

Influence of Pharmacy School Attributes on First-Time NAPLEX Pass Rates

Vanessa R. Coleman^{1*}, Trevor L. Scott¹, Melissa A. Nguyen¹

¹Department of Pharmacy Practice, College of Pharmacy, University of Mississippi, Oxford, United States.

*E-mail ✉ vanessa.coleman@gmail.com

Abstract

This study aimed to evaluate how characteristics of pharmacy schools influence first-time pass rates on the North American Pharmacist Licensure Examination (NAPLEX). A retrospective analysis was conducted using NAPLEX first-time pass rates, institutional attributes, and the proportion of graduates securing a first postgraduate year (PGY1) residency for the years 2014, 2015, and 2016. All U.S. pharmacy colleges accredited as of July 2017 were included. Statistical analyses comprised independent and paired samples t-tests, correlation analyses, and multiple linear regression. Higher first-time NAPLEX pass rates were observed in schools affiliated with academic health centers, those founded before 2000, and public institutions. In 2016, programs following a traditional four-year curriculum outperformed accelerated three-year programs. Additionally, a positive correlation was found between first-time pass rates and both the percentage of fourth-year students obtaining a PGY1 residency and academic health center affiliation. Prior-year pass rates and the proportion of graduates matching into a PGY1 residency emerged as significant predictors in regression models for 2015 and 2016. While certain institutional features are associated with NAPLEX performance, many are non-modifiable. Pharmacy programs may benefit from proactive evaluation of their curricula and student preparedness for licensure examinations.

Keywords: Pharmacy education, Licensure, North American Pharmacist Licensure Examination (NAPLEX), Examination

Introduction

The North American Pharmacist Licensure Examination (NAPLEX) serves as the benchmark for assessing entry-level competence among candidates seeking pharmacy licensure in the United States [1, 2]. Numerous investigations have explored factors potentially linked to first-time NAPLEX success, including preadmission metrics, pre-NAPLEX assessment scores, pre-professional coursework, Pharmacy Curriculum Outcomes Assessment (PCOA) scores, remediation status, and licensure preparation strategies [3–9].

McCall *et al.* reported that higher NAPLEX scores were associated with superior pre-pharmacy GPA, younger

age, and stronger composite scores on the Pharmacy College Admissions Test (PCAT) [3]. Similarly, Chisholm-Burns and colleagues identified both pharmacy GPA and pre-NAPLEX scores as significant predictors of NAPLEX performance [4]. Additional factors, such as race and ethnicity, individual PCAT section scores, on-time graduation, and undergraduate GPA, also showed correlations with higher NAPLEX scores. Naughton *et al.* demonstrated that total and domain-specific PCOA scores were positively associated with NAPLEX outcomes [6]. Moreover, Madden *et al.* found that students who required remediation in pharmacy coursework exhibited lower first-time pass rates compared to peers without remediation [7]. Most prior studies, however, were limited to data from a single institution.

More recently, Whittaker *et al.* analyzed factors influencing institution-wide first-year postgraduate (PGY1) residency match rates across 121 colleges and schools of pharmacy, finding that higher average NAPLEX pass rates, affiliation with academic health

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centers, favorable admit-to-applicant ratios, and higher U.S. News & World Report rankings were positive predictors, while larger class sizes and greater minority enrollment negatively impacted match rates [10].

The NAPLEX itself has undergone substantial changes beginning in 2015, including a revised passing standard, and in 2016, an extension of test duration from 4.25 to 6 hours, an increase in the number of questions from 185 to 250, and a transition from a computer-adaptive format to a preassembled model with questions of varying difficulty. Most questions now rely on patient cases or medical records requiring analytical reasoning [11].

National first-time pass rates have generally declined since 2014, with a notable drop between 2015 and 2016 (92.64% vs 85.86%) [12]. Institutional performance in 2016 varied widely: while roughly 36% of schools achieved over 90% passing, some programs had rates as low as 59%.

