Predicting success in nursing programs

Cheryl Herrera, PhD
Arizona State University

Jennifer Blair
Arizona State University

ABSTRACT

As the U.S. population ages and policy changes emerge, such as the Patient Protection and Affordable Care Act of 2010, the U.S. will experience a significant shortage of Registered Nurses (RNs). Many colleges and universities are attempting to increase the size of nursing cohorts to respond to this imminent shortage. Notwithstanding a 2.6% enrollment increase in 2013, there are still an inadequate number of qualified applicants being accepted to respond to the projected demand for 3.24 million Registered Nurses by 2022, a labor increase of 19% (AACN, 2014).

It is important that nursing schools be able to forecast, with confidence, the probability that a student will successfully complete a nursing program and ultimately pass the National Council Licensure Examination-Registered Nurse (NCLEX-RN). Nursing programs use a variety of factors to determine which students are best prepared for these programs. Some of those factors are scholastic aptitude measures such as GPA and nursing aptitude measures (Byrd, et al., 1999, p.37) and standardized aptitude tests (Newton, Smith & Moore, 2007). Other research has shown that grades in particular courses are predictive of successful completion of nursing programs (Simon & Augustus, 2009; Uyehara et al, 2007; Herrera, 2013).

The purpose of this study was to further examine the extent to which grades in gateway courses, particularly Human Pathophysiology, predict future success in completing a nursing program. The researchers found that the grade earned in Human Pathophysiology and the institution where it was taken were predictive of success in Adult Health.

Keywords: Nursing, Registered Nurse, Pathophysiology, Adult Health

INTRODUCTION

As the U.S. population ages and policy changes emerge, such as the Patient Protection and Affordable Care Act of 2010, we will experience a shortage of Registered Nurses (RNs) in the United States. Many colleges and universities are attempting to increase the size of their nursing cohorts in an attempt to respond to this impending shortage. However, nursing schools are not enrolling enough students in their programs to meet the projected demand for Registered Nurses despite a reported 2.6% enrollment increase. http://www.aacn.nche.edu/media-relations/fact-sheets/nursing-shortage

Not only do nursing schools need to increase their enrollments, they also need to choose those students that are most likely to be successful in their programs and pass the National Council Licensure Examination-Registered Nurse (NCLEX-RN). Nursing programs use a variety of factors to determine which students are best prepared for these programs and to pass the NCLEX-RN. Some of those factors are scholastic aptitude measures such as GPA and nursing aptitude measures (Byrd, et al., 1999, p.37) and standardized aptitude tests (Newton, Smith & Moore, 2007). Other research has shown that grades in particular courses are predictive of successful completion of nursing programs (Simon & Augustus, 2009; Uyehara et al, 2007; Herrera, 2013).

This research is intended to further examine the relationship between grades in particular courses and success in completing a nursing program. Special attention will be paid to Human Pathophysiology and Adult Health.

In the nursing program at Arizona State University, there are more failures in NUR 313 Adult Health than in any other upper division nursing course. Since success in Adult Health is a good predictor of success on the NCLEX-RN, the researchers want to be able to accurately select students for the upper division program that are likely to pass NUR 313 Adult Health. When students fail NUR 313 Adult Health, they are allowed to petition to request that they repeat that course and they must supply evidence of the resources that they will use to ensure their success in the subsequent attempt. The researchers would like to better understand what factors contribute to success in NUR 313 Adult Health.

LITERATURE REVIEW

Nursing schools have an imperative mission to select students that are best prepared to handle rigorous nursing curricula and, ultimately, pass the NCLEX-RN. A review of the literature substantiates that nursing schools have a vested interest in identifying variables that are predictive of NCLEX-RN success as it is a barometer of a program's overall quality and reputation (Davenport, 2007). Cumulative research has shown that grades in particular courses have predictive ability for passing the licensure exam on the first attempt (Simon & Augustus, 2009; Uyehara et al, 2007; Herrera, 2013).

In the *Journal of Research in Nursing* Simon and Augustus published Comparative analysis of NCLEX-RN readiness exam performance (Simon & Augustus, 2009) which investigated the relationship among nursing clinical course grades, foundational science courses, and NCLEX-RN readiness exam scores. They found that the first adult health nursing course is highly predictive of success on the NCLEX-RN. Simon and Augustus proffer that courses such as Pathophysiology and Adult Health are foundational as they provide primary skills and knowledge that buttress later courses in the nursing progression.

Daley et al. (2003) examined specific nursing program variables to determine differentiation between those who successfully completed the NCLEX-RN and those whose first attempt was unsuccessful. Of the programmatic variables studied by Daley et al., they found that students who earned higher grades in pathophysiology and adult health were much more likely than those who earned poorer grades in Pathophysiology to pass the NCLEX-RN on the first attempt (Daley et al., 2003). Consistent with these findings, Uyehara et al. found that the higher the grade earned in pahtophysiology, the more likely a student was to persist in a nursing program (2007). For students that earned a letter grade of A in pathophysiology, Uyeheara et al. predict that the probability of withdrawal from a nursing program is reduced to 5 percent. Conversely, the attrition rate of students that earn an F in pathophysiology is predicted to inflate as high as 80 percent.

