



Endovascular Training: During Residency vs Post-Residency Fellowship?

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Florida Neurosurgical Society
Meeting, August 31, 2013

Disclosures

- NIH (K08NS067058)
- *I have an endovascular neurosurgery fellowship, but also train residents in endovascular*

Why Endovascular?

- Endovascular treatment has a role in neurosurgery
- *And neurosurgeons should have a role in endovascular*

Ruptured Cerebral Aneurysms

- ISAT: 2143 patients, 1 year: **coiling 23.5% vs clipping 30.9%** death/dependency (P=0.0001)¹
- BRAT: 500 patients, 1 year: **coiling 23.2% vs clipping 33.7%** death/dependency (P=0.02)²
- BRAT: 349 patients, 3 year: coiling 30% vs clipping 35.8% death/dependency (P=0.25), but for posterior circulation aneurysms: **coiling 25% vs clipping 61.8%** (P=0.004)³

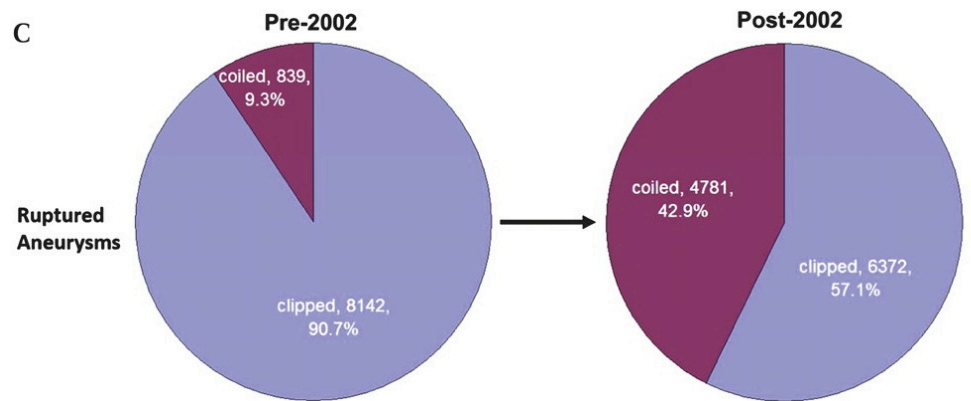
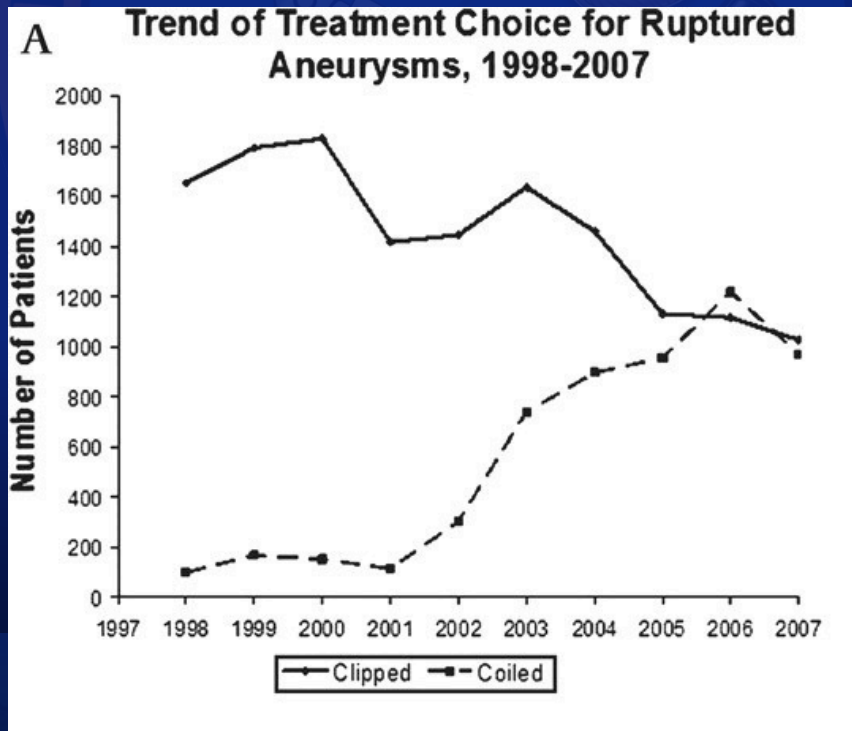
1. Molyneux et al, Lancet 2005

