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Education

<u>Year</u>	<u>Degree</u>	<u>Field of Study</u>	<u>Institution</u>
1992	BA (cum laude)	Biology	Dartmouth College
1996	MD (AOA)	Medicine	Columbia University
2005	Program in Clinical Effectiveness	Public Health	Harvard School of Public Health

Postdoctoral Training

<u>Year(s)</u>	<u>Title</u>	<u>Specialty/Discipline</u>	<u>Institution</u>
1996-1997	Intern	General Surgery	Massachusetts General Hospital
1997-2003	Resident	Neurosurgery	Massachusetts General Hospital
1999-2001	Postdoctoral Research Fellow	Neuro-oncology	Massachusetts General Hospital <i>Chiocca Laboratory</i>
2003-2004	Fellow	Pediatric Neurosurgery	Children's Hospital Boston
2004-2005	Clinical Research Fellow	Biomarker development	Children's Hospital Boston <i>Moses Laboratory</i>

Faculty Academic Appointments

1996-2004	Clinical Fellow	Surgery	Harvard Medical School
2004-2006	Instructor	Surgery	Harvard Medical School
2006 -2011	Assistant Professor	Surgery	Harvard Medical School
2011 -	Associate Professor	Surgery	Harvard Medical School

Appointments at Hospitals/Affiliated Institutions

1996-2004	Clinical Fellow	Surgery	Massachusetts General Hospital
2002-2003	Assistant in Surgery	Neurosurgery	Massachusetts General Hospital
2003-2004	Shillito Staff Associate	Neurosurgery	Children's Hospital Boston
2003 -	Assistant in Surgery	Neurosurgery	Brigham and Women's Hospital
2004 -	Assistant in Surgery	Neurosurgery	Children's Hospital Boston
2005 -	Consulting Staff-Surgical Services	Neurosurgery	Dana Farber Cancer Institute
2009 -	Faculty	Vascular Biology Program	Children's Hospital Boston

Other Professional Positions

2009 -	Scientific Advisory Committee	Brain Science Foundation, Wellesley, MA
2009 -	Medical Advisory Committee	Ella Grace Chiari Foundation, Nassau, NY

Major Administrative Leadership Positions

Local

(at Children's Hospital Boston)

2005 -	Neurosurgery liaison	Vascular Anomalies Center
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		Advanced Fetal Care Center
		Brain Tumor Program
2006 -	Neurosurgery liaison	Brain Injury Program
		Comprehensive Myelodysplasia Clinic
2006 -	Neurosurgery coordinator	Neurology-Neurosurgery Departmental Conference
2007-8	Neurosurgery liaison	Center for Head, Neck and Skull Base
		Stroke Program
2007 -	Neurosurgery coordinator	Endocrinology-Neurosurgery Conference
2008 -	Co-Director	Center for Head, Neck and Skull Base
		Stroke Program
2010 -	Director	Pediatric Cerebrovascular Surgery

Committee Service

2004 -	CHAMPS project – Children’s Hospital Applications Maximizing Patient Safety
2005 -	MRI Research Committee - Children's Hospital Boston
2007 -	Perioperative Clinical Practice Committee, Children’s Hospital Boston
2008 -	Steering Committee, Phenotyping and Banking Core of Neurological Disorders, Children’s Hospital Boston
2009 -	Global Surgery Leadership Committee, Children’s Hospital Boston
2010 -	Neuroscience Strategic Planning Committee, Children’s Hospital Boston
2011 -	Ultrasound Standards Committee, Children’s Hospital Boston

Professional Societies

1992 -	Sigma Xi Scientific Society
1996 -	Massachusetts Medical Society
2003 -	American Medical Association

- 2003 - American College of Surgeons
- 2004 - American Association of Neurological Surgeons
- 2005-2009 Neurosurgery Research and Education Foundation (NREF) Silent Auction Committee
 - 2007-2009 Education Coordinator, Young Neurosurgeons Committee (Scientific Planning Committee, NREF, MOC, EPM)
 - 2007-2009 Neurosurgery Research and Education Foundation (NREF) Executive Committee Liaison
 - 2010 - Fellow of the American Association of Neurologic Surgeons (F.A.A.N.S.)
 - 2010 Co-director - Choosing and Developing a Neurosurgical Practice, Philadelphia, PA, May 2, 2010
 - 2011 Co-director - Choosing and Developing a Neurosurgical Practice, Denver, CO, April 10, 2011
 - 2011-2013 President (elect), Young Neurosurgeons Committee
- 2005 - Congress of Neurological Surgeons
- 2005-2008 Neurosurgical Research Committee
 - 2008 - Fellowships Committee
 - 2010 - SANS (Self-Assessment in Neurological Surgery) Committee
 - 2010 - Education Committee
- 2005 - International Society of Pediatric Neurosurgery
- 2010 Moyamoya Scientific Committee – Annual Meeting
- 2005 - Section on Pediatric Neurologic Surgery, American Association of Neurological Surgeons and Congress of Neurological Surgeons
- 2007-2009 Pediatric Section Executive Committee Liaison to the Young Neurosurgeons Committee
- 2006 - New England Neurosurgical Society
- 2008 - American Heart Association / American Stroke Association
- Fellow of the American Heart Association (F.A.H.A.)
- 2008 - American Association for Cancer Research
- 2008 - American Academy of Pediatrics
- Specialty Fellow of the American Academy of Pediatrics (F.A.A.P.)
- 2009 - American Society for Pediatric Neurosurgery

Childs Nervous System
Developmental Medicine & Child Neurology
European Journal of Neurology
Journal of Angiogenesis
Journal of Cerebral Blood Flow & Metabolism
Journal of Medical Case Reports
Journal of the Neurological Sciences
Journal of Neurology
Journal of Neurosurgery
Journal Watch Neurology
Lancet
Neurosurgery
Pediatric Neurosurgery
Pediatrics
Stroke
Surgical Neurology
The Journal of Headache and Pain
World Journal of Pediatrics

Reviewer

Practical Reviews in Neurosurgery, 2006-2008

(Involved selecting and reviewing pertinent articles for publication, including editing submissions from other authors)

Honors and Prizes

1991-1992 Presidential Scholar Dartmouth College

	Research Grant		
1992	<i>Sigma Xi Cum laude</i>	Dartmouth College	(scientific honor society)
1992-1993	Honors Research Program in Physiology	College of Physicians & Surgeons, Columbia University	
1996	<i>Alpha Omega Alpha (AOA)</i>	College of Physicians & Surgeons, Columbia University	(medical honor society)
2000	Best Resident Presentation Award	American College of Surgeons – Massachusetts Chapter Annual Meeting	
	Best Resident Paper Award	American Association of Neurological Surgeons/Congress of Neurological Surgeons National Tumor Meeting	
	Best Resident Presentation Award	New England Neurosurgical Society	
2002	Synthes Basic Science Award	Congress of Neurological Surgeons	<i>(Individual award for best basic science research related to neurosurgical critical care at national meeting)</i>
	Mayfield Basic Science Award	American Association of Neurological Surgeons/Congress of Neurological Surgeons	<i>(Individual award for best basic science research related to spinal cord at national joint meeting)</i>
2003	Pediatric Section Meeting Poster Award	American Association of Neurological Surgeons/Congress of Neurological Surgeons Joint Pediatric Section Meeting	<i>(Individual award for best presentation at national joint meeting)</i>
2005	Pediatric Section Meeting Electronic Poster Award	American Association of Neurological Surgeons/Congress of Neurological Surgeons Joint Pediatric Section Meeting	<i>(Recognition of best submission at national joint meeting)</i>
2010	Best Poster Award	International Society for Pediatric Neurosurgery	<i>(Individual award for best presentation at international annual meeting)</i>

2010	Pediatric Section Meeting Poster Award	American Association of Neurological Surgeons/Congress of Neurological Surgeons Joint Pediatric Section Meeting	<i>(Recognition of best submission at national joint meeting)</i>
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Report of Funded and Unfunded Projects

