Factors Associated With Successful Matching to Dermatology Residency Programs by Reapplicants and Other Applicants Who Previously Graduated From Medical School

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Objectives: To identify factors associated with and not associated with successful matching and matriculation (hereinafter “matching”) to dermatology residency programs for applicants who previously graduated from medical school and to distinguish which factors are within applicants’ control.

Design: Observational cohort study.

Setting: Six accredited academic dermatology residency training programs in the United States.

Participants: A total of 221 residency applicants who previously graduated from medical school and who applied through standardized electronic application to 1 or more of the participating residency training programs.

Main Outcome Measure: Matriculation to a dermatology residency program by August 2008 following the 2006 residency application period.

Results: Forty-six of 221 former medical school graduates included in this study matched to a dermatology residency program. Factors strongly associated with matching included United States Medical Licensing Examination Step 3 score; submission of letters written by dermatologists from institutions that train dermatology residents; completion of preliminary medicine internships rather than transitional or other internship types; listing of research experience; publishing of medical manuscripts; and completion of non–Accreditation Council for Graduate Medical Examination dermatology fellowships. Factors not associated with increased matching included volunteer work; PhD status; sex; number of posters or presentations at dermatology conferences; quality of journal publications; and first authorship. Most successful applicants limited personal statements to 1 page and did not mention previously failing to match. The study sample represented at least 86% of such nontraditional applicants who matched in 2006.

Conclusions: For candidates seeking to match into dermatology residency programs after graduating from medical school, there are factors within their control that are associated with higher rates of match success. This study provides evidence to assist mentors who counsel such candidates.

helpful for dermatology residency applicants and for those who advise them.

## METHODS

### DATABASE

The Electronic Residency Application Service (ERAS) was developed by the Association of American Medical Colleges to electronically transmit the residency application materials from medical schools to residency programs. At the time of the present study, applicants could apply to 112 dermatology programs through ERAS for the 2006 match. Individuals in each program are given access to ERAS to sort, review, invite, evaluate, and rank applications. Applicants and program representatives submit their rank lists to the National Residency Match Program, which then uses an algorithm to match individuals with residency positions.

### STUDY SUBJECTS

Qualifying applicants who applied in 2006 to the dermatology residency programs at Marshfield Clinic, University of Wisconsin, Madison; Boston University School of Medicine, Boston, Massachusetts; Stanford University, Stanford, California; University of Texas Southwestern Medical Center, Dallas; and University of Missouri, Columbia, were included in the study. Institutional review board approval or exemption was obtained from all relevant institutions to use the data for this study. Lists were extracted of applicants who graduated from each medical school prior to August 2005. All reapplicants had application evidence of failing to match and make up a subset included for analysis in this study.

### DATA ABSTRACTION

Standard applicant data were available through the ERAS database. One investigator was responsible for abstracting data. The ERAS database contains applicant demographic data; a personal statement; United States Medical Licensing Examination (USMLE) scores; letters of recommendation; and information on education and training, awards, volunteer experience, publications, research and work experience, and letters of recommendation. Data files of individuals meeting the study criteria were printed, blinded to candidate identity, and abstracted. No personal identification data were abstracted.

An article written by an applicant was defined as a dermatology-related publication if it met 1 of the following criteria: (1) it was published in a journal indexed as a dermatology journal in either Medline 2005 by the National Library of Medicine or in the 2005 Science Journal Citation Reports; or (2) the title of the article contained at least 1 term from the dermatology lexicon database. Publications in nondermatology journals were recorded and noted only if they appeared in a top 3 impact factor journal in general medicine, rheumatology, infectious disease, allergy, immunology, hematology, pathology, oncology, or medical science. Publication authorship order was recorded prior to application deidentification by a research assistant with no involvement in residency selection. The name of each applicant was encrypted with an alphanumeric code known only to the research assistant.

A complete roster of first-year US dermatology residents is not accessible until after residents matriculate. Such a roster was purchased through the American Academy of Dermatology in August 2007 and used by the research assistant to identify which coded applications should be designated matched and matriculated.

