RESEARCH

Effect of Advanced Pharmacy Practice Experience Grading Scheme on Residency Match Rates

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Objective. To examine the effect of advanced pharmacy practice experience (APPE) grading schemes on residency match rates.

Methods. A cross-sectional survey was administered to U.S. pharmacy schools and colleges to determine an APPE grading scheme. Post-graduate year 1 residency match data for the years 2013-2015 was obtained from the American Society of Health-System Pharmacists. Additional variables thought to affect residency match rates were collected from publicly available sources and prior research. Unadjusted and adjusted multivariate logistic regression analysis was performed to compare 2013-2015 residency match rates between institutions using letter grading and those using pass/fail grading schemes. Potential confounders for incorporation into the adjusted model were identified by Chi-square or Fisher's exact test as appropriate.

Results. There were 110 of 126 schools that responded to the survey. Of these, 100 schools reported using either letter grading or pass/fail grading schemes in APPE courses and were included in the study. Unadjusted analysis revealed no difference in match rates between letter grading and pass/fail grading schemes over the aggregated time frame or in individual years. After adjusting for potential confounders, pass/fail grading was associated with higher match rates in the aggregate analysis and in 2013. However, no association was observed in 2014 or 2015.

Conclusion. This study demonstrates that there is limited difference in residency match rates between schools using pass/fail or letter grading schemes in APPEs.

Keywords: clinical clerkship, pharmacy residencies, educational measurement

INTRODUCTION

In addition to providing students with real-world experiences during their final year of pharmacy school, advanced pharmacy practice experiences (APPEs) offer a framework for postgraduate career planning. As the number of students pursuing postgraduate residency training grows, the residency match process has become increasingly competitive with match rates of only 64.5% and 68% in 2015 and 2016, respectively.^{1,2} Residency candidates are evaluated on a variety of attributes, including pharmacy school grade point average (GPA), familiarity with an applicant's pharmacy school, prior work experience, prior research experience, letter of intent, letters of recommendation, and professional leadership and service.³⁻⁵

Colleges and schools (hereinafter referred to as schools) of pharmacy use a variety of grading schemes

to evaluate student performance on APPEs; two of the most common are traditional letter grading (ie, A, B, C, D, and F) and pass/fail (+/- honors) grading. In a pass/fail grading scheme the preceptor indicates whether a student meets the objectives for the rotation or not, while in a letter grade scheme the preceptor must distinguish between levels of achievement. Thus, letter-grading may place an excess burden on preceptors (ie, assigning objective point values to specific skills and behaviors) and experiential education staff (ie, responding to grade appeals), when time could be better spent on providing formative feedback and fostering personal growth of the student.

Nevertheless, a perception exists that because most students perform well on APPEs, GPA inflation may exist in programs using letter grades, leaving students from schools using pass/fail grading at a disadvantage. Additionally, at least one survey of residency program directors found that a majority (53.7%) viewed pass-fail grades unfavorably, which may reflect a perception that pass/fail

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grading makes it more challenging to distinguish between applicants.⁵ Evidence for an actual detrimental impact on postgraduate match rates has been demonstrated in other health disciplines but not in the pharmacy literature.^{6,7} Given a lack of evidence in this regard, perceptions may influence decisions by schools of pharmacy regarding which grading scheme to use for APPE courses. The objective of this study was to examine if use of letter grading for APPEs is associated with higher residency match rates.

METHODS

A cross-sectional survey of pharmacy schools in the United States was conducted to determine APPE grading scheme (letter grading, pass/fail, combination, or other), the length of time the existing scheme had been in place, and if any alternative grading schemes had previously been used. Schools using a combination of letter grading and pass/fail grading schemes and schools using neither grading scheme were excluded from analysis. Experiential education offices were initially contacted to complete the survey via telephone; if no response was received, directors and/or assistant directors of experiential education were contacted via email. Postgraduate year 1 (PGY1) residency match data for the years 2013-2015 was obtained from the American Society of Health-System Pharmacists (ASHP) for the 127 schools accredited by the Accreditation Council for Pharmacy Education (ACPE) and recognized as members of the American Association of Colleges of Pharmacy (AACCP) during this period. Schools with available residency match rates from 2013-2015 were included in the study. Additional variables related to each program were collected from publicly available sources or prior research, and included: year of establishment, public vs. private classification, program length (defined as 3 professional years, 4 professional years, or 6 years which includes programs that enroll students directly from high school), North American Pharmacist Licensure Examination (NAPLEX) pass rate, total National Institutes of Health funding, funded faculty, PGY1 residency positions within the state where the school is located, graduate programs in addition to Doctor of Pharmacy, presence of a satellite campus, and association with an academic health center.⁸⁻¹⁰