2. McDougall et al, JNS 2012

3. Spetzler et al, JNS 2013

Ruptured Cerebral Aneurysms

- Trend towards coiling: increased two-fold 1998-2007



Unruptured Cerebral Aneurysms

- NIS: 14,050 patients: coiling 2.16% vs clipping 4.75% morbidity ($P < 0.0001$)¹

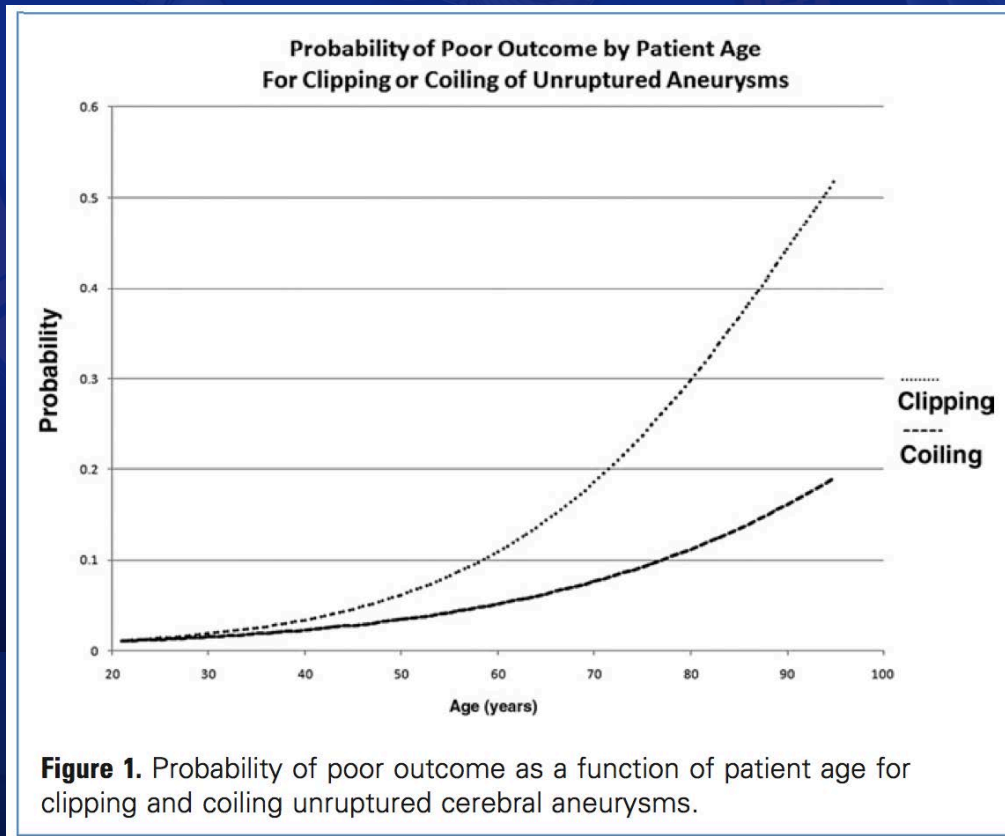


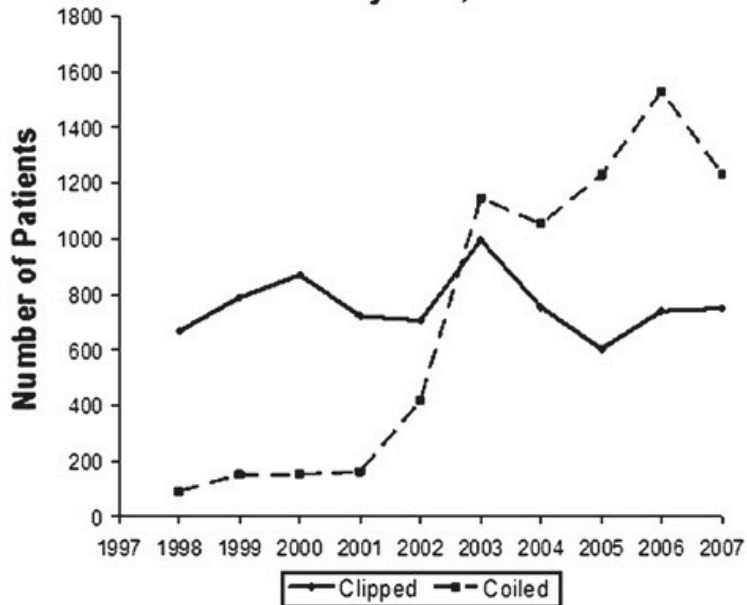
Figure 1. Probability of poor outcome as a function of patient age for clipping and coiling unruptured cerebral aneurysms.