### STATISTICAL ANALYSIS

A total of 221 ERAS applicants were included in the statistical analysis. In the univariate analysis, the descriptive statistics were reported as percentages for categorical measurements and means (SDs) for continuous measurements for each participant and attributed according to the status of successful matching (yes or no). In addition, odds ratios (ORs) and corresponding 95% confidence intervals (CIs) were calculated for the association between each of a participant’s attributes and the status of successful matching using the unconditional logistic regression modeling approach. \(P < .05\) was considered statistically significant. All data analyses were carried out using SAS software, version 9.13 (SAS Institute Inc, Cary, North Carolina).

### RESULTS

Overall, 46 of 221 study applicants matched (21%), and all 46 had new applicant information since graduation. Several factors were significantly associated with previous graduates matching into dermatology residency programs. Some factors were within the candidate’s control at the time of application (Table 1), and some were not (Table 2). Other candidate factors were not significantly associated with matching (Table 3).

### MEDICAL SCHOOL

A total of 187 of 221 study applicants previously completed their education in allopathic medical schools, and 7 completed osteopathic medical schools. The remainder did not identify a medical school degree type. Forty-six of 187 allopathic graduate applicants matched into dermatology programs (25%) compared with 0% of osteopathic graduates. Sixty-nine applicants held valid Educational Commission for Foreign Medical Graduates certificates, indicating foreign medical graduate status, and 5 of these subsequently matched (7%).

### INTERNSHIP SELECTION

Most study applicants had previously pursued residency training in internships or categorical nondermatology residencies (189 of 221, 86%). Applicants who pursued a preliminary year of internal medicine matched at a higher rate than those pursuing transitional year internships (21 of 69, 30%, vs 3 of 21, 14%). Of the 29 applicants with internship or residency experience who subsequently matched, 21 were within or had completed preliminary year internal medicine internships (72%) compared with 3 who pursued transitional year internships (10%) and 5 who pursued other training (eg, preliminary year pediatrics, preliminary year surgery, other categorical program) (17%).

### FELLOWSHIP TRAINING AND OTHER NONRESEARCH WORK EXPERIENCE AFTER GRADUATION

A minority of applicants (31 of 191, 16%) had pursued fellowships following medical school graduation. Nearly all of these fellowships (30 of 31, 97%) were not accredited by the Accreditation Council for Graduate Medical Education. Of those applicants pursuing fellowships, 33%...
matched (11 of 31). Of the applicants who matched, 27% were completing or had completed such fellowships. Listing other forms of work experience was not associated with significant differences in subsequent matching.

RESEARCH

Most applicants reported research experience (175 of 221, 79%). Ninety-three percent of those who matched reported some form of research experience on their ERAS application. Forty-three of 175 candidates who reported research experience subsequently matched (25%) compared with 3 of 46 who did not report any research experience (7%). Those who matched were significantly more likely to list dermatology research experience (39 of 43, 91%, vs 85 of 132, 64%). Those who matched did not have significantly higher rates of new research activity since medical school. Thirty-three of the 117 applicants who documented new or ongoing research activity since graduation matched (28%). Of those who participated in research and subsequently matched, 35% participated in clinical research (15 of 43), 26% in basic research (11 of 43), and 40% in both (17 of 43). Participants in clinical research matched 21% of the time (15 of 73), whereas participants in basic research matched 31% of the time (11 of 36). Participants in both matched 26% of the time (17 of 65).