Unadjusted and adjusted multivariate analysis using logistic regression was performed to compare 2013-2015 ASHP accredited or pre-accredited residency match rates between institutions using letter grading and those using pass/fail grading schemes. Potential confounders for incorporation into the adjusted model were identified by Chi-square or Fisher's exact tests as appropriate; characteristics with $p < .05$ were included as potential founders in the adjusted analysis. Two separate analyses were con-

ducted: the first evaluated the association between grading types and match rates for each separate year while the second compared the three years combined. All statistical

Table 1. Characteristics of Pharmacy Schools Responding to APPE Grading Scheme Survey (N=100)

Characteristic	N
APPE Grading Scheme	
Letter Grading	66
Pass/Fail Grading	34
Pass with Honors Grading	13
Bachelor's Degree Prerequisite	
Yes	96
No	4
Program Length ^{a,b,c,d}	
3 professional years	10
4 professional years	81
6 years (2 prerequisite years + 4 professional years)	9
Year of Establishment ^{a,b,d}	
5-10 years	18
10-20 years	20
>20 years	62
Institution Type ^{a,b,c,d}	
Public	52
Private	48
Affiliation with a Health Center ^{a,b,c,d}	
Yes	57
No	43
Statewide PGY1 Positions ^{b,d}	
<39 positions	26
39-87 positions	26
79-141 positions	31
≥142 positions	17
PhD Program ^{a,b,d}	44
No	56
Yes	
Satellite Campus ^d	
Yes	72
No	27
Unknown	1
NAPLEX Pass Rate ^{b,d,e}	
≤95%	39
>95%	61
Funded Faculty ^{b,d,e}	
<7	62
≥7	38
Total Funding ^{b,d,e}	
<\$340,000	45
\$340,000-\$1,700,000	17
\$1,700,000-\$8,300,000	20
≥\$8,300,000	18

^a Potential confounder 2013

^b Potential confounder 2014

^c Potential confounder 2015

^d Potential confounder aggregate 2013-2015

^e Information only available for 2014

analyses were performed using SAS version 9.4 (SAS Institute, Cary, NC). This study was determined to be exempt by the local institutional review board.

RESULTS

Of 126 schools contacted, 110 (87.3%) responded to the survey. Ten schools were excluded from the analysis based on use of a combination of pass/fail and letter APPE grading scheme (n=9) or neither grading scheme (n=1), leaving 100 schools available for analysis (Table 1). Of these, 66 reported using letter grading, and 34 reported using pass/fail grading schemes in APPE courses. Of the schools reporting use of pass/fail grading, 13 specifically mentioned using a “pass with honors” or similar designation. Residency match rates were divided into low and high match rates using a median of 0.65 for years 2013 and 2015, and a median of 0.64 for year 2014. In the unadjusted analysis, no differences in residency match rate were observed between schools using pass/fail and letter grading schemes in any of the three years (Table 2).

After adjusting for potential confounders, a significant association between pass/fail grading scheme and high match rates was found in 2013 (OR 3.8, 95% CI 1.11-13.25). No differences in residency match rates were found in the adjusted analysis for 2014 or 2015. Program length, time of establishment, association with a health center, number of statewide PGY1 positions, and NAPLEX pass rate were found to be independently related to match rate in some but not all years (Table 3). In 2013, two school characteristics were associated with higher match rates: a six-year program length and having an affiliation with a health center. In 2014, time of establishment, presence of 79-141 statewide PGY1 residency positions, and NAPLEX pass rates over 95% were associated with higher match rates. No school char-

acteristics were independently associated with higher match rates.