A 2005 study by Zarembski *et al.* compared first-time pass rates between programs accredited before 1992 and those accredited afterward, finding modest advantages for more established programs [13]. Since then, the number of accredited pharmacy programs has grown substantially, reaching 138 programs with full or candidate status and four with pre-candidate status as of July 2017 [14]. Many newer programs are private institutions with accelerated three-year curricula. The ongoing growth of pharmacy programs, recent NAPLEX revisions, and declining pass rates raise questions regarding potential relationships among these variables. The present study had two primary aims: first, to examine associations between structural characteristics of individual colleges of pharmacy (e.g., academic health center affiliation, pre- or post-2000 establishment, traditional vs accelerated curriculum, public vs private status) and first-time NAPLEX pass rates for 2014–2016; and second, to identify predictors of 2015 and 2016 first-time NAPLEX pass rates.

Materials and Methods

Publicly accessible online resources were utilized to gather information on all accredited pharmacy schools in the United States as of July 2017, covering the academic periods from 2013–2014 through 2015–2016. Details regarding the founding dates and site locations of pharmacy programs were sourced from the Accreditation Council for Pharmacy Education (ACPE). First-attempt success rates on the NAPLEX were acquired from the

National Association of Boards of Pharmacy (NABP) site [12]. Data on postgraduate year one (PGY1) residency matching were provided by the American Society of Health-System Pharmacists (ASHP) through their National Matching Services reports. Remaining variables were extracted via the interactive reporting tool on the American Association of Colleges of Pharmacy (AACCP) Trends Dashboard [15]. The protocol received approval from the Institutional Review Board at the University of Tennessee Health Science Center.

In the summer of 2017, searches across these platforms yielded data for every accredited U.S. pharmacy school or college, including: affiliation with an academic health center; operation of single or multiple sites; founding date (categorized as achieving precandidate status prior to or following 2000); curriculum format (standard four-year vs. condensed three-year); institutional ownership (public vs. private); ratio of students to faculty; proportion of non-resident students in the PharmD enrollment; proportion of final-year students securing PGY1 residency positions; and initial NAPLEX success rates for the years 2014, 2015, and 2016. These elements were chosen due to their widespread availability and consistency as metrics among pharmacy institutions. The 2000 cutoff was applied given the notable surge in new program establishments thereafter. A derived indicator was also generated to identify institutions with a decline of 10% or more in initial NAPLEX success rates from 2015 to 2016.

Analyses were conducted with IBM SPSS Statistics version 24.0 (Armonk, NY). Frequency counts described categorical items, while means and standard deviations summarized numeric ones. Independent t-tests assessed associations between binary predictors (affiliation with academic health center, multi-site operations, pre- or post-2000 founding, curriculum format, and ownership type) and initial NAPLEX success rates. Paired t-tests compared success rates across the three years (2014, 2015, and 2016). Additional independent t-tests evaluated links between the binary predictors and the indicator for a 10% or greater drop in initial NAPLEX rates (dichotomized as 0 for no such decline between 2015 and 2016, or 1 for a decline of at least 10%). Pearson correlations and point-biserial coefficients examined relationships involving affiliation with academic health center, multi-site status, founding era, curriculum format, ownership type, student-faculty ratios, non-resident enrollment percentages, PGY1 residency match rates for graduating classes, and initial

NAPLEX success rates, with separate computations for each year.

Hierarchical multiple linear regression was performed with the 2015 initial NAPLEX success rate as the outcome, incorporating predictors such as academic health center affiliation (0=no, 1=yes); multi-site operations (0=no, 1=yes); post-2000 founding (0=pre-2000, 1=post-2000); condensed curriculum (0=four-year, 1=three-year); private ownership (0=public, 1=private); student-faculty ratio from 2014-2015; non-resident enrollment proportion from 2014-2015; PGY1 match rate for 2015; and prior-year (2014) NAPLEX success rate. A parallel regression used the 2016 success rate as the outcome, with corresponding updated predictors for 2015-2016 metrics plus the 2015 NAPLEX rate. Predictors were entered simultaneously in a single step for each model. The alpha level was set at 0.05. Given the emphasis on predictors of NAPLEX performance after the 2015 exam updates, no regression was run for the 2014 outcome.

Results and Discussion

Profile summaries for U.S. pharmacy institutions (N=137) appear in **Table 1**. Most programs lacked affiliation with an academic health center (59.9%), operated from a single site (77.4%), had been founded prior to 2000 (60.6%), followed a standard four-year structure (91.2%), and were privately owned (51.8%). Among the 137 accredited programs, NAPLEX participation involved 120 in 2014, 124 in 2015, and 128 in 2016, with absences reflecting emerging programs yet to produce graduates. From 2015 to 2016, 29% of institutions saw a decline exceeding 10% in initial NAPLEX success rates.

