The Relationship of Residency Performance to Match Status and US Versus International Graduate Status

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**Background and Objectives:** This study compared the performance of family practice residents selected through the National Resident Matching Program (NRMP) with those selected outside the NRMP and that of US medical graduates (USMGs) versus international medical graduates (IMGs).

**Methods:** Surveys were mailed to all 470 US family practice residencies asking Match status and USMG versus IMG status of graduates accepted into their programs from 1994–1996. Results: Of 3,222 residents, 2,815 (87.4%) were accepted through the Match, 159 (4.9%) before the Match, and 248 (7.7%) after the Match; 2,874 (89.2%) were USMGs, and 348 (10.8%) were IMGs. Residents accepted after the Match versus residents selected through the Match were more likely to leave their programs early (14.5% versus 4.8%), score in the lower 10% of their In-training Assessment Examination (ITE) (11.7% versus 2.2%), and require remedial programs (12.9% versus 2.6%). A lower proportion of residents accepted after the Match scored in the top 10% on the ITE examination (5.6% versus 15.2%). IMGs were more likely than USMGs to leave the program before graduating (8.0% versus 3.2%), to score within the lower 10% on the ITE examination (7.8% versus 2.5%), and to require remedial programs (7.8% versus 3.2%). Conclusions: Although a large majority of the residents studied here performed well, somewhat less-favorable performance was seen among residents accepted after the Match and among those with international medical degrees.

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US family practice residency programs have seen a progressive decline in the number of residency positions filled over the past few years. The 2001 fill rate of 76.3% was down from the peak rate of 90.5% seen in 1996. Accompanying this downward trend has been a decline in the proportion of residency positions being filled by US medical graduates (USMGs). In 2001, 49% of family practice residency positions were filled by USMGs—the lowest rate in more than a decade.

Residency positions are usually filled through the National Resident Matching Program (NRMP), created in 1952 in an attempt to bring order and fairness to what had previously been at times a rather chaotic process of placing residents in training programs. Applicants interview at various residency programs, and both applicants and program directors submit preferences in rank order to the NRMP. The rank lists are entered into a computer, and a standardized program is used to sort preferences and perform a match, based on an algorithm that somewhat favors students’ selections. Both program directors and students are required to adhere to certain NRMP rules, such as not making other arrangements outside of the Match process and accepting final results of the Match process.

The national decline in residency fill rates can be partly explained by the growth in numbers of family practice residencies in recent years, from 452 programs in 1996 to 472 programs in 2000. Interestingly, however, this increase in total available programs has been associated with a decreased number of residency positions being offered through the Match, from 3,137 positions in 1996 to 3,096 positions in 2001. A likely explanation for this phenomenon is that program directors, eager to fill their ranks, are more aggressively seeking candidates who will commit to their programs before the Match (ie, “pre-Match” candidates). Subsequently, when programs do not fill through the Match, directors seek out “post-Match” candidates, many of whom are international medical graduates (IMGs).
These circumstances have changed the complexion of residency programs so that programs now include both larger numbers of IMGs and residents accepted outside of the Match.

Concerns have arisen about the academic performance of residents who have been selected outside of the Match or who have graduated from non-US medical schools. Laufenburg et al found the attrition rate for IMGs to be higher than that of USMGs (18.5% versus 7.8%), and IMGs selected outside of the Match were even more likely to leave a program than IMGs selected through the Match. Part and Markert found that recent clinical experience and performance on standardized examinations seemed to indicate IMGs who would perform better in the PGY-1 year of internal medicine residencies. Other markers of good resident performance that have been studied include board examination scores, postgraduate clinical experience in the United States, interview performance, recent graduation from medical school, medical school grades, performance on standardized exams, interviews during the application process, and Match-list ranking.

Given the relative lack of information about resident performance according to Match status and source of medical degree (US or international), our study sought to compare academic outcomes of family practice residents selected through the NRMP Match with those selected outside of the Match and to determine whether US versus international graduate status is related to these outcomes.

