

Assessment of Factors Which Influence PharmD Clerkship Grades

Laurie L. Briceland and Robert A. Hamilton

Albany College of Pharmacy, 106 New Scotland Avenue, Albany NY 12208

The purpose of this study was to determine factors which might positively or negatively affect PharmD Clerkship grades in a two-year postbaccalaureate PharmD program. Student- or preceptor-specific data were extracted from records for 40 consecutive PharmD students for 261 rotations offered by 54 preceptors over the program's initial five years. Student factors included: gender; first-year didactic GPA; program (BS/PharmD or post-BS PharmD); residency experience; number of years prior non-clinical and clinical pharmacy experience. Preceptor factors included: gender; faculty status (full-time or other); number of PharmD students precepted per year or ever precepted; program age; and semester clerkship offered. Stepwise linear regression was used to predict clerkship grade on basis of collected data. The regression model was significant at $P < 0.05$ ($r^2 = 0.3953$). Three rotation failures (greater than three standard deviations from the predicted mean) were excluded, leaving data for 258 rotations. Factors which positively predicted clerkship grade were number of years prior clinical experience and first-year GPA. Factors which negatively influenced clerkship grade were greater number of years non-clinical pharmacy experience; greater number of students precepted/year; and female gender. Based on the numbers of students assigned per year, three full-time faculty members were more likely to assign lower clerkship grades. In summary, students with higher first-year GPA and more years prior clinical experience were more likely to earn higher clerkship grades. Females, returning students with more years nonclinical pharmacy experience, and students having preceptors with larger numbers of students/year were more likely to earn lower clerkship grades.

INTRODUCTION

Our institution offers a two-year postbaccalaureate (post-BS) PharmD program, which students may elect to complete part-time within five years from matriculation. In addition, select students may opt to "track-in" to the post-BS program directly from their fourth (of five) undergraduate year, completing BS requirements in the summer preceding the commencement of the post-BS program, and in essence truncating one year from the usual seven required for both a BS and post-BS PharmD degree. Our first post-BS PharmD class graduated in 1991; we have currently graduated a total of five post-BS classes from our institution.

The first year of the post-BS program consists of didactic preparation, followed by two semesters of PharmD clerkship rotations. During our first program year, students completed six six-week clinical clerkships; for all ensuing program years, students completed eight five-week clinical clerkships. All students enrolled in PharmD clerkships are considered full-time, as no part-time clerkship option was available. Students were required to complete certain core rotations, such as drug information, ambulatory care, and medicine (or medicine subspecialty), and were allowed to select from a wide range of clinical electives, most offered in the local area, but some offered at various sites around the country. A sampling of the over thirty electives offered included numerous inpatient clinical offerings (e.g., pediatrics, nutrition, critical care, etc.), pharmaceutical industry, and pharmacy administration. Additionally, all students completed a required research clerkship, which was evaluated on a pass/fail basis. Preceptors are comprised of a combination of full-time college faculty and non-full-time faculty, who are either partially paid (up to 20 percent) by the college, or entirely volunteer. Rotation objectives for each clerkship differed based on site, preceptor, or rotation type, with no two rotations being identical. Each clerkship was graded by the student's preceptor, using a standard

evaluation form and a grading scale (unique to PharmD clerkship) ranging from A+ to C-, or F for a failed rotation (no D grades were allowed). The evaluation form assesses the student's ability in many areas, e.g., to identify, solve and monitor drug-related problems, and also assesses general student aptitudes, such as self-development, communication skills, and professional attributes. Preceptors evaluate students on a scale of 1 to 5. To assist preceptors in evaluating students, sample criteria for each point are provided directly on the forms. No formal outcomes assessments are obtained, as we do not offer a clerkship exam. Thus, the grading of students using the standard evaluation form does offer opportunity for subjectivity because, for instance, some preceptors may place more or less emphasis on communication skills, direct patient care skills, professionalism, etc. It is highly dependent on so many factors (preceptor expectations, preceptor experience, student experience, etc.). Indeed, several faculty perceived inconsistent or dissimilar grading practices of PharmD clerkship rotations. It was suggested that factors including preceptor experience, full or non-full time faculty status of preceptor, rotation type, and student preparation might be related. Upon search of the literature, no studies examining factors which may influence clerkship grades were reported, forming the impetus for this study. The objectives of this study were to determine which student or preceptor characteristics may affect PharmD clerkship grades in our post-BS PharmD program.

