BRIEF

Frequency of Course Remediation and the Effect on NAPLEX Pass Rates

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Objective. Remediation is a tool which allows students to correct an academic deficiency after earning an unsatisfactory grade. There is a lack of data on remediation processes and its impact on future academic performance. This study aimed to evaluate the impact of remediation frequency on NAPLEX performance.

Methods. The primary analysis was the relationship between the NAPLEX first-time pass rate and the frequency of course remediations (no remediations, one remediation, and two or more remediations). Additional analyses included the correlation between the NAPLEX scaled score and the number of course remediations and characteristics of the course remediated.

Results. A total of 116 students with NAPLEX data were included for analysis. Compared to students who never remediated, NAPLEX first-time pass rates were similar among those who remediated only one course; however, students who remediated two or more courses had significantly lower NAPLEX pass rates. Remediation in courses mapped to PCOA Area 4 (Clinical Sciences) and courses with mixed PCOA content areas were negatively correlated with NAPLEX scaled scores. A significant negative correlation existed between P2 and P3 year remediations and NAPLEX scaled score but was not significant for the P1 year.

Conclusion. Multiple course remediations are negatively correlated with NAPLEX scaled scores and a reduced first-time NAPLEX pass rate with a single course remediation having no effect. Institutions should aim to evaluate their current remediation practices and assess whether additional support should be provided to students with multiple course remediations.

Keywords: remediation, North American Pharmacist Licensure Examination, NAPLEX, course repeat, assessment, Pharmacy Curriculum Outcomes Assessment, PCOA

INTRODUCTION

Remediation is a tool which allows students to correct an academic deficiency usually after earning an unsatisfactory grade.[1] As remediation has become more common across colleges and schools of pharmacy, the Accreditation Council of Pharmacy Education (ACPE) 2016 Standards require policies and procedures for academic progression, including remediation.[2] Despite the number of institutions providing remediation, literature is scarce regarding the practices of colleges and schools of pharmacy implementing and assessing their remediation approaches. Existing information is largely derived from health care professions with varying approaches to remediation.[1]

At our institution, students complete the Doctor of Pharmacy requirements in four years. The curriculum is designed in quarters with students required to take courses in 3 of the 4 quarters with a summer break. Remediation at our institution is offered during the summer quarter. Preparation for remediation is primarily self-directed; some students may receive tutoring assistance, additional guidance, or formative activities based on content and course-specific needs. Students are given the opportunity to demonstrate competency of the previously unlearned material through a single, summative assessment. Students who earned less than a "C" letter grade in a given course are permitted to sit for remediation as our institution does not include a D grade. In some courses, a grade below a certain threshold (such as 59.5%), which is traditionally an F grade, requires a student to retake the course the following year. In the first professional year, a student may remediate no more than three courses in the academic year. In subsequent years, a student may remediate no more than two courses in the academic year.

There is a lack of assessment data on remediation processes and whether remediation meets its intended outcome of ensuring student knowledge or skills for successfully passing the NAPLEX. Two studies have demonstrated that students requiring remediation for deficient course grades have lower NAPLEX pass rates compared with those who did not require remediation; however, these studies did not investigate remediated course characteristics, such as the content area covered by the course, or which year in the program these remediations occurred.[3,4] These studies highlight the need

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for further validation and analysis of characteristics of remediation that may impact NAPLEX pass rates.

This study aimed to evaluate the impact of remediation frequency on NAPLEX performance at our private, 4-year program. Given the function of the NAPLEX in assessing outcomes of pharmacy education, the hypothesis was that the number of remediations would negatively correlate with NAPLEX first-time passing rate and that course characteristics, such as the course content area or when the course was sequenced within the curriculum, would be an important factor. A greater understanding of the impact of remediation on NAPLEX performance may be useful to identify at-risk students who would benefit from additional support for NAPLEX.