Beeson and Kissling also confirm that grades as predictors of success are directly related to NCLEX-RN passing rates (2001). Specifically, Beeson and Kissling found that 97 % of the students in their study who achieved As and Bs in nursing courses passed the NCELX-RN on the first attempt. Accordingly, grades of C, D, or F are inversely related to first time NCLEX-RN pass rates. Seldomridge and DiBartolo's (2004) research found strong correlations between grades in Pathophysiology and NCLEX-RN pass rates. Of the 186 students sampled in their study, they were able to successfully predict 81.2 % of first time NCLEX-RN pass rates based solely on student grades in pathophysiology.

HYPOTHESES, DATA, AND VARIABLES

Based on anecdotal information and conversations with nursing faculty, the researchers hypothesized that students who take HCR 240 Human Pathophysiology at Arizona State University will be more likely to pass NUR 313 Adult Health than those students who took HCR 240 Human Pathophysiology at another institution. Most students who transfer in HCR 240 Human Pathophysiology took the course at one of the community colleges in the Maricopa County Community College District (MCCCD). There was a general sense that the community college version of the courses was less rigorous than the ASU version of the course. The researchers also believed that the higher the grade earned in HCR 240 Human Pathophysiology the more likely the student would be to pass NUR 313 Adult Health and the higher the grade that the student would earn in NUR 313 Adult Health. Finally, the researchers also supposed that class size might contribute to success in NUR 313 Adult Health—that the larger the section of the course being taught, the less successful students would be.

Based on the literature review that suggests that HCR 240 Human Pathophysiology and NUR 313 Adult Health are predictive of success in nursing programs on in passing the NCLEX-RN, and on the assumptions made by the researchers, the following hypotheses were developed:
Null Hypothesis: There is no relationship between the grade earned in and the location where HCR 240 Human Pathophysiology was taken and the grade earned in NUR 313 Adult Health, nor in the size of NUR 313 Adult Health or instructor teaching the course.
Hypothesis 1: The institution where HCR 240 is taken is correlated with the HCR 240 grade
Hypothesis 2: The institution where HCR 240 Human Pathophysiology is taken is correlated with the NUR 313 Adult Health grade
Hypothesis 3: The grade in HCR 240 Human Pathophysiology is correlated with the NUR 313 Adult Health grade

Hypothesis 4: The size of the NUR 313 Adult Health class is correlated with the grade in NUR 313 Adult Health
Hypothesis 5: The instructor of NUR 313 Adult Health is correlated with the grade in NUR 313 Adult Health

The data for this research come from the 366 students enrolled in the Traditional Pre-licensure Clinical Nursing Program at Arizona State University during 2012, 2013, and 2014. The following variables were examined: Institution where HCR 240 Human Pathophysiology was taken and the grade received in HCR 240 Human Pathophysiology. For NUR 313 Adult Health, the following data were collected: semester taken; the instructor; the capacity; and, the course grade. The capacity of the course is a scaled variable. All other variables are nominal or ordinal.

METHODOLOGY AND FINDINGS

Ordinal regression analysis was used to examine the relationships between the successful completion of NUR 313 Adult Health (the dependent variable) and the independent variables, course grade in HCR 240 Human Pathophysiology, the institution where HCR 240 Human Pathophysiology was taken, the capacity of NUR 313 Adult Health, and the instructor for NUR 313 Adult Health. Since there was not relationship between courses instructor and course grade in NUR 313 Adult Health, that variable was eliminated from further analysis. Table 1 shows the frequencies of those variables.

Table 1 shows that the course grades for HCR 240 Human Pathophysiology are 20.3% earned grades of "C"; 30.5% earned grades of "B"; and, 49.2% earned grades of "A." Two-thirds of the population, or 67.4% took this course at ASU and 32.6% took it at one of the Maricopa Community Colleges.

Table 1 shows that for the dependent variable, NUR 313 Adult Health, only 6.8% of students "failed" the courses (earned a "D" or "E"); 23.1% earned grades of "C"; 59.4% earned grades of "B"; and 10.8% of students earned grades of "A." The capacity of NUR 313 Adult Health ranged from 21 to 65 students. 8.3% of the courses offered had from 21-30 students; 29.2% had 35 students; 16.9% had 60 students and 45.5% had 65 students.

Table 2 includes the Chi-square for this model which is 44.501. All else being equal, the higher the Chi-square, the stronger the relationship between the dependent and independent variables. A Chi-square of 44.501 indicates that the relationships between the variables are strong. Table 2 also shows that this model is significant at the .000 level.

