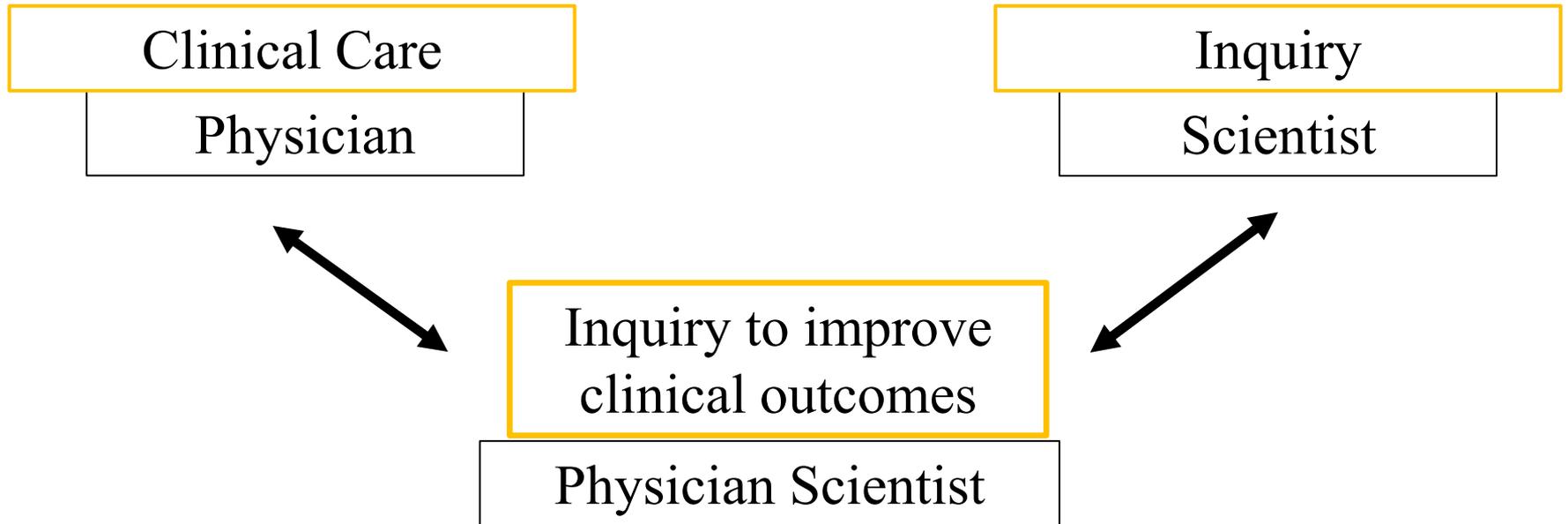


Development of a Neurosurgeon-Scientist

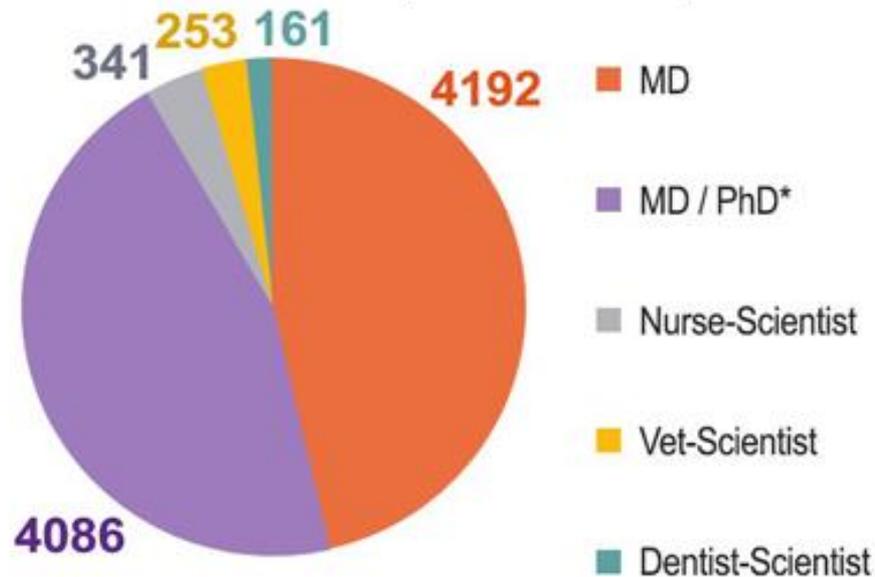
C. Rory Goodwin, MD, PhD
Neurosurgery

What is a physician scientist?