Table 1. Factors Associated With Significantly Increased Rates of Subsequent Matching to Dermatology Residency Programs and Within the Control of Applicants Who Previously Graduated From Medical Schoola

<table>
<thead>
<tr>
<th>Factor</th>
<th>Successful Matching</th>
<th>OR (95% CI)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Or more letters of recommendation written by dermatologists from institutions that train dermatology residents</td>
<td>Yes – 41 (93)</td>
<td>No – 99 (72)</td>
<td>5.25 (1.53-17.96)</td>
</tr>
<tr>
<td>Completing a preliminary medicine internship rather than transitional or other internship type</td>
<td>Yes – 21 (72)</td>
<td>No – 48 (62)</td>
<td>2.52 (1.25-5.06)</td>
</tr>
<tr>
<td>Listing research experience</td>
<td>Yes – 43 (93)</td>
<td>No – 132 (75)</td>
<td>4.67 (1.38-15.81)</td>
</tr>
<tr>
<td>1 Or more letters of recommendation are written by dermatologists (any career type)</td>
<td>Yes – 44 (96)</td>
<td>No – 137 (78)</td>
<td>6.10 (1.41-26.32)</td>
</tr>
<tr>
<td>Residency application lists published medical manuscripts</td>
<td>Yes – 39 (85)</td>
<td>No – 118 (67)</td>
<td>2.69 (1.13-6.39)</td>
</tr>
<tr>
<td>Completing an MBA</td>
<td>Yes – 3 (7)</td>
<td>No – 1 (1)</td>
<td>12.14 (1.23-111.58)</td>
</tr>
<tr>
<td>Completing a non-ACGME dermatology fellowship after failing to match</td>
<td>Yes – 11 (27)</td>
<td>No – 20 (13)</td>
<td>2.38 (1.03-5.50)</td>
</tr>
</tbody>
</table>

**Table 2. Factors Associated With Significantly Increased Rates of Subsequent Matching to Dermatology Residency Programs but Beyond the Control of Applicants Who Previously Graduated From Medical Schoola**

<table>
<thead>
<tr>
<th>Factor</th>
<th>Successful Matching</th>
<th>OR (95% CI)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>AOA member</td>
<td>Yes – 19 (41)</td>
<td>No – 23 (13)</td>
<td>4.65 (2.24-9.68)</td>
</tr>
<tr>
<td>US medical school graduate rather than foreign medical graduate</td>
<td>Yes – 5 (11)</td>
<td>No – 64 (37)</td>
<td>0.21 (0.08-0.56)</td>
</tr>
<tr>
<td>Preliminary medicine internship rather than transitional or other internship type</td>
<td>Yes – 21 (72)</td>
<td>No – 46 (62)</td>
<td>2.52 (1.25-5.06)</td>
</tr>
<tr>
<td>Graduating from an allopathic medical school rather than osteopathic medical school</td>
<td>Yes – 45 (98)</td>
<td>No – 142 (61)</td>
<td>10.46 (1.39-78.64)</td>
</tr>
<tr>
<td>Completion of dermatology rotations during medical school</td>
<td>Yes – 28 (61)</td>
<td>No – 75 (43)</td>
<td>2.07 (1.07-4.03)</td>
</tr>
<tr>
<td>Honors and awards reported on the application, mean (SD) No.</td>
<td>Yes – 8.5 (6.2)</td>
<td>No – 5.8 (4.9)</td>
<td>1.09 (1.03-1.16)</td>
</tr>
<tr>
<td>Honorary and/or professional societies, mean (SD) No.</td>
<td>Yes – 3.2 (2.4)</td>
<td>No – 2.3 (1.9)</td>
<td>1.23 (1.06-1.43)</td>
</tr>
<tr>
<td>USMLE Step 1 score, mean (SD)</td>
<td>Yes – 226.4 (23.8)</td>
<td>No – 217.5 (21.2)</td>
<td>1.02 (1.00-1.04)</td>
</tr>
<tr>
<td>USMLE Step 2 score, mean (SD)</td>
<td>Yes – 229.2 (24.5)</td>
<td>No – 219.7 (22.9)</td>
<td>1.02 (1.00-1.03)</td>
</tr>
</tbody>
</table>

Abbreviations: AOA, Alpha Omega Alpha National Honor Medical Society; CI, confidence interval; OR, odds ratio; USMLE, United States Medical Licensing Examination.

*Unless otherwise noted, data are reported as number (percentage) of applicants.*
Some study applicants had completed advanced degrees at the time of application. Three of 8 candidates who listed PhD degrees matched (38%), as did 3 of 8 who listed MPH degrees (38%) and 3 of 4 candidates listing who listed MBA degrees (75%). No other advanced degree types were identified.

