White Paper

HESI/ATI
Research Summary

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SUMMARY / CONCLUSIONS

- Existing research does not accurately predict students who will not pass the NCLEX—and this group is most in need of identification and intervention.

- Studies which report accurate predictions of students who will pass the NCLEX tend to focus on predicting success for a small group of students who are the highest-achievers.

- Studies looking at predictors to NCLEX success tend to find aptitude measures such as GPA and SAT and school entrance requirements exams to be the best predictors.

- The NLN recommends that predictor tests not be used to preclude graduation or progressions as they are not adequately designed for this purpose, nor is there reliable guidance on setting cut scores or thresholds.

- Most schools using predictor tests to preclude graduation choose cut off scores which unfairly hold back a high percentage of students who would most likely pass the NCLEX if permitted to sit for it.

Assessment in Nursing Education

Assessment in nursing education world has typically focused on NCLEX success prediction using tests such as HESI and ATI predictors. And much of the research conducted on predictive exams tends to focus on tests given towards the end of the nursing program (e.g., HESI E^2) (Spurlock, 2012). This is problematic because results are sometimes used to prevent, or delay graduation, and yet there is little time to effectively remediate based on results.

The NCLEX

Several features of the NCLEX make predicting student success very difficult:

- In 1988 the test became pass/fail which makes teasing out different levels of performance impossible.
- Pass rates are typically high.
- In 2004 the NCLEX became a computer adaptive test which may require students to have experience with computerized test-taking (Beeman & Kissling, 2001).
- The passing standard changes over the years also makes cohort comparisons more challenging.

Futhermore, one cannot ignore the impact of student characteristics and other less tangible variables on NCLEX outcome.

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High-Stakes Testing: Progression and Graduation policies

The likelihood of a nursing student graduating and passing the NCLEX the first time is difficult to predict given the myriad interacting variables which influence success or failure (Uyehara, Magnussen, Itano, & Zhang, 2007). Despite this difficulty, many nursing programs use standardized assessment programs to predict student success on the NCLEX (Holstein et al., 2006). And many schools have policies which preclude students from graduating until they have reached a certain scores on these tests. Data collected in a 2011 survey conducted by the NLN indicated that 33% of RN programs required a minimum score on a standardized test to progress, 20% require a minimum score to graduate, and 12% will not allow students to register for the board exam until they reach a minimum score. But as Spurlock (2006) has indicated, little or no guidance is available to faculty who wish to set cut, or decision, scores for their progression or graduation policies, nor are there accepted policies in place as to how to best implement standardized tests (NLN, 2012).

This process of using tests to allow for progression and graduation is also known as "high-stakes" testing (NLN, 2012), and two of the most commonly used testing programs used in high-stakes testing are Health Educational Systems, Inc., (HESI) and the Assessment Technologies Institute (ATI). Although both companies have a suite of exam offerings, many schools use the HESI Exit Exam (E[2]) as an NCLEX predictor test, or the ATI Comprehensive Predictor.

ATI describes the comprehensive predictor as "a powerful tool in assessing students' readiness to take NCLEX." (ATI Research Brief) They do acknowledge that end-of-program testing may come too late for some students who are at-risk for NCLEX failure, and offer a Content Mastery Series of assessments designed to be used throughout the program. Presumably, if a student took the Content Mastery Series earlier in the program the risk of attrition at the end of the program might be decreased as issues would have been addressed earlier.

HESI also has a host of assessment products, but the one most often used to "predict" NCLEX success is the HESI exit exam (E[2]). The HESI E[2] is a 150-item comprehensive examination designed to measure student preparedness for the NCLEX-RN by using a blueprint similar to that of the NCLEX-RN examination. (HESI Exam Guide, 2014).

High-Stakes Test Scores

Most commercially available standardized predictive tests provide individual student scores linked to a reported probability of passing the NCLEX-RN. For example, according to ATI, if a student scores between an 80.7% and 100% on the RN Comprehensive

Predictor®, they have a 99% chance of passing the NCLEX, an 80%, they have a 98% chance and so on (see Table 1 for ATI scores and their reported "correlation" to NCLEX success).

