Benchmarking Expert Performance to Establish Competency in Wire Navigation

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Benchmarking Expert Performance to Establish Competency in Wire Navigation

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Team member disclosures are current and reported on the AAOS website.

I, along with 3 co-authors (SL, DA, GT), own Iowa Simulation Solutions, LLC (www.iasimsol.com), a company that produces and sells the simulator used in this study.
Wire Navigation

- Common and widely used skill
- Proficiency is important for patient and provider safety
- Task performance metrics can be measured and assessed in a simulated environment
Simulation training demonstrated improved performance in OR like environment

- **CORR 2019 – Editors Spotlight article**

- Image-based Decision Error Analysis (IDEA) provides a composite score that measures OR wire navigation skill.
  - **CORR 2020 (submitted)**

- **What level of proficiency should be required on a simulation platform?**
Objectives

1. Measure expert and novice level performance on a simulated hip wire navigation task

2. Set proficiency training benchmarks for hip wire navigation task based on observed differences between groups
OTA Resident Fracture Course

- 5 simulator stations
  - Simulator orientation
  - Demonstrate ideal wire placement on AP and lateral Images
  - 1 Assessment Case (pre-training)

- 69 Residents total
  - Average PGY 1.88

Residents at OTA Fracture Course
Orlando, Florida 2018
OTA Fellows Course

- 10 Simulator stations
  - Simulator orientation
  - Demonstrate ideal wire placement on AP and lateral Images
- 3 Assessment Cases

- 28 Fellows participated
  - 68 data points from multiple assessments
Simulator Assessment

- Asked to place center-center guide wire on simulator while minimizing TAD, use of fluoro, and wire navigation time
- Given AP and lateral pseudo-fluoro images at their request
## Results

<table>
<thead>
<tr>
<th></th>
<th>Fellows (N=28)</th>
<th>Residents (N=69)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Composite Score Metrics</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TAD (mm)</td>
<td>13.5 ± 5</td>
<td>19.7 ± 7</td>
</tr>
<tr>
<td>Decision Errors</td>
<td>9.2 ± 5</td>
<td>13.8 ± 7</td>
</tr>
<tr>
<td>Average Angle Error (°)</td>
<td>1.6 ± 1.8</td>
<td>3 ± 2.9</td>
</tr>
<tr>
<td>Out of Plane Movement (°)</td>
<td>7.4 ± 9</td>
<td>15.5 ± 20</td>
</tr>
<tr>
<td>Time (s)</td>
<td>121 ± 61</td>
<td>207 ± 88</td>
</tr>
<tr>
<td>Images</td>
<td>18 ± 8</td>
<td>22 ± 10</td>
</tr>
</tbody>
</table>

*Images 18 ± 8 22 ± 10*
Setting the Benchmark

- Standardized Composite Score
- DHS Case Log
- New Simulator Proficiency Benchmark
- OTA Residents
- OTA Fellows
Fellows displayed expected superior performance across all categories of wire navigation assessment.

Ongoing research to demonstrate training to proficiency leads to transfer of skill and improved operating room performance.

Our residents have been doing this for the past 4 years, now we have a better understanding of how to shift learning curve out of the OR.
Acknowledgments

- Funding

- Collaborators
  - 2019 OTA Fellows Course:
    - Paul Tornetta
    - Rachel O’Connell
  - 2018 OTA Resident Course:
    - Carla Smith
    - Michael Leslie
    - Sara Arns
Thank You

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When (Almost) Everyone is Above Average:

A Critical Analysis of Standardized Letters of Recommendation

No Disclosures
Applying to Orthopaedic Surgery

Table ORS-1
Summary Statistics on U.S. Allopathic Seniors
Orthopaedic Surgery

<table>
<thead>
<tr>
<th>Measure</th>
<th>Matched (n=678)</th>
<th>Unmatched (n=132)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Mean number of contiguous ranks</td>
<td>12.5</td>
<td>6.6</td>
</tr>
<tr>
<td>2. Mean number of distinct specialties ranked</td>
<td>1.1</td>
<td>1.3</td>
</tr>
<tr>
<td>3. Mean USMLE Step 1 score</td>
<td>248</td>
<td>240</td>
</tr>
<tr>
<td>4. Mean USMLE Step 2 score</td>
<td>255</td>
<td>246</td>
</tr>
<tr>
<td>5. Mean number of research experiences</td>
<td>4.9</td>
<td>4.9</td>
</tr>
<tr>
<td>6. Mean number of abstracts, presentations, and publications</td>
<td>11.5</td>
<td>6.7</td>
</tr>
<tr>
<td>7. Mean number of work experiences</td>
<td>3.2</td>
<td>3.4</td>
</tr>
<tr>
<td>8. Mean number of volunteer experiences</td>
<td>7.3</td>
<td>6.3</td>
</tr>
<tr>
<td>9. Percentage who are AOA members</td>
<td>40.4</td>
<td>15.9</td>
</tr>
<tr>
<td>10. Percentage who graduated from one of the 40 U.S. medical</td>
<td>31.9</td>
<td>26.5</td>
</tr>
<tr>
<td>schools with the highest NIH funding</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Matching in Orthopaedic Surgery

Chen, Antonia F. MD, MBA; Secrist, Eric S. MD; Scannell, Brian P. MD; Patt, Joshua C. MD, MPH

Author Information

Letters of Recommendation

• Highly-considered during selection process

• Numerous Short-comings
  • “Glowing Reports”
  • Variable interpretation
    • Kappa = 0.28
Standardized Letters of Recommendation

“provide a global perspective on an applicant’s candidacy...that allows for easier and potentially more meaningful comparison to peers”
Objective

• Primary: To define the AOA standardized letter of recommendation utilization and distribution of applicant ratings

• Secondary: Determine the presence of gender differences in AOA standardized letter of recommendation applicant domain ratings
METHODS
• Retrospective Review

• All Applicants to a Single, Midwest Academic Residency Program
  • No Screening Criteria
  • Randomly Selected

• Single Reviewer

• ERAS & Letter of Recommendation
RESULTS
Instrument Utilization

- Standardized Letter (SLOR) Only: 2%
- SLOR and NLOR: 44%
- SLOR and Comments: 32%
- Narrative Letter (NLOR) Only: 22%
Distribution of Domain Ratings

- Patient Care
- Medical Knowledge
- Interpersonal and Communication Skills
- Procedural Skills
- Research
- Ability to Work Within a Team
- Professionalism
- Initiative and Drive
- Commitment to Orthopaedic Surgery
Applicants Domain Ratings

- 16/4,124 (0.3%) below the 50th Percentile
- 2/4,124 (0.04%) below the 40th Percentile
- 48% of Applicants “ranked to guarantee a match”
## Domain Ratings and Applicant Gender

<table>
<thead>
<tr>
<th>Domain</th>
<th>Male, n=392 (Mean ± SD)</th>
<th>Female, n=102 (Mean ± SD)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient Care</td>
<td>86.3 ± 8.7</td>
<td>88.6 ± 8.2</td>
<td>0.01</td>
</tr>
<tr>
<td>Medical Knowledge</td>
<td>86.9 ± 8.8</td>
<td>88.5 ± 7.5</td>
<td>0.17</td>
</tr>
<tr>
<td>Interpersonal &amp; Communication</td>
<td>86.9 ± 9.6</td>
<td>90.6 ± 7.3</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Procedural</td>
<td>86.3 ± 9.2</td>
<td>87.7 ± 7.6</td>
<td>0.40</td>
</tr>
<tr>
<td>Research</td>
<td>88.5 ± 9.6</td>
<td>90.2 ± 6.9</td>
<td>0.33</td>
</tr>
<tr>
<td>Ability to Work Within a Team</td>
<td>89.2 ± 8.8</td>
<td>91.3 ± 6.3</td>
<td>0.05</td>
</tr>
<tr>
<td>Professionalism</td>
<td>90.5 ± 7.7</td>
<td>91.9 ± 5.9</td>
<td>0.09</td>
</tr>
<tr>
<td>Initiative and Drive</td>
<td>90.3 ± 7.9</td>
<td>91.8 ± 6.2</td>
<td>0.06</td>
</tr>
<tr>
<td>Commitment to Orthopaedic Surgery</td>
<td>91.0 ± 6.9</td>
<td>91.7 ± 5.8</td>
<td>0.66</td>
</tr>
</tbody>
</table>
DISCUSSION
Ceiling Effect

- Noted in Recent Similar Studies
  - Samade et al, JBJS 2020
  - Kang et al, JAAOS ahead of print