### Publications

Most study applicants listed publications on the ERAS application (157 of 221, 71%). Of those who matched, 39 of 46 listed publications in ERAS (85%), significantly higher than for those who failed to match (67%). This includes 71% of matched candidates with at least 1 publication since graduation. Thirty-nine of 157 candidates who listed publications matched (25%) vs 7 of 64 who listed no publications (11%). Those who matched listed an average of 5.1 total publications vs 4.6 publications for those who failed to match. This included an average of 2.7 dermatology-related publications since graduating for those who matched and 2.1 for those who did not. There were no differences in number of publications in dermatology top 10 impact factor journals (0.8 vs 0.6 publications per candidate), nor publications in top 3 impact factor journals for other key specialties (0.10 vs 0.04 publications per candidate). Eighty-three percent of those who matched were listed as the first author on at least 1 publication.

### Board Scores

The average USMLE scores were significantly higher for those who matched than for those who did not on Step
VOLUNTEER EXPERIENCE

Most study applicants listed volunteer experience on their applications (163 of 221, 74%). Thirty-nine of the 163 applicants who listed volunteer experience subsequently matched (24%). Of those who matched, 39 of 46 listed volunteer activities (85%). Dermatology-related volunteer experience was reported in 26% for both those who matched (10 of 39) and those who did not (32 of 124). The rate of volunteer experience after graduating from medical school was also not significantly different between groups (44% for matchers [17 of 39] vs 55% for nonmatchers [68 of 124]). The mean total volunteer time reported was not significantly different between those who matched and those who did not (111 and 95 volunteer-months, respectively). Similarly, those who matched did not differ significantly from those who did not in time spent in dermatology-related volunteer work after graduating from medical school (5.1 and 3.1 volunteer-months, respectively) and nondermatology volunteer time after graduating (25.4 and 23.0 volunteer-months, respectively).

HONORS AND AWARDS

Forty-two of the 221 study applicants were Alpha Omega Alpha (AOA) National Honor Medical Society members. Nineteen of 42 AOA applicants subsequently matched (45%). Of candidates who matched, 19 of 46 were AOA members (41%). Being selected to the AOA as a junior medical student held no significant advantage to subsequent matching over selection to the AOA as a senior.

PERSONAL STATEMENT

There was no difference in personal statement length between those who matched and those who did not, with 34 of 46 of those who matched (74%) and 118 of 173 of those who failed to match (68%) submitting 1-page statements. Twenty-nine of 42 applicants mentioned previously failing to match (13%). Nine of these 29 reapplicants subsequently matched (31%). Only 4 of these 29 applicants wrote about why they thought they did not match the first time. Two of these 4 subsequently matched. Twenty-six applicants used the personal statement to describe what they had done to improve their candidacy since failing to match. Of the 9 reapplicants who subsequently matched, 8 of 9 discussed their improvement as a candidate in the personal statement (89%).

LETTERS OF RECOMMENDATION AND DERMATOLOGY ROTATIONS

Applicants who matched submitted an average of 2.3 letters of recommendation from dermatologists, compared with 1.7 letters for applicants who did not match. Forty-one applicants had no letters from dermatologists (19%). Only 2 of these candidates matched (5%). Forty-one applicants had no letters from dermatologists compared with 1.7 letters for applicants who did not match. Twenty-six applicants used the personal statement to describe what they had done to improve their candidacy since failing to match. Of the 9 reapplicants who subsequently matched, 8 of 9 discussed their improvement as a candidate in the personal statement (89%).