Table 1. Profile of accredited U.S. pharmacy schools and colleges examined for associations with initial NAPLEX success rates (N=137)

Pharmacy Program Feature	Value: No. (%) or Mean (SD)
Affiliation with Academic Health Center	
Yes	55 (40.1)
No	82 (59.9)
Operation of Multiple Campuses	
Yes	31 (22.6)
No	106 (77.4)

Year of Establishment (Precandidate Status)	
Before 2000	83 (60.6)
2000 or Later	54 (39.4)
Curriculum Format^a	
Condensed (3-year)	14 (10.2)
Standard (4-year)	124 (91.2)
Institutional Ownership	
Private	71 (51.8)
Public	66 (48.2)
Student-to-Faculty Ratio	
2013–2014	10.2 (4.1)
2014–2015	10.2 (4.4)
2015–2016	10.0 (4.2)
Proportion of Out-of-State Students in PharmD Enrollment (%)	
2013–2014	30.8 (22.5)
2014–2015	30.8 (22.5)
2015–2016	30 (22.1)
Initial NAPLEX Success Rate (%)	
2014	94.8 (4.6)
2015	92.3 (5.7)
2016	86 (8.3)
Percentage of Final-Year Class Matching to PGY1 Residency	
2014	19.2 (9.6)
2015	19.8 (9.4)
2016	22.8 (11.3)

^a One institution, Lake Erie College of Osteopathic Medicine (LECOM), offers both a standard 4-year pathway and a condensed 3-year pathway; as a result, LECOM is included in both curriculum categories.

Initial NAPLEX success rates were markedly reduced in 2015 (M=92.3, SD=5.7; $p<.001$) and 2016 (M=86, SD=8.3; $p<.001$) relative to 2014 (M=94.8, SD=4.6). Additionally, the 2016 rates showed a notable decline compared to 2015 ($p<.001$).

Across all examined years, institutions affiliated with an academic health center, those founded prior to 2000, and public programs demonstrated substantially superior initial NAPLEX success rates versus their counterparts (those without such affiliation, founded in 2000 or later, and private programs; $p<.05$ for each comparison; **Table 2**). For the 2016 cohort specifically, programs with a standard curriculum format also exhibited higher initial success rates than those with a condensed format ($p=.01$). No significant variations in initial NAPLEX performance were observed based on the presence of multiple campus locations ($p>.05$).

Table 2. Initial NAPLEX success rates (2014–2016) by selected features of accredited U.S. pharmacy programs

Pharmacy Program Feature	2016 Mean (SD) (%)	2015 Mean (SD) (%)	2014 Mean (SD) (%)
Affiliation with Academic Health Center^a			
Yes	89.1 (5.7)	94.2 (4.5)	96.3 (3.2)
No	83.7 (9.2)	90.8 (6.2)	93.7 (5.2)
Operation of Multiple Campuses			
Yes	86.5 (8.6)	93.6 (3.8)	95.2 (3.1)
No	85.9 (8.3)	91.8 (6.2)	94.7 (5.0)
Year of Establishment^b			
Before 2000	87.8 (7.7)	93.4 (4.6)	95.5 (4.0)
2000 or Later	82.6 (8.5)	90.0 (7.1)	93.2 (5.5)
p-value	.001	.01	.02
Curriculum Format^c			
Condensed (3-year)	80.4 (7.2)	90.3 (4.4)	92.8 (3.6)
Standard (4-year)	86.6 (8.2)	92.5 (5.8)	95.0 (4.7)
Institutional Ownership^d			
Private	83.4 (8.1)	90.7 (6.4)	93.4 (4.6)
Public	88.6 (7.8)	93.8 (4.6)	96.1 (3.4)

^a Initial NAPLEX success rates were significantly higher for programs affiliated with an academic health center than for those without such affiliation in 2014 ($p=.001$), 2015 ($p<.001$), and 2016 ($p<.001$). ^b Initial NAPLEX success rates were significantly higher for programs established before 2000 than for those established in 2000 or later in 2014 ($p=.02$), 2015 ($p=.01$), and 2016 ($p=.001$). ^c In 2016, initial NAPLEX success rates were significantly higher for programs with a standard curriculum compared to those with a condensed curriculum ($p=.01$). ^d Initial NAPLEX success rates were significantly higher for public programs than for private programs in 2014 ($p=.002$), 2015 ($p=.003$), and 2016 ($p<.001$).