80.7% – 100% = 99% (Probability of Passing the NCLEX)
78.0% – 80.0% = 98% (Probability of Passing the NCLEX)
74.7% – 77.3% = 96% – 97% (Probability of Passing the NCLEX)
72.0% – 74.0% = 94% – 95% (Probability of Passing the NCLEX)
70.0% – 71.3% = 91% – 93% (Probability of Passing the NCLEX)
68.7% – 69.3% = 89% – 90% (Probability of Passing the NCLEX)
66.0% – 68.0% = 84% – 88% (Probability of Passing the NCLEX)
64.7% – 65.3% = 81% – 82% (Probability of Passing the NCLEX)
62.7% – 64.0% = 75% -79% (Probability of Passing the NCLEX)
59.3% – 62.0% = 63% – 73% (Probability of Passing the NCLEX)
53.3% – 58.7% = 37% – 60% (Probability of Passing the NCLEX)
0.0% – 52.7% = 1% – 34% (Probability of Passing the NCLEX)

Table 1: ATI Comprehensive Predictor categories, scoring intervals and expectations

For the HESI Exit Exam (E[2]) the typical cut-score is 850, although some schools implement a cut score of 900. (see Table 2 for HESI scores and their reported "correlation" to NCLEX success)

HESI Score	Correlation to NCLEX Success
A: > 950	OUTSTANDING probability of passing
B: 900-940.9	EXCELLENT probability of passing
C: 850-899.0	AVERAGE probability of passing
D: 800-849.9	BELOW AVERAGE probability of passing
E: 750-799.9	Additional preparation needed
F: 700-749.9	Serious preparation needed
G: 650-699.9	Grave danger of failing
H: <649	Poor performance expected.

Table 2: HESI Exam categories, scoring intervals and expectations

What does the available research tell us about how well predictive tests work?

Because end-of-program tests are marketed as NCLEX predictors, much of the associated research focuses on evaluating these claims. See for example Langford and Young (2013) who report that the E[2] is 96.36-99.16% accurate in predicting NCLEX success.

In the 2013 report, Langford and Young report that of the total sample (N = 3,758), 1,560 students achieved a score of 900 or above on the E². And of those 1,560 students, 1,520 students passed the NCLEX. The authors report this result as 97.44% accurate. If we look at this another way, we might infer that only 40% of the total sample passed the NCLEX, but we don't know that as we are only seeing data from those students who scored a 900 or above on the HESI. There are 2,198 students unaccounted for. These data are from students who took the HESI and NCLEX in 2008. In that year, the overall pass rate for first-time, US-educated test-takers was 86.7% and so are we to assume that the total sample had a 40% pass rate? Or, are we not getting an complete picture? Research indicates that while predictive tests may predict high-performing students who are likely to pass the NCLEX, they are much less precise in identifying the likelihood of failure (Spurlock, 2006; Spurlock and Hunt, 2008). This distinction in describing the accuracy of a test is especially important when progression policies (such as those described above) are in place.

Consider this example.

I look around the room at 100 people and I spot a couple with really shiny, white teeth. I predict that these people (2% of the group) will brush their teeth that evening. I make no prediction as to who in the group of 100 won't brush their teeth. If, lo and behold, everyone brushes their teeth that evening (including the two I said would), I can say that my prediction was 100% accurate; because the 2% of the group I said would brush their teeth actually did. And I made no statement one way or the other about the remaining 98% of the group.

Is this helpful information? Not really. Because what about all the other people I didn't predict would brush their teeth? I was wrong about them inasmuch as I did not make a prediction either way. I did not predict that they would brush their teeth, nor did I predict they would not.

HESI Data and NCLEX Pass Rates

Below are some graphs and study summaries to further illustrate this point. Data in Figure 1 are from Lewis (2006) as presented by Spurlock (2012).
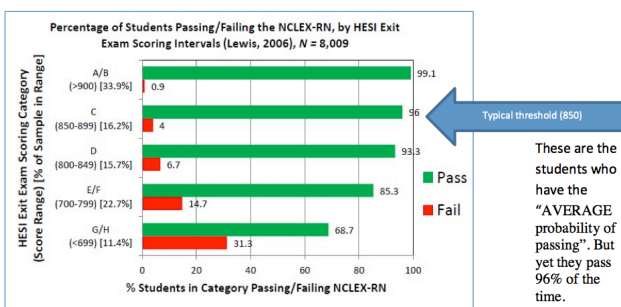

Figure 1: Percentage of students passing/failing the NCLEX-RN

Data in Figure 1 indicate that in all of the scoring categories, a high percentage of students pass the NCLEX, Students who score 850 or above have between 96-99.1% pass rate, but even those who score between 700-799 pass 85.3% of the time (and that is ABOVE the national average in 2013 which was 83% down from 90.34% in 2012).

