

Factors that Influence NCLEX Pass Rates

The purpose of this report is to present initial results concerning factors that influence NCLEX pass rates for nursing students at UMass Boston. First, an initial assessment of the problem is depicted. Then, a summary of relevant literature presents potential factors as predictors of NCLEX outcomes, as well as the methodology used to examine the problem. Finally, a review of the initial results are presented.

Problem Statement

National nursing accreditation requires an 80 percent first pass yield for successful completion of the National Council Licensure Examination for Registered Nurses (NCLEX) exam. However, as a result in exam changes instituted in 2013, UMass Boston nursing program graduates have failed to pass the NCLEX at a rate greater than 80%. In order to improve NCLEX pass rates and maintain accreditation, an Admissions, Programs, Graduation, Licensing (APGL) committee was established. The APGL has identified factors that may influence the NCLEX pass rate and has started to create a database of measures to analyze these factors. However, due to high level of transfer students and the diversity of the student population, identifying factors that potentially contribute to pass rate decline may be elusive. Moreover, the nursing program staff are prohibited from contacting recent graduates concerning NCLEX, making post-exam evaluation of factors impossible.

In addition to improving the NCLEX pass rate, UMass Boston program members want to ensure the access mission of the university is not sacrificed. As a result, limited interventions of the admissions policy will be considered. This complex problem is depicted in Figure 1 and shows the relationship among the factors of NCLEX pass rate, enrollment numbers, retention, graduation rates, revenue, costs, academic program outcomes, interventions, selectivity, and rigor.

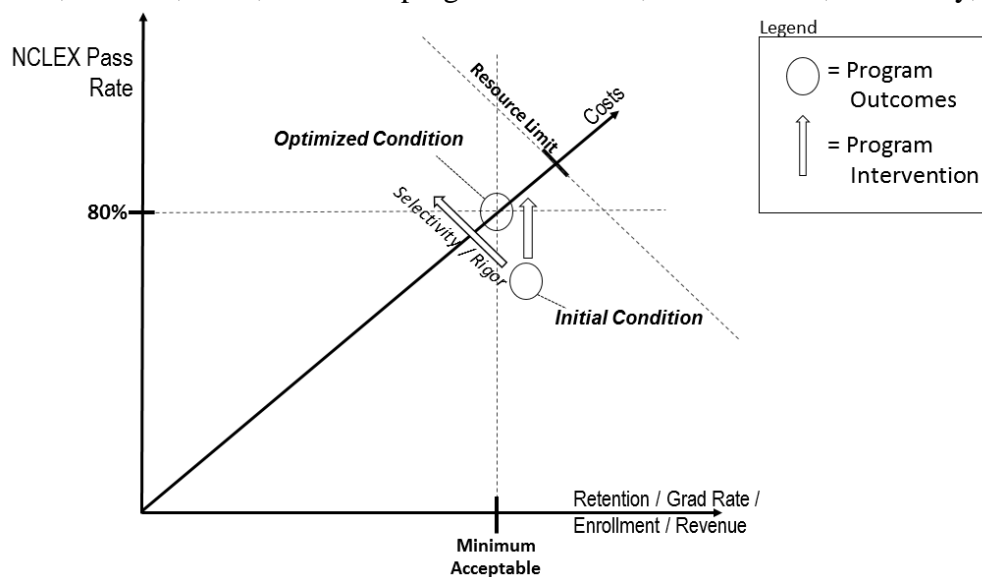


Figure 1. Conceptual optimization model for UMB nursing program.

The initial condition for the nursing academic program results in outcomes that exceed retention, graduation rate, enrollment, and revenue goals, but fall below the threshold for NCLEX pass rates. If the intervention to improve NCLEX pass rates focuses solely on selectivity or rigor, then retention, graduation rate, enrollment, and revenue goals may suffer. The goal is to identify low-cost interventions to increase quality of the nursing program in order to attain an acceptable NCLEX pass rate while maintaining desired enrollment numbers and graduation rates. The first step is to identify at-risk students and best practices in order to focus intervention efforts.

Review of Relevant Literature

Factors that potentially contribute to pass rate decline can be divided into two broad categories: academic and non-academic (McGahee, Gramling, & Reid, 2010). Academic factors may include SAT/ACT scores, performance in pre-nursing or nursing courses, and standardized nursing test scores. For example, certain nursing courses (RN Assessment, Theoretical Foundations, and Pathophysiology) were strong predictors in a study of 153 students (McGahee et al., 2010).

