INTRODUCTION

The Skull Base Fellowship Program at the University of Utah accepts one fellow annually. Applicants must have completed neurosurgical residency training and fellows are selected after review of applications and an interview process. The neurosurgery fellow will spend 12 months on the neurosurgery service at the University of Utah Hospital. In addition they are encouraged to engage in scholarly activity and have the opportunity to participate in research projects with all the vascular neurosurgeons.

The residency training program in the Dept. of Neurosurgery is the priority of our faculty. Fellowship applicants are advised that our educational mission is resident centric. The chief residents have their choice of cases on which to scrub. However, with the volume of material on the neurosurgery service, there are often three or four operating rooms running simultaneously. While the chief residents can choose the cases that interest or challenge them the most, the volume of cases is such that there is ample material for fellowship trainees as well. With this balance, there has been a good acceptance of the case-sharing concept necessary to preserve resident experience.

Unrestricted educational grants are provided by industry and this is used to provide salary support for the fellowship. The department provides structured teaching and case conferences and access to our medical library. The department also provides office space with a computer and clerical staff.

The interactions between the department and the fellow are mutually beneficial. The fellow is able to augment the teaching provided to the residents, assist them in covering OR cases and provide supervisory coverage in clinics, thereby freeing up the chief residents and allow them increased operative experience.

STRUCTURE

Duration: The Fellowship is expected to be for one year.

Training Site: University of Utah Hospital

Clinical Duties: The fellow is expected to rotate and participate in the clinical diagnosis, preoperative assessment, intraoperative participation and postoperative management of patients with skull base lesions. The skull base procedures include management of complex tumors at the base of the skull extending from the anterior to the posterior cranial fossa. Also included in the skull base procedures is the vast experience with management of complex aneurysms located at the cranial base. The clinical material also consists of management of head and neck cancer patients along with the ENT Division within the Department of Surgery. None of the involvement of the fellow will interfere with neurosurgical resident training. The material in the Department of Neurosurgery exceeds the ability of senior resident involvement in all cases. The fellow will also be involved with teaching of residents at all levels.
Clinical Oriented Research: The fellow is expected to be involved in the study of the various disease processes that involve the cranial base. In addition, the anatomical skull base laboratory provided by the Department of Neurosurgery is available for correlative anatomical studies and the developments and refinements in skull base approaches.

The objective of training is to give fellows an organized, comprehensive, supervised, full-time educational experience in open skull base surgery. This experience includes the management of patients with all types of vascular conditions, the performance of simple and complex open surgical procedures, and the integration of these techniques into the surgical therapy of patients with complex vascular and skull base neoplastic diseases.

Educational Commitment: There is a monthly multi-disciplined conference in conjunction with ENT. The cases are presented for discussion and management. The Neuroradiology Department participates in the evaluation of the films for the skull base surgery.

SUPERVISION

Supervision: Program Faculty will have responsibility for teaching, supervision, and formal evaluation of the fellow’s performance in accordance with the program Standards of Performance. All policies and procedures for the skull base fellowship are consistent with the institutional and ACGME program requirements and duty hours.

Procedures: For procedures in the operating room, the faculty will always be present within the building where the operating room is located and within the operating room for the critical portion of all cases. For the majority of cases the faculty neurosurgeon is scrubbed as either primary surgeon or the first assistant.

The Program Faculty includes:
William T. Couldwell, M.D., Ph.D., Professor and Chairman, Fellowship Program Director
Richard H. Schmidt, M.D., Ph.D., Associate Professor of Neurosurgery
Joel D. MacDonald, M.D., Associate Professor of Neurosurgery
Min S. Park, M.D., Assistant Professor of Neurosurgery
Philipp Taussky, M.D., Assistant Professor of Neurosurgery

EVALUATION

Evaluations: The fellow is formally evaluated by the faculty every three months. This is done online at https://www.e-value.net/ using evaluation forms based on the six competencies as outlined by the ACGME/Neurosurgery RRC. An assessment of their strengths and weaknesses and recommendations for improvement is developed. These evaluation forms are reviewed by the Fellowship Director. The Fellowship Director then meets with the fellow individually to review the evaluation. The fellow receives a copy of the evaluation and may discuss it further at any time.

