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Use of standardized testing to predict NCLEX-RN success for associate degree nursing students in a concept-based curriculum

Charla L. Denman, DNP, APRN, FNP-BC, NP-C*, Tanya M. Cohn, PhD, MEd, RN

Simmons University, Boston, MA, USA

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ABSTRACT

The study objective was to evaluate scores on the ATI Level 4 Concept-Based Assessment and demographic variables to predict NCLEX-RN pass rates in Associate Degree nursing students completing a Concept-Based Curriculum.

Background: In response to first time NCLEX-RN failures, a community college in Texas reviewed its current curriculum and identified the need to educate more contextually versus the traditional medical model. The nursing program adopted the Texas Concept-Based Curriculum. Assessment Technologies Institute (also known as ATI) developed the RN Concept-Based level Assessments. The Level 4 assessment is appropriate for assessing RN nursing students at the end of their concept-based curriculum.

Method: The study design was a secondary analysis. In the data analysis, descriptive statistics, bivariate analysis utilizing a *t*-test and Chi-square, and logistic regression were used.

Results: ATI CBAL4 scores were a significant predictor, recording an odds ratio of 1.063. This indicated that students who scored higher on the ATI CBAL4 were more likely to pass the NCLEX. Additionally, Student Type was a significant predictor, odds ratio = 3.93. This indicates that transition students are 3.93 times more likely to pass the NCLEX than traditional students.

Conclusion: Instructors and associate degree nursing students completing a concept-based curriculum should be aware of the predictive power of the CBAL4.

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Introduction/Background

Failing the National Council Licensure Examination for Registered Nurses (NCLEX-RN) can be detrimental to not only the nursing graduate but also the program. For the new nursing graduate, it can be devastating financially and psychosocially (Mathew & Aktan, 2018; Monroe & Dunemn, 2020). For nursing programs, it is detrimental when their graduates fail the NCLEX-RN. Pass rates are scrutinized by the National Council of State Boards of Nursing (NCSBN) and by potential students. A program with lower NCLEX-RN first attempt pass rates may result in decreased enrollment because prospective students may choose a program with higher success rates. Decreased enrollment has significant impacts on the college and at the university/college level (Monroe et al., 2020). Nursing programs that accrue a high first-time failure rate for the NCLEX-RN can be in jeopardy of losing program approval from the state board of nursing, and ultimately result in program closure; further resulting in serious financial implications for the college (Mathew & Atkan, 2018; Monroe & Dunemn, 2020).

The Texas Board of Nursing (BON) approves all schools in Texas that prepare nurses for initial entry into nursing practice. Approval status of each school program is based on the program's performance and demonstrated compliance to the Texas BON's requirements and responses to their recommendations. Change from one status to another is based upon NCLEX-RN examination pass rates as well as other factors defined by the Texas BON. Each program is expected to have at least an 80% pass rate of the NCLEX-RN (Texas Board of Nursing, 2020).

In 2015, in response to first-time NCLEX-RN failures, a community college in Texas reviewed its current curriculum and identified the need to educate more contextually versus the traditional medical model. At this time, the program director and faculty members identified the need to implement the Texas Concept-Based Curriculum (CBC; Varnell, 2016). The 2017 graduating class was the first class to complete a CBC. The NCLEX-RN pass rate for this class increased over the required 80%, which marked a significant improvement over the last 3 years and moved the program from conditional status back into full approval status with the Texas Board of Nursing (Varnell, 2017). Even though administrators did not complete a formal evaluation of the CBC, the change in curriculum proved to be a tremendous benefit for the program based on NCLEX-RN first-time pass rates after complete implementation of a CBC.

*Corresponding author.

E-mail address: charla.denman@simmons.edu (C.L. Denman).

Assessment Technologies Institute (ATI) developed the Registered Nurse (RN) Concept-Based Assessment Level 4 (CBAL4) in 2018 to assess the proficiency level of ADN nursing students at the end of a CBC (ATI, 2018). The ATI RN CBAL4 is a relatively new assessment and has not formally been used in predicting first-time NCLEX-RN pass success (ATI, 2019).