Non-academic factors may include age, gender, ethnicity, primarily language, and critical thinking skills. However, critical thinking measures may predict students that will likely pass the NCLEX, but are poor predictors of those likely to fail it. (Giddens & Gloeckner, 2005; Hyland, 2012).

Factors can be further narrowed to five broad categories (EOHHS, 2016):

- Academic preparation of students entering the nursing program;
- Academic *rigor* of nursing program;
- Nursing student issues;
- Nursing curriculum; and
- Faculty knowledge of current NCLEX test plan.

Academic preparation of students entering the nursing program. Factors that describe the experiences and performance of students prior to admission into the nursing program may predict how the student may perform in the program and ultimately upon taking the NCLEX. For example, students' grade point average (GPA) in science courses, specifically Biology, Anatomy, Physiology, and Chemistry, were strong predictors of ultimate NCLEX success (Higgins, 2005; McGahee et al., 2010).

While increasing selectivity for admissions to nursing programs, Newton, Smith, and Moore (2007) asserted that selective admissions criteria to predict success could result in lower attrition rates, higher graduation rates, increased licensing exam pass rates, and ultimately increase the number of nurses entering the workforce.

Academic rigor of nursing program. These factors involve how challenging the academic program of instruction results in learning outcomes.

Beeman and Waterhouse (2001) conducted a study using three years of data ($N = 289$) involving nursing theory course grades received by end of first semester of senior year and found that the

number of C+ or lower grades were a strong predictor of NCLEX failure ($r = -.394, p = .0001$). Likewise, Haas, Nugent, and Rule (2004) found that students who passed the NCLEX had a GPA approximately 0.3 point higher than failing students. However, nursing programs have different levels of academic rigor and without a benchmark of rigor measured for the programs in these studies, their findings are not directly transferable to nursing programs in other institutions.

Nursing student issues. Anything from certain demographic traits to non-curricular experiences of the students while taking the program can be evaluated as a potential issue. For example the time that lapses between graduation and taking the NCLEX has been found to negatively correlate with pass rates (Hyland, 2012). Taylor (2012) conducted a case study that included noncognitive contributing factors and nontraditional students, defined as working full-time, financially independent, may have dependents, and enters college after delay from high school.

The adult student has many responsibilities that influence their success in the postsecondary education. The literature review disclosed that the unique needs of the adult nontraditional student frequently include family commitments, employment, children, and limited financial resources. In the research data collected, the graduates of this research study listed their additional responsibilities in the decreasing order of commitment; family, children, and employment. The graduates verbalized that their need to spend time with family and children, and to be employed while going to schools were their main causes of exhaustion. (Taylor, 2012, p. 156)

Nursing curriculum. Curricular changes that inadvertently drop content and made without NCLEX content mapping would be a negative factor in NCLEX pass rates.

Use of the Health Education Systems, Inc. (HESI) exit examination has proved to be one of the single best predictors of NCLEX pass rates (Lauchner, Newman, & Britt, 2008), with 98.3% accuracy (Nibert, Young, & Adamson, 2008). Moreover, Hyland (2012) suggested that subtle difference in HESI test scores help in identifying at-risk students.

Faculty knowledge of current NCLEX test plan. Faculty awareness of NCLEX content and the importance of practice testing would influence student preparedness for the NCLEX.

Conclusion. Overall, the literature suggests that “no single variable should be used to predict success...first semester is critical to accomplish the objectives necessary to pass at subsequent levels (McGahee et al., 2010, p. 8). Therefore, in order to have successful remediation, the process must begin early in the program and not relegated to the last semester (Culleiton, 2009). Moreover, multiple strategies of interventions are necessary, from standardized testing to review courses (Hyland, 2012).

Methodology

Sample. The sample consisted of 431 nursing student graduates that were believed to have attempted taking the NCLEX exam. The data bank of variables for the sample were provided by the APGL committee and merged with OIRAP data for admissions, enrollment, and degree

completion. Names are withheld in the analysis and every effort has been made to ensure results are not attributed to any individual in the sample.

Variables. The dependent variable was the outcome of NCLEX exam, either pass or fail. The independent variables included all academic and non-academic variables that reliable data are available and interpretable.