FELLOWSHIP IMPACT

The skull base fellow works primarily with Dr. Couldwell on complex vascular and skull base cases. On most operative days Dr. Couldwell runs two operative rooms, with the chief resident working in one room and the fellow in the other. Occasionally, on cases with exceptional teaching value, the skull base fellow and the chief, senior or junior resident may work together in
the same room. The skull base fellow also scrubs in and assists in cases where a resident is not available. There are enough complex skull base and vascular procedures that the fellow does not interfere with senior or chief resident education. The skull base fellow routinely assists in the instruction of the resident staff by teaching in the OR. Overall, the impact of the skull base fellow is very positive on the resident training program. The skull base fellow participates in the Wednesday resident educational sessions. The skull base fellow also helps in the didactic instruction in the OR with junior and mid-level residents (opening and closing).

FELLOWSHIP FACULTY

William Couldwell M.D., Ph.D. (Fellowship Program Director)
Medical Specialty: Neurosurgery
Institution: University of Utah Health Care
Faculty Rank: Professor
Hospital Position: Chairman, Department of Neurosurgery
Participation in Subspecialty: Full-time
% Practice in Subspecialty: 100

Education
Medical School / Graduation Year: McGill University/1984
Internship / Graduation Year: University of Southern California / 1985
Residency / Graduation Year: University of Southern California / 1989
State and License #: Utah 5022518-1205
Certification Body / Year: ABNS/1994
Date Current Appointment Began: 11-1-2001

Joel MacDonald M.D.
Medical Specialty: Neurosurgery
Institution: University of Utah Health Care/Intermountain Medical Center
Faculty Rank: Associate Professor
Hospital Position: Associate Professor
Participation in Subspecialty: Full-time
% Practice in Subspecialty: 100

Education
Medical School / Graduation Year: University of North Carolina/1989
Internship / Graduation Year: Carolinas Medical Center /1990
Residency / Graduation Year: University of Utah/1995
State and License #: Utah 183354-1205
Certification Body / Year: ABNS / 2001
Date Current Appointment Began: 7-1-1999

Min S. Park, M.D.
Medical Specialty: Neurosurgery
Institution: University of Utah Health Care
Faculty Rank: Assistant Professor
Hospital Position: Assistant Professor
Participation in Subspecialty: Full-time
% Practice in Subspecialty: 100

Education
Medical School / Graduation Year: Indiana University / 2002
Internship / Graduation Year: University of California, San Diego / 2003
Residency / Graduation Year: University of California, San Diego / 2007
State and License #: Utah 8955730-1205
Certification Body / Year: ABNS/2013
Date Current Appointment Began: 7-21-2014
Richard Schmidt M.D., Ph.D.
Medical Specialty: Neurosurgery
Institution: University of Utah Health Care
Faculty Rank: Associate Professor
Hospital Position: Associate Professor
Participation in Subspecialty: Full-time
% Practice in Subspecialty: 100

Education
Medical School / Graduation Year: University of Iowa/1985
Internship / Graduation Year: University of Washington/1986
Residency / Graduation Year: University of Washington/1993
State and License #: Utah 265597-1205
Certification Body / Year: ABNS/1998
Date Current Appointment Began: 8-15-1993

Philipp Taussky M.D.
Medical Specialty: Neurosurgery
Institution: University of Utah Health Care
Faculty Rank: Assistant Professor
Hospital Position: Assistant Professor
Participation in Subspecialty: Full-time
% Practice in Subspecialty: 100

Education
Medical School / Graduation Year: University of Basel, Basel, Switzerland / 2003
Internship / Graduation Year: University Hospital Bern, Bern Switzerland / 2004
Residency / Graduation Year: Kantonsspital Aarau, Aarau, Switzerland / 2009
State and License #: Utah 8127589-1252
Certification Body / Year: N/A
Date Current Appointment Began: 9-1-2012

PREVIOUS FELLOWS

<table>
<thead>
<tr>
<th>NAME</th>
<th>RESIDENCY</th>
<th>FELLOWSHIP COMPLETION DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aaron Cutler, M.D.</td>
<td>UCLA</td>
<td>6-30-2014</td>
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<tr>
<td>Martin Cote, M.D.</td>
<td>Laval University, Quebec Canada</td>
<td>6-30-2013</td>
</tr>
<tr>
<td>Roukoz Chamoun, M.D.</td>
<td>Baylor</td>
<td>6-30-2012</td>
</tr>
<tr>
<td>Tamer Altay, M.D.</td>
<td>Hacettepe University, Ancara, Turkey</td>
<td>6-30-2011</td>
</tr>
<tr>
<td>Philip Taussky, M.D.</td>
<td>Inselspital Bern, Kantonsspital Aarau, Switzerland</td>
<td>6-30-2010</td>
</tr>
<tr>
<td>Michael Walsh, M.D.</td>
<td>University of Vermont</td>
<td>6-30-2009</td>
</tr>
<tr>
<td>Jeroen Coppens, M.D.</td>
<td>St. Louis University</td>
<td>6-30-2008</td>
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Goals and Objectives