Literature Review

Due to the calamitous consequences of first time NCLEX-RN failure, it is essential that nurse educators adopt strategies to assist nursing graduates in passing the NCLEX-RN. One strategy is to adopt curricular models that can better prepare graduates for NCLEX-RN success, such as a Concept-Based Curriculum (CBC) (Mathew & Aktan, 2018; Repsha et al., 2020). Traditional teaching models utilized in some nursing programs focus on a teacher-centered approach (Holman & Hanson, 2016). Most include a focus on memorizing facts and information, transferring large amounts of information to passive students, and limiting time to learn how to problem-solve in the classroom (Baron, 2017). With this model there is a perceived disconnect between academia and practice due to increased volume of nursing content covered. A CBC consolidates information by placing information into concepts and promoting student-led active-learning strategies that foster critical thinking (Harrison, 2018; Lee & Willson, 2018). Concepts are spaced throughout the curriculum to promote greater understanding and application while decreasing opportunities for unnecessary repetition (Repscha et al., 2020). The Texas Nursing CBC Curriculum Consortium recognized the CBC as a way to help nursing programs in Texas manage content saturation and provide a better method for content management (Higgins & Reid, 2017). The Texas CBC defines key characteristics of the implemented model in Texas. These characteristics include: promoting development of clinical judgment, allowing for deeper learning of concepts, providing methods for content management, preventing content saturation while maximizing efficiency; then, after focusing on generalities of the concepts, the students are able to apply what they have learned to specific exemplars. The concepts are applied in a variety of clinical settings, which prepares the new graduates for a greater variety of job choices. Throughout this application process, emphasis is placed on active learning activities with a focus on conceptual learning, so students learn how to organize information into logical mental structures and increase skilled thinking. Texas concepts are divided into Professional (nursing and healthcare) and Healthcare Concepts (biophysical and psychosocial), making 43 concepts in the Texas CBC (Higgins & Reid, 2017). Nursing requires application of knowledge, skills and abilities, and the majority of items are written at the application or higher levels of cognitive ability, which requires more complex thought processing (National Council of State Boards, 2019). A concept-based curriculum provides the model needed to apply these cognitive skills and abilities to nursing practice.

Entry into nursing practice is regulated by the licensing authorities within each of the NCSBN jurisdictions including state, commonwealth, and territorial boards of nursing. To ensure the safety of the public, each jurisdiction requires that graduate students for licensure meet the requirements set by NCSBN which includes passing an examination that measures the competencies needed to perform safely and effectively as a newly licensed, entry-level RN. The National Council for State Boards of Nursing (NCSBN) is responsible for the maintenance of minimum practice standards for graduate nurses entering the workforce. The NCSBN creates psychometrically sound standardized examinations to measure readiness of an entry-level registered nurse that will be entering a complex and demanding healthcare environment (Jenkins, 2016; Smith Glasgow et al., 2019). Nursing programs have an obligation to produce graduates who are not only competent, critical thinkers, but students adequately

prepared to pass the NCLEX-RN on the first attempt (Monroe & Dunem, 2020).

Nursing is a dynamic, continually evolving discipline that requires critical thinking to integrate increasingly complex knowledge, skills, technologies, and client care activities into evidence-based nursing practice. In addition to addressing curricular design, it is also essential to identify high-risk students prior to program completion so that faculty can implement remediation support. While faculty can use a variety of methods, literature supports the use of NCLEX-RN predictor exams for this regard (Harrison, 2018; Jenkins, 2016; Mathew & Aktan, 2018). These assessments are accurate predictors of NCLEX-RN success (Jenkins, 2016). According to ATI (2018), the RN Concept-Based Assessment Level 4 (CBAL4) is appropriate for assessing RN nursing students at the end of their concept-based curriculum. However, there is a lack of literature comparing ADN students ATI RN CBAL4 predictor scores to first time NCLEX-RN success. Predicting NCLEX-RN success can help nurse educators work with students who are at risk for failing this high-stakes exam. This may assist in alleviating the devastation of NCLEX-RN failure incurred by graduates and nursing programs