Procedures. Following a deductive approach, data attained from the APGL were analyzed using SPSS and tested for correlational relationships between variables. In some cases, a logistic regression was used with NCLEX exam outcome as the dependent variable. Since this variable was a nominal measure and discrete, a logistic regression test helped identify any significant relationship for independent variables in predicting exam outcome. It is appropriate whether the independent variables are continuous, nominal, or a mix of continuous and nominal.

Results

The sample consisted of 431 students that completed the nursing program from Spring 2013 to Spring 2015 semesters. The students that were admitted to, but did not persist in, the nursing program were not included in this analysis. The actual NCLEX results were not available, but the date of licensure was known. Thus, it was assumed that if the graduate did not receive his/her licensure before the second subsequent semester from completion, then it was assumed the graduate failed his/her first attempt at the NCLEX. There may be some difference in the actual results due to this uncertainty. However, the distribution of graduates based on this assumption included 341 that passed and 90 that failed, consistent with reported NCLEX pass rates (about 79%) reported by the Massachusetts Board of Registration in Nursing and National Council of State Boards of Nursing.

The following initial results are presented according to the APGL category it is most associated.

Admissions. A number of variables associated with demographics background and admissions criteria were assessed. First, a difference existed for graduates according to gender. Female graduates ($N = 354$) passed the NCLEX at a higher rate (88.2%) than male graduates ($N = 66$, 71.2%). This result is consistent with other studies, including Haas et al. (2004).

Age of test-takers at the time they were admitted into the program proved to show differences among those that passed ($M = 23.16$ years old) and those that failed ($M = 25.75$ years old). Age was positively correlated with NCLEX failure ($r = .147$, $p = .004$). Age distribution among all test-takers were 40% at age 19 or younger, 30% in the range of 20-25 years old, and 30% at age 26 or older.

Table 1 presents the test results according to admit type. While first-time freshman attained a pass rate above 80%, transfer students attained pass rates that were marginal. These results suggest admission standards for first-time freshman are more effective than the admission standards for transfer students.

Table 1
NCLEX outcomes according to admit types

Admit Type	<i>N</i>	%	NCLEX Exam Results		
			Pass	Fail	Pass Rate
First-time/full-time	128	30.5	107	21	83.6%
Transfer	256	61.1	205	51	80.1
UMass Transfer	16	3.8	11	5	68.8
Second Degree	19	4.5	15	4	78.9

Note. Data set included 12 missing or unknown entries for admit types.

For the group of transfer students, the mean number of credits transferred was about 50 credits. However, there was no significant correlation to NCLEX pass rate relative to the number of credits transferred. Table 2 depicts the transfer schools with the most students admitted to the UMB nursing program, along with the respective NCLEX pass rate.

Table 2
NCLEX outcomes according to transfer student feeder schools

Transferred from	<i>N</i>	Pass Rate
Bunker Hill Community College	36	72%
Massasoit Community College	32	91
Quincy College	22	86
Roxbury Community College	21	38
Mass Bay Community College	17	65
North Shore Community College	12	83

To examine the admissions standards, high school grade point average (GPA), transfer GPA, and SAT scores were tested for correlation to NCLEX pass rates and for differences among admit types. While high school GPA and transfer GPA had no significant correlation to the pass rate, SAT scores were significantly correlated to pass rate ($n = 207$, $t = 2.67$, $p = .008$) with the mean combined score of 1051 for those that passed versus a score of 977 for those that failed. However, when examining specific admit types, SAT scores were not correlated to pass rates for first-time freshmen, but were correlated for the 67 transfer students that SAT scores were available ($t = 2.92$, $p = .004$), with a mean SAT combined score of 1023 ($n = 55$) for those that passed versus a score of 857 for those that failed ($n = 12$). Overall, first-time freshmen and transfer students reflected significant differences in terms of high school GPA and SAT scores

(Table 3), but had no significant differences between the two groups in terms of NCLEX pass rate.

Table 3
Differences between admit types in terms of high school GPA and SAT scores

Measure		<i>N</i>	<i>M</i>	<i>SD</i>	<i>t</i>	<i>p</i>
High School GPA						
	Transfer	31	3.11	.57	4.99	.000
	First-time Freshman	123	3.57	.42		
Math SAT						
	Transfer	67	495	94.14	3.69	.000
	First-time Freshman	122	540	71.26		
Verbal SAT						
	Transfer	67	498	101.71	2.08	.039
	First-time Freshman	122	527	82.71		
Combined SAT						
	Transfer	67	993	185.66	3.135	.002
	First-time Freshman	122	1067	133.61		

It should be noted that the differences noted in Table 3 represent a small proportion of the 256 transfer students that admissions data for high school GPA and SAT scores were available, because these measures are typically not considered or required for admission as a transfer student.