FELLOWSHIP GOALS

In this subspecialty, the objective of training is to give fellows an organized, comprehensive, supervised, and full time educational experience in cerebrovascular and skull base neurosurgery. This expertise includes the evaluation and medical and surgical treatment of diseases of the vasculature of the brain and spinal cord, complex tumors at the base of the skull extending from the anterior to the posterior cranial fossa. Also included in the skull base procedures is the vast experience with management of complex aneurysms located at the cranial base. The clinical material also consists of management of head and neck cancer patients along with the ENT Division within the Department of Surgery.

By the end of the training, fellows:

- will have received broad exposure to clinical evaluation and appropriate patient selection for operative and non-operative management in both the inpatient and outpatient settings
- will have an expanded and cultivated their knowledge and skills developed during residency in the diagnosis, treatment, and management of skull base diseases
- will have actively participated in the operative management of a wide range of cerebrovascular conditions including both extracranial and intracranial vascular diseases and abnormalities
- will have taken part in clinical, anatomic, and neuroscience research as an integral component of the educational experience
- will gain training and experience in the:
  - signs and symptoms of disorders amenable to diagnosis and treatment by skull base techniques;
  - pathophysiology and natural history of neurological disorders;
  - indications for and contraindications to skull base surgical procedures;
  - clinical and technical aspects of skull base surgical procedures;
  - medical and surgical alternatives;
  - preoperative and postoperative management of skull base surgical patients;
  - neurointensive care management;
  - fundamentals of imaging physics and radiation biology; and,
  - interpretation of neuroangiographic studies pertinent to the practice.
COMPETENCY-BASED OBJECTIVES

Patient Care

Fellows must be able to provide patient care that is compassionate, appropriate, and effective for the treatment of health problems and the promotion of health. Fellows:

- will participate in the daily operation of the clinical skull base service
- must make daily rounds with the attending faculty during which patient management decisions are discussed and made;
- will participate in the assessment of patients including clinical examination and diagnostic procedures
- will perform clinical pre-procedure evaluations of patients;
- will participate in diagnostic procedures including radiologic and physiologic studies
- will interpret preliminary diagnostic studies;
- will participate in the interpretation of the above data leading to the decision making process, ultimately developing a treatment plan
- will participate as an active member of the surgical team, enabling him/her to gain the essential surgical experience to conduct these procedures efficiently and effectively
- will consult with clinicians on other services;
- will perform diagnostic and therapeutic skull base surgical procedures;
- will generate procedural reports;
- will play an active role in the perioperative management of these patients, particularly management of the patient in the Neurosurgical Critical Care Unit.
- will participate in short-term and long-term post-procedure follow-up care, including neurointensive care;
- will maintain continuity of care of sufficient duration to ensure that the fellows are familiar with the outcome of all skull base surgical procedures;
- will serve as consultants under the supervision of staff neurosurgical practitioners. Direct interactions of fellows with patients must be closely observed to ensure that appropriate standards of care and concern for patient welfare are strictly maintained. Communication, consultation, and coordination of care with the referring clinical staff and clinical services must be maintained and documented with appropriate notes in the medical record
- must attend conferences organized by the faculty and held to allow discussion of topics selected to broaden knowledge in the field of skull base neurosurgery.
Medical Knowledge

Fellows must demonstrate knowledge of established and evolving biomedical, clinical, epidemiological and social-behavioral sciences, as well as the application of this knowledge to patient care. Fellows:

- will gain expertise in the clinical management of patients sustaining ischemic and/or hemorrhagic injury to the brain and/or spinal cord including:
  - Initial resuscitation and emergency treatment/diagnostic evaluation.
  - Critical care management and treatment of ischemic/hemorrhagic brain and spinal cord injuries.
  - Transitioning patients to the neurological rehabilitation phase of their treatment.

- will gain knowledge and understanding of the collaborative interaction between neuroradiologists, neurologists, and neurosurgeons

- will gain a working knowledge of the physiology and pathophysiology of ischemic/hemorrhagic brain and spinal cord injury.

- will gain expertise in the surgical treatment and management of patients with cerebrovascular disease including aneurysms, arteriovenous malformations, intracerebral hemorrhages, and carotid artery disease.