Aim

Using secondary data, the purpose of this predictive research study was to evaluate the relationship between the ATI CBAL4 scores and the corresponding NCLEX-RN pass rates in ADN students completing a CBC. One aim served to drive the study's purpose:

1. To assess the predictive validity of CBAL4 scores on first time NCLEX-RN success for ADN students completing a CBC, while controlling for the variance due to demographic variables (gender, race/ethnicity, and traditional or transition ADN students) by including these variables in the model as covariates.

Ethical Consideration

Based on low first-time pass rates of NCLEX-RN, the research site adopted the concept-based curriculum in 2015, graduating the first cohort in 2017. The purpose of this secondary analysis is to predict NCLEX-RN pass rates using ATI CBAL4 scores and demographic variables. Prior to conducting the study, permission was secured from the Vice-President, the Dean of Health Sciences, and the Director of Nursing Programs of the study college as well as a representative from Assessment Technologies Institute TM, LLC, and the institutional review board from Simmons University. Ethical review indicates that student consent is not required. The variables examined included gender, race/ethnicity, Traditional vs. Transition ADN students, scores on the CBAL4 assessment and NCLEX-RN pass/fail.

Setting, Sample, and Recruitment

The setting for this study was an associate degree nursing program at a community college in Texas. The study participants were a convenience sample of ADN students. The research site implemented ATI's level 4 assessment in May 2020. Student scores for this study included students that graduated from the program in May 2020 and May 2021 (N = 116). Each student in the study took the assessment in their final semester of nursing school during week 13 of a 16-week semester. Only data on graduates who took the NCLEX-RN were collected. Those who did not take the NCLEX-RN were excluded from the study.

Researchers used previous research to conduct an odds ratio power analysis. An article similar to this research by Brodersen and Mills (2014) utilized an OR = 2.25. Using that as a guideline, a sensitivity analysis was completed. A sensitivity analysis was used to estimate the OR that could be detected with a predetermined sample

size. G*Power 3.1 suggested that for 116 OR=2, with 80% power, two-tailed alpha = .05. 113 students would be required to detect an Odds Ratio of OR = 2 with 80% power, two-tailed alpha = .05.

Data Collection and Tool Selection

Data came from ATI and the Texas Board of Nursing. Access to ATI data were achieved using a unique username and password. The NCLEX-RN results are public record. The ATI CBAL4 was one of the instruments utilized for data collection. As this assessment is copyrighted by ATI, permission to utilize this assessment tool in this study was given prior to data collection. The other instrument was the NCLEX-RN, for which copyrights are maintained by the NCSBN. In addition, demographic information was collected including gender, race/ethnicity, Traditional vs. Transition ADN students. Traditional students are ADN students that were admitted to the nursing program with no previous nursing experience. Transition students are ADN students that have previously attended a licensed vocational nursing (LVN) program, successfully passed the NCLEX-LVN, and have previously practiced nursing as an LVN.

The RN Concept-Based Assessments are designed to provide assessment data regarding a student's mastery of concepts and exemplars at specific points of the concept-based curriculum. The Level 4 CBC exam is comprised of 140 (110 scored and 30 pretest) items developed to assess RN nursing students' comprehension and understanding of 20 different concepts. The ATI CBAL4 is taken at the completion of a CBC. Cut scores for the CBAL4 were established through formal studies in accordance with the recommendations of the American Educational Research Association, American Psychological Association, and National Council on Measurement in Education Standards for Educational and Psychological Testing. Cut scores and proficiency levels are defined by ATI. A score of 64.5% or Level 2 demonstrates a proficiency in the knowledge and skills related to the assessed concepts and exemplars required to deliver safe, effective nursing care at the entry-level for the profession. It also demonstrates the student is prepared for successful performance in subsequent curricular material (ATI, 2018). According to the ATI CBA Technical Manual (2021), the CBAL4 assessment has demonstrated that it is a reliable measure of concepts appropriate for students at the end of their CBC nursing program. For example, the Cronbach's alpha reliability coefficient was 0.95.