Physician Scientist Workforce working group report -2014

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

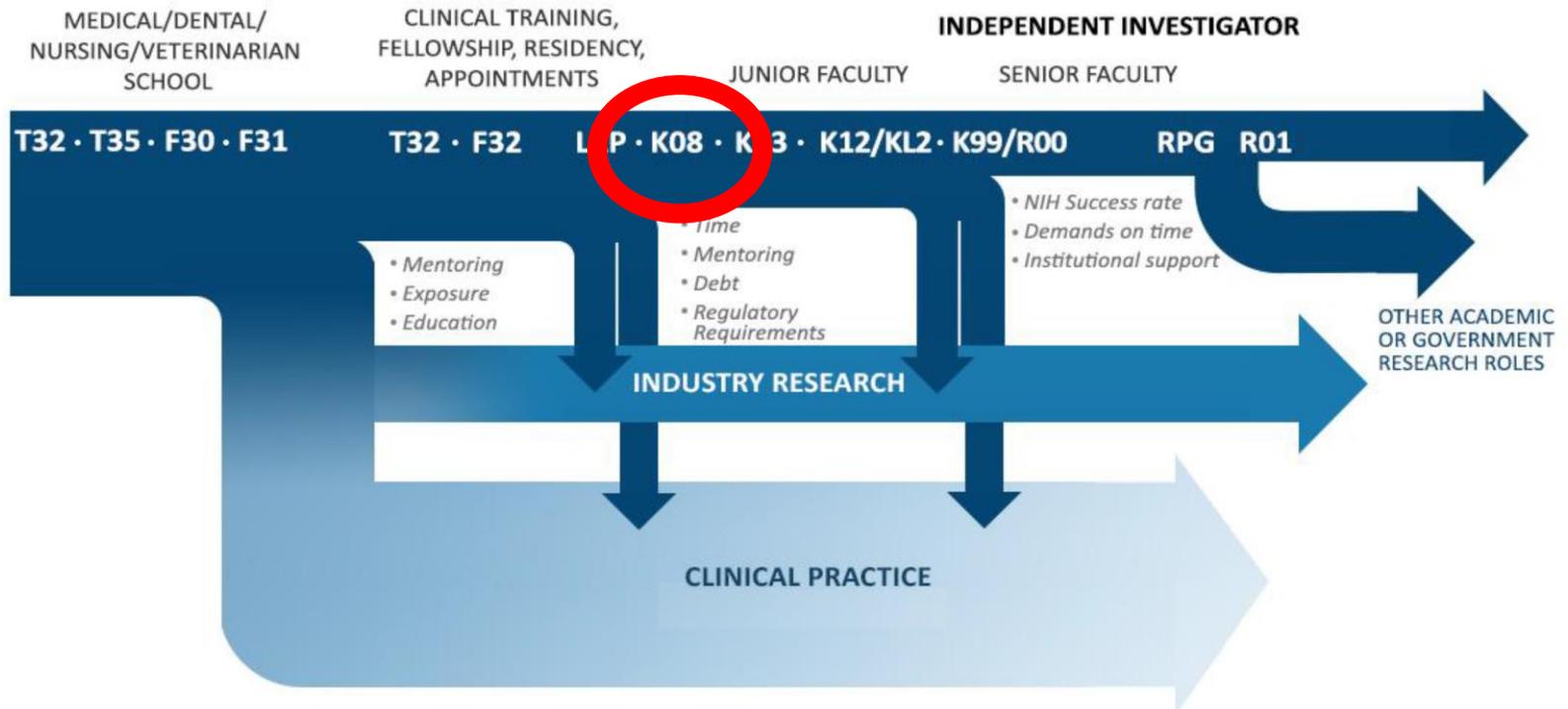


Timeline to Surgeon-Scientist



- ❑ **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

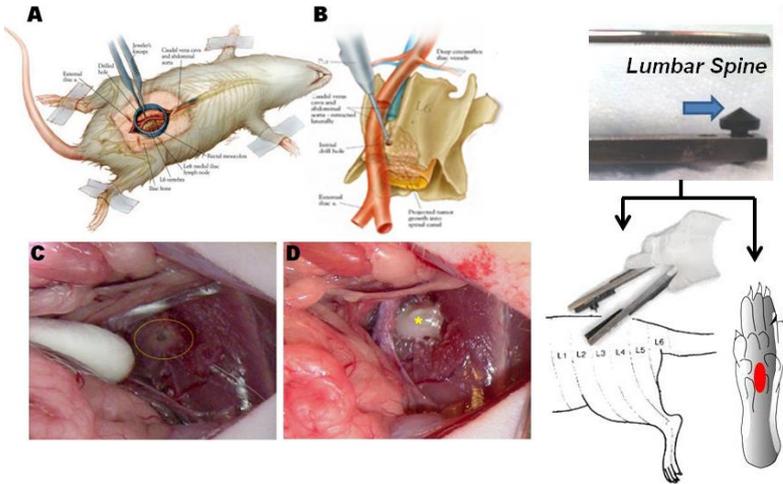


Inquiry to improve clinical outcomes

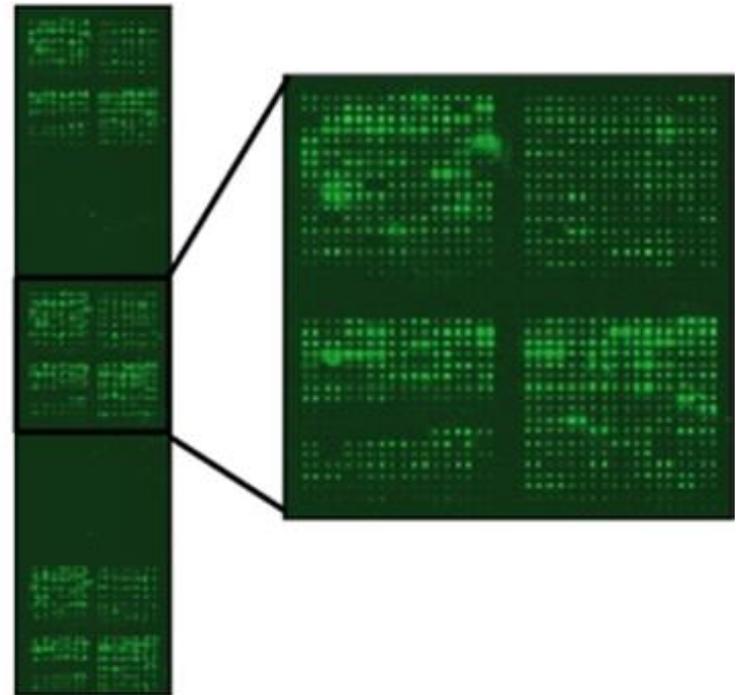
Spine cancer -What's Most Important to Patients?

- 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



