Residency Selection:
Can applicant data predict residency performance?

Horatio F. Wildman, MD
Program Director, Dermatology Residency
Associate Professor of Clinical Dermatology
NewYork Presbyterian Hospital / Weill Cornell Medicine
Applicant Data

- Medical School Transcripts
- USMLE Scores
- Honor Societies
- Research Experiences
- Personal Statement
- Dean’s Letter / MSPE
- Letters of Recommendation
- Special Skills
- Interview
PD Perceptions:
Dermatology Residency Selection Criteria

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Dermatology Residency Selection Criteria

Defining Success in Residency

- Definitions varied per study
- Objective criteria:
  - ITE and Certifying exam performance
  - Completion of residency (Surgery)
- Subjective criteria:
  - Overall rating by clinical faculty (ENT, ortho, urology)
  - Program director rating (neurology)
  - Faculty ranking residents and placing in quartiles (OB-GYN)
  - Placement in the top 1/3 of the graduating class in the final semi-annual evaluation (EM)
Interview allows assessment of non-cognitive factors

- Interpersonal and communication skills
- Professionalism
- Enthusiasm for Dermatology
- Honesty
- May identify negative characteristics such as anxiety or aggression
- Allows for faculty and applicants to have a “gut feeling”

- Risks
  - Poor inter-rater reliability, idiosyncratic rapport, bias
  - Lack of standardization
  - Standard interview questions are highly “prepable”
  - Potential for “Halo effect” - prior knowledge of the applicant academic record affect outcome
  - Illegal questions – reproductive plans, marital status, inquiry about other programs

Does the interview predict subsequent resident performance?

- Meta-analysis of 34 studies (n=3,793)
  - Outcomes studied
    - Clinical evaluations during residency
    - Global evaluation or ranking of residents
    - In-training Examination Results
    - Attrition
    - Problems with professionalism
  - 11 studies found the interview moderately predicted subsequent clinical performance in internship or residency ($r=0.37-0.6$)
  - 17 found no association between the interview and performance ($r=-0.27$ to $+0.27$)
  - Attrition was not consistently predicted by interview (6 studies)
  - Professionalism / problem residents / or future referral to impaired physician program could not be predicted by the interview (2 studies)

Stephenson-Famy et al; J Grad Med Educ. 2015; 7:539-48
Certain interview formats may be more predictive

• Traditional, unstructured interviews were the least predictive
  – Halo effect and other biases

• Interviews that included an assessment of surgical skills found mixed results (7 studies total)
  – Surgical station (ENT) correlated with future faculty ratings ($R^2= 0.55$; $p<0.0001$)
  – Soap carving station (ENT) was not predictive of manual dexterity, visuospatial ability, decision making, cognitive knowledge or overall resident performance at time of graduation

Moore et al. Laryngoscope. 2015; 125(2):E57-61
Certain interview formats may be more predictive

- Multiple mini-interviews (MMI) tended to correlate best with future clinical performance
  - Behavioral based, structured interview
  - Multi-station circuit designed to assess characteristics important to the field –
    - Relationship-building
    - Team skills
    - Integrity
    - Recognition of limitations
    - Communication skills
  - Types of stations:
    - Scenario with questions
    - Role Play
    - Simple task
    - Traditional Interview

Stephenson-Famy et al; J Grad Med Educ. 2015; 7:539-48
Interview aspects to improve reliability

BOX
Attributes of the Resident Interview That Improve Reliability

1. Explicit written description of the desired traits in an applicant/resident
2. Standardized questions to every applicant
3. Provision of behavior-specific anchors for rating scales for interviewers and using a scoring rubric to improve interrater and intrarater scoring
4. Use of multiple observers rather than a single interviewer
5. Training of interviewers in the format and scoring and including unethical and “illegal” question rules
6. Blinding of the interviewer to cognitive application data to minimize bias\textsuperscript{107}

Stephenson-Famy et al; J Grad Med Educ. 2015; 7:539-48
Cost of Dermatology Application

- US Medical graduates enter residency with a median debt of $170,000
- 2014 estimation
  - $10K / applicant
  - $5 million total