METHODS

Student-specific data were recorded for all PharmD students enrolled in PharmD clerkships during the first five years of the post-BS program. For Year Five, only first semester data was retrieved. For each clinical clerkship rotation, the following student data was collected: gender; first-year didactic GPA; program type (post-BS or track-in BS/PharmD); notation of prior residency experience; num-

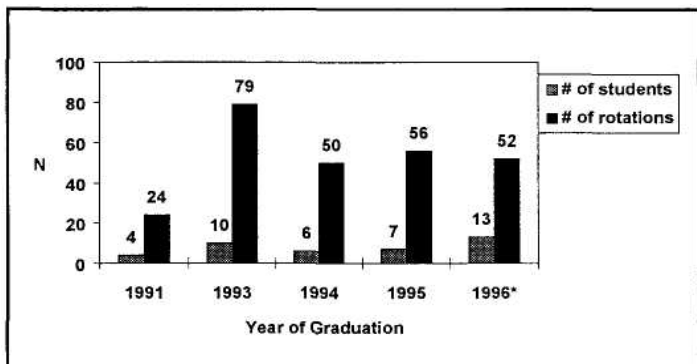


Fig. 1. Program enrollment.

ber of years prior clinical and/or non-clinical pharmacy experience, designated on PharmD program applications (*i.e.*, "clinical pharmacist" vs. staff pharmacist, which was considered nonclinical); and clerkship grades assigned. Residency experience was counted as a distinct entity and was therefore not counted as part of prior clinical pharmacy experience. Similarly, for each rotation, the following preceptor- and rotation- specific data were collected: preceptor gender; faculty status (full or non-full time faculty status); number of PharmD students precepted per current clerkship year; number of PharmD students precepted over last five years; program age (Year 1 through Year 5) at time of grading; clerkship semester (first or second); and rotation type (ambulatory care; inpatient clinical rotation; or drug information/pharmacy administration).

Stepwise linear regression was used to determine the relationship between clerkship grade and recorded variables using Statistix 4.1. Second-order interaction terms were incorporated as appropriate for analysis of significant variables. Analysis of variance was used to determine if differences existed between some interaction variables. Statistical significance was set a priori at $P < 0.05$.

The predictive value of the regression equation was evaluated using the second semester grades of the fifth program year (which were not included in original analysis). The distribution of errors, the mean square error, root mean square error and regression of predicted clerkship grade versus actual clerkship grade were used to evaluate the regression model.

RESULTS

Student enrollment and number of clerkship rotations per program year are indicated in Figure 1. Student and preceptor/rotation characteristics examined for potential influence on PharmD clerkship grades are listed in Tables I and II, respectively. Of the 261 rotations, 67 percent were in inpatient pharmacy settings, 18 percent in ambulatory care settings, and 15 percent in drug information or pharmacy administration. Forty-four percent of rotations were precepted by a relatively inexperienced preceptor having precepted up to two PharmD students over the last five years, as indicated in Figure 2. Three rotation failures (greater than three standard deviations from mean) were excluded, leaving data for 258 rotations for linear regression analysis.

