Development of a Neurosurgeon-Scientist

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Neurosurgery
What is a physician scientist?

Clinical Care

Physician

Inquiry to improve clinical outcomes

Physician Scientist

Inquiry

Scientist
Physician Scientist Workforce working group report -2014

Figure 2.1. NIH-funded Physician-Scientist Workforce (FY2008-2012)
Timeline to Surgeon-Scientist

- **1994-1998** Wellington High School, Valedictorian
- **1998-2002** University of Florida: Bachelor of Science in Neurobiological Sciences with Highest Honors, Bachelor of Arts in Business Administration with High Honors, Specialization in Chemistry and Minor in Economics
- **2002-2010** Johns Hopkins University School of Medicine: M.D and Ph.D. in Neuroscience
- **2009-2010** Postdoctoral Fellowship, UNCF-Merck Science Initiative
- **2010-2011** Neurological Surgery/Halsted General Surgery Internship, Johns Hopkins Hospital
- **2011-2017** Neurological Surgery Residency, Johns Hopkins Hospital
PSW TRAINING PIPELINE

MEDICAL/DENTAL/NURSING/VETERINARIAN SCHOOL

CLINICAL TRAINING, FELLOWSHIP, RESIDENCY, APPOINTMENTS

INDEPENDENT INVESTIGATOR

JUNIOR FACULTY

SENIOR FACULTY

T32 T35 F30 F31

T32 F32 L P K08 K03 K12/KL2 K99/R00

RPG R01

INDUSTRY RESEARCH

CLINICAL PRACTICE

OTHER ACADEMIC OR GOVERNMENT RESEARCH ROLES

• NIH Success rate
• Demands on time
• Institutional support

• Time
• Mentoring
• Debt
• Regulatory Requirements

• Mentoring
• Exposure
• Education
Inquiry to improve clinical outcomes
Spine cancer - What’s Most Important to Patients?

- How long am I going to live?
- What are the risks of treatment?
- Will I be in the hospital a long time?

- I don’t want to be in constant pain!
- Is there anything new to detect my disease?
  - What’s my quality of life after treatment?
  - How much will it cost?
  - Will I be a burden on my family to take care of me?
Preclinical Pain models

- Few animal models assess pain.
- Animals implanted with breast Cancer in spinal column assessed for pain via pressure applied to back.

Towards precision medicine (Microarray analysis)

Microarray-Based Phospho-proteomic Profiling of Complex Biologic Systems
Summary of Three Years (2014-2017):

Clinical Cases:
190 surgical cases
75 Tumor Cases

Basic and Clinical Research:
71 Accepted Publications
30 Manuscripts in review
22 Book Chapters
7 pending submission

Fellowships and Professional Groups:

Research Certificate
1. Harvard Medical School Global Clinical Scholars Research Training Program

4 Fellowships:
1. Burroughs Wellcome Fund Postdoctoral Enrichment Program
2. UNCF-Merck Science Initiative
3. Neurosurgery Research and Education Foundation
4. The Johns Hopkins Neurosurgery Pain Institute

Professional Groups:
1. AOSpine Knowledge Forum Tumor/Spine Oncology Study Group
2. National Football League Player’s Association Mackey-White Health Committee
Physician Scientist workforce – The midlife crisis

1. Late Start

2. Older and Aging

Figure 3.10. Average Age of NIH Research Project Grant Awardees, PhD, MD, and MD/PhD Degree (FY1999-2012)

Figure 3.11. Average Age of First-time NIH Research Project Grant Awardees, PhD, MD, and MD/PhD Degree (FY1999-2012)
Physician Scientist workforce – Shrinking and underrepresented

3. Shrinking relative to PhD

4. Poor gender representation
Physician Scientist workforce – Shrinking and underrepresented
Some challenges

Clinical pressures
• Operate, operate, operate

Work-life balance (mid 40s)

Mechanisms to enhance timeline to independence require >70% time in the lab

• Early Independence Award (22% awarded PI’s have clinical training, 19/88)
• K99/R00 (51 MDs or MD/PhD applicants in 2012, compared to 700 PhDs)