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<tr>
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<th>US medical school senior applicants</th>
</tr>
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<tbody>
<tr>
<td>Matched</td>
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</tr>
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<td>352</td>
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<table>
<thead>
<tr>
<th>Median number of applications to programs</th>
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<table>
<thead>
<tr>
<th>Minimum number of applications to intern year programs based on prior median interview acceptance data</th>
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<tr>
<th>Estimated overall application cost</th>
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<tr>
<td>ERAS: $95 + ($10 \times 10) + (16 \times 10) + (26 \times ((72 or 81) - 30) + 95)</td>
<td>$1,682</td>
<td>$1,916</td>
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<tr>
<td>USMLE fee: $75</td>
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<td></td>
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<tr>
<td>Average number of interviews accepted (sum of both preliminary and dermatology averages)</td>
<td>15</td>
<td>10</td>
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<tr>
<td>Estimated overall interview cost ($500 per interview)</td>
<td>$7,500</td>
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<td>Estimated away rotation cost</td>
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<td>Estimated overall cost per applicant</td>
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<td></td>
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<td>Application, interview, and away rotation costs</td>
<td>$11,324</td>
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<td>Estimated overall cost</td>
<td>$3,986,048</td>
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<tr>
<td>Estimated overall total cost for all applicants</td>
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Cost of Dermatology Application

• Mansouri has suggested to reduce application costs:
  – Limit the number of programs to which applicants can apply
  – Limit competition for limited number of spots
  – May also reduce the burden of reviewing the applications for the program

Letters of Recommendation

• Designed to provide a unique perspective on the student’s strengths and abilities not found in other performance measures

• Shortcomings –
  – Selection bias
  – Inconsistencies between grades and written comments
Letters of Recommendation (LOR) are rated as the #1 factor in selecting candidates for interview

- **Survey of the APD (2013)**
  - 129 surveys were returned from 352 active members (37%).
  - LORs found to be more important in deciding which applicants to interview rather than determining the final rank list ($p < 0.0001$)

- **IM survey (2009)**
  - 110 institutions surveyed with a 75% response rate
  - 78% agreed LORs were important for trainee selection
  - Few believed it could discern marginal performance (31%) or predict future performance (25%)

Academic dermatologists prefer LORs written by dermatology professors and “Dermatologists I know”
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LOR – Mixed predictor of success

- No data in dermatology looking at the association of letters of recommendation and resident success
- No association was found in OB-GYN, ENT, radiology, ortho, psych
- Quality of LOR associated with better clinical evaluations (urology, p=0.018)
- LOR weakly correlated with workplace based assessments and examinations (surgery, r = 0.15-0.35)
- IM study found that strongly favorable comparative statements in LOR were the only variable associated with professionalism scores during internship (p=0.001)
- Emergency Medicine found that “global rating” and “competitiveness” on standardized letter of recommendation (SLOR) from nonprogram leadership associated with placement in the top 1/3 of a resident’s graduating class (p= 0.03; 0.015)

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LOR – Negative comments are meaningful

• Case control study of psychiatry residents found that any negative comment in the Dean’s letter was associated with identifying a “problem resident.” (p<0.01)

• Medical School Application LOR
  – Being rated “the best” among peers was associated with future AOA induction. (p=0.01)
  – Any non-positive comment was associated with being in the bottom of the class. (p=0.005)

DeZee et al. Acad Med. 2014; 89(10);1408-15.
USMLE Step 1 cited as an important factor in the selection process

- 91% of derm PDs cited USMLE Step 1 scores as important for selecting for interview (4.3 – 1-5 scale)
  - 2nd most important factor (#1 was LOR)
- Average USMLE Score of dermatology matched US Senior was the among the highest of all specialties
  - USMLE Step 1 – 249
  - USMLE Step 2 – 257
- 82% of dermatology programs have a “target score”
- 100% of dermatology programs seldom or never consider applicants who failed on the first attempt

USMLE score has a moderate correlation with dermatology ITE score

Correlation coefficients with USMLE were 0.48, 0.54, and 0.53 for ITE in years 1, 2, and 3, respectively (p<0.001)

IM, Peds, OBGYN, ER, ENT, ortho, radiology, psych, & surgery found a similar correlation between USMLE and ITE scores