A reduced share of pharmacy programs featuring a standard four-year format, in comparison with those offering a condensed three-year format, recorded a drop of at least 10% in initial NAPLEX success rates between 2015 and 2016 ($\chi^2 = 5.54$, $p = .02$). None of the remaining comparisons yielded statistically meaningful variations for this metric.

According to **Table 3**, initial NAPLEX success rates demonstrated persistent positive and significant links ($p < .05$) across the examined years with both the rate of final-year students securing PGY1 residency positions and affiliation with a university medical center. In contrast, these success rates displayed consistent inverse

and significant relationships ($p < .05$) with the enrollment share of non-resident students (i.e., greater non-resident enrollment corresponded to reduced success rates), with establishment date (i.e., institutions founded prior to 2000 achieved superior rates), and with institutional type (i.e., state-funded institutions outperformed privately funded ones). Success rates in 2016 for initial NAPLEX attempts showed strong positive associations with those from 2014 and 2015 ($p < .01$). Moreover, 2016 initial success rates exhibited a significant negative association ($p = .02$) with curriculum format, such that programs using the conventional four-year model posted higher initial NAPLEX performance.

Table 3. Associations between selected characteristics of U.S. pharmacy schools/colleges and initial NAPLEX pass rates^a

Characteristic	NAPLEX 2016	NAPLEX 2015	NAPLEX 2014
Affiliation with an Academic Health Center^b			
Pearson's r	.32	.30	.29
p value	<.001	.001	.001
Year of Establishment (Before or After 2000)^b			
Pearson's r	-.30	-.28	-.23
p value	.001	.002	.01
Curriculum Format^b			
Pearson's r	-.22		
p value	.01	NS	NS

Institutional Type (Public vs. Private) ^b			
Pearson's r	-.31	-.27	-.29
p value	<.001	.003	.002
Proportion of Out-of-State Students in PharmD Program			
Pearson's r	-.27	-.25	-.25
p value	.003	.007	.007
Percentage of Final-Year Students Matched to PGY1 Residency			
Pearson's r	.61	.49	.55
p value	<.001	<.001	<.001
Prior NAPLEX Pass Rate – 2014			
Pearson's r	.60	.74	
p value	<.001	<.001	
Prior NAPLEX Pass Rate – 2015			
Pearson's r	.65		.74
p value	<.001		<.001

^a Only characteristics demonstrating at least one statistically significant correlation with initial NAPLEX pass rates during the study period are included in the table. ^b Academic health center affiliation was coded as 0 = No, 1 = Yes; Establishment year coded as 0 = Before 2000, 1 = 2000 or after; Curriculum format coded as 0 = Conventional four-year, 1 = Accelerated three-year; Institutional type coded as 0 = Public, 1 = Private.

Results and Discussion

In the multiple linear regression for 2015, the significant predictors ($p < .05$) of the 2015 NAPLEX first-time pass rate were the 2014 NAPLEX first-time pass rate and the percentage of the 2015 graduating class that matched to a PGY1 residency. After removing nonsignificant variables and rerunning the analysis, these two predictors remained significant ($p < .01$). The final model accounted for 56.8% of the variance (adjusted $R^2 = .568$; $p < .001$) in 2015 NAPLEX first-time pass rates, with the 2014 NAPLEX first-time pass rate alone explaining 54.4% of the variance.

For 2016, the initial multiple linear regression identified three significant predictors ($p < .05$) of the 2016 NAPLEX first-time pass rate: the 2014 NAPLEX first-time pass rate, the 2015 NAPLEX first-time pass rate, and the percentage of the 2016 graduating class that matched to a PGY1 residency. After excluding nonsignificant variables and conducting a second regression, the 2014 NAPLEX rate was no longer significant; the final model retained the 2015 NAPLEX first-time pass rate and the 2016 PGY1 residency match percentage as significant predictors ($p < .01$). This model explained 51.1% of the variance (adjusted $R^2 = .511$; $p < .001$) in 2016 NAPLEX first-time pass rates, with the 2015 NAPLEX first-time pass rate alone accounting for 42.4% of the variance.