METHODS

This study was a retrospective review of students who matriculated on or after 2014 and graduated from our college of pharmacy in 2018 or 2019. The university's Institutional Review Board determined this study did not qualify for "human subjects research" and did not require IRB oversight.

Students were included if they graduated from the pharmacy program and had NAPLEX data available via the National Association of Boards of Pharmacy. Course remediation data was obtained from the College's Office of Academic Affairs, which has maintained a database of remediation activities for student progression reasons since 2014.

The primary analysis was the relationship between the NAPLEX first-time pass rate and the frequency of course remediations divided into three groups (no remediations, one remediation, and two or more remediations). The "no remediation" cohort was used as a reference group for statistical analyses. As a secondary analysis, the correlation between the NAPLEX scaled score and the number of course remediations as a continuous variable was explored.

All courses were mapped to the Pharmacy Curriculum Outcomes Assessment (PCOA) content areas (Area 1: Biomedical Sciences, Area 2: Pharmaceutical Sciences, Area 3: Social, Behavioral, & Administrative Sciences, and Area 4: Clinical Sciences) to classify the type of content associated with each course. Mapping was conducted through investigator consensus based on course syllabi. Some courses contained mixed content that spanned multiple PCOA areas; these courses were analyzed separately. Subgroup analyses were conducted based on the academic year, PCOA area, and between the two graduating cohorts.

Statistical Analysis

Descriptive analyses were used to quantify the frequency of remediation throughout the curriculum. NAPLEX first-time pass rates were compared using Fisher's exact test and NAPLEX scaled scores using a Mann-Whitney U test. Correlation between the NAPLEX scaled score and the number of remediations, the number of remediations per year (P1-P3), and the mapped PCOA areas were calculated using Spearman's rank correlation coefficient. A two-tailed P value of 0.05 was considered statistically significant for all analyses. A sensitivity analysis using multivariate linear regression was conducted to determine whether pre-matriculation GPA or PCAT score were confounding variables. Statistical analysis was performed using R Statistical Software (version 4.1.0; R Foundation for Statistical Computing; Vienna, Austria).

RESULTS

A total of 131 students graduated in 2018 (n=64) and 2019 (n=67). Of these, course remediation and NAPLEX data was available for 116 students (57 in 2018 and 59 in 2019). Those 15 students without data either matriculated prior 2014 (in which remediation data was not systematically collected, n=7) or did not yet take the NAPLEX (n=8). Of the eight students who did not yet take the NAPLEX, two students had no remediations, two students had one remediation, and the remainder had two or more remediations. Approximately 60% of students were female with an average pre-matriculation GPA of 3.01 and average composite PCAT percentile of 53. The first-time NAPLEX pass rate for these students was 83.6% with a median scaled score of 91 (IQR 83 to 102). Demographic and remediation characteristics were similar between the two graduating years.

As shown in Table 1, 59.5% (n=69) of students did not require any remediation during the didactic portion of the curriculum, 22.4% remediated one course, and 18.1% remediated two or more courses. Most course remediations occurred in the P2 and P3 years. The remediation pass rate was 91.8%.

NAPLEX first-time pass rates and NAPLEX scaled scores were similar between students who never remediated and those who remediated only one course (Table 2 and Figure 1). Compared to students who never remediated, students with two or more remediations were less likely to pass the NAPLEX on the first attempt (89.9% vs. 57.1%, p=.002) and had significantly lower median NAPLEX scaled scores (95 vs. 81, p<.001). A multivariate linear regression sensitivity analysis demonstrated that the relationship of NAPLEX scaled score and total number of remediations was significant (p<.001) when controlling for pre-pharmacy GPA and PCAT score (R^2 0.25, p<.001).

Correlation analysis demonstrated that the number of remediations for all years combined (r=-0.381, p<0.001) and within the P2 and P3 years (r=-0.356, p<.001 and r=-0.336, p<.001) were negatively correlated with NAPLEX scaled

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score whereas remediation in the P1 year was not significantly associated (r=-0.017, *p*=.859).