NBME part I correlated with ABD Board exam scores

Case and Swanson. Acad Med. 1993; 68; S51-6.
USMLE does not predict overall resident quality

- USMLE scores do not correlate well with subjective performance as a dermatology resident (faculty rankings, evaluations, standardized patient encounters)
- Psych, Neurology, OB/GYN, Ortho, ENT, Peds Radiology had similar findings
- ER – USMLE score correlated with graduating the top 1/3 of the class (OR=1.02 (1.01-1.04); p=0.004)
- Surgery – Mixed results
- Multicenter review concluded USMLE scores are not correlated with clinical skill acquisition

USMLE

• Predicts cognitive competence – MK
  – May predict future performance on exams
• NOT predictive of non-cognitive performance
  – Studies involving residents do not find a correlation to subjective performance
  – Few studies following cohorts of entire graduating classes of medical students tend to find correlations

3rd Year Clerkship Performance

• Medical School Grades rated as fairly important (7.5/10) in selecting dermatology residents (4th most important)
• Combination of examinations and supervisor evaluation
• Evidence that clerkships grades reflect both cognitive and non-cognitive performance
• Low clerkship GPA predicted poor knowledge ratings and was the only predictor of low professionalism ratings during internship (OR=7.29, 95% CI=4.1-13.0)
• Two prospective studies of medical students found clinical GPA correlated with PD ratings of overall performance during internship (r=0.49, p<0.005) (r=0.46, p<0.0001)

3rd Year Clerkship Performance

• Clerkship Grades
  – Correlated with faculty rating – IM, PMR
  – No correlation with faculty rating – urology, OB-GYN, ENT, radiology, surgery
  – Mixed – ER, ortho

• Most studies that failed to find an association between grades and non-cognitive performance tended to examine specialty-specific grade rather than overall performance

• Students who were referred to a committee for review following completion of their internal medicine clerkship are more likely to receive poor ratings medical expertise and professionalism in internship and fail USMLE Step 3.

Clerkship Comments

- Contain qualitative comments designed to give feedback about professional behavior
- Most comments are positive, negative comments should be taken seriously
- U Michigan Study – 1 medical school class (n=153)
- Clerkship written comments evaluated
  - 1845 professionalism comments (2997 total)
  - Coded positive, negative, equivocal
  - 1721 positive, 106 negative, 18 equivocal
  - # of positive comments correlated with the student’s clerkship Likert-type professionalism score
  - Negative comments and equivocal comments correlated with a lower professionalism score (r= -0.45, p<0.001)(r=-0.25, p=0.002)

MSPE (Dean’s Letter)

• Few studies found that the MSPE ranking of medical students had a low correlation with PD evaluations
• Most studies found no significant relationship to resident performance measures – radiology, OB-GYN, pediatrics, ortho, ER, urology, ENT

MSPE – Negative comments predict problems

• Case control study examined problem residents from 1987-2007 in a psychiatric program
• Defined as any difficulty that directly affected performance to below minimum standards of the program – in residency or post residency
• Strong correlation between negative comments in the Dean’s letter and having problems (χ²= 7.5, p<0.01)
• No correlation between interview or letters of recommendation

AOA Status

• AOA members are usually in the top quartile academically and selected based on additional demonstrations of leadership, professionalism, and service to the community

• AOA status —
  – Standardized tests
    • One ortho study - ITE
    • Correlated with USMLE Step 3 score & board passage
  – Faculty rating
    • Correlated - ER, ortho (esp ICS), surgery (PC, PBL, ICS)
    • No correlation - OB-GYN, pediatrics, radiology
    • Mixed - ENT

57% of dermatology matched US Seniors were AOA (compared to 28% of unmatched)

AOA Membership

<table>
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<tr>
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<th>Matched</th>
<th>Not Matched</th>
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<td>179</td>
<td>24</td>
</tr>
<tr>
<td>No</td>
<td>136</td>
<td>61</td>
</tr>
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</table>

Research Experience

- EM study found that applicants with 5 or more publications were more likely to be placed in the top 1/3 of the graduating residency class.
- Ortho study found that student research may predict resident research productivity.
- Most studies found no correlation with number of publications as a student with success as a resident (neuro, OB-GYN, ortho, surgery)
- Some studies found evidence of students misrepresenting their research experience (derm, ortho, family med, radiology)

