



AMERICAN
NEUROLOGICAL
ASSOCIATION

INNOVATORS IN DISCOVERY,
EDUCATION, AND CARE

#ANA2020

Medical Student Recruitment into Neurology *via Curricular Reform*

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ANA2020 **OCTOBER**
4-9, 2020 **VIRTUAL MEETING**

145TH ANNUAL MEETING OF THE AMERICAN NEUROLOGICAL ASSOCIATION

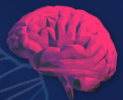
SOCIAL JUSTICE SYMPOSIUM: OCTOBER 3, 2020

DISCLOSURES

Under Accreditation Council for Continuing Medical Education guidelines disclosure must be made regarding relevant financial relationships with commercial interests within the last 12 months.

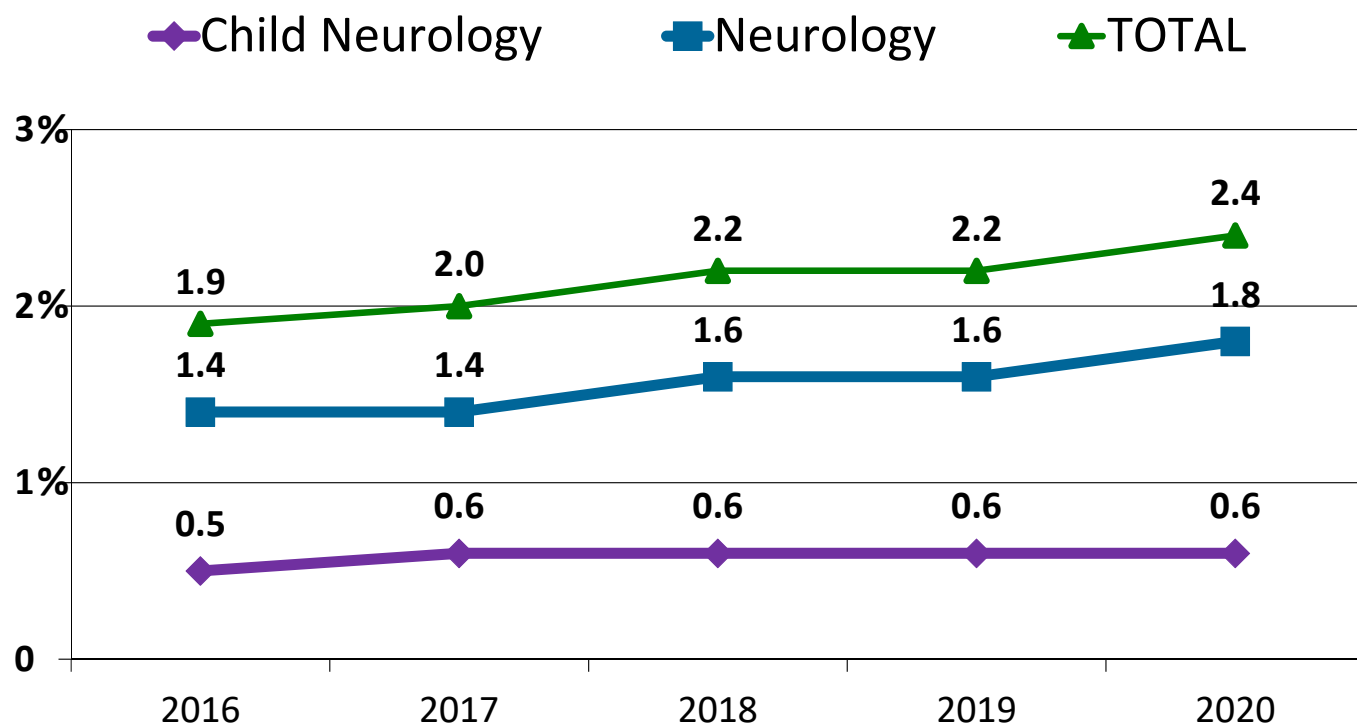
David Lee Gordon, M.D.

I have no relevant financial relationships or affiliations with commercial interests to disclose.