When using a cut score of 900 (above which students progress, below which they do not), only 13% of those in the "do not progress" group actually failed the NCLEX when they took it. This means that 87% of these students who are told they have not meet the "standard" actually could pass the NCLEX.

Data in Figure 2 are adapted from: Nibert, A. T., Young, A., & Adamson, C. (2002), as presented by Spurlock (2102).
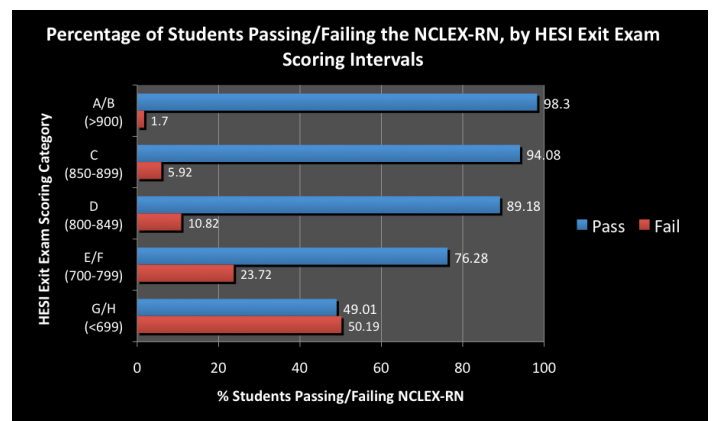

Figure 2: Percentage of students passing/failing the NCLEX-RN

Of the total population (N = 5,903) the proportion of students in each category was:
 • A/B: 35%,
 • C: 17%,
 • D: 17%,
 • E/F: 22%,
 • G/H: 9%

Nibert et al., (2002) found that when using a cut score of 900, only 19% of those in the "do not progress" group actually failed the NCLEX when they took it—again the HESI exam was wrong about 81% of this group.

In another study (Lauchner, Newman, & Britt, 2008), 2,613 RN students (1,991 ADN, 563 BSN and 59 diploma) took the E². Schools were asked to report the number of students who were predicted by the E² to pass the NCLEX, but did NOT pass.

The exams were scored using "HESI's predictability model"—this model is not described in the literature and so it is difficult to form opinions on its validity or effectiveness.

A table showing the results is below. What we see here are low percentages of students expected to pass (for example 49% of ADN students and 42% of BSN students), and low numbers of students who were predicted to pass but didn't. What this means is that the HESI exit exam is giving a lot of false negative results, or in other words, telling a lot of people they won't pass, when they end up passing, and only telling a small number that they will pass and then they end up not.

Most striking about the results presented is this: If we look at the total RN number, the information in Table 3 shows that 1,248 RN students (48.4% of the total sample) were predicted to pass the NCLEX. Of those 1,248 students predicted to pass, 34 did not pass. This is a 2.7% "error rate".

But what about the other 1,307 students who were NOT predicted to pass? What was their outcome? Surely if they were not predicted to pass, they are predicted to fail, but we don't know if they did. And if they didn't fail, then this should factor into the accuracy of the predictions being made. So there were, in this sample, 1,307 students who were not predicted to pass. And if they passed at the national NCLEX passing average for 2008 (86.7%)—the results would look very different. If the remaining students who were NOT expected to pass, ended up passing at the national average, there would have been 1,133 students who passed when they were told they would fail. This would mean that the predictive model was WRONG 86.7% of the time.

HESI Exit Exam Predicted Passes on NCLEX that Failed by Program			
Program	Number (%) of Respondents	Number (%) of Respondents Predicted to Pass	Number of Predicted Passes that Failed
RN			
ADN	1976 (77.34)	986 (49.90)	27
BSN	520 (20.35)	218 (41.92)	7
Diploma	59 (2.31)	44 (74.58)	0
Total RN	2555 (100)	1248 (48.84)	34
PN	170 (100)	65 (38.24)	0
Total RN and PN	2725 (100)	1313 (48.18)	34

RN = registered nurse; AND = associate degree students; BSN = baccalaureate students; PN = practical nurse.