Methods

Surveys were mailed to all US family practice residency program directors (n=470) between January and May 2000, requesting the following information: whether the program had enrolled new PGY-1 family practice residents in 1994–1996, whether the program accepted residents outside of the NRMP, and the number of USMGs and IMGs that had been accepted into the program from 1994–1996 through the Match, before the Match, and after the Match. Directors were also asked to state the number of residents for each of these Match categories that had left the program before graduating, failed to complete residency on time, received a PGY-3 (third-year resident) composite In-Training Assessment Examination (ITE) score within the top or bottom tenth percentile nationally for residents taking the exam, or had required a remediation program (such as a repeat rotation, extra reading, learning contract, probation, or disciplinary action). Since graduation was used as one of the performance criteria, we looked at residents entering residency in the years 1994–1996 with anticipation that those residents would have graduated in the years 1997–1999.

The performance indicators used in the surveys (early withdrawal from the residency program, failure to complete residency on time, ITE composite scores of 1st–10th percentile or 90th–100th percentile, and requiring a remedial program) were selected on the basis of their influence on faculty time and resources and/or their being objective, easily documented measures of residents’ academic attainment. Previous data have shown that the ITE composite score is independently predictive of performance on the American Board of Family Practice Certification Examination. A second survey and cover letter were mailed to those who did not respond to the first mailing. All surveys completed by May 1, 2000, were included in the analysis.

Data Analysis

Chi-square tests were used to identify significant differences in the proportion of residents seen in various Match categories (accepted within the Match, before the Match, and after the Match) for several academic performance characteristics (left program before graduating, failed to complete residency on time, <10th percentile on PGY-3 composite ITE score, >90th percentile on PGY-3 composite ITE score, required remedial program). These tests were performed both for the resident group as a whole and for USMGs and IMGs separately. For those performance characteristics with significant or near-significant (\( P < .05 \)) chi-square \( P \) values, two-by-two chi-squares were performed comparing “matched” to “after-Match” groups, since these group differences appeared to be the most pronounced. In addition, chi-square tests were used to compare USMGs and IMGs on the five residency academic performance characteristics. The Mantel-Haenszel common odds ratio estimate was used to test for homogeneity of USMGs’ and IMGs’ odds ratios on the presence (versus absence) of the five residency academic performance characteristics.

Results

A total of 285 surveys were returned, for a 61% response rate. Of the 285 programs represented, 80 were excluded from the analysis because they either did not participate in the NRMP Match (mostly military programs) or they answered “no” to the question, “Did you have any PGY-1 or PGY-2 family practice residents enter your program either through the NRMP Match or outside the Match in 1994, 1995, or 1996?” Data were thus analyzed on a total of 3,222 residents, including 2,874 USMGs and 348 IMGs.

Table 1 shows the proportion of total residents in each Match category who left the program before graduating, failed to complete residency on time, were in the bottom and top tenth percentile of ITE composite score distributions nationally for family practice residents, and required remedial programs. For the group as a whole, a higher proportion of residents accepted after the Match, compared to those matched, left the pro-
program before graduating ($P=.000$), scored in the lowest 10th percentile on the ITE ($P=.000$), and required remedial training ($P=.000$). Consistent with these findings, a lower proportion of residents accepted after the Match, compared to those matched, scored in the top tenth percentile of the ITE ($P=.000$). In general, residents accepted through the Match and before the Match tended to be similar to one another in their academic performance characteristics.

When USMGs and IMGs were analyzed separately, findings were similar (Tables 2 and 3). USMGs accepted after the Match, compared to those taken through the Match, were more likely to leave the program prematurely ($P=.000$), not complete the program on time ($P=.041$), score at the bottom 10th percentile of the ITE ($P=.000$), and require remedial training ($P=.000$); they were less likely to score in the top tenth percentile of the ITE ($P=.000$).IMGs accepted after the Match showed similar patterns, which were statistically significant only for being less likely to score in the top tenth percentile of the ITE ($P=.044$) and requiring remedial programs ($P=.002$). The absence of statistically significant differences on the other variables may have been due to lack of power, given the smaller number of IMGs (compared to USMGs) in this study.

Comparisons between USMGs and IMGs on various academic performance characteristics are shown in Table 4. A higher proportion of IMGs, compared to

USMGs, left the training programs early (8.0% versus 5.2%, $P=.029$), scored in the lowest tenth percentile of the ITE (7.8% versus 2.5%, $P=.000$), and required remedial training (7.8% versus 3.2%, $P=.000$). Using the Mantel-Haenszel common odds ratio estimate, IMGs were three times as likely to score $<$ tenth percentile on the PGY-1 ITE exam (odds ratio [OR]=3.099, $P=.000$) and twice as likely to require a remedial program (OR=$2.098, P=.001$).