% U.S. MD SENIORS MATCHING IN NEUROLOGY

PGY-1 Matches 2016-2020 per NRMP



**Mean values
2016-2020:**

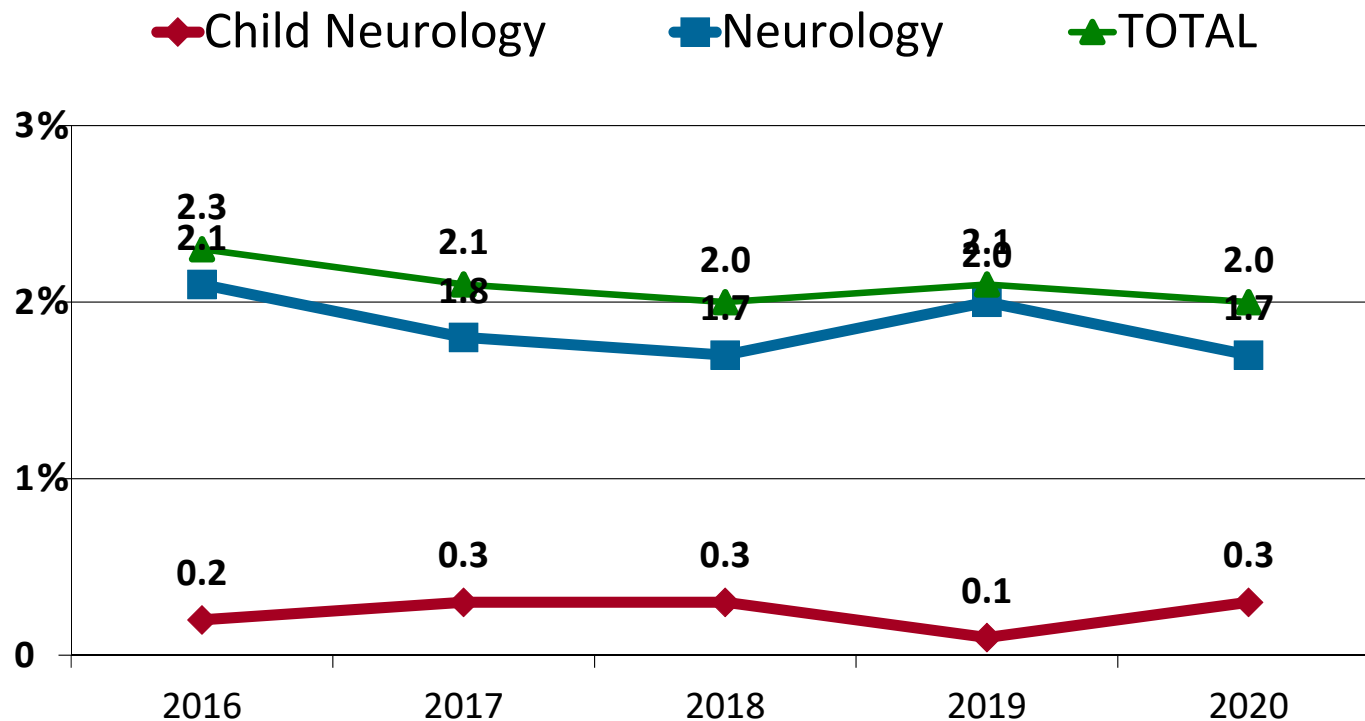
Neurology 1.6%
Child Neurology 0.6%
Total 2.1%

NRMP 2020



% U.S. DO SENIORS MATCHING IN NEUROLOGY

PGY-1 Matches 2016-2020 per NRMP



**Mean values
2016-2020:**

Neurology 1.9%
Child Neurology 0.2%
Total 2.1%

NRMP 2020

MEDICAL STUDENT CAREER CHOICE

General Factors & Clerkship Influence

- **General factors** that affect a medical student's choice of specialty include:
 - Gender
 - Lifestyle
 - Specialty archetype/personality
 - Perceived specialty prestige
 - **Student experiences**
- **Clinical clerkships** influence medical student career choices based on:
 - **Clinical experiences**—including patient type
 - **Role modeling**
 - **Perceived work conditions**

*Jordan JT et al.
Neurology 2020;95:e1080-e1090*

*Maiorova T et al.
Medical Education 2008;42:554-562*

CHOICE OF NEUROLOGY AS A CAREER

Results of a Qualitative Study

Medical student & resident participation in focus groups and semistructured individual interviews determined that four factors may increase medical student recruitment into neurology

1. Early and broad ***clinical exposure***
2. ***Preclerkship experiences*** & a strong neuroscience curriculum
3. ***Positive personal interactions*** with neurology providers
4. ***Debunking negative stereotypes*** about neurologists, neurology patients, and neurology treatment options