High percentage of dermatology applicants list 5+ research projects

- Matched US Seniors averaged 4.7 projects compared to unmatched seniors with 3.8

Chart DM-5

Number of Research Projects of U.S. Allopathic Seniors

Dermatology

<table>
<thead>
<tr>
<th>Research Projects</th>
<th>Matched</th>
<th>Not Matched</th>
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<tr>
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<tr>
<td>4</td>
<td>55</td>
<td>11</td>
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<tr>
<td>5 or More</td>
<td>186</td>
<td>44</td>
</tr>
</tbody>
</table>

Most dermatology applicants list 5+ abstracts, presentations, or publications

- Matched US Seniors averaged 11.7 compared to unmatched seniors with 8.7

Source: NRMP Data Warehouse

Interest in Academics

• Study of the Harvard Combined Dermatology Residency program reviewed residency applications of former residents from 1991-2005 (n=89)
  – 37% of graduates worked in an academic setting
  – Factors correlating with an academic career:
    • # of research publications as a student (5.2 vs. 1.9 articles)
    • Advanced degree in addition to MD
    • # of volunteer experiences

• MD/PhDs were 1.63x more likely than MDs to choose a career in academics and remain academics

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Program characteristics may influence interest in academics

• One study found that dermatology residents interested in academic careers at the time of application often lost interest during residency.

• Lack of mentorship shown to be associated with a loss of interest in academic careers.

• Program characteristics may influence pursuit of academic careers:
  – # of full time faculty members
  – # of full-time faculty publications

Wu et al. Arch Dermatol. 2006; 142:845-850
Table 1.

Dermatology Residency Program Variables Affecting the Ratio of Full-time Faculty Members Graduated to Estimated Total No. of Graduates

<table>
<thead>
<tr>
<th>Variable</th>
<th>Spearman Rank Correlation Coefficient</th>
<th>P Value</th>
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<tbody>
<tr>
<td>Ratio of faculty to residents in 2008</td>
<td>0.60</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Total no. of full-time faculty in 2008</td>
<td>0.54</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>No. of full-time faculty publications in 2008</td>
<td>0.45</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>No. of full-time faculty lectures given at annual society meetings in 2008</td>
<td>0.42</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>No. of full-time faculty on editorial boards in 2008</td>
<td>0.37</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Presence of NIH funding in 2008</td>
<td>0.34</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Presence of DF funding in 2008</td>
<td>0.28</td>
<td>&lt;.05</td>
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<tr>
<td>Total no. of residents in 2008</td>
<td>0.19</td>
<td>&lt;.05</td>
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<tr>
<td>Department vs division(^a)</td>
<td>N/A</td>
<td>.92</td>
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Abbreviations: NIH, National Institutes of Health; DF, Dermatology Foundation; N/A, not applicable.
\(^a\)Two-sample \(t\) test.
Predermatology fellowship may increase chance of matching for dermatology

- Survey of preresidency fellowships directors and fellows
  Fellowship Directors: 57% response rate (26/46)
  - 92% of 190 past fellows obtained dermatology residency position
  Fellows: 63% response rate (29/46)
  - 24 had unsuccessfully attempted to match prior to the fellowship
  - Of the 27 who attempted to match, 24 were successful (89%)

- In a study of previous graduates from medical school applying for dermatology (2006):
  - 16% (31/191) completed postgraduate fellowship following medical school
  - Nearly all fellowships were non-ACGME accredited (97%; 30/31)
  - 35% of applicants pursuing fellowship matched in dermatology (11/31), which was significantly increased compared to those without fellowship (OR 2.38, p= 0.4)

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Stratman and Ness. JAMA Dermatol. 2011; 147(2);196-202
Quality of the medical school attended does not predict performance as a resident

- EM and ENT studies found very weak association between the rank of the medical school and faculty rating of the resident
- No correlation found in other EM, ENT, radiology, OB-GYN, or neurology studies
- Likely more indicative of performance in college and experiences prior to medical school
- Medical school attended may relate to the culture and expectations of the applicant