Unadjusted analysis revealed no difference between grading schemes for the aggregate analysis of the three years as well. After adjusting for confounders, a significant association between pass-fail grading and higher match rates (OR 1.94, 95% CI 1.01-3.71) for the aggregate time period was identified. Program length, association with an academic health center, and presence of 79-141 statewide PGY1 positions were independently associated with higher match rates

DISCUSSION

Although previous studies have assessed residency match rates and characteristics which may affect a student’s chance of matching, to our knowledge, no other study has specifically evaluated the effect of APPE grading scheme on residency match rates. In a survey of residency directors, Pick and colleagues identified letters of recommendation and letters of intent, leadership and work experience, GPA, and residency interviews as characteristics that define a strong residency candidate.⁵ Additionally, it was noted that letter grading for experiential education courses was preferred over pass/fail among survey respondents, but this finding was not examined in detail.⁵ Another study by Feemster and colleagues evaluated program characteristics associated with low and high residency match rates, and found that higher match rates were associated with higher NAPLEX pass rates, greater number of funded faculty, and public status.¹¹ Our research extends upon previous studies by examining APPE grading scheme while controlling for these aforementioned characteristics.

Based on assertions made in prior research, we hypothesized that using letter grading for APPEs would be

Table 2. Unadjusted Logistic Regression Analysis of High vs. Low Match Rates by Grading Scheme

Year	Low Match Rates N (%)	High Match Rates N (%)	OR (95% CI)
2013			
Letter grades	39 (72.2)	27 (58.7)	
Pass/Fail	15 (27.8)	19 (41.3)	1.83 (0.79-4.22)
2014			
Letter grades	37 (69.8)	29 (61.7)	
Pass/Fail	16 (30.2)	18 (38.3)	1.44 (0.62-3.30)
2015			
Letter grades	37 (69.8)	29 (61.7)	
Pass/Fail	16 (30.2)	18 (38.3)	1.44 (0.62-3.30)
Aggregate 2013-2015			
Letter grades	112 (70.4)	86 (61)	
Pass/Fail	47 (29.6)	55 (39)	1.52 (0.92-2.47)

OR=odds ratio, CI=confidence interval

Table 3. Adjusted Multivariate Logistic Regression Analysis of High vs. Low Residency Match Rates by Grading Scheme

Characteristics	2013 OR (95% CI)	2014 OR (95% CI)	2015 OR (95% CI)	Aggregate 2013-2015 OR (95% CI)
Program length				
3 years	0.053 (0.003-1.08)	1.20 (0.05-32.06)	N/A	0.10 (0.014-0.73) ^a
4 years	0.11 (0.01-0.85) ^a	2.13 (0.27-17.15)	3.38 (0.51-22.04)	0.54 (0.16-1.78)
6 years	1	1	1	1
Years since establishment				
5-10	0.33 (0.041-2.61)	0.095 (0.01-0.89) ^a	-	0.37 (0.12-1.05)
10-20	0.62 (0.12-3.21)	0.23 (0.03-1.34)	-	0.51 (0.20-1.26)
>20	1	1	-	1
Institution Type				
Public	1.62 (0.35-7.39)	3.84 (0.63-23.45)	1.23 (0.36-4.14)	1.79 (0.76-4.15)
Private	1	1	1	1
Affiliation with a health center				
No	0.18 (0.05-0.67) ^a	0.98 (0.23-4.09)	0.44 (0.13-1.44)	0.35 (0.17-0.70) ^a
Yes	1	1	1	1
Statewide PGY1 positions				
<39 positions	-	4.05 (0.77-21.31)	-	1.74 (0.74-4.04)
39-78 positions	-	2.17 (0.37-12.69)	-	1.62 (0.65-3.99)
79-141	-	6.64 (1.28-34.34) ^a	-	2.92 (1.17-7.21) ^a
≥142	-	1	-	1
PhD program				
No	0.57 (0.10-3.25)	0.69 (0.08-6.12)	-	1.03 (0.38-2.77)
Yes	1	1	-	1
Satellite Campus				
Yes	-	-	-	0.86 (0.40-1.84)
No	-	-	-	1
NAPLEX pass rate				
≤95%	-	0.14 (0.04-0.50) ^a	-	-
>95%	-	1	-	-
Funded Faculty				
<7	-	1.18 (0.08-16.46)	-	-
≥7	-	1	-	-
Total funding				
<\$340,000	-	1.41 (0.05-39.24)	-	-
\$340,000-\$1,700,000	-	0.62 (0.03-11.70)	-	-
\$1,700,000-\$8,300,000	-	0.31 (0.051-1.86)	-	-
≥\$8,300,000	-	1	-	-
Grading scheme				
Pass/Fail Grading	3.8 (1.11-13.25) ^a	1.03 (0.31-3.36)	1.76 (0.61-5.03)	1.94 (1.01-3.71) ^a
Letter Grading	1	1	1	1