1. Lawson, Hoh, World NS, 2013

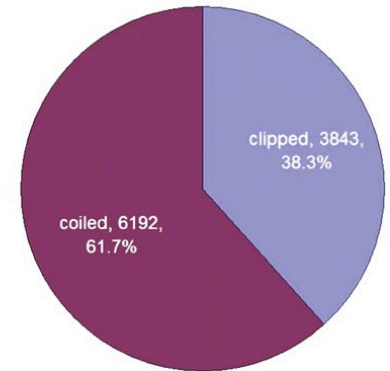
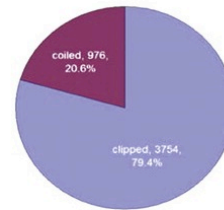
Unruptured Cerebral Aneurysms

- Trend towards coiling: increased two-fold 1998-2007

B Trend of Treatment Choice for Unruptured Aneurysms, 1998-2007

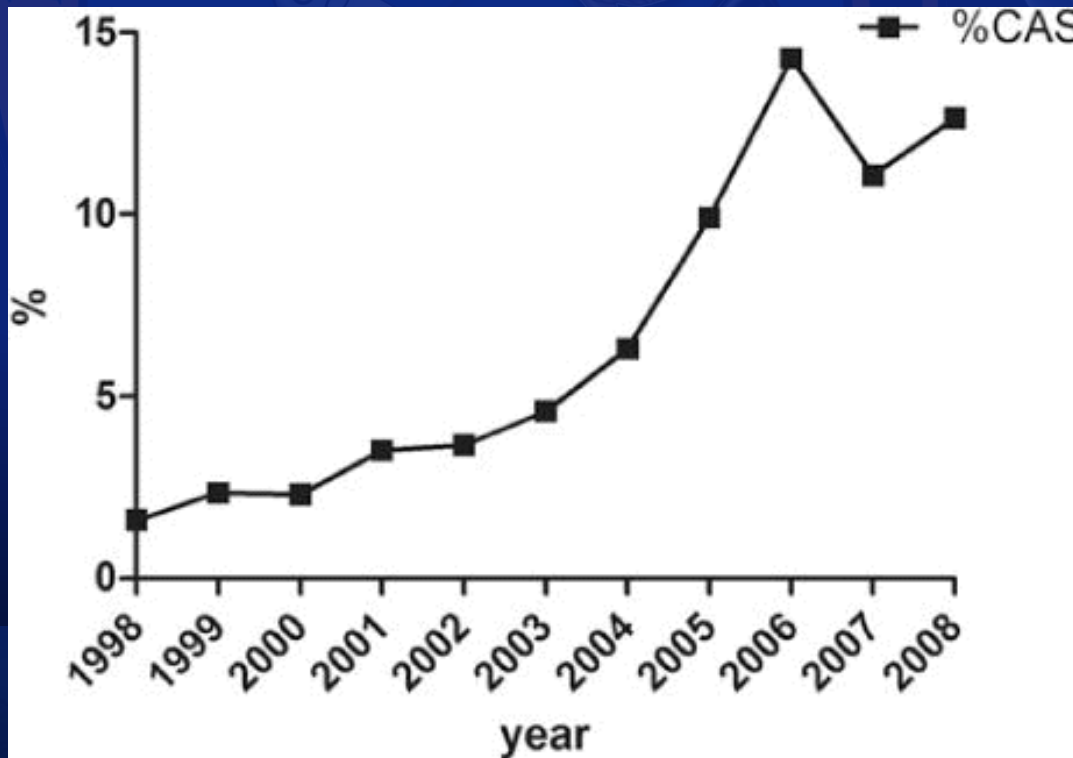


Unruptured Aneurysms



Carotid Disease

- CREST: 2502 patients, 4 year: CAS 7.2% vs CEA 6.8% (P=0.51) stroke/MI/death¹



- Steady increase in CAS performed²

1. Brott et al, NEJM 2010
2. Dumont et al, JNS 2012

Others

- AVMs
- Stroke
- Vasospasm
- Venous sinus thrombosis
- Tumor embolization
- Epistaxis/Head & Neck bleeding
- Pseudotumor cerebri?