Past

1991-1992	Synaptic Regeneration and Calcium Ionophores Presidential Scholar Research Grant, Dartmouth College Mentor - Samuel J. Velez, PhD, Dartmouth College This year-long independent project for honors students focused on the ions critical to the regeneration of synapses in a crayfish model of neural injury.
1994	<i>Bcl-2</i> and Apoptosis in Prostate Cancer Columbia-Presbyterian Cancer Research Center Research Grant Mentor - Ralph Buttyan, PhD, Columbia University College of Physicians and Surgeons This year-long study focused on the role of the oncoprotein <i>Bcl-2</i> in the development of prostate cancer, examining its role in suppressing apoptosis.
1996	Advanced Glycation Endproducts in Neurovascular Disease NIH Student Research Grant Mentor - E. Sander Connolly, MD, Columbia University College of Physicians and Surgeons This project examined the contribution of glycation to the development of cerebrovascular disease, looking at a model of carotid atherosclerosis.
1999-2001	Characterizing the Interaction Between Oncolytic Viruses and Tumors American Brain Tumor Association Post-Doctoral Fellowship Award Mentor - E. Antonio Chiocca, MD, PhD, Massachusetts General Hospital This national peer-reviewed grant was awarded to study the proteins critical to the replication of brain tumors using genetically engineered herpes virus.
2004-2005	Role of Matrix Metalloproteinases in Brain Tumors Hagerty Research Fellow Grant PI This peer-reviewed grant focused on a proof-of-principle study to evaluate the potential of using urinary biomarkers to detect brain tumors.
2005-2007	Angiogenesis and Intracranial Arteriovenous Malformations Lucas Warner AVM Research Fund Co-PI (Smith ER and Moses MA)

This funding was designated to study the role that aberrant angiogenesis plays in the development and progression of cerebrovascular disease, focusing on key proteins in the angiogenic switch, including matrix metalloproteinases.

- 2005-2007 Non-Invasive Brain Tumor Biomarkers
NIH K12 Neuro-oncology Training Grant/ 1K12CA90354-01
Mentor - Marsha Moses, PhD, Children's Hospital Boston
This grant focused on the development of urinary biomarkers for brain tumors targeting proteins critical to the angiogenic switch.
- 2005-2010 NIH Pediatric Loan Repayment Program Award
PI
This peer-reviewed grant was awarded for continued research on the mechanisms underlying the development of brain tumors and cerebrovascular disease in children.
- 2008-2010 Microrobotics for Minimally-Invasive Neurosurgery
National Institutes of Health (NIH), #2R44RR020247-03
Co-PI (Goldie J, Madsen J)
Co-Investigator
The focus of this grant is on the creation of devices specific to the treatment of neurosurgical disease, including small, multi-articulated working ports and cameras.

Current

- 2006-2011 Maria Pearl Miller Cerebrovascular Disease Research Fund
PI – (\$20,000)
A grant designated to improve the early detection of cerebrovascular disease, such as arteriovenous malformations.
- 2006-2011 Non-Invasive Detection of Pediatric Brain Tumors
Tara Bean Brain Tumor Research Fund
PI – (\$120,000)
This reviewed grant is focused on the discovery of early detection of brain tumors, with a specific focus on non-invasive biomarkers for pediatric patients.
- 2007-2012 Christopher K. Fellows Family Fund For Research in Pediatric Neurosurgery
PI – (\$110,000)
Research for this award has been primarily focused on the isolation of molecules critical to the growth of pediatric brain tumors, particularly regarding the angiogenic switch.
- 2007-2012 Emma Marrone Brain Tumor Research Fund
PI – (\$75,000)
Work funded by this grant centers on the discovery of novel methods of early detection of high grade brain tumors.

- 2009-2011 Urinary Biomarkers for Non-invasive Assessment of Therapeutic Efficacy in Glioma
James S. McDonnell Grant, Brain Tumor Funders Collaborative
PI – (\$100,000)
This peer-reviewed grant was awarded to study the longitudinal changes in biomarker profiles following treatment of gliomas in adults and children.
- 2011-2012 Biomarker Profiling of Metastasis
Discovery Grant, American Brain Tumor Association
PI – (\$50,000)
This peer-reviewed grant was awarded to study the differences in biomarker profiles between tumors within and outside of the central nervous system.

Current Unfunded Projects

- 2008 - The Long Term Outcome Of Children With Moyamoya Syndrome Treated By Pial Synangiosis (CH Protocol # M05-10-249)
In conjunction with Michael Scott, we are collecting long-term data on the patients with moyamoya treated at Children’s Hospital Boston in a prospective database.
- 2009 - Genome Wide Linkage Study of Moyamoya Syndrome
(CH Protocol # 07-08-0328)
This prospective study is being conducted in collaboration with Dr. Mustafa Sahin of the Department of Neurology in which I identify and characterize specific moyamoya phenotypes, which are then correlated with individual genetic mutations.
- 2010 - A Study Of Idiopathic Syringomyelia In The Pediatric Population: Natural Progression and Implications For Management (CH Protocol # M09-03-0151)
This multicenter trial, headed by myself and Dr. Matthew Smyth of the Washington University School of Medicine, is a longitudinal study of pediatric patients with idiopathic syringomyelia. We have published our initial findings and continue to accrue data.
- 2011 - Angioarchitectural Features Associated with Hemorrhagic Presentation in Pediatric Cerebral Arteriovenous Malformations (CH Protocol # P00000157)
This multicenter prospective study is being conducted in collaboration with Dr. Michael Ellis of the University of Toronto / Sick Kids Hospital and Dr. Darren Orbach of the department of neuroradiology to better understand the risk factors that predict the likelihood of AVM rupture.

Report of Local Teaching and Training

Teaching of Students in Courses

2000	Neuroanatomy 2 nd year medical students, Harvard	3hrs per wk for 3 wks
2001	Neuroanatomy 2 nd year medical students, Harvard	3hrs per wk for 3 wks
2004-2007, 2009 -	Neuroanatomy 2 nd year medical students, Tufts	2hrs per wk for 2 months

Formal Teaching of Residents, Clinical Fellows and Research Fellows (post-docs)

2003	North Service Teaching Rounds 20 residents and students (MGH)	1hr per wk for 6 months
2007 -	Resident Skull Dissection Lab 20 residents, Harvard (MGH/BWH)	2 sessions per year; each 4 hr
2008 -	Neurosurgery Resident Teaching Conference 15 residents, Harvard and rotating residents	1 hour sessions, ~ 4/ year

Clinical Supervisory and Training Responsibilities

2004 -	Shillito Pediatric Neurosurgery Fellow Work with other members of pediatric neurosurgery faculty to mentor clinical fellow	Daily supervision on wards, all year
2004 -	Pediatric Neurosurgery resident rotations Work with other members of pediatric neurosurgery faculty to mentor rotating residents and pre-residency fellows (2-4 every 3-6 months)	Daily supervision on wards, all year
2005 -	Neuroscience Career Guidance Panel 50 1 st /2 nd year medical students, Harvard	2 hour panel, twice yearly
2006	Medical student mentor 1 st year medical students, Harvard	2-2hr sessions per week, 1 month
2008	Student Summer Fellowship Mentor 2 nd year medical student	Daily supervision on wards, 2 months

Laboratory and Other Research Supervisory and Training Responsibilities

2005-2007	Supervision of technician in laboratory Presented research project data at national meetings, mentored her in career projects	Weekly supervision in lab, 2 years
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applied and graduated from Physician's Assistant program, now working at Dana-Farber (A. Exharhopoulos)

- 2006-2008 Training of technician in laboratory Weekly supervision in lab, 2 years
Published data from research and experience in lab led to his decision to obtain M.D. Is now completing medical school and applying to surgical residency (R. Doiron)
- 2008 - Initially trained technician in benchtop techniques Weekly supervision in lab, 2 years
Now mentored in independent research; has two national presentations accepted and is submitting manuscripts; has chosen to apply to graduate school (B. McNeish)

Formally Supervised Trainees

- 2005-2006 Paul Klimo, MD, MPH, Shillito Fellow in Pediatric Neurosurgery

Following military commitment, now staff at St. Jude's Hospital focusing on brain tumors and cerebrovascular disease; published over 10 chapters and manuscripts, co-edited two textbooks, now submitting multicenter trial on brain tumor biomarkers
- 2006-2007 Edward Ahn MD, Shillito Fellow in Pediatric Neurosurgery

Currently staff pediatric neurosurgeon at Johns Hopkins, published and presented over 9 papers, chapters and talks
- 2006 - Patrick Codd, MD, Neurosurgery Resident, MGH