Researchers used NCLEX-RN first-time pass rates from the NCLEX-RN reported datasets. The NCLEX-RN examination was utilized to determine RN competency for entry-level practice. A decision consistency statistic was used to measure the reliability of the NCLEX-RN because the results are reported dichotomously as pass/fail (Harrison, 2018). All items on the NCLEX-RN are written and reviewed by nurse experts with varied practice and educational backgrounds to ensure content validity. Additionally, the NCSBN reevaluates the passing standard every 3 years or when the test plan changes to ensure a consistent standard of competence in nursing practice (NCSBN, 2019). After completing all of the requirements for graduation and after meeting all of the state licensing board eligibility requirements, the study participants are given permission to take the NCLEX-RN. Only first attempt scores will be utilized in the study data.

Data Analysis

Statistical Package for Social Sciences (SPSS) version 28 software (IBM Corp, 2021) was used for data management and analysis. The data obtained was inspected and edited for coding and transfer errors. Data was checked for normality and all descriptive statistics are presented in Table 1: Participant Demographics. Preliminary, bivariate analyses were completed next to establish relationships between demographic variables and CBAL4 scores with NCLEX-RN

Table 1
Participant demographics.

Measure	n %
Sex	
Male	13 (11.5%)
Female	100 (88.5%)
Race/Ethnicity	
White	79 (69.9%)
Black/African American	15 (13.3%)
Hispanic/Latino	16 (14.2%)
Two or more races	2 (1.8%)
Nonresident Alien	1 (0.9%)
Student type	
Traditional	31 (27.4%)
Transition	82 (72.5%)
Year of graduation	
2020	74 (65.5%)
2021	39 (34.5%)
NCLEX-RN	
Pass	97 (85.8%)
Fail	16 (14.2%)
Remediation (offered 2021 only)	
Yes	13 (11.5%)
No	100 (88.5%)

Note: Total sample $N = 113$.

pass/fail rates. After exploring each variable's relationship with NCLEX-RN pass/fail rates, a logistic regression was used to assess the impact of significant variables on the likelihood that students would pass the NCLEX-RN. Logistic regression is preferable with a nominal-level, dichotomous dependent variable, such as pass/fail rates (Harrison, 2018). Demographic variables that were found to have a significant relationship with NCLEX-RN status were included in the logistic model. It is the opinion of the researchers that using an informed selection of variables can reduce unnecessary noise in the prediction.

Findings

Demographics

The demographic data included in this research were gender, race/ethnicity, and student type (Traditional RN students or Transition RN students). The sample was mostly female ($n = 100$, 88.5%) and the majority of students identified as white ($n = 79$, 69.9%). The sample contained both Traditional RN students ($n = 31$, 27.5%) and Transition RN students ($n = 82$, 72.5%). See Table 1: Participant Demographics.

Logistic Regression

The first bivariate analysis, an independent t-test, explored differences in CBAL4 scores between the students that passed the NCLEX-RN and those that failed. ADN students that passed the NCLEX-RN had higher CBAL4 scores ($M = 70.12$, $SD = 10.77$) than ADN students that failed ($M = 63.29$, $SD = 10.14$); these differences were statistically significant ($t(111) = -2.361$, $p < .05$). Cohen's d indicated a medium effect size between these groups ($d = .65$). The next series of bivariate analyses looked for relationships between categorical, demographic variables and NCLEX-RN pass/fail status; these analyses were run using chi-square (χ^2). Only student type (traditional/transition) had a statistically significant relationship with NCLEX-RN pass/fail status ($\chi^2(1, 113) = 4.768$, $p < .05$). See Table 2: Chi-Square Analysis.