**Discussion**

These results indicate that, for the population surveyed, residents’ Match status when entering a residency program was related to their subsequent residency performance. Residents who were accepted after the Match tended to perform worse than those accepted through the Match, as noted by their greater likelihood of leaving their training programs early, failing to complete their residencies on time, receiving low scores on the ITE, and requiring remedial training. Therefore, in general, accepting a graduate after the Match process was associated with more performance problems by the parameters used in this study. Residents accepted before the Match tended to perform in a manner similar to those accepted through the Match. Although US medical graduates, compared to international graduates, were more likely to remain in their programs until graduation, perform better on ITEs, and
“Remedial program” refers to such requirements or activities as repeat rotations, extra reading, learning contracts, probation, and disciplinary action.

Table 2

US Medical Graduates With Various Academic Performance Characteristics Who Were Accepted Through, Before, or After the Match

| Academic Performance Characteristics | MATCH CATEGORIES | |
|--------------------------------------|------------------|
|                                      | Accepted Before the Match (PGY-1) | Accepted After the Match (PGY-1) | Total | Overall P Value | Matched Versus After-Match P Value |
| Left program before graduating       | Matched           | Accepted Before the Match (PGY-1) | Accepted After the Match (PGY-1) | Total | Overall P Value | Matched Versus After-Match P Value |
|                                      | 119 (4.6%)        | 9 (6.0%)                        | 5 (4.0%)                        | 12 (7.1%)                        | 116 (4.0%) | .076 | .041 |
| Failed to complete residency on time | 101 (3.9%)        | 4 (3.2%)                        | 3 (2.4%)                        | 12 (7.1%)                        | 116 (4.0%) | .076 | .041 |
| < 10th percentile on ITE in PGY-3 year | 49 (1.9%)        | 4 (3.2%)                        | 20 (11.9%)                      | 73 (4.2%)                        | .000 | .000 |
| > 90th percentile on ITE in PGY-3 year | 393 (15.2%)     | 22 (17.6%)                      | 9 (5.4%)                        | 424 (14.8%)                      | .001 | .000 |
| Required remedial program5            | 62 (2.4%)         | 11 (8.8%)                       | 20 (11.9%)                      | 93 (3.2%)                        | .000 | .000 |
| Total residents entering 1994–1996    | 2,581 (89.8%)     | 125 (4.4%)                      | 168 (5.8%)                      | 2,874 (100.0%)                   | —    | —    |

ITE—In-training Assessment Exam

1 Differences between Match categories were determined by chi-square tests.
2 “Failed to complete program on time” means that it took longer than 3 years to complete the residency for a new PGY-1 or took longer than 2 years to complete residency for a PGY-2 who transferred into a program.
3 Residents who in their third year of training scored at or lower than the 10th percentile nationally on the composite score of their ITE.
4 Residents who in their third year of training scored at or higher than the 90th percentile nationally on the composite score of their ITE.
5 “Remedial program” refers to such requirements or activities as repeat rotations, extra reading, learning contracts, probation, and disciplinary action.

Table 3

International Medical Graduates With Various Academic Performance Characteristics Who Were Accepted Through, Before, or After the Match

| Academic Performance Characteristics | MATCH CATEGORIES | |
|--------------------------------------|------------------|
|                                      | Accepted Before the Match (PGY-1) | Accepted After the Match (PGY-1) | Total | Overall P Value | Matched Versus After-Match P Value |
| Left program before graduating       | Matched           | Accepted Before the Match (PGY-1) | Accepted After the Match (PGY-1) | Total | Overall P Value | Matched Versus After-Match P Value |
|                                      | 17 (7.3%)         | 1 (2.9%)                        | 10 (12.5%)                      | 28 (8.0%)                        | .171 | .149 |
| Failed to complete residency on time | 9 (3.8%)          | 2 (5.9%)                        | 4 (5.0%)                        | 15 (4.3%)                        | .811 | .655 |
| < 10th percentile on ITE in PGY-3 year | 14 (6.0%)        | 4 (11.8%)                       | 9 (11.3%)                       | 27 (7.8%)                        | .206 | .119 |
| > 90th percentile on ITE in PGY-3 year | 35 (15.0%)      | 6 (17.6%)                       | 5 (6.3%)                        | 46 (13.2%)                       | .101 | .044 |
| Required remedial program5            | 11 (4.7%)         | 4 (11.8%)                       | 12 (15.0%)                      | 27 (7.8%)                        | .008 | .002 |
| Total residents entering 1994–1996    | 234 (67.2%)       | 34 (9.8%)                       | 80 (23.0%)                      | 348 (100.0%)                     | —    | —    |