Table 4. Top Questions From Dermatology Residency Candidates and Answers From Mentors Who Counsel Dermatology Applicants

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
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<tbody>
<tr>
<td>What are my chances of matching in dermatology after I previously fail to match?</td>
<td>Around 20%</td>
</tr>
<tr>
<td>If I am a borderline candidate but I really want to pursue dermatology, what should I do for a “plan B”?</td>
<td>If applicants are dedicated to dermatology but not strong candidates to match initially, encourage them to pursue preliminary internal medicine internships over other internship-only plan B options. If the candidates are indifferent to internship type; rather than have them pursue a categorical residency, consider a non-ACGME dermatology fellowship experience as a plan B before or after an internship.</td>
</tr>
<tr>
<td>What sort of scholarly activity should I pursue?</td>
<td>Research, if you have none (bench research experience may provide a slight match advantage to clinical research), and publish articles.</td>
</tr>
<tr>
<td>Are there other extracurricular activities that will boost my chances?</td>
<td>While volunteer activity should not be discouraged, volunteer activity after failing to match is not associated with increased matching on reapplication.</td>
</tr>
<tr>
<td>How should I approach the application the next time around?</td>
<td>Most applicants who match write a 1-page personal statement; in the personal statement, explain how you have used the time to become a better candidate; try to obtain letters of recommendation from 2 or 3 dermatologists from institutions that train residents if possible.</td>
</tr>
<tr>
<td>Am I at a disadvantage because of my sex? Any other advice you would have?</td>
<td>Continue to try hard on all remaining portions of the USMLE because scores on all 3 steps are significantly higher for those who eventually match.</td>
</tr>
</tbody>
</table>

Abbreviations: ACGME, Accreditation Council for Graduate Medical Education; USMLE, United States Medical Licensing Examination.
DERMATOLOGY-RELATED POSTERS AND PRESENTATIONS

There was no significant difference in the number of posters or presentations at dermatology-related conferences for those who matched. Those who matched had an average of 1.5 presentations while those who did not match had an average of 1.4.

COMMENT

Each year, many applicants fail to match into dermatology programs. Most will immediately or eventually pursue careers in other fields. However, there are those with a strong continued desire to pursue dermatology. The present study is intended to provide evidence for mentors to better advise applicants facing failure to match or seeking a path change to dermatology after graduating from medical school. Table 4 summarizes general recommendations from this study. This is not a prescription for successful matching. If every applicant failing to match followed every statistically significant recommendation listed within the data presented here, there would still remain a high percentage failing to match, given the limited supply of dermatology positions.

“PLAN B” OPTIONS BEFORE THE FIRST MEDICAL SCHOOL MATCH

There are many paths an applicant can pursue. However, many of these paths are determined when completing the first rank list during medical school. When completing the rank list, candidates have opportunities to rank “plan B” options or alternate internship-only or nondermatology residency training paths (eg, internal medicine, pediatrics) in case they do not match into dermatology programs. If no alternative path is ranked, the candidate may go unmatched. For many in this circumstance, this time is spent pursuing nonaccredited clinical fellowships, research, or other nonresidency pathways. It may be reasonable to pursue clinical fellowships or research fellowships in dermatology.

Borderline candidates serious about pursuing dermatology may want to consider a preliminary year of medicine over other internships. Our study did not examine the importance of the relative order of internship and nonaccredited fellowship. For those seeking a career switch from another field to dermatology, completing a categorical residency may seem desirable because of added expertise provided by the alternate training. However, this does not appear to have a dermatology match advantage over completing only an internship or leaving a categorical program. There does not appear to be a match advantage for reapplicants or transitioning applicants in earning a PhD, as has been reported for senior medical student applicants to dermatology programs. We did not analyze when applicants received these advanced degrees.

FACTORS CONTROLLED BY THE APPLICANT

At the time of the initial match during medical school, all candidates have taken Step 1 of the USMLE. Many students invest significant energy to score high on USMLE Step 1 because many programs use minimum Step 1 scores to filter applicants for interviews. However, performance on all 3 USMLE steps appears important, with Step 3 score being the strongest predictor of USMLE-related match success in this study.

After failing to match, candidates should be advised to pursue as many dermatology projects as are manageable, with intent to publish results or to get articles accepted for publication by the time of the next application. If interested applicants have no previous research experience, their applications would benefit if they obtained such experience. The quality of the research was not assessed, but basic science research experience held a slight match advantage.