Discussion

The purpose of this study was to assess the predictive validity of CBAL4 scores on first time NCLEX-RN success for ADN students completing a CBC, while controlling for the variance due to significantly

Table 2
Chi-square analysis.

	n (% of N)	
	Fail	Pass
Sex		
Male	2 (1.7%)	11 (9.7%)
Female	14 (12.4%)	86 (76.1%)
$\chi^2(1, 113) = .018, p = .893, \text{Cramer's } V = 0.0001$		
Race/Ethnicity		
White	11 (9.7%)	68 (60.2%)
Black/African American	3 (2.7%)	12 (10.6%)
Hispanic/Latino	2 (1.8%)	14 (12.4%)
Two or more races	0 (0.0%)	2 (1.7%)
Nonresident alien	0 (0.0%)	1 (0.8%)
$\chi^2(4, 113) = .956, p = .893, \text{Cramer's } V = 0.0005$		
Student type		
Traditional	8 (7.1%)	23 (20.4%)
Transition	8 (7.1%)	74 (65.5%)
$\chi^2(1, 113) = 4.768, p < .05, \text{Cramer's } V = 0.2054$		
Graduation year		
2020	11 (9.7%)	63 (55.8%)
2021	5 (4.4%)	34 (30.1%)
$\chi^2(1, 113) = .088, p = .797, \text{Cramer's } V = 0.0003$		
Remediation		
Yes	0 (0.0%)	13 (11.5%)
No	16 (14.2%)	84 (74.3%)
$\chi^2(1, 113) = 2.423, p = .120, \text{Cramer's } V = .1464$		

related demographic variables (traditional/transition ADN students) by including these variables in the model as covariates. The model was statistically significant, ($\chi^2(2) = 10.37, p = .006$), indicating that the model was able to predict NCLEX status from these two variables. This indicates that while the model is statistically significant, the strength of the model is relatively small. ATI CBAL4 scores were a significant predictor (OR = 1.063, $p < .05$). This indicated that students who scored higher on the ATI CBAL4 were more likely to pass the NCLEX-RN, further indicating that for every one-point increase in CBA score, the odds of passing the NCLEX-RN increase by 6.3%. Additionally, Student Type was a significant predictor (OR = 3.93, $p < .05$). This indicates that transition students are 3.93 times more likely to pass the NCLEX-RN than traditional students.

Limitations

This study is limited in generalizability because data were collected only from one college. Increasing the sample size by collecting data from more colleges and universities would increase the generalizability of the conclusions drawn from this study. Additionally, at this community college, remediation was required with the students that graduated in 2021, but not required with the students that graduated in 2020. Adding this component during the course of the study could have skewed results. Alternatively, more remediation data could increase power to find a significant association with NCLEX pass rates (trending significant at $p = .12$). Lastly, data collection only included CBA scores and demographic information which only accounted for 4–7% of the variance in pass rates.

Implications

The findings are significant to the study college. Predicting NCLEX-RN success can help nurse educators work with students who are at risk for failing the NCLEX-RN. Other schools of nursing that offer a CBC may be interested in the predictive power of the ATI CBAL4.

Additionally, while not significant statistically, it is worth noting that all students that participated in remediation passed the NCLEX-RN. Therefore, it is worth consideration to implement remediation strategies prior to the graduate taking the NCLEX-RN to help ensure their success. In addition to collecting data from more academic institutions, future research should involve a larger sample to collect more information, which would improve the identified generalizability. This may better predict the likelihood of NCLEX-RN success. Many factors could contribute to NCLEX-RN pass rates, such as whether the student is employed full-time, their GPA, and nursing entrance exam scores.

Conflicts of Interest Statement

The authors whose names are listed immediately below certify that they have NO affiliations with or involvement in any organization or entity with any financial interest (such as honoraria; educational grants; participation in speakers' bureaus; membership, employment, consultancies, stock ownership, or other equity interest; and expert testimony or patent/licensing arrangements), or non-financial interest (such as personal or professional relationships, affiliations, knowledge or beliefs) in the subject matter or materials discussed in this manuscript (Authors names: Charla Denman and Tanya Cohn).

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