ITE—In-training Assessment Exam

1 Differences between Match categories were determined by chi-square tests.
2 “Failed to complete program on time” means that it took longer than 3 years to complete the residency for a new PGY-1 or took longer than 2 years to complete residency for a PGY-2 who transferred into a program.
3 Residents who in their third year of training scored at or lower than the 10th percentile nationally on the composite score of their ITE.
4 Residents who in their third year of training scored at or higher than the 90th percentile nationally on the composite score of their ITE.
5 “Remedial program” refers to such requirements or activities as repeat rotations, extra reading, learning contracts, probation, and disciplinary action.
Comparisons Between US and International Graduates on Academic Performance Characteristics

<table>
<thead>
<tr>
<th>Academic Performance Characteristics</th>
<th>US Graduates</th>
<th>International Graduates</th>
<th>Total Group</th>
<th>P Value</th>
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</thead>
<tbody>
<tr>
<td>Left program before graduating</td>
<td>n=2,874 (89.2%)</td>
<td>n=348 (10.8%)</td>
<td>(n=3,222)</td>
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<td>Failed to complete program on time&lt;sup&gt;2&lt;/sup&gt;</td>
<td>150 (5.2%)</td>
<td>28 (8.0%)</td>
<td>178 (5.5%)</td>
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<td>&lt; 10th percentile ITE&lt;sup&gt;3&lt;/sup&gt;</td>
<td>116 (4.0%)</td>
<td>15 (4.3%)</td>
<td>131 (4.1%)</td>
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<td>&gt; 90th percentile ITE&lt;sup&gt;4&lt;/sup&gt;</td>
<td>73 (2.5%)</td>
<td>27 (7.8%)</td>
<td>100 (3.1%)</td>
<td>.000</td>
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<tr>
<td>Required remedial program&lt;sup&gt;5&lt;/sup&gt;</td>
<td>93 (3.2%)</td>
<td>27 (7.8%)</td>
<td>120 (3.7%)</td>
<td>.000</td>
</tr>
</tbody>
</table>

ITE—In-training Assessment Exam

1 Differences between US and international graduates were determined by chi-square tests.
2 “Failed to complete program on time” means that it took longer than 3 years to complete the residency for a new PGY-1 or took longer than 2 years to complete residency for a PGY-2 who transferred into a program.
3 Residents who in their third year of training scored at or lower than the 10th percentile nationally on the composite score of their ITE.
4 Residents who in their third year of training scored at or higher than the 90th percentile nationally on the composite score of their ITE.
5 “Remedial program” refers to such requirements or activities as repeat rotations, extra reading, learning contracts, probation, and disciplinary action.

Limited fewer remedial programs, the absolute differences between these two groups were not large.

Limitations

There were several limitations to this study. Although our response rate was fair (61%), it is possible that selection bias may have influenced our results, in that programs that had more difficulty in filling their residency positions through the Match may have been more likely to respond. In addition, it is difficult to know whether the data provided by program directors were always accurate. For example, some may have consulted their records to determine the number of residents who scored in the bottom or top tenth percentile of the ITE, while others relied on personal recall, thus introducing the potential for recall bias. The restriction of performance indicators to easily documented objective measures, in some respects a strength of the study, made it impossible to look at other important measures, such as clinical skills, teamwork, patient rapport, and daily work performance. Yet, despite these limitations, this study provides important information about how Match status and US/international graduate status relate to residency performance.

Conclusions

These results indicate that, for residents in this population, those accepted after the Match appeared to have less-favorable performance measures than residents accepted through the Match. In addition, IMGs, compared to US graduates, tended to have slightly lower performance measures. However, it should be emphasized that a large majority of the post-Match residents and international graduates assessed here performed well, according to the indicators used in this study.

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