Abbreviations: OR=odds ratio, CI=confidence interval, PGY1=postgraduate year 1, PhD=Doctor of Philosophy, NAPLEX=North American Pharmacist Licensure Examination

Only characteristics found to be potentially significant confounders through univariate analysis were included in the multivariate adjusted analysis

^a Statistical significance on multivariate analysis

associated with higher residency match rates.⁵ However, unadjusted analysis showed no difference between the two grading schemes in individual years from 2013 to 2015 or the aggregate of all three years. Additionally, adjusted analysis showed no difference between the two grading schemes for years 2014 and 2015. After adjusting for confounders, it was found that use of a pass/fail

APPE grading scheme was associated with higher residency match rates compared to letter grading in the aggregate analysis of years 2013-2015 and in year 2013 individually. While this finding is not conclusive as it was inconsistent across the years studied, the fact that it seems to contradict commonly held perceptions is noteworthy.

We were unable to elucidate a reason for this finding, as it was not the subject of our study. However, one possibility we considered was that a letter-grading scheme may actually penalize applicants by drawing attention to lower grades. For example, a student earning a B- in a letter-grading scheme would receive a “pass” in a pass/fail scheme, making the former more noticeable when compared to other rotation grades. Another possibility is that schools with historically higher match rates were more inclined to use a pass/fail grading scheme. Additional research on the potential causes is warranted.

A variety of confounders were considered in this analysis, and different program characteristics were shown to be significantly associated with match rates in different individual years. Longer program length (6 years vs. 3 years), presence of 79-141 statewide residency positions compared to a smaller or larger number, and affiliation with a health center were significant factors in the aggregate analysis of the years 2013-2015, though no program characteristic was shown to be consistently significant across the years studied.

The results of this analysis indicate that APPE grading scheme does not appear to consistently affect residency match rates. Similarly, no single program characteristic was found to be independently associated with high residency match rates in the years for which they were available, nor for any that were available in all three years. These data should provide assurance that use of pass/fail APPE grading scheme is unlikely to negatively impact students' ability to obtain a residency. Future research into additional school characteristics, as well as individual candidate characteristics, that influence residency match rates may be of interest to pharmacy schools as they prepare students for a competitive residency match process.

Strengths of this study included a high response rate, which makes it more generalizable, and the consideration of multiple potential confounders. Limitations included inconsistency in the availability of data on potential confounders (eg, NAPLEX pass rate, funded faculty, and total funding) across the years studied, and the potential that significant confounders (eg, average graduating GPA) could have been omitted from this study. Match rates included in this analysis only included ASHP accredited or pre-accredited programs and did not account for students who pursued fellowships or non-accredited programs.

CONCLUSION

This study demonstrates that there is limited difference in residency match rates between schools using pass/fail or letter grading schemes in APPEs. APPE grading scheme may not be a major determinant of a student's

likelihood of obtaining a residency, though there was a signal toward improved match rates in programs using pass/fail grading in the adjusted analyses for the aggregate data from 2013 to 2015 and in the 2013 year, but not in other years studied. Specific confounders may affect the likelihood of matching, but further research is needed to analyze which characteristics have significant and consistent impact.

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