Jordan JT et al. Neurology 2020;95:e1080-e1090

CHOICE OF NEUROLOGY AS A CAREER

Factors Determined in Past Studies

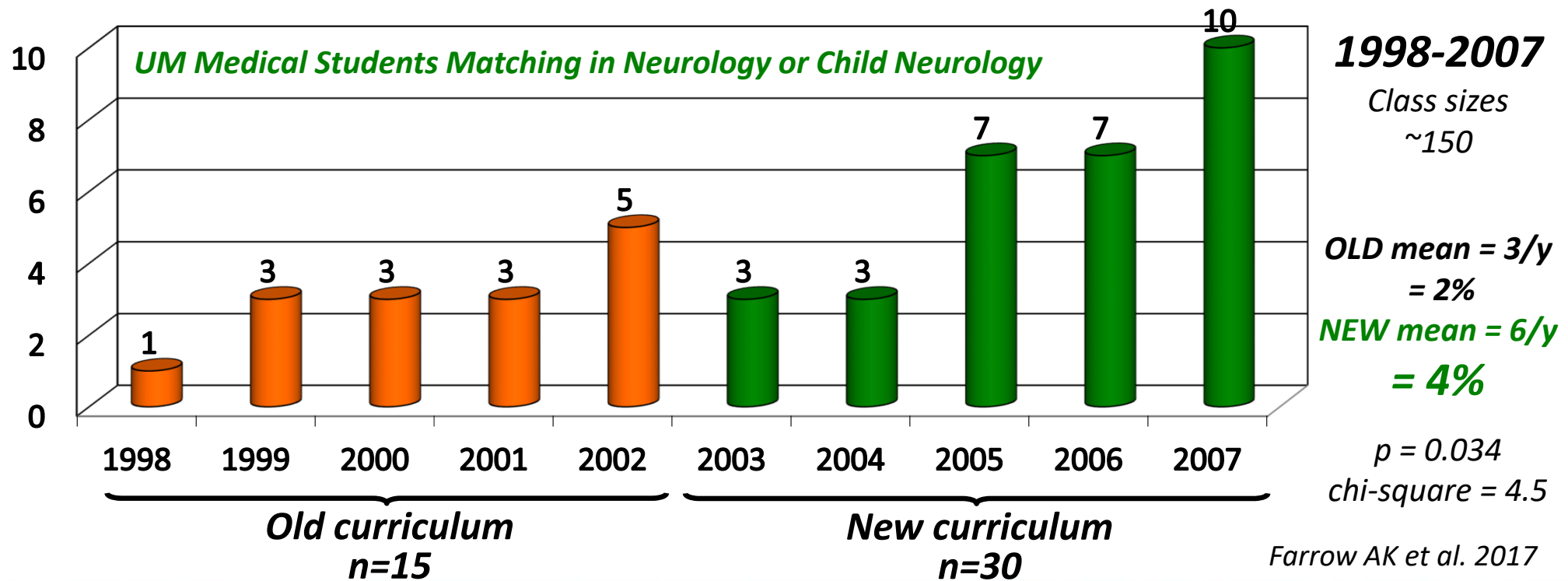
- ***Medical students are more likely to choose a career in neurology if they:***
 - Attend a medical school with a required neurology clerkship*
 - Majored in neuroscience as an undergraduate**
 - Were interested in neurology upon medical school matriculation**
 - ***Rated their basic neuroscience course or neurology clerkship as excellent on the AAMC Graduation Questionnaire (GQ)*****