SKILL

• High performance accomplishments outside the medical field – performing arts and collegiate athletics
• Predicted successful completion of general surgery residency
• Excelling in a team sport, but not musical excellence, correlated with higher faculty ratings (ENT) ($R^2=0.32$, $p<0.001$)
• ENT study found that having an exceptional trait in a nonacademic pursuit predicted faculty rating in the top 1/3 of the class (57% vs 10%; $p<0.01$)

Personal Statement

• 332 personal statements from applications to the UC Davis Dermatology Residency Program in 2012

• Themes emphasized by matched applications (p≤0.05)
  – Study cutaneous manifestations of systemic disease (34% vs. 23%)
  – Contribute to the literature gap (8% vs. 1%)
  – Study pathophysiology of disease (8% vs. 2%)

• The authors state:
  – Describing “why dermatology” trended positively (75% vs. 70%) (p=0.15)
  – Stating a personal story trended negatively (64% vs. 73%) (p=0.28)

Take home points

• USMLE score may predict future cognitive performance, such as medical knowledge, ITE, and ABD certifying exam performance
  – Should not be used to predict noncognitive performance
• Clerkship GPA may predict future cognitive and non-cognitive performance
• Equivocal or negative narrative comments should be taken seriously
• Strongly positive comparative statements in the LOR are associated with higher professionalism scores
  – Some data supporting standardized LOR as more predictive
• Interviewers blinded to applicant data may more accurately assess non-cognitive performance
• Slight trend for prior dermatology research or Ph.D to indicate an academic career
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Influence on applicant selection

- Residency selection committees may use this data to tailor their selection process, however there are a few caveats:
  - Some applicant selection criteria is not well measured by ERAS data, including:
    - Performance during elective/away rotation in the department
    - Applicant “fit” with program culture and training experience
    - Applicant “fit” with current resident group
    - Research projects and interests that may be continued
    - If members of the selection committee would actually enjoy training the applicant
  - “Success” in residency and beyond is not best measured through criteria such as ITE score, faculty rating as “the top 1/3 of their residency class”, or ability to simply complete residency.
  - “Success” beyond residency may be heavily influenced by program characteristics that prepare the resident for their ultimate career
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• “Success” in residency and beyond is not best measured through criteria such as ITE score, faculty rating as “the top 1/3 of their residency class”, or ability to simply complete residency.

• “Success” beyond residency may be heavily influenced by program characteristics that prepare the resident for their ultimate career
From: **Factors Influencing Applicants’ Ranking of Dermatology Residency Programs in the National Resident Matching Program**


Table 2. Factors in Determining Rank-Ordered Lists

<table>
<thead>
<tr>
<th>Factor</th>
<th>Score, Mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived happiness of current residents</td>
<td>4.63 (0.69)</td>
</tr>
<tr>
<td>Personal interactions with faculty during interview</td>
<td>4.44 (0.75)</td>
</tr>
<tr>
<td>Personal interactions with residents during interview</td>
<td>4.30 (0.86)</td>
</tr>
<tr>
<td>Interview experience</td>
<td>4.25 (0.82)</td>
</tr>
<tr>
<td>Geographical location</td>
<td>4.10 (1.11)</td>
</tr>
<tr>
<td>Impression after medical student rotation at an institution</td>
<td>3.98 (1.72)</td>
</tr>
<tr>
<td>Impression of program director</td>
<td>3.96 (0.93)</td>
</tr>
<tr>
<td>Proximity of program to family, friends, or significant other</td>
<td>3.94 (1.26)</td>
</tr>
<tr>
<td>Advice by mentor or other trusted source</td>
<td>3.83 (1.29)</td>
</tr>
<tr>
<td>Successful placement of residents in desired fellowships</td>
<td>3.78 (1.12)</td>
</tr>
<tr>
<td>Didactic curriculum</td>
<td>3.75 (0.92)</td>
</tr>
<tr>
<td>Amount of surgical experience</td>
<td>3.68 (1.06)</td>
</tr>
<tr>
<td>Amount of dermatopathologic experience</td>
<td>3.66 (0.98)</td>
</tr>
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<td>University-based program vs community-based program</td>
<td>3.63 (1.37)</td>
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