- Limits utility of Instrument
  - “When everyone is outstanding, no-one in particular stands out”

- Innumerable Causes
  - Outstanding population of applicants
  - Desire to improve applicant’s chance
  - Limited exposure to discerning situations
Future Direction

• Widely Adopted
  • Continued Standardization

• Improved ability to discriminate between applications
  • Increased granularity

• Etiology of gender differences noted in domain ratings
Competence Measures for the ACGME Meniscus Milestone:
Arthroscopic Video Cadaveric Assessment

Alexander E. Loeb MD, Johnathan A. Bernard MD MPH,
Dawn M. LaPorte MD
June 13, 2020
Disclosures

- Arthroscopic shavers donated by Stryker
- Fast-Fix 360 devices donated by Smith and Nephew
- Other coauthors disclosures available on EOA App
Purpose

• “Lack of assessment methods and tools” for Milestones
• One-on-one feedback, group evaluation, self-assessment, “self-directed assessment seeking”
• Create a rubric for a Milestone
  – Standardized, interrater-validated, unbiased
• Allows for comparison, competence-based evaluation
Methods

- 24 resident participants
  - Demographic and case log data
- Cadaveric model, arthroscopic video
  - High fidelity training
  - Inherently anonymous
- Blinded video evaluated by fellowship-trained faculty
  - Arthroscopic Surgical Skill Evaluation Tool (ASSET)
  - Task-specific checklists: meniscectomies, meniscus repairs
Results

Average Times x PGY

Times x ASSET GRS

R² = 0.8632

R² = 0.7698
Results

Task Checklist Scores by PGY

Task Checklist Scores x ASSET GRS Score
Conclusions

• Task-Specific Checklists and ASSET can assess competence in the “Patient Care” domain of the Meniscus Tear Milestone
• Anonymous arthroscopic video could be used in evaluation and formative educational feedback
• Expansion to different Milestones, residency programs
Resident Recruitment in the Digital Age:

What Information Are Residency Applicants Looking For And Where Do They Turn To Find It?

Taylor M. Yong, MD, MS\textsuperscript{1,2}; Daniel C. Austin, MD, MS\textsuperscript{1}; Ilda B. Molloy, MD, MS\textsuperscript{1,2}; Michael T. Torchia, MD, MS\textsuperscript{1}; Marcus P. Coe, MD, MS\textsuperscript{1}

\textsuperscript{1}Department of Orthopaedics, Dartmouth-Hitchcock Medical Center, Lebanon, New Hampshire;
\textsuperscript{2}The Dartmouth Institute of Health Policy and Clinical Practice, Lebanon, NH
Disclosures

None of the authors have conflicts of interest or financial disclosures relevant to the content of this work.
Applicants reference online resources frequently
- Residency program websites
- Circulating Google Doc
- Doximity Residency Navigator

The quality ratings of online resources lag in comparison to direct advice from various types of mentors

Quality of life and interpersonal factors are important to applicants
- Resident camaraderie
- Quality of relationships between faculty and residents
- Overall happiness and quality of life

Information may impact application patterns
Background

- Applying to orthopaedic surgery residency is incredibly competitive

Average number of positions and applications per program

![Graph showing the average number of positions and applications per program. The average number of positions is 5, and the average number of applications received is 641. The graph is adapted from data in the 2018 NRMP Program Director Survey.]
Background

• Proliferation of online platforms for applicants
What type of information?

Which resources are referenced?

Are they useful?
Methods

Study design

- Web-based, anonymous, voluntary survey
- All NRMP applicants to our residency program during the 2018-2019 application cycle (610)

Survey

- 3 domains
  - Frequency of use and quality of selected resources
  - Applicant attitudes about available information
  - Factors important to applicants in decision-making
Table 1: Demographics of Survey Respondents (N = 259)