Current Neurosurgery Workforce

- Currently 3500 neurosurgeons provide care for 299 million Americans: a ratio of 1 neurosurgeon to 85,542 people¹
- 795,000 strokes in the US each year²
- *Who is going to provide stroke care?*
(Remember, stroke includes SAH, ICH, aneurysms, AVMs, carotid disease)

1. Rahman and Hoh, World NS 2012

2. Roger et al, AHA Statistical Update, Circulation, 2012

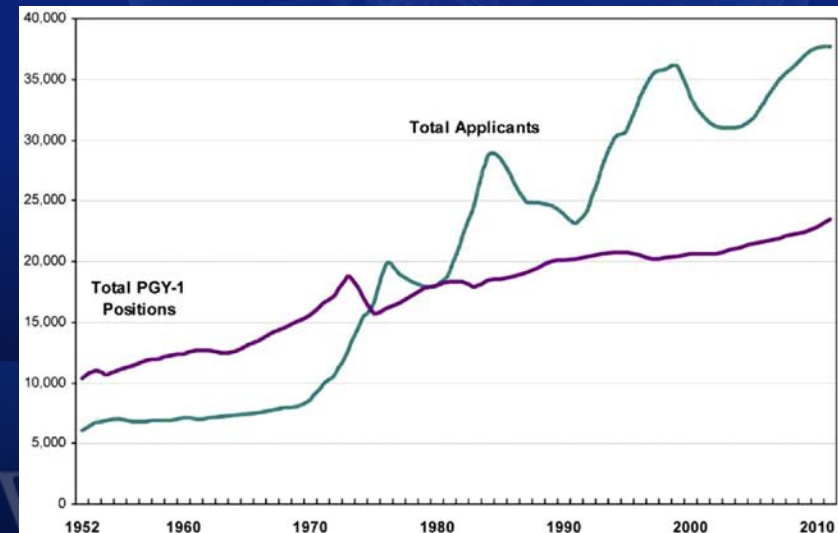
Future Neurosurgery Workforce

- Number of medical schools and medical students increasing
- Association of American Medical Colleges (AAMC) called for increase enrollment by 30% over the next decade to address projected physician shortages in 2020
- More than 18,000 students started medical school in 2010, compared to the 16,000 that started in 2002

1. Rahman and Hoh, World NS 2012

Future Neurosurgery Workforce

- However, number of residency slots not keeping up (or are decreasing)
- Proposed 60% cut in GME funding (National Commission on Fiscal Responsibility and Reform)
- Number of neurosurgical graduates unlikely to increase



Current Neuroendovascular Workforce

- About 800 neurointerventional physicians in the US¹
- 80 fellowships graduating about 80-100 NI fellows each year (compared to 160 neurosurgery residents from 100 neurosurgery residency programs each year)¹

1. Fiorella et al, JNIS 2012

Current Neuroendovascular Workforce

- What does this mean?
- If current trends continue, neurosurgeons are not the future of neuroendovascular
- Who will be?
- *Neurologists, cardiologists and vascular surgeons*

Endovascular Fellowships

- 43 fellowship programs¹ (probably higher now: 80²)
- 80% academic, 20% academic/private
- Faculty: 57 radiologists, 39 neurosurgeons, 10 neurologists
- Requirements:
 - 86% 2-year fellowship
 - 49% mandatory resident rotation
 - 34% infolded partial fellowship
 - 9% no resident exposure at all

1. Strozyk et al, World NS 2010

2. Fiorella et al, JNIS 2012

Endovascular Fellowships

- 68 fellows in training
 - 38% entered immediately after residency
 - 26% after a fellowship
 - 26% while in residency