Research and projects likely to result in publication are worthy scholarly pursuits. Higher numbers of publications did not correlate to higher match rates, but those applicants who matched averaged about 5 total publications, with nearly 3 of those publications occurring after graduation. Only 15% of those who matched listed no peer-reviewed publications. Surprisingly, the quality of publication as determined by journal impact factor did not appear to be a match advantage.

Pursuing new volunteer activities does not appear to be a match advantage either. The timing, dermatology relevance, and substance of the volunteer work (as determined by duration of volunteer activities) were not significantly higher in those who matched.

Status as AOA member is not a guaranteed pathway to matching in a dermatology program. Most applicants who matched did not have AOA status, and most applicants with AOA status still failed to match, including 4 of 9 applicants with junior AOA status, often the highest academic performers of a medical school class.

APPROACHING THE APPLICATION THE NEXT TIME AROUND

Completing the ERAS application, especially crafting the personal statement, can be challenging for a reapplicant. Lengthy personal statements are unnecessary. Most candidates do not write about previously failing to match. If they choose to discuss failing to match, applicants should describe why they are now better applicants but should not feel obligated to explain why they feel they did not match previously.

Letters of recommendation can be important in such a small field. Candidates should request letters from multiple dermatologists or dermatology researchers rather than letters from physicians in different fields. Letters from dermatologists at institutions with residency programs should be included when possible. It is very difficult to match in dermatology programs otherwise. Away rotations should be emphasized for medical schools that do not offer dermatology rotations. If the student fails to match and has no dermatology rotation experience, that candidate should be encouraged to arrange a rotation before graduation.

There are several limitations to this study. First, the study population is a sample of candidates from 6 geographically diverse US regions and may not represent all
qualifying applicants. Our study sample identified 46 applicants who matched. According to the 2006 post-match summary report from the National Residency Match Program, a total of 53 independent applicants matched in US dermatology residencies in 2006. Independent applicants include, but are not limited to, our study population. Thus, our study sample of 46 includes 87% of the desired target population.

We did not account for name changes that might have occurred between ERAS application and matriculation as a first-year dermatology resident about a year and a half later. Applicants lost as a result of a name change would underestimate our match success rates. We also assumed that the new resident files of the American Academy of Dermatology are comprehensive.

The present study assumes that reapplicants make up the largest portion of the applicants in this study and that many of the findings herein should be used when counseling reapplicants. However, the only certain objective way to identify a reapplicant is a declaration in the personal statement or through information in a letter of recommendation that the applicant previously failed to match. Such a declaration was found in only a minority of applicants.

Some of our findings highlight weaknesses of the application review process rather than offer direction for applicants. For instance, the quality of publications, research, and volunteer work does not appear to affect match success. The message should not be for applicants to pad the resume with minor or meaningless volunteer activities or publications but rather for reviewers to be more critical in the review of an application. This is not easy. The average program receives over 400 applications, often for only 2 or 3 residency positions. Owing to time constraints, it is difficult for reviewers to further scrutinize the applications. However, resident competencies unrelated to medical knowledge and other factors that predict residency success may influence the need to scrutinize applicants beyond volume and scores.

Finally, these data are for nontraditional applicants only and are not intended to be extrapolated to the first-time applicant during medical school.

In conclusion, the purpose of our study was to gather data that would allow us to better advise nontraditional dermatology residency applicants, including those who previously failed to match. No advisor should determine who should or should not pursue a desired career as a dermatologist. Instead, it should be the advisor’s role to present the information and explore with the applicant the most sensible next steps. These data are not intended to serve as a screening tool to determine whether an applicant should apply again for dermatology residency, nor are they a recipe to successfully match. There are few, if any, absolutes in counseling nontraditional dermatology residency applicants. Post–medical school pursuit of research, publication, presentations, volunteer work, dermatology fellowship training, dermatology rotations, and ERAS application completion must be individualized. The candidate must consider the data, the mentor’s evidence-based advice, and his or her own preferences to make an appropriate individualized decision.

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REFERENCES