*Albert DV et al. *Neurology* 2015;85:172-176

**Jordan JT et al. *Neurology* 2020;95:e1080-e1090

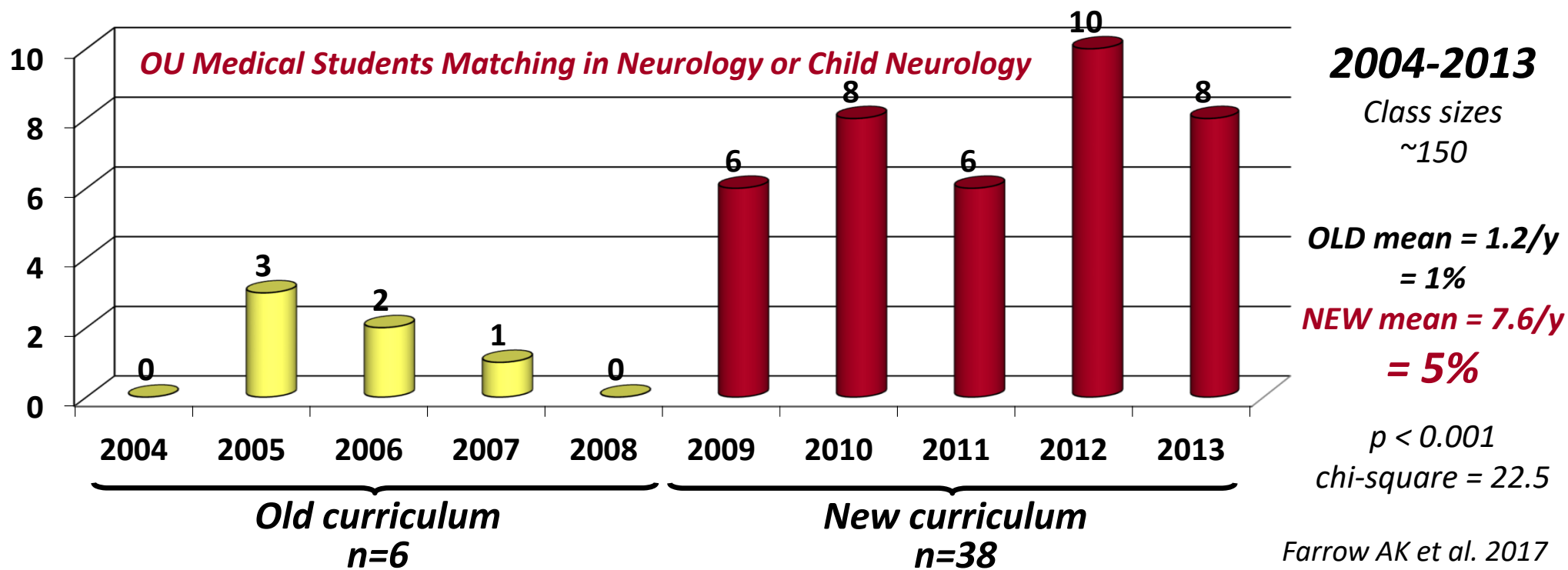
UNIVERSITY OF MIAMI 10-YEAR EXPERIENCE

Effect of Curriculum on Career Choice



UNIVERSITY OF OKLAHOMA 10-YEAR EXPERIENCE

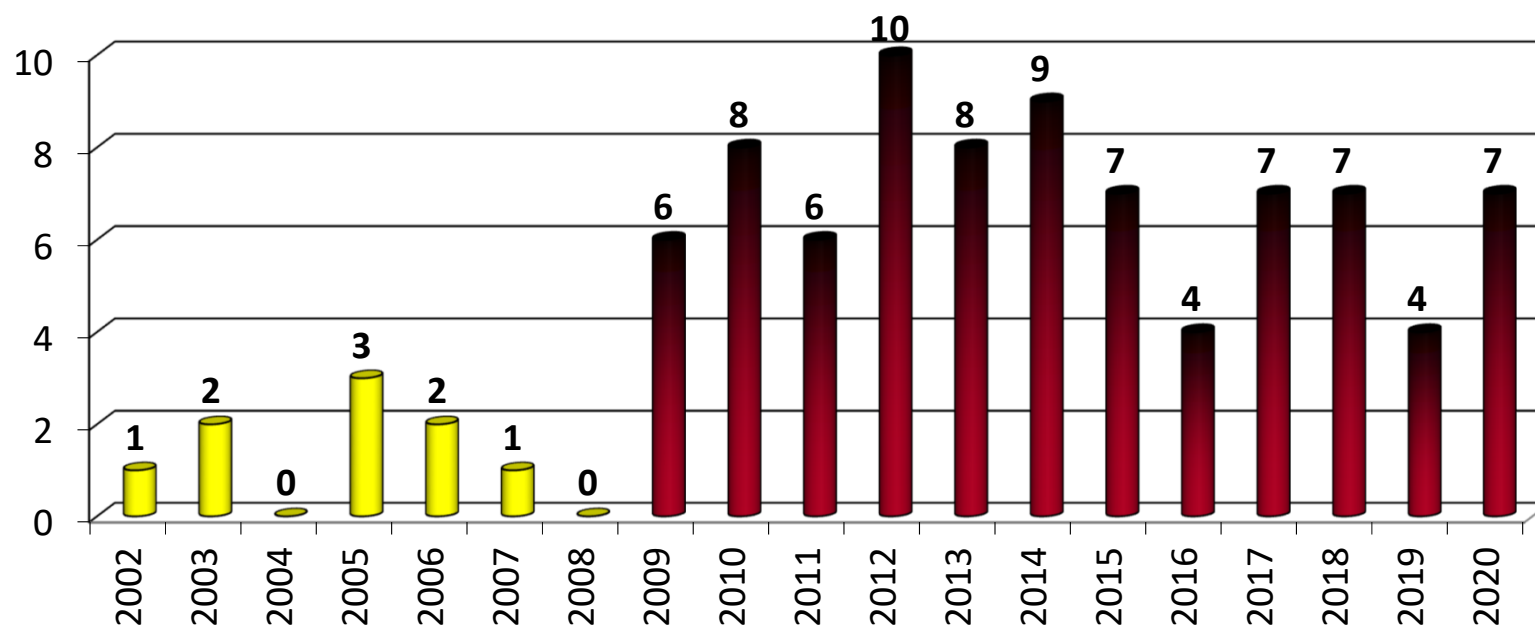
Effect of Curriculum on Career Choice



UNIVERSITY OF OKLAHOMA 19-YEAR EXPERIENCE