Towards precision medicine (Microarray analysis)



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



Microarray-Based Phospho-proteomic Profiling of Complex Biologic Systems

C. Rory Goodwin, Crystal L. Woodard, Xin Zhou, Jianbo Pan, Alessandro Olivi, Shuli Xia, Chetan Bettegowda, Daniel M. Sciubba, Jonathan Pevsner, Heng Zhu, John Laterra.

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

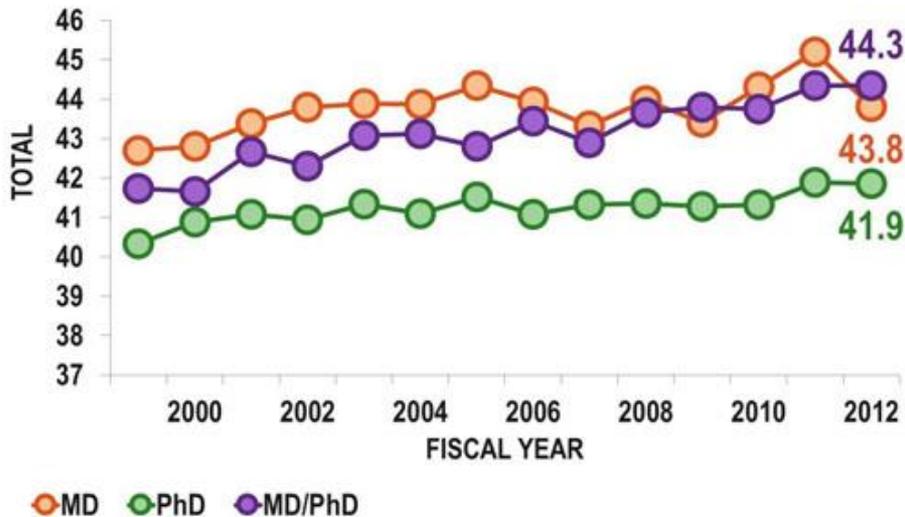
Professional Groups:

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

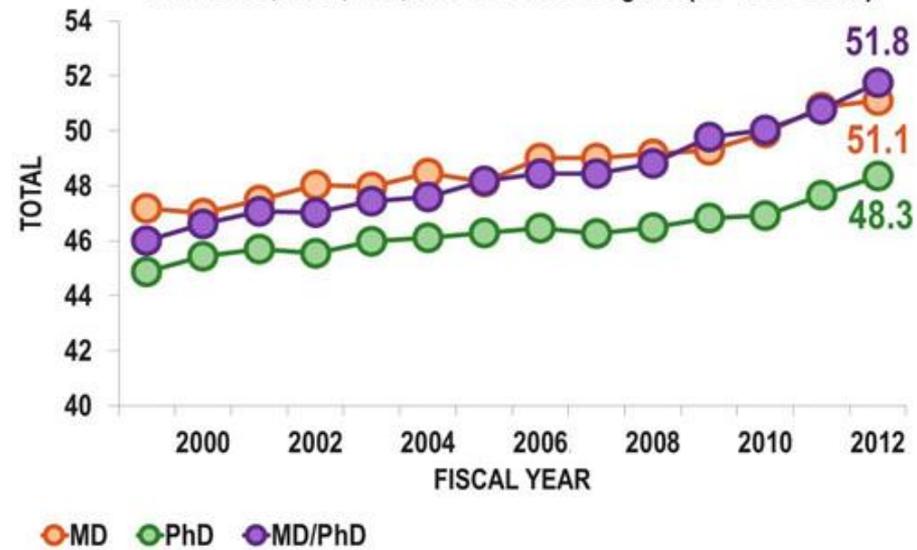
1. Late Start

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



2. Older and Aging

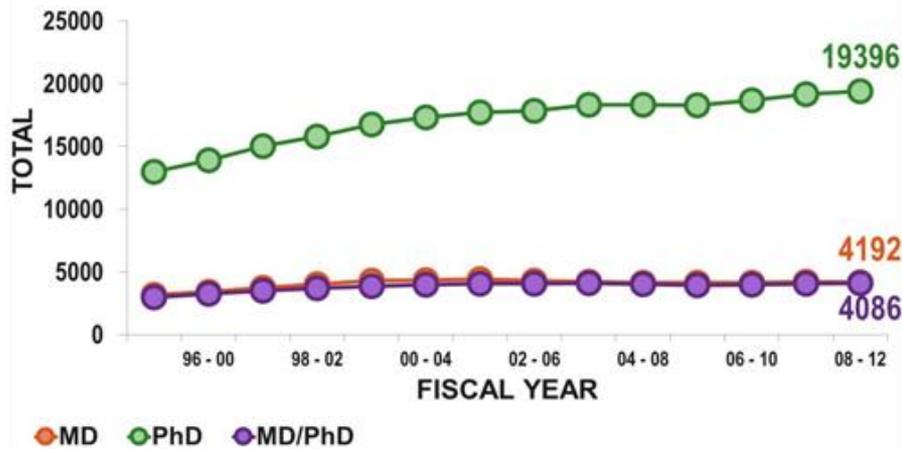
Figure 3.10. Average Age of NIH Research Project Grant Awardees, PhD, MD, and MD/PhD Degree (FY1999-2012)