- will participate in available opportunities for clinical and/or laboratory research in ongoing and/or newly developed studies.

- will have the opportunity to carry out all of the following under close supervision:
  - Anatomical and physiologic basic knowledge:
    - Basic knowledge in arterial and venous angiographic anatomy of the brain, spine, spinal cord, and head and neck.
    - Venous angiographic anatomy of the brain, spine, spinal cord, and head and neck.
    - Collateral circulation
    - Dangerous anastomoses
    - Cerebral blood flow
    - Autoregulation
    - Pharmacology of CNS vasculature
  - Technical aspects of endovascular neurological surgery including:
    - Catheter and delivery systems
    - Embolic agents in cerebral, spinal, and head and neck embolization
    - Flow-controlled embolization
    - Complications of cerebral embolization
    - Flow control between the extracranial and intracranial circulation
    - Electrophysiology
    - Provocative testing (pre-therapeutic evaluation)
    - Complications of brain, spine, spinal cord, and head and neck embolization.
    - Imaging of the vascular system
  - Pharmacology
    - Contrast materials
    - Provocative testing with anesthetics and sedatives
    - Anticoagulants
    - Thrombolytics
  - Coagulation cascade
Brain/spine arteriovenous malformations, arteriovenous fistulas of the brain, spine, spinal cord, head and neck vascular malformations, ischemic stroke, and cerebral aneurysms (all types of ischemic and hemorrhagic diseases of central and peripheral neuraxes)

- Classification
- Clinical presentations
- Natural history
- Epidemiology
- Hemodynamic basis
- Indications for treatment
- Contraindications for treatment
- Therapeutic modalities
- Combined therapies

- Tumors of the head, neck, spine, and central nervous system
- Revascularization for occlusive vascular diseases
  - Arteriopathies
  - Atherosclerotic lesions
  - Techniques of revascularization: balloon angioplasty, thrombolytics, and stenting. All forms of pharmacologic and mechanical revascularization.

- Embolization for epistaxis or other causes of hemorrhage
- Invasive functional testing
- Balloon test occlusions

**Practice-Based Learning and Improvement**

Fellows must demonstrate the ability to investigate and evaluate their care of patients, to appraise and assimilate scientific evidence, and to continuously improve patient care based on constant self-evaluation and life-long learning. Fellows are expected to develop skills and habits to be able to meet the following goals:

- identify strengths, deficiencies, and limits in one’s knowledge and expertise;
- set learning and improvement goals;
- identify and perform appropriate learning activities;
- systematically analyze practice using quality improvement methods, and implement changes with the goal of practice improvement;
- incorporate formative evaluation feedback into daily practice;
- locate, appraise, and assimilate evidence from scientific studies related to their patients’ health problems;
- use information technology to optimize learning; and,
- participate in the education of patients, families, students, fellows and other health professionals.
Interpersonal and Communication Skills

Fellows must demonstrate interpersonal and communication skills that result in the effective exchange of information and collaboration with patients, their families, and health professionals. Fellows are expected to:

- communicate effectively with patients, families, and the public, as appropriate, across a broad range of socioeconomic and cultural backgrounds;
- communicate effectively with physicians, other health professionals, and health related agencies;
- work effectively as a member or leader of a health care team or other professional group;
- act in a consultative role to other physicians and health professionals; and,
- maintain comprehensive, timely, and legible medical records, if applicable.

Professionalism

Fellows must demonstrate a commitment to carrying out professional responsibilities and an adherence to ethical principles. Fellows are expected to demonstrate:

- compassion, integrity, and respect for others;
- responsiveness to patient needs that supersedes self-interest;
- respect for patient privacy and autonomy;
- accountability to patients, society and the profession; and,
- sensitivity and responsiveness to a diverse patient population, including but not limited to diversity in gender, age, culture, race, religion, disabilities, and sexual orientation.

Systems-Based Practice

Fellows must demonstrate an awareness of and responsiveness to the larger context and system of health care, as well as the ability to call effectively on other resources in the system to provide optimal health care. Fellows are expected to:

- work effectively in various health care delivery settings and systems relevant to their clinical specialty;
- coordinate patient care within the health care system relevant to their clinical specialty;
- incorporate considerations of cost awareness and risk-benefit analysis in patient and/or population-based care as appropriate;
- advocate for quality patient care and optimal patient care systems;
- work in inter-professional teams to enhance patient safety and improve patient care quality; and,
- participate in identifying system errors and implementing potential systems solutions.