Sustained Effect of Curriculum on Career Choice

OU Medical Students Matching in Neurology or Child Neurology



2002-2020

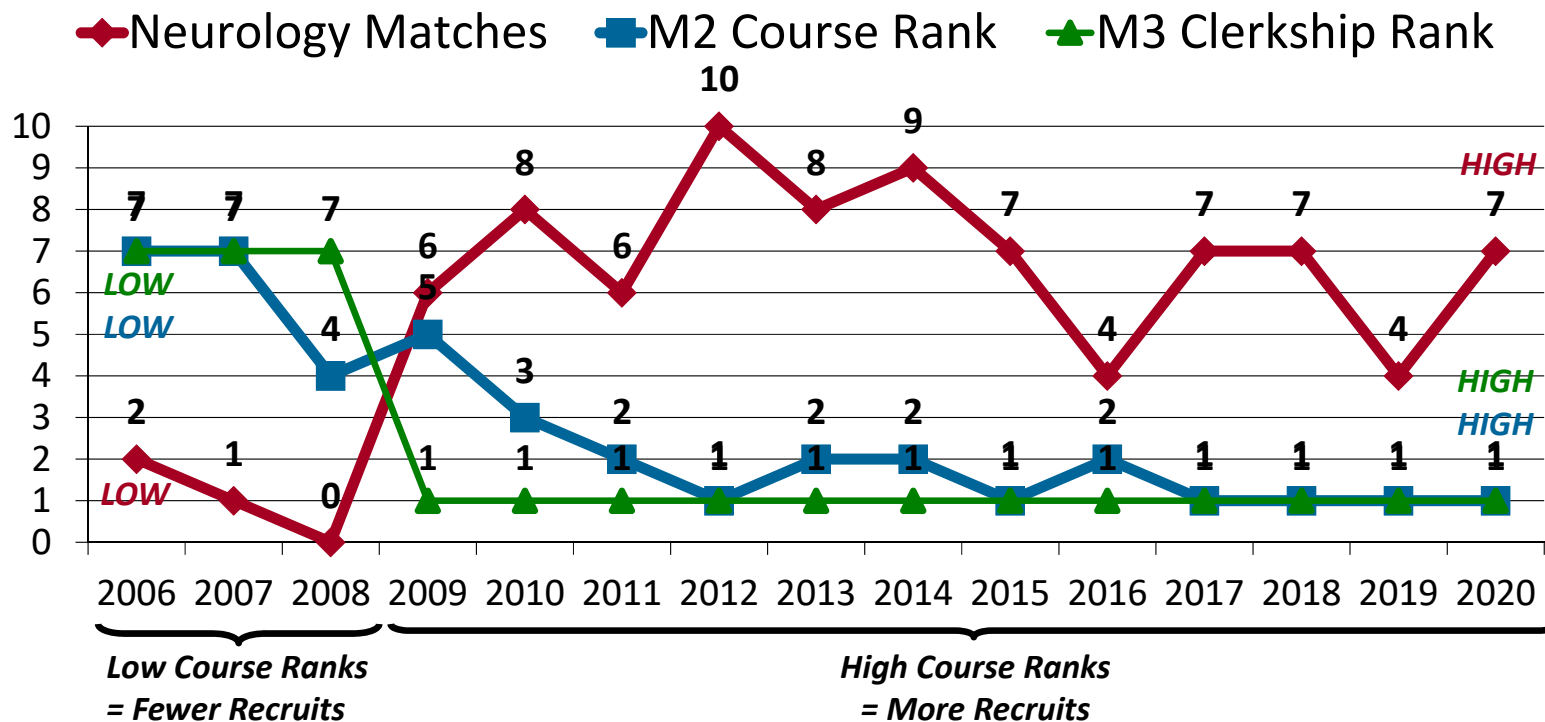
Class sizes
~150

OLD mean = 1.3/y
= 1%

NEW mean = 6.9/y
4.6%

AAMC GRADUATION QUESTIONNAIRE (GQ)

OUCOM Within-School Rank & Career Choice



Neurology Matches =
Total OU medical students
matching in neurology &
child neurology