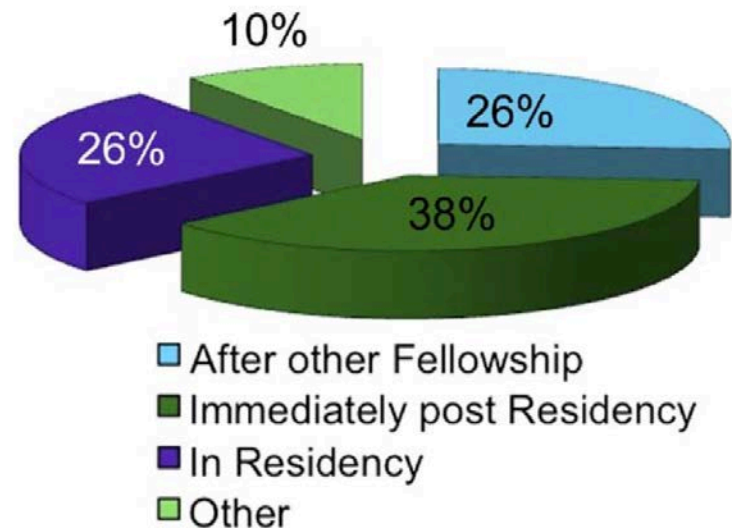


Figure 5. Time of Training: Current Fellows. In examining when trainees pursue a fellowship during their career, 38% entered fellowship immediately after residency, 26% pursued training after another fellowship, and 26% obtained training during residency.

Endovascular Fellowships

- 14% increase of graduates within the next five years
- Radiologists declining by 37%
- Neurosurgeons increasing by 42.5%
- *Neurologists increasing by 112%*
- 12% respondents know vascular surgeons or cardiologists performing intracranial procedures

1. Strozyk et al, World NS 2010

Cardiology

The Journal of Invasive Cardiology > Editorial

Should Interventional Cardiologists Treat Ischemic Strokes? A Global Perspective

Elad I. Levy, MD, Michael J. Rinaldi, MD, Jay U. Howington, MD, Bernard R. Bendok, MD, Stanley H. Kim, MD, Mark R. Harrigan, MD, Adnan I. Qureshi, MD, Lee R. Guterman, PhD, MD, L. Nelson Hopkins, MD | [Disclosures](#)

J Invasive Cardiol. 2002;14(11)

Stroke is the third leading cause of death and the leading cause of severe neurological disability in our nation. The stroke death rate has the potential to reach epidemic proportions as the elderly segment of the population continues to rise. There is an insufficient number of trained physicians to supply the care for this patient population. The logical source for qualified physicians to care for these patients is the interventional cardiologist. We review the

Stroke Intervention

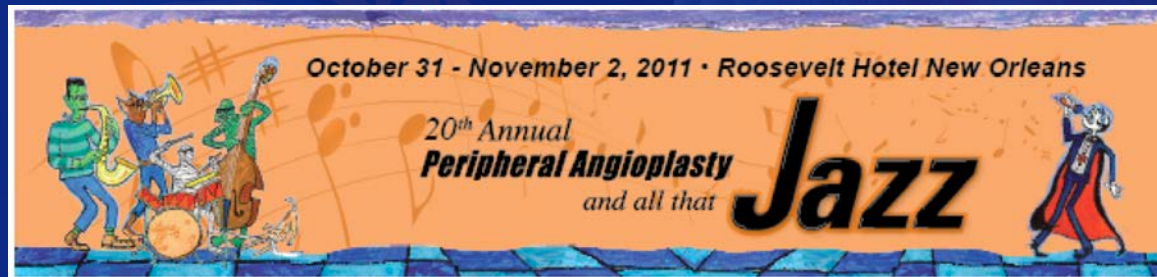
Catheter-Based Therapy for Acute Ischemic Stroke

Christopher J. White, MD,* Alex Abou-Chebl, MD,† Christopher U. Cates, MD,‡
Elad I. Levy, MD,* Paul W. McMullan, MD,§ Krishna Rocha-Singh, MD,||
Jesse M. Weinberger, MD,¶|| Mark H. Wholey, MD#

*New Orleans, Louisiana; Louisville, Kentucky; Atlanta, Georgia; Buffalo and New York, New York;
Springfield, Illinois; and Pittsburgh, Pennsylvania*

Finally, we need to put the turf battles behind us and recruit from the pool of willing interventionalists (Cardiology, Neurology, Radiology, Neurosurgery, Vascular Surgery, and Vascular Medicine) with carotid stent experience and work together as a team to improve delivery of much-needed care to stroke patients.