Table 3: Study table indicating HESI Exam Predictions (from Lauchner, Newman, & Britt, 2008)

The study goes on to say: "The E^2 was found to be highly predictive of students' success on the licensing exam. The accuracy of E^2 predictions of success on the NCLEX was so close to the students' actual outcome on the licensing exam, that the probability that these results could have occurred by chance alone was infinitesimal…" (Lauchner, Newman, & Britt, 2008, p. 7).

ATI and NCLEX pass rates

Fewer studies have been conducted on the use of ATI as a predictor of NCLEX success. This may be because according to survey studies (e.g., Crow et al., 2004), the ATI predictor is a less commonly used test than the HESI.

In a study published by ATI (*Evaluating the predictive power of ATI's RN Comprehensive Predictor, 2010*), Leawood describes an effort to explore the relationship between ATI scores and student NCLEX success.

Students took the ATI and then were asked if they would consent to providing their NCLEX outcome. 102,329 students opted into the study, but students were excluded if they were not first-time test takers and if they were at a school with fewer than 30 volunteers. Of these 102,329 students, 7,126 (~7%) were eligible for the study. This low rate of acceptance into the study is not discussed by the author.

Research questions from the study are presented below:

Research question 1: At what rate do students taking the ATI predictor pass the NCLEX?

What this is really saying is of the schools selected, what is the NCLEX pass rate? The question really has nothing to do with the predictor test outcomes. This information is descriptive in nature and would not provide any information about the relationship of scores on the ATI and NCLEX outcome. It could potentially be useful in comparing NCLEX pass rates between schools who use predictor tests and those that do not. But again, this information alone would provide no indication of accuracy of prediction.

Research question 2: How well do scores on the ATI predictor predict NCLEX outcome?

Research question 3: How does the probability of pass score predict actual pass rates on the NCLEX?

Findings

RQ1: 91.9% of the students in the sample (or 6,550) passed the NCLEX.

RQ2 and RQ3: In the sample, 4,268 students/7,126 students (~60%) scored in the "probability of passing" interval between 90-100%. Looking at the score table above, we can see that this includes those students who scored 70% or higher on the predictor. Of the students who were in this group (N = 4,268), ATI predicted that 96% would pass, and actually 98% of this group passed. So ATI would say they did a "good job" at predicting NCLEX success.

But, 6,550 students actually passed the NCLEX. Which means than 2,282 students who passed the NCLEX were below the 90% predictor level, but they still passed. In other words, the predictor test results predicted that 4,268 students had between a 90-100% chance of passing the NCLEX, but in fact over 50% more of the group passed. This is significant because in schools where there is a cut score for the predictor tests, it tends to be 95% and above probability of passing. If a school had implemented such a policy, and if we assume that half of the students were in the 90-95% band and the other half in the 95.1%-100% band, this would mean that 4,416 students would be below the 95% threshold and yet they actually passed the NCLEX

Looking at this another way:

The sample included 7,126 students who were, as we saw above selected in a non-random and self-selecting way and represented only 7% of students who volunteered. So we would hypothesize that they are not necessarily representative of the overall population. Furthermore, that they volunteered to have their scores reported introduces some additional potential bias. Of the 7,126 students in the sample, the ATI test predicted with a 90-100% probability rate that 4,268 of them would pass the NCLEX. That is a 59.9% pass rate. Depending on the time of year tested and the year, the NCLEX pass rates for first-time, US-educated test takers are usually between 80-90% +/1.

So ATI says they predict that 59.9% of students will pass the NCLEX (with a 90-100% probability) when usually around 90% pass. This is an incredibly conservative prediction and one that almost certainly could not be disproven.

Again what we see here is a tendency to predict fewer people are likely to pass than actually do. The author goes on to say that the fact that more student pass than were predicted is evidence that they used the information to remediate. This is possible, although there is no data gathered on this and if schools are making progression decisions based on these data then remediation would not necessarily have any impact.

Are there factors associated with higher NCLEX pass rates?

- Seldomridge and DiBartolo (2004) found that a combination of average score in advanced medical-surgical nursing as well as the percentile score on the NLN Comprehensive Achievement Test for Bacculaureate students predicted 94.7% of NCLEX-RN passes and 33% of failures.