Remediation in courses mapped to PCOA Area 4 (Clinical Sciences) (r=-0.343, *p*<.001) and courses with mixed PCOA content areas (r=-0.309, *p*<.001) were negatively correlated with NAPLEX scaled scores. Remediation of a course mapped to PCOA Areas 1, 2, or 3 were not significantly correlated (*p*>.05); however, these Areas 1, 2, and 3 only comprised 10% of all course remediations.

DISCUSSION

In two cohorts of graduates from a private 4-year program, students with two or more summer remediations were less likely to pass the NAPLEX on the first attempt and had significantly lower NAPLEX scaled scores when compared to students with no remediations. A single course remediation was not associated with a reduced NAPLEX first-attempt pass rate.

Palmer and colleagues most recently examined NAPLEX pass rates in students at an accelerated three-year program who completed remediation between quarters compared to students who did not require remediation and did not have to repeat a course.[4] Their analysis found lower NAPLEX performance for students who remediated or repeated multiple courses but no difference for students who remediated only one course. Although the timing of when remediation occurred varied, our analysis identified a similar association of the impact of a singular remediation versus multiple remediations on NAPLEX outcomes, suggesting that remediation as an intervention for single course deficiencies may be acceptable. Other literature has suggested a relationship between pre-NAPLEX and the need to remediate a course as a binary outcome; however, we suggest future researchers to use multiple categories to classify remediation frequency (eg, 0, 1, 2 or more) to potentially improve predictive value.[5]

In comparison to our report, previous works on remediation do not stratify remediation data by year or by course content type. Our data finds that the number of remediations in the second and third professional years negatively correlated with NAPLEX scaled score whereas P1 year remediation did not. Possible reasons for this finding could including survival bias (students who remediate in the P1 year may be less likely to graduate), an underpowered sample size, the timing is too distant from the NAPLEX to be predictive, or the course content in the P1 year is less applicable to the NAPLEX blueprint.

Related to course content, remediating courses mapped to PCOA Area 4 (Clinical Sciences) and those with mixed PCOA content areas were negatively correlated with NAPLEX scaled scores. Remediation of courses mapped to other PCOA areas were not significantly correlated; however, because remediation was less common in these other areas, analysis may have been underpowered. Regardless, these findings are perhaps not unexpected given the NAPLEX blueprint emphasis on clinical sciences.

In concept, a "successful" remediation is intended to indicate that a student has corrected an academic deficiency and has mastered the material for a course equivalently to a student who passed the course without remediation. The findings from this report and Palmer *et al.* suggest that students who required multiple remediations may have a weaker knowledge base upon graduation, as measured by NAPLEX, compared to their peers with fewer remediations. These implications warrant further research regarding how remediation is conducted and how mastery of the course material can be appropriately measured.

These findings also validate the need for additional support and interventions for those qualifying for remediation but particularly in those remediating several courses. Individualized remediation plans and student directed remediation to include readings, assignments, practice problems, and discussion could all be considered for more supportive remediation approaches. Additionally, schools and colleges of pharmacy may need to consider these findings when drafting student progression policies, such as remediation limits, or in advising a student with academic difficulties. ACPE does not currently prescribe the specifics of remediation policies or remediation limits, but given the relationship between remediations and NAPLEX performance, programs should consider evaluating their current process to ensure that remediation is accomplishing its desired outcome.[1] Survey data indicate significant heterogeneity in remediation practices among schools and colleges of pharmacy, which is likely a result of the lack of high-quality data to support a specific approach as highlighted in a recent systematic review.[6,7]