Multicollinearity was not a concern in either final model, as tolerance values exceeded 0.1 and variance inflation

factors (VIF) were below 10. All other assumptions of multiple linear regression were satisfied.

With the implementation of NAPLEX changes in 2015 and 2016, national average first-time pass rates declined correspondingly. A 2.5% decrease from 2014 to 2015 aligned with the 2015 revision of NAPLEX standards, while a further 6.3% drop from 2015 to 2016 corresponded to the 2016 increase in question count and exam duration. Nearly 30% of programs saw a decline of 10% or more in first-time pass rates between 2015 and 2016. Although other influences may have contributed to the nationwide decline, the modifications to the NAPLEX format likely explain a substantial portion of it.

Across the three years examined, NAPLEX first-time pass rates were significantly higher for programs housed at academic health centers, those established before 2000, and those affiliated with public institutions. In addition, the 2016 pass rate was significantly higher for traditional four-year programs. Many programs possess multiple or all of these traits: among schools founded before 2000, 54 of 83 (65% of this subgroup, representing 39% of the full sample of 137 schools) were four-year public programs, and 38 of these 54 (70% of this subgroup, or 28% of the total sample) were located at academic health centers.

Variations in pass rates among programs may stem from multiple sources. Because average admission GPAs and PCAT scores were not publicly available for all schools, it was not possible to assess whether certain program

types admit academically stronger students. Comparing curricular rigor across programs to evaluate preparation quality is also challenging. Despite ongoing debate about the NAPLEX's utility beyond licensure, pharmacy literature commonly employs NAPLEX performance as an indicator of program quality [4, 7, 13, 16-18]. Similarly, NAPLEX pass rates serve as an accreditation metric for ACPE, and schools must publicly report them [19].

First-time pass rates showed a significant inverse correlation with the percentage of out-of-state students. Without data on the academic profile of out-of-state cohorts, this relationship is hard to interpret, as students choose out-of-state programs for diverse reasons.

No significant differences in NAPLEX first-time pass rates emerged between programs with multiple campuses and those without. Given the substantial growth in distance education pharmacy programs over the past two decades, it is encouraging that this expansion has not adversely impacted NAPLEX performance.

In the final regression model for 2015 NAPLEX first-time pass rates, the 2014 NAPLEX first-time pass rate and the 2015 PGY1 residency match percentage remained significant predictors. A parallel pattern occurred for 2016, where the 2015 NAPLEX first-time pass rate and the 2016 PGY1 residency match percentage were retained as significant predictors. These two variables together accounted for over 50% of the variance in each year, demonstrating that a graduating class's success in securing PGY1 residencies strongly predicts its NAPLEX performance. This association is unsurprising, as stronger NAPLEX outcomes likely make graduates more competitive for residency positions. Moreover, a program's NAPLEX performance in one year reliably forecasted its performance the next, suggesting stability in many programs' ability to prepare students consistently for licensure.

These results are relevant for pharmacy programs that experienced sharp declines in NAPLEX first-time pass rates from 2014 to 2016, as well as for those worried about future drops. Comparing strategies among programs sharing similar characteristics—particularly those that maintained stable pass rates—could help identify effective NAPLEX preparation approaches.

This study has several limitations. Although the regression models explained more than 50% of the variance for 2015 and 2016, the factors driving the remaining variance remain unidentified. Access to additional variables—such as incoming student academic

metrics, board review course utilization, average PCAT scores, proportion of students with prior degrees, or average student age—could enable future research to uncover further influences on NAPLEX success.

Conclusion

Identifying factors associated with NAPLEX first-time pass rates is valuable as programs seek to understand recent declines. Although NAPLEX revisions provide a straightforward explanation for drops, not all programs were equally affected. Detailed examination reveals that programs lacking an academic health center affiliation, established after 2000, offering accelerated curricula, or operating as private institutions tended to experience larger declines following the exam changes. While many of these characteristics are fixed, programs can still actively review their curricula and ensure students are adequately prepared for the NAPLEX.

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