Mentored as student; several national presentations has 2 publications, including first description of a moyamoya association; applied and accepted to MGH neurosurgery residency, now clinically mentoring in pediatric neurosurgery
- 2008 Matthew Naunheim BA, Harvard Medical School 2nd year student

Was awarded Harvard Medical School Pasteur Fellowship; for "Transcranial Doppler in Moyamoya Syndrome"; work resulted in oral presentation at national neurosurgical meeting
- 2008-2009 Suresh Magge MD, Shillito Fellow in Pediatric Neurosurgery

During fellowship focused on cerebrovascular disease and tumors, leading to focus in his practice at Children's National Hospital; led and co-authored manuscript on multi-center study of syringomyelia, multiple national presentations

2010 Manish K Kasliwal MBBS, MCh (Neurosurgery), International Pediatric Neurosurgery Traveling Fellow (India)

Work during Fellowship resulted in two publications and 3 presentations at national and international meetings

2011 Evelyne Gone BA, Harvard Medical School 1st year student

Was awarded Harvard Medical School Health Disparities Scholars in Medicine program fellowship for “Moyamoya and Sickle Cell Disease”; helped to create database and contributed to ongoing multicenter study of this disorder

Formal Teaching of Peers (e.g., CME and other continuing education courses)

2005 The Significance of Headache in the Pediatric Patient: When to Evaluate or Refer, Surgical Frontiers Conference, (sponsored by Children’s Hospital Boston), Burlington, MA

Lumps and Bumps of the Scalp and Spine, Pediatric Health Care Summit, (sponsored by Children’s Hospital Boston), Beverly Hospital, Beverly, MA

PERCS Contini Event: Decision-Making and Communication Workshop for Critically Ill Children, (sponsored by Children’s Hospital Boston), Boston, MA

2006 Head Injuries: Office Evaluation and Significance of Post Concussive Symptoms. Frontiers in Pediatric Surgery Conference, (sponsored by Children’s Hospital Boston), Waltham, MA

2007 Chiari Malformations – Refer or Defer? Frontiers in Pediatric Surgery Conference, (sponsored by Children’s Hospital Boston), Waltham, MA

PERCS Contini Event: Decision Making and Communication Workshop for Critically Ill Children, (sponsored by Children’s Hospital Boston), Boston, MA

2008 Lumps and Bumps of the Scalp and Spine, Frontiers in Pediatric Surgery Conference, (sponsored by Children’s Hospital Boston), Waltham, MA

2010 Assessment of a Child with a CSF Shunt, Practical Pediatrics Course, (sponsored by the American Academy of Pediatrics), Breckenridge, CO

Pediatric Headache, Practical Pediatrics Course (sponsored by the American Academy of Pediatrics), Breckenridge, CO

Pediatric Lumps and Bumps of the Scalp and Spine, Practical Pediatrics Course, (sponsored by the American Academy of Pediatrics), Breckenridge, CO

Identifying Congenital Spinal Cord Malformations- Dysraphism and Tethered Cord, Practical Pediatrics Course, (sponsored by the American Academy of Pediatrics),

Breckenridge, CO

Pediatric Headache, Frontiers in Pediatric Surgery Conference, (sponsored by Children's Hospital Boston), Waltham, MA

Moyamoya in Children, New England Pediatric Neuroscience Nursing Education Conference, (sponsored by the American Association of Critical Care Nursing), Waltham, MA

Local Invited Presentations

- 2000 The Evolving Role of Craniectomy in Trauma and Subarachnoid Hemorrhage, Neurosurgery Grand Rounds, Massachusetts General Hospital
- CT-Angiography, Sylvian Hematoma Removal and Hemicraniectomy Can Facilitate Management of Patients Presenting in Poor Grade after MCA Aneurysm Rupture. Neurosurgery Grand Rounds, Massachusetts General Hospital
- 2002 Report of the West Neurosurgical Service, Grand Rounds, Massachusetts General Hospital
- Clinical Case Presentation, Grand Rounds, Massachusetts General Hospital
- 2003 Decompressive Craniectomy, Grand Rounds, Invited Speaker, Department of Neurosurgery, Brigham and Women's Hospital
- 2004 Pediatric Arteriovenous Malformations, Intensive Care Unit and Transport Team Meeting, Children's Hospital Boston
- Genetic Heterogeneity of NF1, Neurology Grand Rounds, *New England Journal of Medicine* Clinicopathologic Conference, Massachusetts General Hospital, (Discussant)
- Pediatric Brain Tumors, Nursing Education Day, Children's Hospital Boston
- Hydrocephalus, Neuroradiology Grand Rounds, Children's Hospital Boston
- Interesting Cases from the Pediatric Neurosurgery Service, Surgical Grand Rounds, Children's Hospital Boston
- Evaluation and Treatment of the Child with Closed Myelomeningocele, Teaching Rounds, Children's Hospital Boston
- Matrix Metalloproteinases in Neurosurgical Disease, First Annual Symposium in Cellular, Molecular and Clinical Research in Surgery, Children's Hospital Boston
- 2005 Raised Intracranial Pressure: A Neurosurgical Perspective on Monitoring and Operative Therapies, Combined Anesthesia - Surgery Grand Rounds, Children's Hospital Boston
- Matrix Metalloproteinases in Cerebrovascular Disease, Department of Neurosurgery,

Brigham and Women's Hospital

Pediatric spinal epidural abscess – a neurosurgical perspective, Department of Medicine Teaching Grand Rounds, Children's Hospital Boston

Pediatric Hydrocephalus, Department of Neurosurgery, Brigham and Women's Hospital

Matrix Metalloproteinases in Neurosurgical Disease, Partners Department of Neurology Research Rounds

Pediatric Intensive Care: Increased Intracranial Pressure and Hydrocephalus, Nursing Education Day, Children's Hospital Boston

2006 Neurosurgical Management of Split Cord Malformations, Department of Neurosurgery, Brigham and Women's Hospital

Biomarkers for Brain Tumors, Partners Department of Neurology Research Rounds,

2007 Biomarkers in Pediatric Neurosurgery, Shillito Fellowship Day, Children's Hospital Boston

A 17-year-old boy with a pituitary tumor and skull abnormalities, Clinicopathological Conference – Case Records of the Massachusetts General Hospital (Primary discussant), Massachusetts General Hospital

Moyamoya Syndrome, Neuroscience Education Day, Children's Hospital Boston

Chiari Malformation, Neuroscience Education Day, Children's Hospital Boston

2008 Hydrocephalus, Department of Neurosurgery, Brigham and Women's Hospital

Moyamoya Syndrome, Neuroscience Education Day, Children's Hospital Boston

Chiari Malformation, Neuroscience Education Day, Children's Hospital Boston

Surgical Treatment of Cerebrovascular Disease, Combined Anesthesia and Surgery Grand Rounds, Children's Hospital Boston

2009 Hemangioblastoma and VHL disease, Dana Farber Cancer Center Combined Case Conference, Children's Hospital Boston

Cutaneous Manifestation of Tethered Cord, Shillito Fellowship Day, Children's Hospital Boston

Pediatric Hydrocephalus, Department of Neurosurgery, Brigham and Women's Hospital

Moyamoya Syndrome, Neuroscience Education Day, Children's Hospital Boston

Chiari Malformation, Neuroscience Education Day, Children's Hospital Boston

Urinary Biomarkers for Neurosurgical Disease, Work in Progress Seminar, Children's Hospital Boston

2010 Pediatric Moyamoya and Biomarkers, Department of Neurosurgery, Brigham and Women's Hospital

The Neurosurgery Perspective of Chiari Malformation, Nursing Education Week, Children's Hospital Boston

Moyamoya Disease, Nursing Education Week, Children's Hospital Boston

Moyamoya and Sickle Cell Disease, Grand Rounds, Department of Neuroradiology, Children's Hospital Boston

Pediatric Moyamoya Disease – Clinical Practice and Advances in Biomarker Development, Grand Rounds, Visiting Professor, Department of Neurosurgery, Massachusetts General Hospital

Innovations in Moyamoya, 1st Annual Orphan Disease Symposium, Children's Hospital Boston

Clinical and Research Advances in Pediatric Stroke, Department of Neurosurgery, Brigham and Women's Hospital