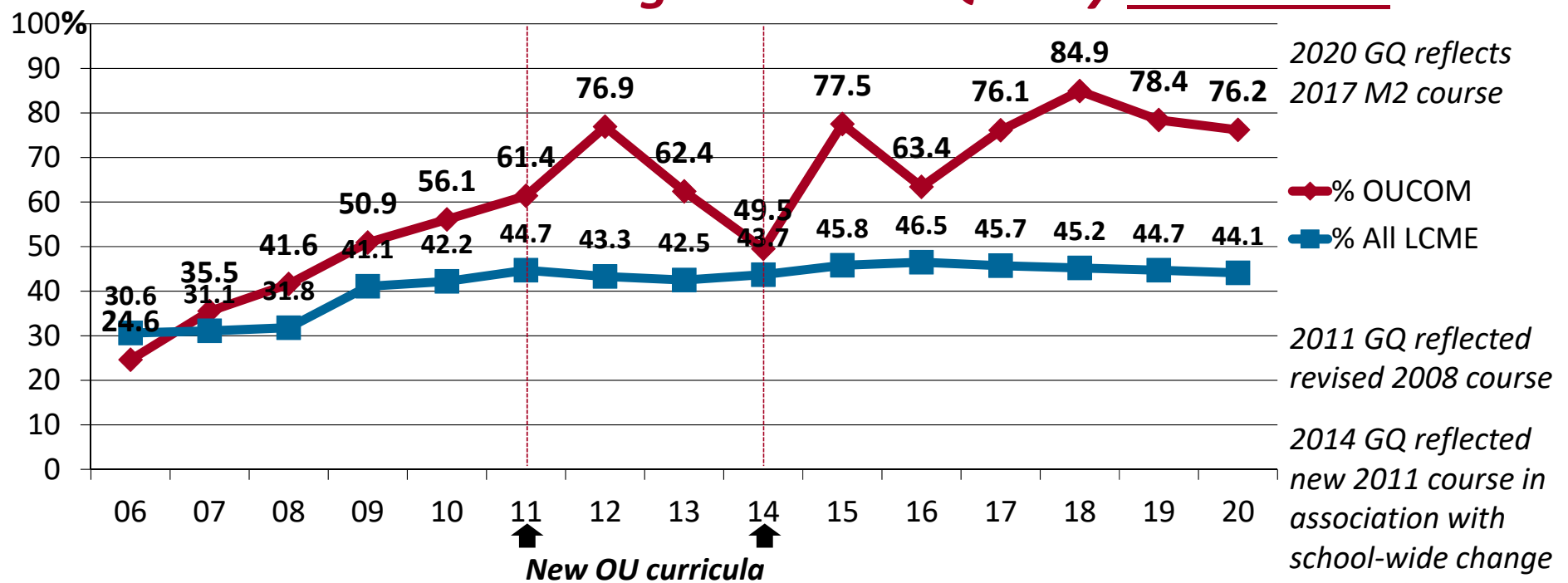
M2 Course Rank =
% students rating
educational quality
excellent vs. 13 other
OUCOM preclinical topics

M3 Clerkship Rank =
% students rating
educational quality
excellent vs. 6 other
OUCOM clerkships

OU NEUROSCIENCE COURSE (M2)

AAMC GQ Results vs. Other Schools 2006-20

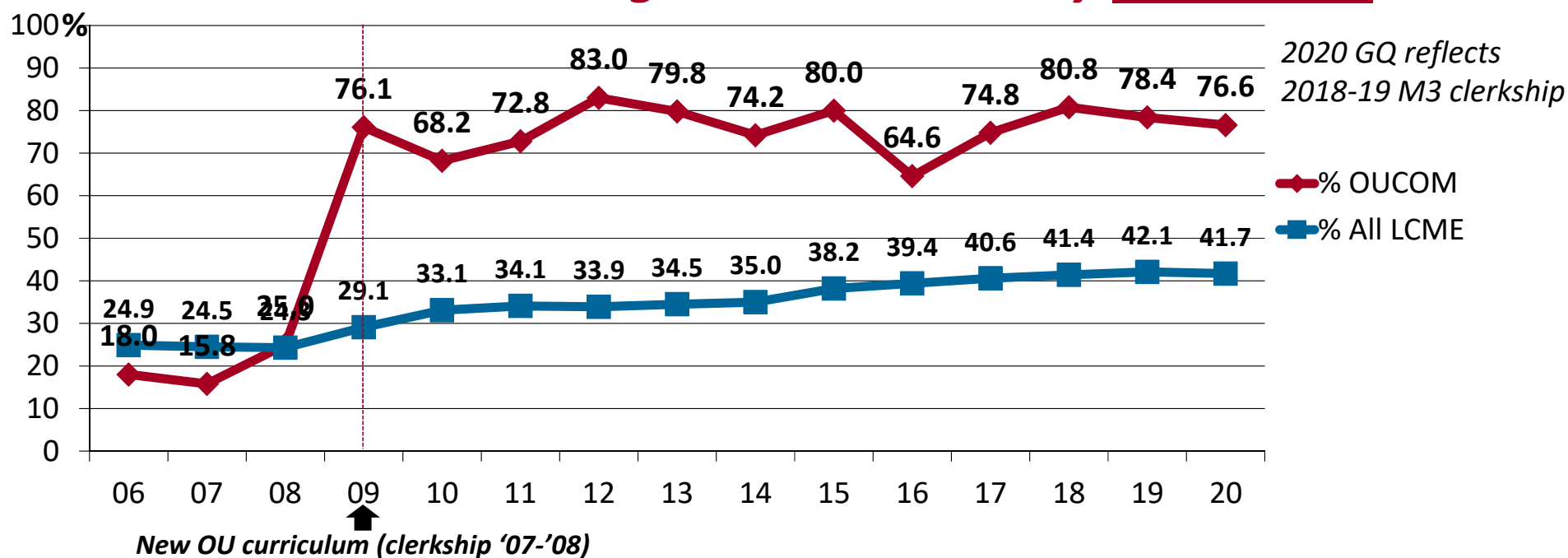
% Students Rating Education Quality EXCELLENT



OU NEUROLOGY CLERKSHIP (M3)

AAMC GQ Results vs. Other Schools 2006-20

% Students Rating Education Quality EXCELLENT



MEDICAL EDUCATION SUCCESS STRATEGY

Flip the Paradigm

Change from neurologist who teaches
to educator who teaches neurology

EXPERIENTIAL LEARNING ALONE

Is Insufficient

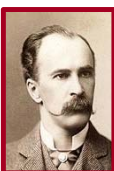
Learners crave clinical experiences & experience is the “best” teacher (results in optimal recall), but...