There are limitations to this study. We excluded students who did not have remediation or NAPLEX data; therefore, students who remediated and were dismissed or withdrew prior to graduation were not included and may introduce a survival bias. This bias would have also contributed to a falsely elevated remediation pass rate as those who do not pass remediation would have had delayed progression or left the program. Additionally, students who matriculated prior to 2014 (in which remediation data was systematically collected) or those who did not did not take the NAPLEX within the time frame of our study were also excluded. Finally, as remediation practices vary nationally, results from our 4-year program with summer remediation may not be applicable to institutions with alternative academic structures. An area of future research is to better understand the optimal approach to remediation and accurately evaluating students'

competency of course content. At the time of this publication, schools and colleges are no longer provided student-level NAPLEX pass rates nor scaled scores, therefore, future studies may need to focus on other standardized exams that are correlated with NAPLEX success, such as the PCOA or pre-NAPLEX exams.

CONCLUSION

Results of this analysis provide further evidence that multiple course remediations are negatively correlated with NAPLEX scaled scores and a reduced first-time NAPLEX pass rate. A single course remediation seems to have no effect. Institutions should aim to evaluate their current remediation practices and assess whether additional support should be provided to students with multiple course remediations. Future research is needed to investigate the characteristics associated with valid remediation methods in accurately assessing student knowledge.

REFERENCES

1. Maize DF, Fuller SH, Hritcko PM, et al. A review of remediation programs in pharmacy and other health professions. *Am J Pharm Educ*. 2010;74(2):25. doi:10.5688/aj740225
2. Accreditation Standards and Guidelines 2016. Accreditation Council for Pharmacy Education. https://www.acpe-accredit.org/pdf/Standards2016FINAL.pdf Accessed July 14th, 2021.
3. Madden MM, Etzler FM, Schweiger T, Bell HS. The impact of pharmacy students' remediation status on NAPLEX first-time pass rates. *Am J Pharm Educ*. 2012;76(10):191. doi:10.5688/ajpe7610191
4. Palmer EC, Esposito ER, Shin M et al. Impact of intersession course remediation on NAPLEX/PCOA scores in an accelerated Doctor of Pharmacy program. *Am J Pharm Educ.* 2020;84(9) doi: 10.5688/ajpe7827
5. Chisholm-Burns MA, Spivey CA, McDonough S, Phelps S, Byrd D. Evaluation of student factors associated with pre-NAPLEX scores. *Am J Pharm Educ*. 2014;78(10):181. doi:10.5688/ajpe7810181
6. Wittstrom KM, Godwin DA, Bleske BE. Intervention and remediation: a descriptive study of practices in pharmacy education. *Curr Pharm Teach Learn*. 2021;13(3):206-212. doi:10.1016/j.cptl.2020.10.012
7. Harmon KS, Gonzales AD, Fenn NE 3rd. Remediation and reassessment methods in pharmacy education: A systematic review. *Curr Pharm Teach Learn*. 2021;13(1):81-90. doi:10.1016/j.cptl.2020.07.005

Table 1. Descriptive Statistics of Remediation Assessments

Total Remediations per Student, n (%)	
0	69 (59.5)
1	26 (22.4)
2	10 (8.6)
3	5 (4.3)
4 or more	6 (5.2)
Number of Remediations Offered by Academic Year, n (%)	
P1	16 (18.6)
P2	40 (46.5)
P3	30 (34.9)
Remediation Exam Pass Rate, (%)	
Overall	91.8%
P1	100%
P2	87.5%
P3	93.3%
Class of 2018	90.6%
Class of 2019	92.6%

Table 2. NAPLEX Performance Comparison by Remediation Frequency

	No Remediations n=69	1 Remediation n=26	2 or More Remediations n=21
NAPLEX First-Time Pass Rate (%)	89.9%	88.5% $p>0.99*$	57.1% $p=0.002*$
NAPLEX Scaled Score, median (IQR)	95 (86 to 105)	94 (82 to 99) $p=0.215$	81 (65 to 87) $p<0.001$

* p values indicate a comparison to the "No Remediation" cohort

Figure 1. NAPLEX Scaled Score Distribution by Remediation Frequency