2011 Clinical and Translational Advances in Moyamoya, Department of Neurosurgery, Brigham and Women's Hospital

Report of Regional, National and International Invited Teaching and Presentations

Invited Presentations and Courses

Regional

2004 Pediatric Brain Tumors, Grand Rounds, Invited Speaker, Department of Neurosurgery, Brown University, Rhode Island Hospital, Providence, RI

2005 Pediatric Head Trauma, (Plenary Session), Pediatric –Neonatal Critical Care Transport Conference, Seaport World Trade Center, Boston, MA

2007 Headaches in Children: When to Worry, St. Joseph's Hospital, Nashua, NH

2008 Sickle Cell Disease and Moyamoya, Grand Rounds, Invited Speaker, Department of Pediatrics, Boston Medical Center, Boston, MA

- 2009 Personalized Non-invasive Detection of Brain Tumors/ Invited Panelist/
Moderator (Scientific Session), Meningioma Awareness Day, Boston, MA
(Sponsored by the Brain Science Foundation)
- 2010 Moyamoya: Advances in Treatment, Visiting Professor, Department of Neurosurgery,
Dartmouth College, Hanover, NH
- 2011 Headaches in Children, Grand Rounds, Department of Pediatrics, Holy Family Hospital,
Methuen, MA

National

- 2002 Increased Frequency of Cells Expressing a Neuronal Phenotype in the Injured Spinal Cord
after Intravascular Transplantation with Bone Marrow Cells. Grand Rounds, Invited
Speaker, Department of Neurosurgery, University of Rochester, Rochester, NY
- Esthesioneuroblastoma. Clinical Neurosurgery Presentation, Invited Speaker, Department
of Neurosurgery, University of Rochester, Rochester, NY
- 2005 Moderator - Pediatric Scientific Session, Annual Congress of Neurological Surgeons
National Meeting, Boston, MA
- 2006 Moderator - Pediatric Scientific Session – Neurosurgical Forum, Annual Congress of
Neurological Surgeons National Meeting, Chicago, IL
- Moderator – Open Papers Session, Annual AANS/CNS Section on Pediatric Neurological
Surgery Annual Meeting, Denver CO
- 2008 The Chiari Malformation: What Does It Mean? (Selected Subject), Invited Expert,
American Academy of Pediatrics (AAP) Annual Meeting, Boston, MA
- 2009 Non-Invasive Biomarkers for Pediatric Brain Tumors, 1st Annual Temple Neuro-
Oncology Seminar, Philadelphia, PA
- A Study of Idiopathic Syringomyelia in the Pediatric Population: Natural Progression and
Implications for Management, Presented at the American Association of Neurological
Surgeons Annual Meeting, San Diego, CA (Invited Plenary Session
Presentation)
- Biomarkers for Pediatric Neurosurgical Disease, Grand Rounds, Visiting Professor,
Department of Neurosurgery, State University of New York, Buffalo, Buffalo, NY
- National Institutes of Health Grant Writing Course, Congress of Neurological
Surgery, New Orleans, LA
- 2010 Choosing and Developing a Neurosurgical Practice, American Association of
Neurological Surgeons Annual Meeting, Philadelphia, PA

Treatment Options in Sickle Cell Disease: Medical vs Surgical, American Society of Pediatric Neuroradiology, Boston, MA

Pediatric Moyamoya Disease; Clinical and Translational Advances, Visiting Professor, Department of Neurosurgery, University of Florida (Gainesville), Gainesville, FL

Vascular Anomalies of the Brain - Pediatric Moyamoya for Neurologists, Child Neurology Society Annual Meeting, Providence RI

2011 Urinary Biomarkers for the Assessment of Recurrent Pediatric Brain Tumors, Pediatric Brain Tumor Consortium, Annual Meeting, Atlanta, GA

Choosing and Developing a Neurosurgical Practice, American Association of Neurological Surgeons Annual Meeting, Denver, CO

Current Advances in Moyamoya Research, 2011 Moyamoya Gathering, Philadelphia, PA (Sponsored by Moyamoya.com)

International

2009 Management of Childhood Moyamoya Disease, 1st International Working Group Meeting on Moyamoya, Stanford University, Palo Alto, CA

Moderator, Management of Vein of Galen and Other Neonatal/Early Infancy Arteriovenous Shunts – XIV World Congress of Neurological Surgery of the World Federation of Neurosurgical Societies, Boston, MA

2010 Chair, Imaging and Treatment Symposium - Pial Synangiosis; Moyamoya Disease Update, 38th Annual Meeting of the International Society for Pediatric Neurosurgery (ISPN 2010), Jeju, South Korea

2011 Translational Research Advances in Pediatric Moyamoya Syndrome, 2nd International Working Group Meeting on Moyamoya, Zurich, Switzerland

Report of Clinical Activities and Innovations

Current Licensure and Certification

1999- Registered Physician - Commonwealth of Massachusetts Board of Registration in Medicine

2007- Board Certified in Neurosurgery – American Board of Neurological Surgery

2008- Board Certified in Pediatric Neurosurgery – American Board of Pediatric Neurological Surgery

Practice Activities

2004 -

Pediatric Neurosurgery

Department of Neurosurgery
Children's Hospital Boston

Daily

Clinical Innovations

Introduction of endoscopic transsphenoidal and skull base techniques to pediatric patients at Children's Hospital Boston (2007)

Endoscopic transsphenoidal and skull base techniques had primarily been used in adults. Collaborating with Edward Laws, we developed the ability to safely incorporate these technical innovations as part of operations even in children as young as 2. Our data - including our series from Children's Hospital Boston - have been presented nationally, earning recognition with an award at the pediatric section meeting. These approaches are now part of fellowship training at CHB and BWH.

Development of a novel embolization-surgical technique for treatment of pediatric cerebral arteriovenous malformations (AVM) (2009)

As an international referral center for pediatric vascular malformations, we have developed a novel method of staged embolization-resection of cranial AVMs, including a multidisciplinary perioperative management protocol. We have published the largest pediatric experience in North America with the embolization agent, Onyx. I (along with Darren Orbach from interventional neuroradiology) have presented this work nationally, with other centers now adopting our methods and sending trainees to study here (including a current fellow from Toronto).

Intraoperative EEG for the treatment of moyamoya patients (2010)

Moyamoya patients are at high risk of stroke during surgery. In collaboration with a founder of moyamoya surgery, Michael Scott, we have created a method to use EEG during operations to reduce stroke risk. This innovation has been presented at major meetings, has been published as both stand-alone peer-reviewed manuscripts (as both an EEG paper and also as a critical part of management protocols) and also has been incorporated in numerous surgical textbooks as suggested practice.

Surgical treatment of sickle cell patients with moyamoya (2010)

Patients with sickle cell and moyamoya are among the most fragile individuals to treat. I have worked to develop a perioperative protocol (including timed exchange transfusions, ICU management and medication regimen) and modified surgical technique. The results have been published, presented nationally, referenced by other institutions and have resulted in

surgeons from other national centers visiting Children's Hospital Boston to study our methods.

Report of Technological and Other Scientific Innovations

Urinary biomarker panel for the diagnosis of moyamoya and cerebrovascular disease (2007)

Working in the Vascular Biology Program under the leadership of Dr. Marsha Moses, I developed a panel of biomarkers able to be detected in the urine that can non-invasively identify the presence of moyamoya and related cerebrovascular disease. This work has been presented at national meetings, is now being tested in pre-clinical studies and undergoing patent evaluation.

Urinary biomarker panel for the diagnosis of novel and recurrent brain tumors (2008)

In collaboration with laboratory and clinical colleagues, I have created a urinary biomarker panel able to non-invasively detect brain tumors. This novel technology has been supported by NIH funding, published and cited in several journals, is undergoing patent evaluation and is slated to begin a multi-center trial in 2011.