Cardiology



Symposium on Stroke for the Interventionist

Monday, October 31

- 1:30 p.m. Embolic Stroke: Role of the Comprehensive Stroke Center
Cerebrovascular Anatomy, Common Variants and Optimal Acute Imaging for Acute Stroke
- 1:45 p.m. Stroke
- 2:00 p.m. Thrombolysis for Acute Stroke
- 2:15 p.m. Intervention for Acute Stroke: Lysis, Clot Retrieval or Stent?
- 2:30 p.m. Why Should Cardiologists Be Involved in the Stroke Team?
What Is the Role of Antiplatelet Therapy and Anticoagulation in the Treatment and Prevention of Stroke?
- 2:45 p.m. Prevention of Stroke?
- 3:00 p.m. Refreshment Break and Visit Exhibits
Ischemic Stroke: Direct Stent Versus Thrombectomy: Stenting Is Quicker and Better
- 3:30 p.m. Debate: Ischemic Stroke: Direct Stent Versus Thrombectomy: Thrombectomy Does a Better Job
- 3:45 p.m. a Better Job
- 4:00 p.m. After the Stroke: How Do We Manage the Patient?
- 4:15 p.m. Diagnostic Workup: How Do We Prevent the Next Stroke?
- 4:30 p.m. Cases from the Pros: Acute Stroke
- 5:00 p.m. Adjourn

New Neurosurgery Residency Requirements

- As of July 1, 2013, the ACGME Neurosurgery RRC lengthened mandatory neurosurgery residency training to 84 months
 - 54 months of clinical neurosurgery after PGY-1 year
 - 18 months elective
- As of July 1, 2013, the RRC mandates all neurosurgery residents perform 40 craniotomies for intracranial vascular lesion, 10 endovascular procedures, and 25 angiograms

ACGME Duty Hour Restrictions

- 80 hours/week
- 1 day off in 7
- Can not work >24 hours continuous (plus 4 hours for handoffs or education)
- PGY-1 can not take call and can not >16 hours continuous. All activity must be supervised
- Must have 8 hours (should have 10 hours) off between shifts
- In-house call can not be more frequent than every 3rd night

ACGME Duty Hour Restrictions

- *For a senior resident taking in-house call every 4th night, can not be in the hospital >12 hours the days he/she is not oncall*
- *Round at 5am, must leave at 5pm*