<table>
<thead>
<tr>
<th>Age</th>
<th>27.1 (2.5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>70% (181)</td>
</tr>
<tr>
<td>Female</td>
<td>29% (76)</td>
</tr>
<tr>
<td>Race</td>
<td></td>
</tr>
<tr>
<td>White, non-Hispanic</td>
<td>71% (183)</td>
</tr>
<tr>
<td>Asian/Pacific Islander</td>
<td>14% (35)</td>
</tr>
<tr>
<td>Hispanic</td>
<td>5% (14)</td>
</tr>
<tr>
<td>Black/African American</td>
<td>4% (10)</td>
</tr>
<tr>
<td>Multiple race or ethnic minority</td>
<td>7% (17)</td>
</tr>
<tr>
<td>Geographic region of medical school</td>
<td></td>
</tr>
<tr>
<td>Northeast</td>
<td>34% (87)</td>
</tr>
<tr>
<td>Midwest</td>
<td>25% (65)</td>
</tr>
<tr>
<td>Southeast</td>
<td>18% (46)</td>
</tr>
<tr>
<td>Southwest/Texas</td>
<td>8% (21)</td>
</tr>
<tr>
<td>West Coast</td>
<td>5% (13)</td>
</tr>
<tr>
<td>Pacific Northwest</td>
<td>2% (4)</td>
</tr>
<tr>
<td>Other</td>
<td>9% (23)</td>
</tr>
</tbody>
</table>

| Orthopaedic rotations (excluding home program) | |
| 0 | 2% (4) |
| 1 | 3% (8)  |
| 2 | 24% (62) |
| 3 | 56% (146) |
| 4 | 12% (30) |
| More than 4 | 4% (9) |

- **42% response rate**
- **Corresponds to 22% of overall applicant pool (1,191 US and Canadian medical graduates)**
Online resources are used frequently

- Individual residency program websites
  - Advice from medical school faculty: 17%
  - Advice from orthopaedic residents at: 23%
  - Circulating private Google Documents: 24%
  - Doximity Residency Navigator: 38%
  - Advice from other medical students in: 41%
  - Advice from alumni of your medical: 36%
  - Orthogate.com: 23%
  - Fellowship and Residency Electronic: 23%
  - Accreditation Council for Graduate: 34%
  - Student Doctor Network: 36%
  - Residency social media: Facebook: 18%
  - Residency social media: Twitter: 24%
  - Residency social media: Instagram: 26%

 Occasional
 - Occasionally
 - Frequently
 - Very Frequently
Quality ratings of online resources lag behind direct advice from mentors

- Advice from orthopaedic residents at... 4.16
- Advice from alumni of your medical... 4.06
- Individual residency program websites 3.78
- Advice from medical school faculty... 3.74
- Circulating private Google... 3.58
- Advice from other medical students... 3.56
- Doximity Residency Navigator 3.47
- Fellowship and Residency Electronic... 3.32
- Accreditation Council for Graduate... 3.29
- Orthogate.com 2.98
- Residency social media: Facebook... 2.87
- Residency social media: Twitter... 2.83
- Residency social media: Instagram... 2.73
- Student Doctor Network 2.46
Quality of life and interpersonal factors are important to applicants

<table>
<thead>
<tr>
<th>Factor</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resident camaraderie</td>
<td>4.49</td>
</tr>
<tr>
<td>Happiness and quality of life of residents</td>
<td>4.43</td>
</tr>
<tr>
<td>Volume of cases</td>
<td>4.34</td>
</tr>
<tr>
<td>Geographic location: region of country</td>
<td>4.23</td>
</tr>
<tr>
<td>Geographic location: city versus rural setting</td>
<td>3.97</td>
</tr>
<tr>
<td>Proximity to friends and family</td>
<td>3.87</td>
</tr>
<tr>
<td>Education curriculum and conference</td>
<td>3.59</td>
</tr>
<tr>
<td>Size of program (Number of residents)</td>
<td>3.47</td>
</tr>
<tr>
<td>Needs and preferences of spouse/partner</td>
<td>3.43</td>
</tr>
<tr>
<td>Program diversity by sex/gender</td>
<td>3.32</td>
</tr>
<tr>
<td>Salary</td>
<td>3.31</td>
</tr>
</tbody>
</table>

- 0 1 2 3 4 5
Sufficient information?

- Agree: 49%
- Neither: 20%
- Disagree: 31%

Fewer programs?

- Yes: 36%
- Unsure: 15%
- No: 49%
Applicants reference online resources frequently
• Residency program websites
• Circulating Google Doc
• Doximity Residency Navigator

The quality ratings of online resources lag in comparison to direct advice from various types of mentors

Quality of life and interpersonal factors are important to applicants
• Resident camaraderie
• Quality of relationships between faculty and residents
• Overall happiness and quality of life

Information may impact application patterns

Conveying the type of information applicants are looking for on the appropriate platforms will benefit applicants and programs.
Thank You