Report of Education of Patients and Service to the Community

Activities

- 2008 National Youth Leadership Forum on Medicine/ Invited Panelist / Moderator, National Youth Leadership Forum on Medicine, Wellesley, MA
- 2009 Patient Education Question and Answer session, Meningioma Awareness Day, Boston, MA
- 2011 Invited Panel for Moyamoya Patients: Audience Discussion Moyamoya Gathering, Philadelphia, PA

Educational Material for Patients and the Lay Community

Books, monographs, articles and presentations in other media

- 2007 Vascular anomalies webcast Panelist
- Sponsored by
Children's Hospital
Boston
- http://www.orlive.com/childrenshospitalboston/videos/interactive-vascular-anomalies-webcast1?cmpid=active_redirect

5. **Smith ER**, Butler WE, Barker FG. In-hospital mortality after ventriculoperitoneal shunt procedures in the United States 1998-2000: relation to hospital and surgeon volume of care. *Journal of Neurosurgery, Pediatrics* 2004, Feb 100(2): 90-97.
6. **Smith ER**, Butler WE, Barker FG. Craniotomy for resection of pediatric brain tumors in the United States 1988-2000: the effect of provider caseload and progressive centralization and specialization of care. *Neurosurgery*, 2004 Mar 54(3): 553-563.
7. **Smith ER**, Butler WE, Barker FG. Is there a "July effect" in pediatric neurosurgery at teaching hospitals? *Journal of Neurosurgery*, 2006 Sep; 105 (3 Suppl): 169-176.
8. **Smith ER**, Manfredi M, Scott RM, Black PM, Moses MA. Case of a recurrent craniopharyngioma used to illustrate the potential utility of urinary matrix metalloproteinases as non-invasive biomarkers, *Neurosurgery* 2007 Jun; 60 (6) E1148-1149; discussion E1149.
9. **Smith ER**, Zurakowski D, Saad A, Scott RM, Moses MA. Urinary biomarkers predict brain tumor presence and response to therapy. *Clinical Cancer Research* 2008 Apr 15;14(8):2378-2386.
10. Thiex R, Mulliken JB, Revencu N, **Smith ER**, Orbach DB. A novel association between RASA1 mutations and spinal arteriovenous anomalies. *American Journal of Neuroradiology* 2010 Apr;31(4):775-779.

Other Peer Reviewed Articles

1. **Smith ER**, Ott M, Wain J, Louis DN, Chiocca EA. Massive growth of a meningioma into the brachial plexus and thoracic cavity after intraspinal and supraclavicular resection: A case report and review of the literature. *Journal of Neurosurgery* 2002 Jan;96(1 Suppl):107-111.
2. **Smith ER**, Carter BS, Ogilvy CS. Proposed use of prophylactic decompressive craniectomy in poor grade aneurysmal subarachnoid hemorrhage patients presenting with associated large Sylvian hematomas. *Neurosurgery*, 2002 Jul 51(1):117-124.
3. **Smith ER**, Chapman PH, Ogilvy CS. Far posterior subtemporal approach to the dorsolateral brainstem and tentorial ring: Technique and clinical experience. *Neurosurgery*, 2003 Feb 52(2): 364-368.
4. **Smith ER**, Scott RM. Moyamoya Syndrome: Children's Hospital Boston experience, *Argentine Journal of Neurosurgery* 2005 Mar. 19(1); p. 31-40.
5. **Smith ER**, Scott RM. Surgical management of moyamoya syndrome, *Skull Base Surgery* 2005 Feb;15(1):15-26.
6. Ahn E, **Smith ER**. Acute clival and spinal subdural hematoma with spontaneous resolution: Clinical and radiographic correlation in support of a proposed pathophysiologic mechanism *Journal of Neurosurgery, Pediatrics* 2005 Aug;103(2):175-179.
7. Jea A, **Smith ER**, Robertson R, Scott RM. Moyamoya syndrome associated with Down syndrome: Outcome following surgical revascularization, *Pediatrics* 2005 Nov;116(5):e694-701.

8. Kim AH, Maher CO, **Smith ER**. Lumbar intramedullary spinal schistosomiasis presenting as progressive paraparesis: A case report and literature review, *Neurosurgery* 2006 May;58(5):E996; discussion E996.
9. Tailor J, Dunn I, **Smith ER**. Conservative treatment of spontaneous spinal epidural hematoma associated with oral anti-coagulant therapy in a child. *Child's Nervous System* 2006 Dec;22(12):1643-1645.
10. Codd PJ, Riesenburger RI, Klimo P, Slotkin JR, **Smith ER**. Vertebra plana due to an aneurysmal bone cyst of the lumbar spine: Case report and review of the literature. *Journal of Neurosurgery* 2006 Dec;105(6):490-495.
11. Dunn ID, Woodworth G, Siddiqui A, **Smith ER**, Vates GE, Day AL, Goumnerova LC. Traumatic pericallosal artery aneurysm: A rare complication of transcallosal surgery, *Journal of Neurosurgery, Pediatrics* 2007 Feb;106(2):153-157.
12. Klimo P, Khalil A, Slotkin JR, **Smith ER**, Scott RM, Goumnerova LC. Wound complications associated with the use of bovine serum albumin-glutaraldehyde surgical adhesive (BioGlue®) in pediatric patients, *Neurosurgery* 2007 Apr; 60 (4 suppl 2): 305-309.
13. Nahed BV, Darbar A, Doiron R, Ahn E, Robson C, **Smith ER**. Acute hydrocephalus secondary to obstruction of foramen of Monro and cerebral aqueduct by a choroid plexus cyst of the lateral ventricle. *Journal of Neurosurgery* 2007 Sep;107(3 Suppl):236-239.
14. Dunn IF, Agarwalla PK, Papanastassiou AM, Butler WE, **Smith ER**. Multiple pilocytic astrocytomas of the cerebellum in a 17-year-old patient with Neurofibromatosis Type I *Child's Nervous System* 2007 Oct; 23(10): 1191-1194.
15. Jha RM, Klimo PK, **Smith ER**. Foramen magnum stenosis from overgrowth of the opisthion in a child with achondroplasia. *Journal of Neurosurgery, Pediatrics* 2008 Aug;2(2):136-8.
16. **Smith ER**, Scott RM. Progression of disease in unilateral moyamoya syndrome *Neurosurgery Focus* 2008;24(2):E17.
17. **Smith ER**, Loeffler, Misra M, Pomerantz S, Stemmer-Rachamimov A, Post MD. Case records of the Massachusetts General Hospital. Case 37-2008. A 17-year-old boy with a pituitary tumor and skull abnormalities. *New England Journal of Medicine* 2008 Nov 27;359(22):2367-2377.
18. Agarwalla PK, Dunn IF, Turner CD, Ligon KL, Schneider KA, Papanastassiou AM, **Smith ER**. A novel TP53 germline mutation in a family with a history of multiple malignancies: Case report and review of the literature. *Pediatric Neurosurgery* 2008;44(6):501-508. Epub 2009 Jan 6.
19. Saad A, Poussaint TY, **Smith ER**, Folkerth RD, Ligon K. Meningioangiomas associated with meningioma: case report with surgical cytology. *Acta Cytologica* 2009 Jan-Feb;53(1):93-97.