The pseudo R-squares are shown in Table 3 and ranges from .064 to .145. Therefore, the research explains between 6.4% and 14.5% of the variance with this model.

Table 4 shows the parameter estimates for this model. These estimates indicate that the location where HCR 240 Human Pathophysiology was taken and the grades earned in NUR 313 Adult Health are all significant at the .002 or lower. Other than the classes that were 21-30 which was significant at the .029 level, the class sizes were not significant.

SUMMARY AND CONCLUSIONS

The purpose of this study was to further reexamine the extent to which grades in gateway courses, particularly HCR 240 Human Pathophysiology, predict success in completing a nursing program. Because more students fail NUR 313 Adult Health than any other upper division

nursing course at Arizona State University, and because NUR 313 Adult Health is critical for progressively difficult concepts in nursing and passing the NCLEX-RN examination, the researchers felt that it was of significant importance to examine variables that predict success in NUR 313 Adult Health. In this study, the researchers examined one pre-major variable, HCR 240 Human Pathophysiology, as it relates to success in NUR 313 Adult Health. The researchers also analyzed success in NUR 313 Adult Health against capacity and instructor to see whether there was any predictive value.

Two factors found to be moderately predictive of success in NUR 313 Adult Health were the grade in HCR 240 Human Pathophysiology, the institution where HCR 240 Human Pathophysiology was taken, and the capacity of NUR 313 Adult Health. This study substantiates the extant literature and adds to the literature with regard to the size of Adult Health course.

The ultimate purpose of advancing the most prepared students to the nursing program at Arizona State University is to graduate students that have the highest probability to become registered nurses. Failure to do so is detrimental to society's critical need for nurses.

This is a descriptive study that helps to explain how prerequisite courses relate to nursing courses. One of the limitations of this study is the sole use of quantitative methods rather than multimethods. In addition, this is mostly a correlational study that helps to describe and predict success in the nursing program at ASU. There are many other factors that contribute to success in this nursing program than were considered in this study including nonacademic factors.

This study may help decision makers consider policies that will increase the success rate for students in a nursing program. Examples include considering that students complete Human Pathophysiology with a B grade or better before beginning the clinical nursing coursework to assure mastery in that subject matter before taking adult health.

Further research is indicated by this study. The researchers plan to evaluate success in adult health and NCLEX-RN pass rates as well as to examine the curriculum and pedagogy for Human Pathophysiology offered by the community colleges in Maricopa County.

Table 1: Frequencies

		N	Marginal Percentage
CourseGrade313	1 Fail	22	6.8%
	2 C	75	23.1%
	3 B	193	59.4%
	4 A	35	10.8%
CourseGrade240	2 C	66	20.3%
	3 B	99	30.5%
	4 A	160	49.2%
Institution	1 ASU	219	67.4%
ASU_MCCCD	13 MCCCD	106	32.6%
Capacity313	30 or fewer (21)	27	8.3%
	35	95	29.2%
	60	55	16.9%
	65	148	45.5%
Valid		325	100.0%
Missing		41	
Total		366	

Table 2: Model Fitting Information

Model	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	197.626			
Final	153.125	44.501	6	.000

Table 3: Pseudo R-Square

Cox and Snell	.128
Nagelkerke	.145
McFadden	.064

Table 4: Parameter Estimates

		Estimate	Std. Error	Wald	df	Sig.
Threshold	[CourseGrade313 = 1]	-2.826	.302	87.741	1	.000
	[CourseGrade313 = 2]	-.949	.231	16.827	1	.000
	[CourseGrade313 = 3]	2.365	.277	73.067	1	.000
Location	[CourseGrade240=2]	-1.960	.349	31.599	1	.000
	[CourseGrade240=3]	-.971	.296	10.736	1	.001
	[CourseGrade240=4]	0[a]	.	.	0	.
	[Institution=1=ASU]	.904	.295	9.363	1	.002
	[Institution=13=MCCCD]	0[a]	.	.	0	.
	[capacity313 =30]	.956	.437	4.780	1	.029
	[capacity313 =35]	-.028	.269	.011	1	.917
	[capacity313 =60]	.302	.333	.826	1	.363
	[capacity313 =65]	0[a]	.	.	0	.

Table 4 (continued): Parameter Estimates

		95% Confidence Interval	
		Lower Bound	Upper Bound
Threshold	[CourseGrade313 = 1]	-3.418	-2.235
	[CourseGrade313 = 2]	-1.403	-.496
	[CourseGrade313 = 3]	1.823	2.907
Location	[CourseGrade240=2]	-2.644	-1.277
	[CourseGrade240=3]	-1.552	-.390
	[CourseGrade240=4]	.	.
	[Institution=1=ASU]	.325	1.483
	[Institution=13=MCCCD]	.	.
	[capacity313 =30]	.099	1.813
	[capacity313 =35]	-.555	.499
	[capacity313 =60]	-.350	.954
	[capacity313 =65]	.	.

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