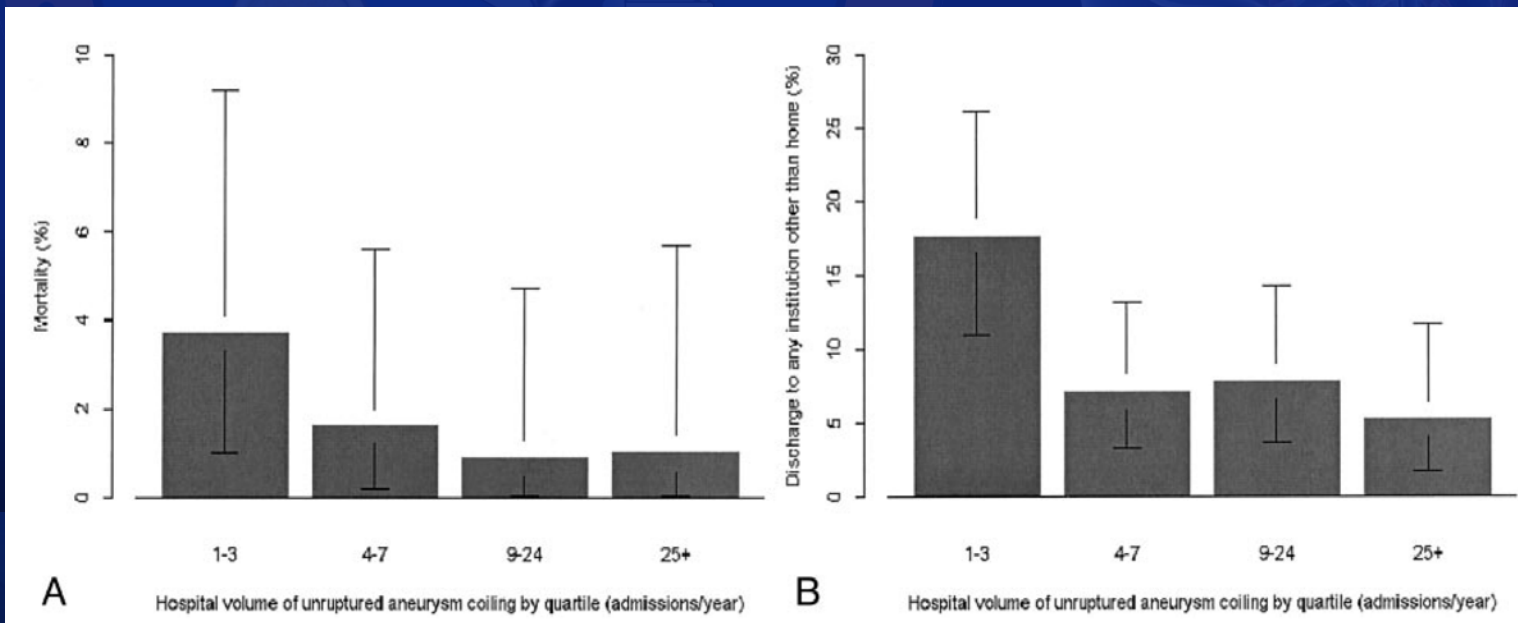
Endovascular is Complex

- Different skill set than other types of neurosurgery
- Complications can be catastrophic
- Continuously evolving with new devices and technology



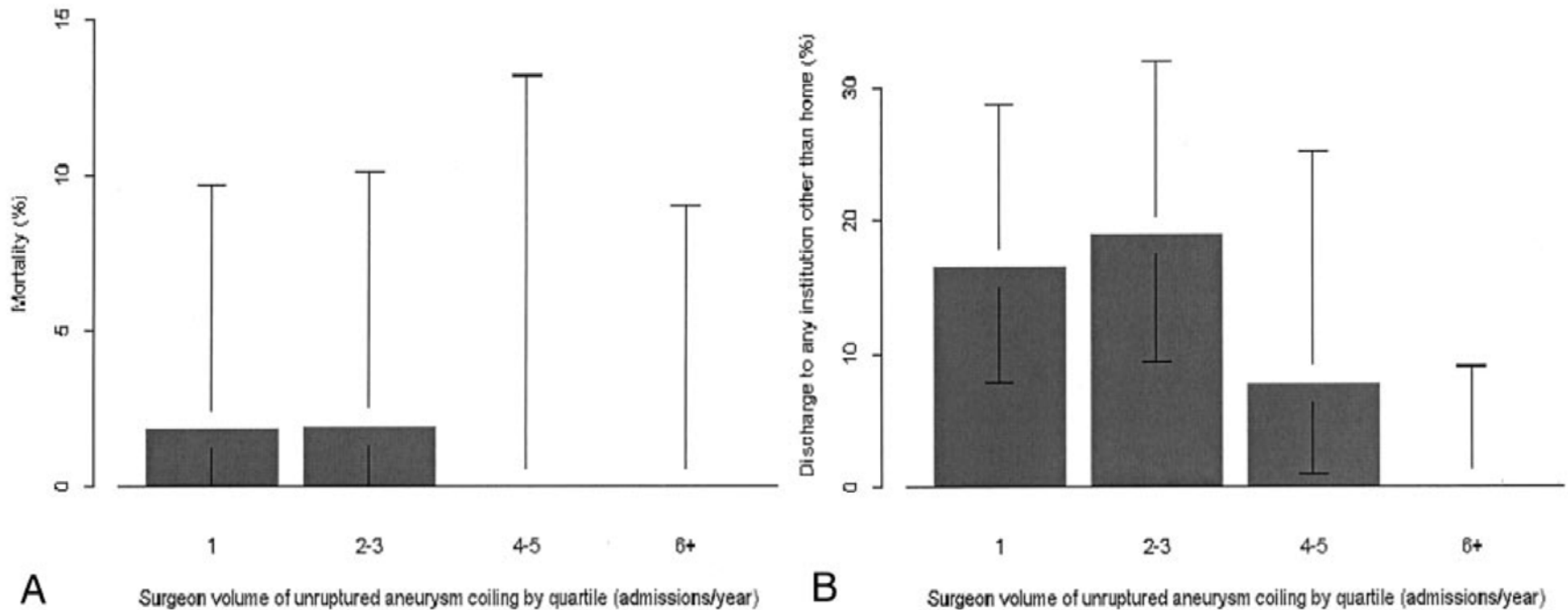
Learning Curve for Endovascular

- 421 patients underwent coiling for unruptured CAs at 81 hospitals
- High volume hospital 5.2% vs low volume hospital 17.6% discharge other than home ($P < 0.001$)