20. Nahed BV, Ferreira M, Naunheim MR, Kahle KT, Proctor MR, **Smith ER**. Intracranial vasospasm with subsequent stroke after traumatic subarachnoid hemorrhage in a 22-month-old child. *Journal of Neurosurgery, Pediatrics* 2009;3(4):311-315.
21. Qaiser R, Scott RM, **Smith ER**. Identification of an association between Robinow syndrome and moyamoya. *Pediatric Neurosurgery* 2009;45(1):69-72. Epub 2009 Mar 4.
22. **Smith ER**, Scott RM. Moyamoya disease and moyamoya syndrome. *New England Journal of Medicine* 2009 Mar 19;360(12):1226-1237.
23. Codd PJ, Scott RM, **Smith ER**. Seckel syndrome and moyamoya. *Journal of Neurosurgery, Pediatrics* 2009 Apr;3(4):320-324.
24. **Smith ER**, McClain CD, Heeney M, Scott RM. Pial synangiosis in patients with moyamoya syndrome and sickle cell anemia: perioperative management and surgical outcome. *Neurosurgery Focus* 2009 Apr;26(4):E10.
25. **Smith ER**, Scott RM. Moyamoya disease. *Neurosurgery Focus* 2009 Apr;26(4):E1.
26. Viswanathan V, **Smith ER**, Kozakewich H, Burrows P, Fishman S, Mulliken J, Orbach DB. Infantile hemangiomas involving the neuraxis: Clinical and imaging findings. *American Journal of Neuroradiology* 2009 May;30(5):1005-1013.
27. Thiex R, Williams A, **Smith ER**, Scott RM, Orbach DB. The use of Onyx for embolization of central nervous system arteriovenous lesions in pediatric patients. *American Journal of Neuroradiology* 2010 Jan;31(1):112-120.
28. Magge SN, Smyth MD, Governale LS, Goumnerova LC, Madsen JR, Munro B, Nalbach SV, Proctor MR, Scott RM, **Smith ER**. Idiopathic syrinx in the pediatric population: A combined center experience, *Journal of Neurosurgery, Pediatrics* 2011 Jan;7(1):30-36.
29. Ullrich NJ, Zimmerman M, **Smith E**, Irons M, Marcus K, Kieran MW. Association of rapidly progressive moyamoya syndrome with Bevacizumab treatment for glioblastoma in a child with neurofibromatosis type 1. *Journal of Child Neurology* 2011 Feb; 26(2): 228-230.
30. Nahed B, Ferreira M, Babu M, Terry A, Kahle KT, Walcott B, **Smith ER**. Dural scalp and intracranial hemangiomas causing hydrocephalus and venous sinus thrombosis in an infant, *Journal of Child Neurology* 2011 Jun; 26(6):777-81.
31. Alomari AI, Chaudry G, Rodesch, G, Burrows PE, Mulliken JB, **Smith ER**, Orbach DB. Complex spinal-paraspinal fast-flow lesions in CLOVES syndrome: Analysis of clinical and imaging findings, *American Journal of Neuroradiology* 2011 Feb. (epub ahead of print)
32. Moftakhar P, **Smith ER**, Choulakian A, Scott RM, Danielpour M. Moyamoya disease in children with congenital dwarfing conditions. *Pediatric Neurosurgery* 2011 Mar; 46 (5):373-380.

33. Mehta AL, Papanastassiou AM, Dunn IF, Aliabadi HR, **Smith ER**, Redefining the seat belt syndrome – neurological injuries resulting from flexion-distraction injury of the spine: Case illustration and review of the literature, *Journal of Surgical Radiology* 2011 Apr; 2(2): 182-186.
34. Vendrame M, Kaleyias J, Loddenkemper T, **Smith E**, McClain C, Rockoff M, Manganaro S, Mckenzie B, Gao L, Scott M, Bourgeois B, Kothare S. EEG monitoring during intracranial surgery for moyamoya disease, *Pediatric Neurology* 2011 Jun; 44(6): 427-32
35. Kasliwal MK, Rogers GF, Ramkissoon S, Moses-Gardner A, Kurek KC, **Smith ER**. Psammomatoid ossifying fibroma in the sphenoid bone reconstructed using autologous particulate exchange cranioplasty, *Journal of Neurosurgery, Pediatrics* 2011 Mar;7(3):238-43.

Clinical Communications

1. Korf BR, Henson JW, Stemmert-Rachamirnov A, Case 13-2005: A 48-year-old man with weakness of the limbs and multiple tumors of spinal nerves *New England Journal of Medicine* 2005, Apr. 28; 352 (17): 1800-1808. (Discussant)

Non-peer reviewed scientific or medical publications/materials in print or other media

Books/Textbooks for the medical or scientific community

1. Co-Editor, Moyamoya disease, *Neurosurgery Focus*. 2009 Apr.
2. Co-Editor, Pediatric vascular neurosurgery, *Neurosurgery Clinics of North America* 2010 Jul.
3. Section Editor, Paediatric neurosurgery, Evidence Based Neurosurgery, Ghogawala Z, Krishnaney A, Steinmetz M, Batjer H, Benzel E (Ed.) TFM Publishing, Ltd., 2011.
4. Co-Editor, Pediatric Head and Neck Tumors: A-Z Guide to Presentation and Multimodality Management. Springer Publishing, 2011.
5. Section Editor, Cerebrovascular disease, Electronic Handbook for Pediatric Neurosurgery International Society for Pediatric Neurosurgery, MoonBrand Publishing, 2011.
6. Co-Editor, Incidentally discovered central nervous system neurosurgical disease, *Neurosurgery Focus*. 2012 Dec.

Book Chapter and Review Articles

1. **Smith ER**, Amin-Hanjani S. Diagnosis and management of elevated intracranial pressure *UpToDate*, Rose, BD (Ed), *UpToDate*, Wellesley, MA, 2005- (on-line).
2. **Smith ER**, Butler WE, Ogilvy CS. Surgical approaches to vascular anomalies of the child's brain, *Current Opinion in Neurology*, 2002, Apr. 15(2): 165-171.

3. **Smith ER**, Madsen JR. Cerebral pathophysiology and critical care neurology: Basic hemodynamic principles, cerebral perfusion and intracranial pressure, *Seminars in Pediatric Neurology*, Bodensteiner JB (Ed.) Elsevier Press, New York, 2004, Jun. 11(2): 89-104.
4. **Smith ER**, Madsen JR. Neurosurgical aspects of critical care neurology, *Seminars in Pediatric Neurology*, Bodensteiner JB (Ed.) Elsevier Press, New York, 2004, Jun. 11(2): 169-178.
5. **Smith ER**, Ebb DH, Tarbell NJ, Barker FG. Pilocytic astrocytoma, *Textbook of Neuro-Oncology*. Berger MS, Prados MD, eds. Philadelphia: Elsevier Saunders, 2005;149-155.
6. Chen C, **Smith ER**, Ogilvy CS, Carter BS. Decompressive craniectomy *Operative Neurosurgical Techniques: Indications, Methods and Results*, Schmidek HM and Sweet WH (Eds.) Elsevier Press, New York, 2006; 70-80.
7. Scott RM, **Smith ER**, Ellenbogen RG. Treatment of moyamoya syndrome in children with pial synangiosis, *Neurosurgical Operative Atlas*, American Association of Neurological Surgeons Publication Committee, 2007; (CD-ROM).
8. **Smith ER**. Ischemic stroke in the pediatric population, *Principles and Practice of Pediatric Neurosurgery*, Second Edition; Albright LA (Ed.) Thieme Medical Publishers, New York, 2007; 1004-1014.
9. **Smith ER**, Scott RM. Encephaloduralarteriosynangiosis (EDAS), *Fundamentals of Operative Techniques in Neurosurgery*, 2nd Edition, Connolly ES, McKhann GM, Huang J, Choudhri TF and Mocco, J (Ed.), Thieme Medical Publishers, 2008, p. 871-879.
10. Maher CO, **Smith ER**, Proctor MR, Scott RM. Vascular malformations of the spinal cord, *Surgery of the Pediatric Spine*, Kim, Betz, Hunh, Newton (Ed.), Thieme Medical Publishers, 2008, p. 337-344.
11. Agarwalla PK, Dunn IF, Scott RM, **Smith ER**. Tethered cord syndrome, *Neurosurgery Clinics of North America* Klimo P (Ed.), Elsevier Press, New York, 2007, July; 18(3):531-547.
12. **Smith ER**, Scott RM. Pediatric arteriovenous malformations, *Textbook of Paediatric Neurosurgery* (<http://surgicalneurology.pbwiki.com>), Narenthiran G (Ed.) 2007.
13. **Smith ER**, Scott RM. Pediatric moyamoya, *Textbook of Paediatric Neurosurgery* (<http://surgicalneurology.pbwiki.com>), Narenthiran G (Ed.) 2007.
14. Grondin R, **Smith ER**, Scott RM. Moyamoya disease: Pial synangiosis: encephaloduroarteriosynangiosis–encephalomyosynangiosis, *Controversies in Pediatric Neurosurgery*, Jallo, Kothbauer, Padilla (Ed.), Thieme Medical Publishers, New York, 2009 p.162-166.
15. Katsetos CD, **Smith ER**, Scott RM. Cerebrovascular disorders in children, American Association of Pediatrics, Pediatric Neurosciences for Primary Care, Piatt, Legido (Ed.) American Academy of Pediatrics, 2009 p. 171-215.