The results of the final stepwise linear regression model selected are indicated in Table III, which indicates variables determined to be statistically significant at $P < 0.05$; the r^2 for the linear regression association was 0.3953. Students with positive predictive factors by linear regression, *i.e.*, students

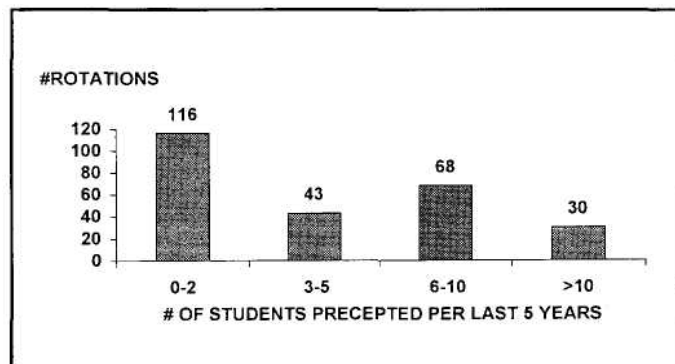


Fig. 2. Experience of preceptors.

with more years prior clinical pharmacy experience and higher first year GPAs, were more likely to earn higher clerkship grades. Students with negative factors, *i.e.*, students with female gender, higher numbers of years of prior nonclinical pharmacy experience, and having preceptors assigned greater numbers of students per year, were more likely to receive lower clerkship grades.

In the final regression model, three full-time faculty preceptors who were assigned greater numbers of students per year predictably awarded lower clerkship grades; considered as individual factors, (*i.e.*, faculty members regardless of number of students assigned) these faculty members did not statistically assign lower clerkship grades. All other variables tested for possible influence on clerkship grades, as indicated in Table III, were determined by the model to be non-statistically significant factors.

The association of student female gender and lower clerkship grade was evaluated further to determine if an interaction with preceptor gender occurred. Table IV includes the average clerkship grade by both student gender and preceptor gender. Preceptors tended to award higher grades to students of the same gender as the preceptor. These differences did not achieve statistical significance.

To test the regression equation's ability to predict PharmD clerkship grades, the clerkship grades for the second semester of students in the fifth program year were predicted using the regression model. The regression model predicted 36 of the 52 clerkship grades (69 percent) within plus or minus 0.5 grade points. The mean square error for the regression of predicted clerkship grade versus actual clerkship grade was 0.24 and the root mean square error was 0.49. Linear regression of predicted versus actual clerkship grade resulted in a statistically significant association ($P=0.0012$) with an r^2 value of 0.19.

DISCUSSION

This study served to dispel several popular notions, at least among our faculty, regarding certain factors felt to influence PharmD clerkship grading. Most notably, it was commonly felt that non-full-time faculty preceptors graded higher than full-time faculty, and that students on certain rotation types, such as drug information or ambulatory care, were more likely to receive higher clerkship grades; however, no differences in grading were observed. We believe our findings will be of interest to other college of pharmacy faculty who share the same concerns. Surprisingly, students having prior residency experience did not predictably earn higher clerkship grades, as had been expected; instead, students with extensive prior clinical pharmacy experience did earn higher

Table I. Student characteristics examined for potential influence on PharmD clerkship grades

Characteristic	Result
Number	40
Female gender	30 (75%)
Mean (SD) First year GPA	3.5 +/- 0.3
Mean (SD) Clerkship grade	3.6 +/- 0.5
Track-in to Post-BS program	8 (20%)
Prior residency experience	0 (25%)
Median (range) # years prior nonclinical experience	1 (0-20)
Median (range) # years prior clinical experience	0 (0-15)

Table II. Preceptor and rotation factors examined for potential influence on PharmD clerkship grades

Characteristic	Preceptor	Rotation
Number	54	261
Female gender	27 (50%)	158 (61%)
Full-time faculty	15 (28%)	145 (56%)
Track-in students	NA	43 (16%)
Prior residency experience	NA	69 (27%)

NA = not applicable.

grades, perhaps due to year-after-year clinical exposure, as opposed to one intense residency year.

The second factor which predicted higher clerkship grades, having a higher first-year GPA, was not altogether unexpected. The strength of the association was striking as the model improved significantly when the first year grade was squared. Our finding is not unlike a previous study assessing medical student clinical clerkship performance which found that college GPA was the strongest single predictor of positive clinical clerkship grades(1). On the other hand, another study examined the potential value of a didactic science exam in predicting pharmacy student clerkship performance, and found no significant correlation(2). Additionally, many preceptors have noted that students who are "book-smart" have fared less well in the clinical setting, presumably due to lack of experience applying their didactic information, or lack of common sense in some circumstances. Based on our study findings, perhaps these "book-smart" students who perform poorly clinically are exceptions that stand out due to higher expectations on the part of preceptors.