“Experience itself teaches nothing”

W. Edwards Deming (1900-1993)

American management consultant & champion of quality improvement



“The value of experience is not in seeing much, but in seeing wisely.”

Sir William Osler (1849-1919)

Canadian, Johns Hopkins, & Oxford physician & father of modern medicine



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EXPERIENTIAL LEARNING ALONE

May Lead to Inaccurate Learning

- U. of Michigan investigators:
 - Reviewed patient logs of 212 neurology clerkship students from 2005-6 academic year
 - Determined number of patients each student saw in 5 diagnostic areas—seizure, headache, stroke, acute mental status change, dementia
 - Compared number of patients seen by student with student written exam scores (including 5 diagnostic area subscores) & clinical performance scores
- ***The more patients a student saw in a given diagnostic area, the LOWER the student's exam subscore in that area ($p=0.03$)***
- ***The total number of patients seen did NOT correlate with total written exam score ($p=0.77$) or clinical performance score ($p=0.23$)***

Poisson SN et al. Neurology 2009;72:699-704

NEUROLOGY CLERKSHIP

Pitfalls of Focus on Clinical Experiences & Shelf

- ***Providing experiences without feedback*** does not lead to learner growth and, in fact, may lead to regression through inaccurate experience interpretation
- ***Providing experiences without learner preparation*** leads to missed opportunities and increased learner anxiety/neurophobia
- ***Testing material not covered in the didactic curriculum***—such as by using an NBME shelf exam—results in:
 - Learners ignoring the didactic curriculum & clinical instructors
 - Lack of focus and direction for the learners
 - Increased learner anxiety/neurophobia

OPTIMIZING EXPERIENTIAL LEARNING

Lessons of Educational Psychology

Experiences result in optimal learning if learners are:

Corresponding educational psychology concepts

- ***Prepared*** → ***Priming***
- ***Focused*** → ***Curriculum alignment***
- ***Motivated*** → ***Flow channel***
- ***Provided feedback*** → ***Deliberate practice***

PRIMING

Prepare Learners for Experiences

- **Priming** = *influencing learners' responses to an experience by first exposing them to a related stimulus (e.g., didactic session, case-based learning, or simulation exercise before seeing a patient)*
- Expands the knowledge base or “experience” of the learner in preparation for an upcoming experience
- Lessens anxiety & optimizes potential learning during experience
 - Utilizes the **framing** heuristic – guides learners appropriately
 - Avoids the **availability** heuristic – does not allow them to generalize based on lack of knowledge or experience

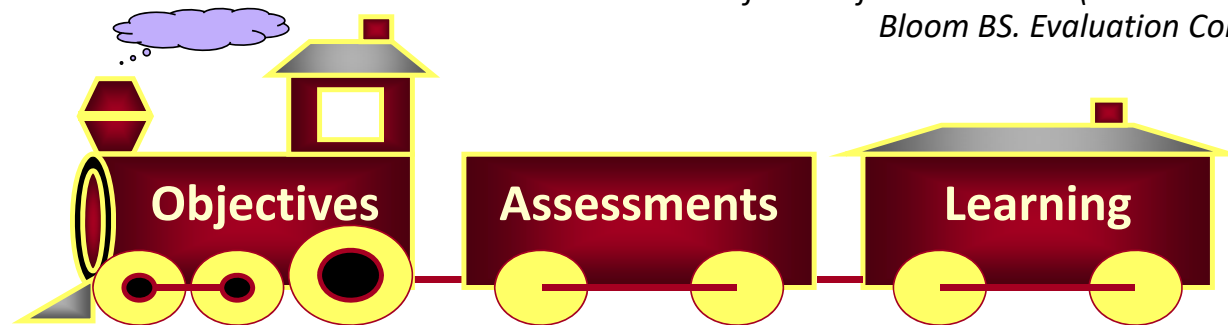
After KS Lashley 1951

CURRICULUM ALIGNMENT

Focus Learners by Teaching to the Test

- **Curriculum alignment** = the process of linking objectives, assessments, & learning experiences to ensure learners achieve what is expected of them
- Has positive effect on learner growth & satisfaction (facilitates **flow**)

After Benjamin S. Bloom (1913-1999), educational pioneer
Bloom BS. *Evaluation Comment* 1968; 1(2):1-12



