicit negotiation of Authorship from the beginning of a project and throughout a project. Difficulties with authorship generally arise when expectations differ between team members. Research team leaders should initiate discussions about authorship from the very beginning of a project and throughout a project. A team can choose to indicate their agreement in writing and modify it as the project moves along and according to the role(s) adopted by each member till the time of the publication.

Team members should recognize that a principle author (PA) has responsibility and authority over the final author list. The decisions of the PA may be challenged. Challenges should be as follows:

- 1) supported with reasons and evidence;
- 2) conducted openly, as part of a formal research meeting; and
- 3) handled as reasonably and amicably as possible.

In order to ensure fulfillment of the responsibility to their teams, if the PA does not have a working draft prepared when 75% of the allocated time has elapsed, the co-authorship team may reasonably consider reallocating PA status for that specific manuscript. This decision must be made collectively by the whole authorship team. It cannot be made unilaterally.

PA status can be reallocated only when:

- 1) The team has set clear goals at the outset, including the specific manuscript to be prepared and the date by which it should be prepared; and

- 2) In the case of a PA who is a junior researcher, the PA has received appropriate support and assistance from their appointed mentor.

If PA status is reallocated, the original PA has a responsibility to provide their existing work to the new PA and support them to develop the final manuscript. The original PA may retain their warrant for authorship, but is unlikely to be the first author.

If agreement cannot be reached to the satisfaction of all team members, the challenger(s) and/or the PA should make a joint submission, or separate submissions if necessary, to the fellowship Director who shall present this dispute to the fellowship research director to offer guidance. If the dispute cannot be resolved to the satisfaction of all parties within the fellowship level, the matter should be referred by the Director to the appropriate person in the institution in which the research is conducted for external mediation, in consultation with the disputing parties

References

Snyderman C, Carrau R, Kassam A. Who Is the Skull Base Surgeon of the Future? *Skull Base*. 2007;17(6):353-355. doi:10.1055/s-2007-986427.