16. Grondin R, Scott RM, **Smith ER**. Advances in pediatric brain tumors. *Advances in Pediatrics (56th Ed.)*, Kappy (Ed.), Elsevier Medical Publishers, *Adv Pediatr.* 2009;56 p.249-269.
17. **Smith ER**, Scott RM. Treatment of moyamoya syndrome in children with pial synangiosis, *Pediatric Neurosurgery; Neurosurgical Operative Atlas (2nd Edition)*, Goodrich J (Ed.) Thieme Medical Publishers, 2009 p. 171-177.
18. **Smith ER**, Scott RM. Moyamoya Syndrome, *National Organization for Rare Disorders*. (http://www.rarediseases.org/search/rdbdetail_abstract.html?disname=Moyamoya%20Syndrome)
19. **Smith ER**, Scott RM. Pial synangiosis, *Moyamoya Disease Update*. Cho and Tominaga (Ed.) Springer-Verlag Publishers, 2010, p. 321-331.
20. Klimo P, Maher C, **Smith ER**. Introduction to pediatric vascular neurosurgery, *Pediatric Vascular Neurosurgery*, Klimo P, Maher C, Smith ER (Ed.) Elsevier Press, *Neurosurgery Clinics of North America* Jul;21(3):xiii-xiv 2010.
21. **Smith ER**, Scott RM. Moyamoya: Epidemiology, presentation and diagnosis, *Pediatric Vascular Neurosurgery*, Klimo P, Maher C, Smith ER (Ed.) Elsevier Press, *Neurosurgery Clinics of North America* 2010 Jul;21(3):543-551.
22. **Smith ER**, Scott RM. Cavernous malformations, *Pediatric Vascular Neurosurgery*, Klimo P, Maher C, Smith ER (Ed.) Elsevier Press, *Neurosurgery Clinics of North America* 2010 Jul;21(3):483-490.
23. **Smith ER**, Scott RM. Indirect revascularization for moyamoya syndrome, *Cerebral Revascularization: Microsurgical and Endovascular Techniques*, Nussbaum ES and Mocco J, (Ed.) Thieme Medical Publishers, 2011, p.111-119.
24. **Smith ER**, Scott RM. Moyamoya disease, Chapter 210 *Youmans Neurological Surgery* 6th Edition, Elsevier Press. In press.
25. **Smith ER**, Scott RM. Revascularization techniques in pediatric cerebrovascular disorders, *Schmidek And Sweet Operative Neurosurgical Techniques* 6th Edition, Elsevier Press. In press.
26. **Smith ER**, Scott RM. Craniopharyngioma, *Approaches to Pathology of the Sellar and Parasellar Area*, Laws E, Sheehan J (Ed.), Thieme Press, In press.
27. **Smith ER**, Scott RM. Surgical treatment of cavernous malformations in children, *Cavernous Malformations of the Nervous System*, Rigamonti D (Ed.), Cambridge University Press, In press.
28. Gross BA, **Smith ER**, Day AL, Scott RM. Moyamoya – Surgical indications and strategies, *Hemorrhagic and Ischemic Stroke: Surgical, Interventional, Imaging, and Medical Approaches*. Bendok, Batjer, Naidech, and Walker (Ed.) Thieme Medical Publishers, In press.
29. **Smith ER**, McClain CD, Soriano SG. Complications following operative interventions for vascular anomalies in pediatrics. *Neuroanesthesia and Critical Care Handbook*, Brambrink A and Kirsch JR (Ed.), Springer Medical Publishers, In press.

30. **Smith ER**, Scott RM. Cerebrovascular disease, *Pediatric Neurosurgery On Call*, Ritter A (Ed.), Congress of Neurologic Surgeons, In press.
31. **Smith ER**. Pediatric neurosurgery: controversies, *Evidence for Neurosurgery*. Krishnaney A, Steinmetz M, Batjer H, Benzel E (Ed.), tfm Publishing, United Kingdom, In press.
32. Orbach D, **Smith ER**, Ellis M. Designing the ideal hybrid neurovascular operating room, *Intraoperative Imaging and Image-Guided Therapy*, Jolenz F (Ed.), Springer Medical Publishers, In press.
33. **Smith ER**, Scott RM. Pediatric arteriovenous malformations, Abbott R (Ed.), International Society for Pediatric Neurosurgery On-Line Textbook, In press.
34. **Smith ER**, Burrows PE, Scott RM. Vascular malformations of the central nervous system, *Second Edition of Vascular Anomalies: Hemangiomas and Malformations*, Mulliken J, (Ed.), Oxford University Press, In press.

Professional educational materials or reports, in print or other media

ISPN (International Society for Pediatric Neurosurgery) Guide to Pediatric Neurosurgery (www.ispneurosurgery.org)

This is an international effort to develop a comprehensive, interactive textbook for pediatric neurosurgery on-line as a wiki/web resource. It involves authors from around the world and is the first effort of its kind, which has been in progress over the past year. I have been appointed as an editor of the vascular disease section, which includes contributors from Asia, Europe and North America.

Clinical Guidelines and Reports

Professional Guidelines

Roach ES, (Chair), Golomb M, Adams R, Biller, Daniels JS, deVeber G, Ferriero D, Ichord R, Jones B, Kirkham F, Scott RM, **Smith ER**. Guidelines for the management of cerebrovascular disorders in infants and children: A statement for healthcare professionals from a special writing group of the stroke council, American Heart Association. *Stroke*. 2008 Sep;39(9) 2644-2691.

Abstracts, Poster Presentations and Exhibits Presented at Professional Meetings

1. Grondin R, Scott RM, **Smith ER**. Treatment of Moyamoya Disease in the Adult Population with Indirect Cerebral Revascularization Utilizing Pial Synangiosis, American Heart Association International Stroke Conference, New Orleans, LA, February 21, 2008.
2. Grondin R, **Smith ER**, Scott RM. Pial Synangiosis for Moyamoya Disease with Hemorrhagic Presentation in Children: Long-term Follow-up, (poster) American Heart Association International Stroke Conference, New Orleans, LA, February 20-22, 2008.

3. Grondin R, Scott RM, **Smith ER**. Progression of disease in unilateral moyamoya syndrome, (poster) American Heart Association International Stroke Conference, New Orleans, LA, February 20-22, 2008.
4. **Smith ER**, Zurakowski D, Saad A, Scott RM, Moses MA. Urinary Biomarkers Predict Brain Tumor Presence and Response to Therapy, Presented at the American Association of Neurological Surgeons Annual Meeting, Chicago, IL, April 28, 2008.
5. Grondin R, **Smith ER**, Scott RM. Pial Synangiosis for Moyamoya Disease with Hemorrhagic Presentation in Children: Long-term Follow-up, (poster), Presented at the American Association of Neurological Surgeons Annual Meeting, Chicago, IL, April 29-May 1, 2008.
6. **Smith ER**, Zurakowski D, Saad A, Scott RM, Moses MA. Urinary Biomarkers Predict Brain Tumor Presence and Response to Therapy, (poster) Presented at the American Association for Cancer Research, San Diego, CA, April 13, 2008.
7. **Smith ER**, Scott RM. Treatment of Moyamoya Disease in the Adult Population with Indirect Cerebral Revascularization Utilizing Pial Synangiosis, Presented at the New England Neurosurgical Society Annual Meeting, Chatham, MA, June 20, 2008.
8. Viswanathan V, **Smith ER**, Kozakewich H, Orbach DB. Infantile hemangiomas with CNS manifestation: Prevalence, imaging characteristics, and clinical significance. American Society of Neuroradiology; New Orleans, Louisiana, June 5, 2008.
9. Viswanathan V, **Smith ER**, Kozakewich H, Orbach DB. Infantile hemangiomas with intracranial or intraspinal extension: Clinical, histopathologic, and radiologic correlation. International Society for the Study of Vascular Anomalies, Boston, Massachusetts, June 24, 2008.
10. **Smith ER**, Zurakowski D, Scott RM, Moses MA. Urinary Biomarkers Predict Presence of Moyamoya Disease, AANS/CNS Section on Pediatric Neurological Surgery Annual Meeting, Spokane, WA, December 5, 2008.
11. Magge S, Orbach D, Soriano S, **Smith ER**. Combined Preoperative Embolization And Perioperative Administration Of Tranexamic Acid To Decrease Blood Loss During Resection Of A Choroid Plexus Papilloma, (poster) AANS/CNS Section on Pediatric Neurological Surgery Annual Meeting, Spokane, WA, December 5, 2008.
12. Naunheim M, **Smith ER**. Surgical Treatment Of Moyamoya With Pial Synangiosis Provides Independence From Exchange Transfusions In Sickle Cell Disease, AANS/CNS Section on Pediatric Neurological Surgery Annual Meeting, Spokane, WA, December 5, 2008.
13. **Smith ER**, Zurakowski D, Scott RM, Moses MA. Biomarkers for Moyamoya. Presented at the American Association of Neurological Surgeons Annual Meeting, San Diego, CA, May 5, 2009.
14. Magge SN, Fadl S, Governale LS, Nalbach SV, **Smith ER**. A Study of Idiopathic Syringomyelia in the Pediatric Population: Natural Progression and Implications for Management. Presented at the American Association of Neurological Surgeons Annual Meeting, San Diego, CA, May 4, 2009 (Plenary Session Presentation).