You can expect what you inspect

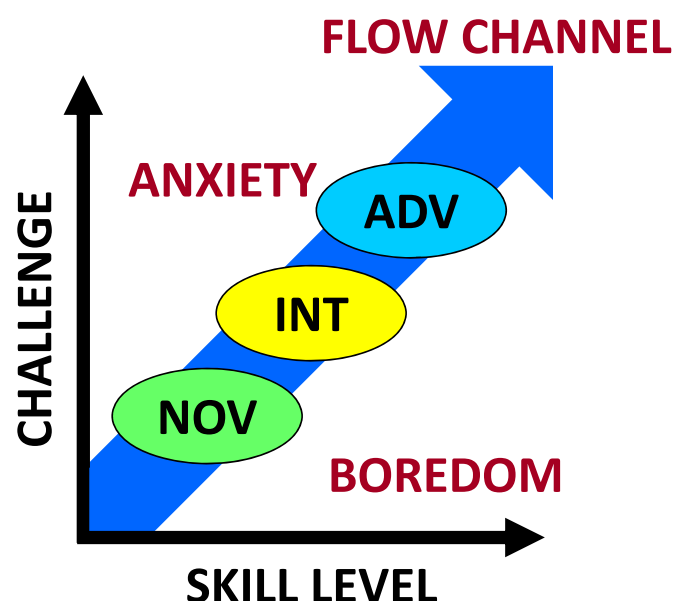
W. Edwards Deming (1900-1993), quality improvement pioneer

Assessment drives learning

George E. Miller (1918-1998), medical education research pioneer
Miller GE. *Acad Med* 1990;65:S63-S67

FLOW CHANNEL

Motivate Learners by Providing Sufficient Skill



- **Flow channel / flow**

- State of optimal experience (enjoyment & maximal concentration) – confident & content
- Occurs as a result of participating in activities that one perceives as worth pursuing for their own sake

- Requires both:

- Learner skills matching challenge difficulty—facilitated by **priming**
- Goals, structure, & feedback—facilitated by **curriculum alignment** & **deliberate practice**

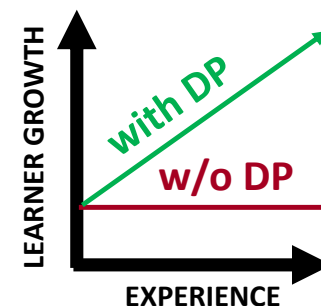
NOV = Novice learner; INT = Intermediate learner; ADV = Advanced learner

After M Csikszentmihalyi 1990

DELIBERATE PRACTICE

Provide Feedback to Promote Learner Growth

- ***Deliberate practice*** = *focused, repetitive practice designed by instructors to improve performance of specific tasks necessary to advance to the level of expert*
 - 10,000 hours improves learner likelihood of achieving level of expert
 - Essential components:
 - Motivated & attentive learner (flow channel)
 - Well-defined task & goals (priming & curriculum alignment)
 - Appropriate level of difficulty (flow channel)
 - Informative feedback from instructor (curriculum alignment)
 - Opportunities for repetition & refinements (priming & flow)



Modified from KA Ericsson et al. 1993; KA Ericsson 2008; WC McGaghie et al. 2011

OU NEUROLOGY CLERKSHIP

Didactic Curriculum Components

***Neurology clerkship didactic curriculum based on AAN core curriculum.*
Taught by select faculty, including nurse educator.***

- Lesion localization
- Neurologic history
- Neurologic exam
- Neurologic findings
- Brain imaging (CT & MRI)
- Unconscious bias
- Case summaries (SBAR)
- Ward-based learning (H&P)
- Patient-centered articles
- Aphasia SP/OSCE
- Coma SP/OSCE
- Case-based learning
 - 10 outpatient cases
 - 10 emergency cases
- Ethics & professionalism
- Interdisciplinary team

***Taught via mix of
self-learning and
small-group
sessions***

*SP = standardized patient
OSCE = objective structured clinical
examination*

**Gelb DJ et al. Neurology 2002; 58:849-852*

OU NEUROLOGY CLERKSHIP

Learning Materials & Assessments

To promote curriculum alignment:

- Clerkship supplies all required learning material
- All tests based on clerkship-supplied materials
- Final Exam is an internal exam—NOT NBME Shelf—yet students consistently perform > national average in neurology on USMLE 2
- “Ward Performance” is worth only 10% of total grade & is the only component not part of the structured, didactic curriculum

IMPROVING RECRUITMENT INTO NEUROLOGY

Student Satisfaction & the Didactic Curriculum

- ***Student satisfaction – surrogate outcome measure***
 - Successful medical student curricula as determined by AAMC Graduation Questionnaire results increase the likelihood of students choosing a career in neurology or child neurology
- ***Didactic curriculum reform – methodology***
 - Basing a neurology clerkship's didactic curriculum on core educational psychology principles significantly affects both student satisfaction and the number of medical students who choose to pursue a career in neurology

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THE END



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