Unexpectedly, the regression model predicted that female students would obtain lower clerkship grades, regardless of the preceptor gender, rotation type, etc. Upon closer inspection of the data, however, the association was found to be very modest, with females earning <0.2 quality points less than male counterparts. Thus, the significance of this finding is sufficiently minimized. While it was not a statistically significant association, the appearance of an interaction between preceptor gender and student gender (with students earning higher grades from same gender preceptors) was potentially worrisome. As can be seen in Table IV, the difference was not marked and, as the statistical test implies, is likely due to random variation. The size of the sample supports this interpretation since it is large enough to make the possibility of a beta error less likely.

A more easily explained factor predicting lower clerkship grades was that of a preceptor having greater numbers of students assigned per year; presumably, such an occur-

Table III. Results of final stepwise linear regression: Factors which influence grading of PharmD clerkships

Characteristic	Coefficient	P-value
# of years prior clinical pharmacy experience	0.0499	0.0000
First year GPA	-10.76	0.0000
First year GPA (squared)	1.62	0.0000
# of years prior nonclinical pharmacy experience	-0.043	0.0000
Female gender of student	-0.178	0.0084
# of students precepted per year	-0.040	0.0086
Rotation type (inpatient; ambulatory care; drug information or pharmacy administration)		NS
Program type (BS/PharmD track-in or Post-BS PharmD)		NS
Faculty status (Full-time vs. Non-full-time)		NS
Preceptor experience (number of students precepted over past 5 years)		NS
Student completion of pharmacy residency prior to program entry		NS
Semester when clerkship taken (first or second)		NS
Year when clerkship taken (first through fifth year of program offering)		NS
Preceptor gender		NS

Regression Equation Intercept = 21.7; NS = non-significant.

Table IV. Mean clerkship grades (SD) as a function of student and preceptor gender

Student gender	Preceptor gender	
	Female	Male
Female	3.72 (0.43)	3.52 (0.67)
Male	3.64 (0.49)	3.72 (0.49)

rence would provide ample numbers of students to serve as "benchmarks" for a given clerkship year. In other words, a preceptor may have a very good student and assign a grade of B+, knowing that he/she still has five more students assigned this year, at least one of which will probably fare better than student #1, and will receive a grade of A. While this premise is purely speculative and implies more subjectivity than most preceptors might admit, our results would support that position.

The predictive value of the regression equation is of primarily research interest, as one would not suggest that student grades be determined with a calculator. The fact that the predictive value of the equation appeared strong gives support to the accuracy of the model and reinforces our primary conclusion that rotation type and full- or non-full-time preceptor status are not significant factors in determining clerkship grades. Another institution could "test" our model to determine the generalizability of our findings.

CONCLUSION

Several factors which could potentially influence PharmD Clerkship grades were examined. Higher didactic GPAs and having prior clinical pharmacy experience were positive predictors of clerkship grades. Factors which negatively influenced clerkship grades were greater number of years prior nonclinical pharmacy experience and preceptors hav-

ing greater numbers of students to precept per year. Although the GPAs earned by females were marginally lower than those of males, female gender was statistically associated with lower clerkship grades. We could not detect an apparent explanation for this finding, which deserves further study.

Am. J. Pharm. Educ., **61**, 157-160(1997); received 10/8/96, accepted 1/15/97.

References

- (1) Jones, B.J., "Can trait anxiety, grades, and test scores measured prior to medical school matriculation predict clerkship performance?" *Acad. Med.*, **66**,(9) S22-S24(1991).
- (2) Fassett, W.E. and Campbell, W.H., "Basic Pharmaceutical Sciences Examination as predictor of student performance during clinical training," *Am. J. Phar. Educ.*, **48**, 239-242(1984).