- Crow et al., (2004) used a survey measure to determine the best predictors of NCLEX-RN success used by BSN programs. Survey respondents were 160 students. Results indicated that the most significant predictors of NCLEX pass rates included the use of standardized entrance exams and SAT scores for admission criteria, mental-health and community health nursing exam scores (these were only used by some of the sample). The use of an exit exam and clinical proficiency were also positively related to NCLEX pass rates.

- Besson and Kissling (2001) used a retrospective analysis to look at predictors of success for baccalaureate nursing graduates on the NCLEX. Students who passed the NCLEX had fewer C grades (or below) and scored higher on the Mosby AssessTest than those who failed. Additionally, students who passed the NCLEX had higher scores in their biology courses and higher sophomore GPAs than those who did not pass.

- Heupel (1994) looked at the relationship between academic predictors and NCLEX success. The sample included a retrospective analysis of data from 152 students in a baccalaureate nursing program. The best predictors of NCLEX success were grades in a sophomore nursing theory course, junior GPA, senior nursing theory course grade.

- Poorman and Martin (1991) explored the role of non-academic factors in helping predict NCLEX success. Research findings indicated that test anxiety was inversely related to passing score on the NCLEX. Academic aptitude positively correlated with passing score on the NCLEX.

- Campbell and Dickson (1996) conducted a meta-analysis looking at predictors of NCLEX success. They found that across the 47 studies examined, most were descriptive in nature, used convenience samples and identified (most frequently) GPA in science and nursing courses as the best predictors of NLCLEX success.

NLN Guidelines and Recommendations on High-Stakes Testing and Progression Policies

In response to the issue of using high-stakes testing as a progression policy, the NLN published the The Fair Testing Imperative in Nursing Education report (2012) which states:

"Across the United States, an increasing number of schools of nursing are implementing progression policies (Spurlock, 2006). But because there are no universally accepted standards for how predictive tests and related policies should be implemented, individual schools struggle to implement policies and standards on their own."

The NLN conducted a survey in 2011 to determine how widespread these issues were. For RN programs, initial findings indicated:

- Approximately one in three schools require pre-licensure RN students to obtain a minimum score on a standardized test in order to progress.

- Twenty percent of schools require a minimum test score to graduate.

- Twelve percent of schools will not forward students' names to state boards for licensure exam registration unless they reach minimum standardized test scores.

- Twelve percent of schools require that students meet minimum score levels at more than one point, or juncture, in the program. (NLN, 2012, p. 2).

Essentially what we see happening is schools are implementing progression policies which make sure that only those people who they are very certain will do well on the NCLEX are able to progress through the program, graduate the take the exam. As Giddens (2009, p. 124) noted, "Is there really anything to celebrate when a nursing program with only a 50% persistence to graduation rate boasts of a 100% first-time [test taker] NCLEX-RN pass rate?"

The NLN (2012) put forth guidelines in which they urge nursing programs to:

- Use multiple sources of evidence to evaluate basic nursing competence

- Make sure that tests and other evaluative measures are used not only to evaluate student achievement, but, as importantly, to support student learning, improve teaching, and guide program improvements.

- Make sure that faculty are held responsible for assessing students' abilities and assuring that they are competent to practice nursing, while recognizing that current approaches to learning assessment are limited and imperfect.(NLN, 2012, p. 4).

Furthermore, Spurlock and Hunt (2008) suggest that:

"Best practices in testing and assessment require faculty to perform a more comprehensive assessment of students' abilities and to not rely on one predictor alone when making important educational decisions."

"Focusing on studying for an exit examination (in this case the HESI E^2) that has little use in predicting NCLEX-RN failure seems a poor use of end-of-program students' time.

Looking at a single, clinical-only indicator to represent students' readiness for graduation devalues the rest of their education, whether it occurred in a community college, diploma school, or university setting" (Spurlock & Hunt, 2008). This means not making an important decision, like whether a student will graduate or not, on the basis of a single test score.

In short, we should not be making important educational decisions—for example regarding students' readiness for graduation—based only on information provided by single test score. The use of student achievement data to make educational decisions must be based on a variety of data sources and must also be grounded in sound interpretations and hypotheses about how data relate to student performance.

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