Table 4 depicts the NCLEX outcomes for various ethnic groups. The proportion of white students (55.2%) is consistent with the overall proportion of white students at UMB of 54%, as reported for Fall 2014 students enrolled. Overall, the pass rates for white students and non-white students are 90% and 68% respectively. Given the influence of SAT scores on the NCLEX outcomes, it was observed that differences in SAT between white students and non-white students may explain some of the variation in pass rates. White students mean SAT scores were 538 math, 536 verbal, and 1074 combined. Non-white students mean SAT scores were 494 math, 478 verbal, and 972 combined.

Table 4
NCLEX outcomes according to ethnic categories

Ethnic category	N	%	NCLEX Exam Results		
			Pass	Fail	Pass Rate
White	232	55.2	209	23	90.1%
Black/African American	83	19.8	51	32	61.4
Asian	47	11.2	28	19	59.6
Hispanic	27	6.4	26	1	96.3
Other*	15	3.6	12	3	80.0
Not specified	16	3.8	12	4	75.0

Note. Other includes students that self-reported as American Indian (1), Hawaiian Native/Pacific Islander (2), non-resident alien (3), and two or more races (9).

Progression. The NCLEX exam as an assessment of student competency attempts to measure content knowledge, student motivation, and critical thinking skills. When examining the progression of individual students in the nursing program, the goal is to identify those key academic or non-academic experiences that highlight potential differences in these key measurements.

Table 5 depicts the correlation between grades in courses taken by nursing program students and the NCLEX exam outcomes. While most of the nursing courses are significant, most of the non-nursing courses are not significant. It should be noted that none of the mathematics (statistics) courses were found to be significantly correlated with passing the NCLEX exam. The only non-nursing course that was significant at the .05 level was Anatomy & Physiology II (BIOL 208). Also, after the NCLEX preparation course itself (NUR 450), the next highest correlated nursing course was Health Assessment (NUR 220). Therefore, BIOL 208 and NUR 220 are valuable indicators of identifying those students that are *at-risk* for failing the NCLEX.

Table 5
Correlation of student course grades with NCLEX outcomes

Course	<i>N</i>	<i>r</i>	<i>p</i>	
ENGL 101 Freshman English I	89	.168	.115	Not Significant
ENGL 102 Freshman English II	104	.092	.353	Not Significant
PSYCH 201 Intro to Behavioral	56	.034	.805	Not Significant
PSYCH 270 Statistics	18	.029	.909	Not Significant
BOIL 207 Anatomy & Physiol I	107	.106	.279	Not Significant
BIOL 208 Anatomy & Physiol II	115	.189	.043	Note 1
BIOL 209 Medical Microbiology	150	.064	.439	Not Significant
CHEM 130 Physiological Chem	127	.128	.150	Not Significant
EHS 150 Introduction to Nutri	173	.054	.480	Not Significant
EHS 280 Stats for Health Prof	44	.286	.060	Not Significant
MATH 125 Intro to Statistics	65	.065	.605	Not Significant
NUR 201 Pathophysiology	325	.147	.008	Significant at $\alpha=.05$
NUR 212 Hlth Promotion & Tchng	290	.076	.195	Not Significant
NUR 220 Health Assessment	325	.435	.000	Significant at $\alpha=.001$
NUR 226 Intro Nursing Pract	327	.257	.000	Significant at $\alpha=.001$
NUR 230 Human Growth & Devel	163	.128	.103	Not Significant
NUR 310 Adult Health Nursing	333	.272	.000	Significant at $\alpha=.001$
NUR 314 Pharmacology	328	.135	.014	Significant at $\alpha=.05$
NUR 320 Research	330	.010	.861	Not Significant
NUR 332 Legal Ethical & Heal	333	.278	.000	Significant at $\alpha=.001$
NUR 335 Maternity&Women's He	333	.321	.000	Significant at $\alpha=.001$
NUR 345 Mental Health Nursing	334	.396	.000	Significant at $\alpha=.001$
NUR 430 Nursing in the Commu	334	.242	.000	Significant at $\alpha=.001$
NUR 435 Nursing Care of Chil	333	.259	.000	Significant at $\alpha=.001$
NUR 440 Nurs Leadershp & Mgt	334	.204	.000	Significant at $\alpha=.001$
NUR 450 Pre Prof Licnse&Prac	334	.442	.000	Significant at $\alpha=.001$
NUR 455 Nursing Synthesis	334	.380	.000	Significant at $\alpha=.001$

Note. 1: Type I error may result when significant at .05 level and Type II error may result when not significant using Bonferroni adjusted $\alpha = .002$ (.05/27).