15. Moftakhar P, **Smith ER**, Lee MB, Steinberg GK, Scott RM. Danielpour M, Moyamoya Disease Associated with Congenital Dwarfing Conditions. Presented at the American Association of Neurological Surgeons Annual Meeting, San Diego, CA, May 4, 2009.
16. **Smith ER**, McNeish B, Zurakowski D, Moses MA. Non-Invasive Biomarkers For Brain Arteriovenous Malformations. Presented at the Congress of Neurological Surgeons Annual Meeting, New Orleans, LA, October 26, 2009.
17. **Smith ER**, McNeish B, Zurakowski D, Moses MA. Non-invasive Biomarker Fingerprinting for Brain Tumors. Presented at the Congress of Neurological Surgeons Annual Meeting, New Orleans, LA, October 26, 2009.
18. Kim AH, **Smith ER**, Silvera VM, Proctor MR. Radiographic features of the lumbar spine following filum terminale sectioning. Presented at the Congress of Neurological Surgeons Annual Meeting, New Orleans, LA, October 26-29, 2009.
19. Ullrich N, **Smith ER**, Marcus K, Kieran M. Rapid progression of Neurofibromatosis-associated Moyamoya after bevacizumab for glioblastoma, Presented at the 14th International Symposium on Pediatric Neuro-Oncology (ISPNO), Vienna, Austria, June 20-23, 2010.
20. Robinson NJ, Chi S, Kieran M, Manley P, Cohen L, Goumnerova L, **Smith E**, Scott M, Ullrich N. Evaluation of patients with pituitary stalk enlargement. Presented at the 14th International Symposium on Pediatric Neuro-Oncology (ISPNO), Vienna, Austria, June 20-23, 2010.
21. **Smith ER**, Scott RM. Pial Synangiosis for Pediatric Moyamoya; The Children's Hospital Boston Experience, Moyamoya Disease Update Seminar (as part of the International Society for Pediatric Neurosurgery Annual Meeting), Jeju, South Korea, October 30, 2010.
22. Scott RM, **Smith ER**. Pial Synangiosis in Patients with Moyamoya Syndrome and Sickle Cell Anemia, International Society for Pediatric Neurosurgery Annual Meeting, Jeju, South Korea, November 1, 2010.
23. Kim AH, Kasiwal M, Silvera VM, Proctor MR, **Smith ER**. Radiographic features of the lumbar spine following filum terminale sectioning. International Society for Pediatric Neurosurgery Annual Meeting, Jeju, South Korea, November 2, 2010.
24. Orbach D, Puri A, Scott RM, **Smith ER**. Treatment of Pial Arteriovenous Malformations, International Society for Pediatric Neurosurgery Annual Meeting, Jeju, South Korea, November 3, 2010.
25. Governale L, Laws ER, **Smith ER**. The Transsphenoidal Approach In Pediatric Patients: A Single Institution Experience, Presented at the American Association of Neurological Surgeons/Congress of Neurologic Surgeons Pediatric Section Annual Meeting, Cleveland OH, December 3, 2010.
26. Koss M, Scott RM, **Smith ER**, Ullrich NJ, Moyamoya Syndrome Associated with Neurofibromatosis Type 1: Perioperative and Long-Term Outcome After Surgical Revascularization. Child Neurology Society Annual Meeting, Savannah, GA, October 26, 2011.

27. Walcott BP, **Smith ER**, Scott RM, Orbach DB. Pial arteriovenous fistula in pediatric patients: Associated Syndromes and Treatment Outcome. World Federation of Interventional and Therapeutic Neuroradiology Annual Meeting, Cape Town, South Africa, November 8, 2011.
28. Walcott BP, **Smith ER**, Scott RM, Orbach DB. Dural arteriovenous fistula in pediatric patients: outcome of endovascular and surgical treatment. World Federation of Interventional and Therapeutic Neuroradiology Annual Meeting, Cape Town, South Africa, November 8, 2011.
29. Ellis MJ, Armstrong D, Vachhrajani S, Kulkarni AV, Dirks PD, Drake JM, **Smith ER**, Scott RM, Orbach DB. Angioarchitectural Features Associated with Hemorrhagic Presentation in Pediatric Cerebral Arteriovenous Malformations. World Federation of Interventional and Therapeutic Neuroradiology Annual Meeting, Cape Town, South Africa, November 8, 2011.
30. Lin N, Bergin AM, Landrigan M, **Smith ER**, Scott RM, Orbach DB. Endovascular treatment of a middle cerebral artery aneurysm associated with Moyamoya disease after pial synangiosis. World Federation of Interventional and Therapeutic Neuroradiology Annual Meeting, Cape Town, South Africa, November 8, 2011.
31. Lin N, **Smith ER**, Scott RM, Orbach DB. Safety of Neuroangiography and Embolization in Children: Complication Analysis in 379 consecutive cases. World Federation of Interventional and Therapeutic Neuroradiology Annual Meeting, Cape Town, South Africa, November 8, 2011.

Narrative Report

As a pediatric neurosurgeon at Children's Hospital Boston (CHB), I divide my time equally between clinical and research efforts. My practice focuses on cerebrovascular disease and brain tumors, with a particular interest in moyamoya, arteriovenous malformations (AVM) and skull base tumors, including pituitary disease. These areas of clinical expertise are reflected in my roles as Director of Pediatric Cerebrovascular Surgery and Co-Director of the Stroke Center and Skull Base Center at Children's Hospital.

CHB was ranked first in the country in 2010 by *US News & World Report* for Neurology and Neurosurgery, and we are recognized as having one of the largest pediatric moyamoya programs in the world, performing 40-50 operations annually and having treated over 600 patients for this disorder. This high-volume international practice is mirrored in our AVM and brain tumor referrals, enabling me – in collaboration with colleagues - to develop a number of clinical innovations, including novel methods of AVM treatment, minimally invasive skull base endoscopic techniques in young children and new perioperative and surgical approaches for moyamoya patients. This work has impacted practice nationally, as recognized by invitations to serve as visiting professor, chair international symposia, author invited state-of-practice papers (such as the recent moyamoya article in the *New England Journal of Medicine*) and participate in the creation of clinical practice guidelines, including the American Heart Association *Guidelines for the Management of Cerebrovascular Disorders in Infants and Children*.

My clinical practice drives my research efforts, with my laboratory focused on mechanisms of vascular regulation shared by both brain tumors and cerebrovascular disease. In particular, I am interested in the development of tests to better screen for the presence, recurrence and progression of brain tumors and cerebrovascular disease using non-invasive biomarkers. My laboratory published the first report describing the successful use of urinary biomarkers to identify brain tumors and has since expanded this work to include – for the first time – the ability of urinary biomarkers to predict therapeutic efficacy in cerebrovascular disease. This research, supported by the NIH and national foundations, will serve as the core of a planned 2011 national multicenter trial to study brain tumor recurrence.

In addition to my clinical and research efforts, I enjoy teaching medical students, residents, fellows and colleagues in numerous capacities. Part of this educational effort includes authoring more than 30 chapters as part of over 80 publications. I am actively involved in organized neurosurgery, serving local, regional and national leadership roles, including recently being named Chair of the Ethics Committee of the American Society of Pediatric Neurosurgery and voted as President-elect of the Young Neurosurgeons Committee of the American Association of Neurologic Surgery – positions sought for their capacity to draw interested colleagues into the field and to drive neurosurgery toward translational research.

My academic career has a discrete focus on pediatric cerebrovascular disease and brain tumors; disorders linked by similar operative approaches I use in the hospital and by common biologic processes I study in the laboratory. Through this specialization – with efforts in education, organized neurosurgery, clinical practice and research – it is my professional objective to develop cures for children afflicted with these diseases.