Physician Scientist workforce – Shrinking and underrepresented

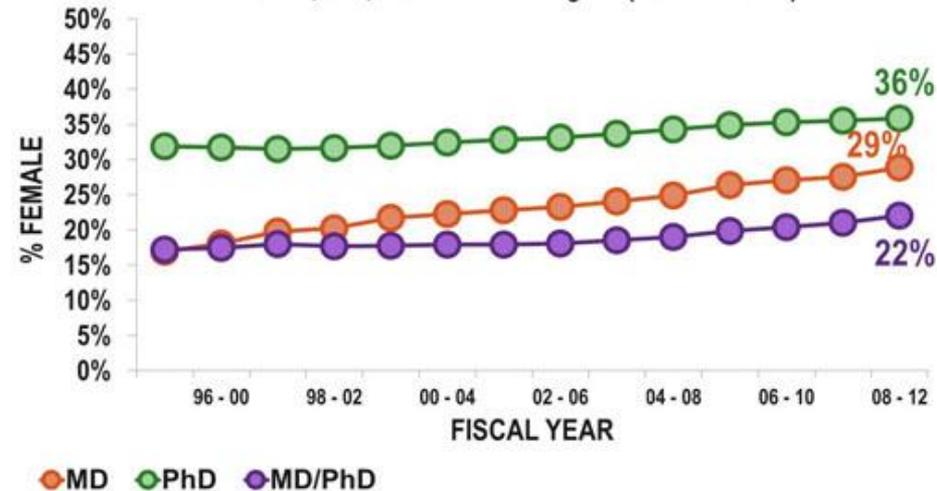
3. Shrinking relative to PhD

Figure 3.3. Individual NIH Research Project Grant Awardees, PhD, MD, and MD/PhD Degree (FY1995-2012)



4. Poor gender representation

Figure 3.12. Percent Female NIH Research Project Grant Awardees, PhD, MD, and MD/PhD Degree (FY1999-2012)



Physician Scientist workforce – Shrinking and underrepresented

Figure 3.19. Individual NIH Research Project Grant Awardees, MD/PhD Degree by Race/Ethnicity, White and Asian (FY1999-2012)

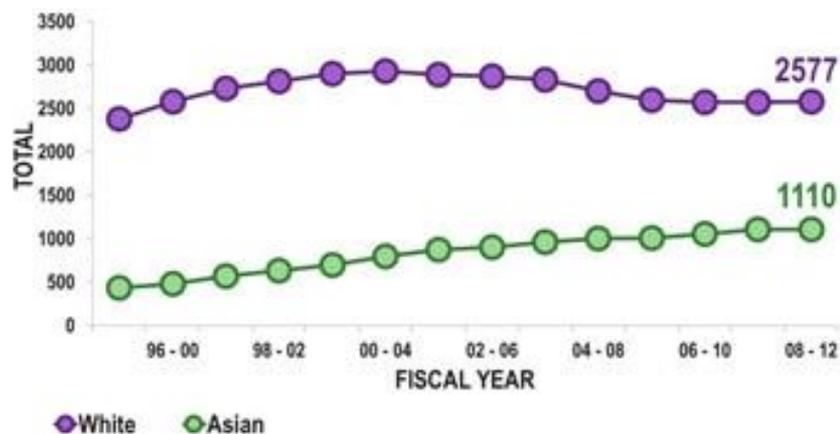
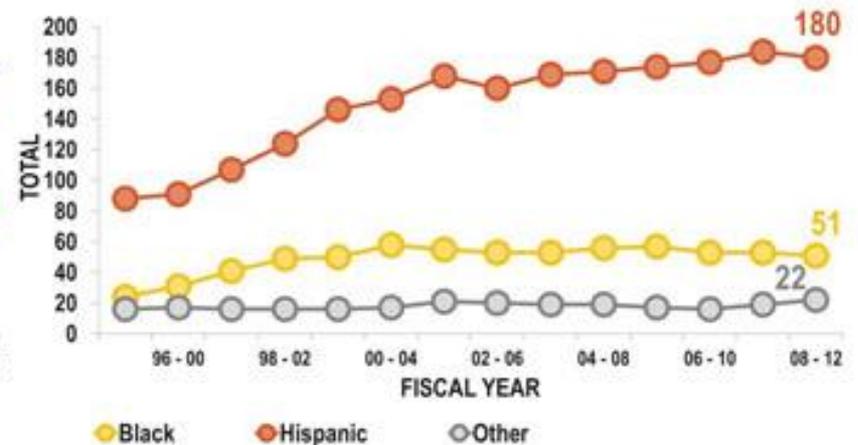


Figure 3.20. Individual NIH Research Project Grant Awardees, MD/PhD Degree by Race/Ethnicity, Underrepresented Groups (FY1999-2012)



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)