The analysis was redone using a final logistic regression using a collection of independent variables or courses that had high r^2 values. The final logistic regression model ($N = 325$) was significant, indicating that the grades attained for two courses, NUR 220 and NUR 450, explained 34% (Nagelkerke's R^2) of the variance in NCLEX outcomes and correctly predicted

84% of the cases. Therefore, the grades attained for the courses NUR 220 and NUR 450 can be considered the best indicators for students *at-risk* of failing the NCLEX exam.

The number of semesters that a student took to complete the program resulted in significant results. For first-time freshman, the mean time to graduate was 8.38 semesters (SD = 1.90) and proved to be minor predictor of NCLEX failure ($r = .191$, $r^2 = .036$, $p = .031$). If a first-time freshman students graduated in 8 semesters or less, they would pass the NCLEX exam at a 86.4% rate, but the pass rate drops to 78.7%, 72.4%, and 70.0% when graduating in 9 or more, 10 or more, and 11 or more semesters respectively. For transfer students, the mean time to graduate was 6.39 semesters and was a minor predictor of NCLEX failure ($r = .126$, $r^2 = .016$, $p = .044$). If transfer students graduated in 6 or less semesters, they would pass the NCLEX exam at a 81.8% rate, but the pass rate drops to 76.9% when graduated in 7 or more semesters. Students that stay on track have an improved chance of passing the NCLEX exam.

Graduation. The term that students graduated was examined. For Fall graduates ($N = 144$), the pass rate was 88.2%. For Spring graduates ($N = 259$), the pass rate was 79.9%. For Summer graduates, the pass rate was 23.5%. Again, students that do not stay on track and graduate on time in the Spring semester, have a reduced probability of ultimately passing the NCLEX exam.

The final GPA for graduates was positively correlated to passing the NCLEX exam ($r = .390$). Table 6 depicts the mean final GPA for graduates that passed and failed. For the 99 graduates that attained a final GPA less than 3.23, 51 passed and 48 failed. That is nearly a 50% chance of failing the NCLEX if the final GPA falls below 3.23.

Table 6
Final grade point average (GPA) by NCLEX outcomes

NCLEX Outcome	<i>N</i>	<i>M</i>	<i>SD</i>
Pass	338	3.49	.25
Fail	82	3.23	.22

The status in the final semester provides a strong indication of at-risk students to fail the NCLEX. If a student is projected to have a final GPA of less than 3.23 and attains a B- or below in NUR 450, past performance of students ($N = 23$) have suggested that this student would have only a 31% pass rate. Moreover, these 23 students included 18 students that received an incomplete for the final grade in NUR 450.

Licensure. No direct data were available for actual outcomes of the NCLEX exam or the circumstances associated with graduates after they have completed the program. However, the performance on the HESI exit examination has proven to be the best indicator of NCLEX outcomes according to past studies. Insufficient HESI results during the nursing program are unavailable at this time for analysis.

Conclusion

More analysis can be conducted when adequate data are available. Areas for further research could results with data for the following areas:

- HESI scores
- TEAS scores
- Exam grades for specific courses (e.g. NUR 220)
- Grades from courses transfer students took prior to the program
- Academic review actions
- Writing House Online measures of self-reported hours worked

In the meantime, program administrators might consider a number of changes that are informed by the analysis provided in this report. Recommendations may include:

- Review of the admissions criteria for transfer students to enhance selectivity while not preventing access to under-represented groups. A measure might be to consider SAT scores as a criteria for admission as a transfer. For all admit types, it may be better to weigh the results for SAT exams more than high school GPA.
- It would be easy to increase the selectivity and rigor of the program to attrite those at-risk students in order to increase NCLEX pass rates. However, in order to protect the access mission of the institution, it is prudent to implement more focused interventions, such as mentoring, tutoring, or remedial program, for students identified as at-risk for NCLEX failure.
- Use early indicator courses, such as BIOL 208 and NUR 220, to identify at-risk students.

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