Learning Curve for Endovascular

- High volume physician 0% vs low volume physician 16.4% discharge other than home (P=0.03)



Quality of Training is Critical

Evaluating Obstetrical Residency Programs Using Patient Outcomes

David A. Asch, MD, MBA

Sean Nicholson, PhD

Sindhu Srinivas, MD, MSCE

Jeph Herrin, PhD

Andrew J. Epstein, PhD, MPP

Context Patient outcomes have been used to assess the performance of hospitals and physicians; in contrast, residency programs have been compared based on non-clinical measures.

Objective To assess whether obstetrics and gynecology residency programs can be evaluated by the quality of care their alumni deliver.

Design, Setting, and Patients A retrospective analysis of all Florida and New York

- Studied all Florida and New York obstetrical discharges 1992-2007: 4,906,169 deliveries
- Analyzed where alumni did their OB training (mean 20.4 years of experience)
- Alumni of bottom quintile programs had adjusted complication rate of 13.6%, compared to 10.3% for alumni of programs in the top quintile (absolute difference, 3.3%; 95% confidence interval, 2.8%-3.8%).

10,000 Hour Rule

- K. Anders Ericsson
- Malcolm Gladwell: "Outliers: The Story of Success"
 - The Beatles: performed live over 1200 times in Hamburg from 1960-1964 amassing >10,000 hours
 - Bill Gates: 1968 at age 13 gained access to U. Washington computer and programmed >10,000 hours
 - Violin students in Berlin in 1990s: all started at age 5, by age 20, elite performers >10,000 hours practice; less able performers had about 4,000 hours practice

10,000 Hour Rule for Neurosurgery Training?

- 80 hours/week, 49 weeks per year (3 weeks vacation), 3920 hours/year
- 7 years = 27,440 hours
- Split between
 - Spine
 - Cranial
 - Functional
 - Peripheral Nerve
 - Pediatric
 - Critical care
 - Trauma
 - Epilepsy
 - Endovascular
 - Radiosurgery

Neurosurgery Residents not seeking Post-Graduate Fellowships

- 26 UF grads over last 10 years (2003-2013)
- *2 did post-graduate fellowships*
- 12 did “infolded” fellowships during residency (6 endovascular, 4 functional, 2 spine)

Endovascular: Residency vs Post-Residency Fellowship?

- We MUST train neurosurgeons in endovascular
- Neurosurgeons must lead the field of endovascular
- We take care of aneurysms, SAH, AVMs, stroke, carotid disease
- Unless we train the next generation, the field will be taken over by others (cardiology, neurology, vascular surgery)

Endovascular: Residency vs Post-Residency Fellowship?

- Residency: probably not enough time to master
 - Duty-hour restrictions
 - Have to learn all other aspects of neurosurgery
 - Enough cases for all residents?
 - The notion that every neurosurgery graduate is capable of performing endovascular is improbable

Endovascular: Residency vs Post-Residency Fellowship?

- Post-residency fellowship
 - Residents do not want to add further years to long training
 - Credentialing for fellowships largely ignored
 - Only 2 neurosurgery ACGME-accredited fellowships (UF and BNI)
 - 2 neurology, 3 radiology
 - Lack of open surgery during fellowship

ANSWER?

- Infolded 2-year fellowship during residency, *or*
- 1 year during residency and 1 year after residency
- Need to incorporate part of training into residency, otherwise, training too long and neurosurgeons won't pursue endovascular
- Yet, need 2 years of dedicated time to gain adequate experience and case numbers

Conclusions

- Neurosurgeons need take a leadership role in endovascular
- Cerebrovascular, including stroke, is a neurosurgical disease
- Unless we shorten training (9-year training not viable), less of our trainees will pursue endovascular

Conclusions

- Quality of Training is Critical



THANK YOU

