

## RESEARCH BRIEF:

### *Using RN Content Mastery Series test data to identify student needs*



*Although end-of-program testing is an important indicator of readiness for NCLEX, it often comes too late to help those students most at risk for failure. Formative information about students' content mastery as they progress through the nursing program is of key importance. However, educators may struggle to determine which indicators and benchmarks of student learning are most indicative of a need for remediation. This paper evaluates the utility of ATI's Content Mastery Series (CMS) assessments in providing information about students' probability of passing NCLEX, as defined by the Comprehensive Predictor. Proficiency level scores and the relative contribution of each of the CMS assessments are discussed.*

## INTRODUCTION

An institution's NCLEX pass rate is one of the key indicators by which it is judged (CCNE, 2009; NLNAC, 2011). In light of the impact of NCLEX failure on both the institution and its students, many institutions have chosen to implement predictive testing at the close of a program in order to identify those students at risk of NCLEX failure. ATI's Comprehensive Predictor is one such assessment; aligned with the NCLEX blueprint and providing both percentage-correct and probability-of-pass scores, the Comprehensive Predictor can be a powerful tool in assessing students' readiness to take NCLEX.

Unfortunately, for many students, end-of-program testing comes too late to identify and prevent program attrition and NCLEX failure. Recent research indicates that the second most common point of attrition is near the end of the program, when the unsuccessful student has occupied a seat and taken up a maximum amount of valuable program resources (Dunham, McKee, & Nash, 2012). An earlier indicator of at-risk status is needed.

Assessment Technologies Institute's RN Content Mastery Series (CMS) is a group of nine content assessments aligned to the NCLEX-RN blueprint and designed to measure mastery in the major nursing content areas as students progress through the program. The

benefits of CMS tests as potential indicators are that they are standardized, secured, aligned to NCLEX, and used by multiple programs in multiple settings. Accordingly, ATI determined to investigate the utility of these assessments in the early identification of student needs.

As such, the following research questions are explored in this paper:

- *How are scores on the Content Mastery Series tests related to scores on the Comprehensive Predictor?*
- *How does the number of CMS tests on which a student is successful relate to scores on the Comprehensive Predictor?*
- *How does the number of CMS tests on which a student is successful relate to the probability of passing the NCLEX?*
- *Which CMS tests are most predictive of scores on the Comprehensive Predictor?*

## METHODOLOGY

For these analyses, data were available for 2440 RN students who had taken all nine 2007 Content Mastery Series assessments and the 2010 RN Comprehensive Predictor (CP). It should be noted that the majority of programs do not administer all nine CMS assessments. However, in order to make comparisons across all assessments, only those students having complete sets of data were included.

Percentage correct scores were available for each CMS assessment as well as the Comprehensive Predictor. Additionally, scores on the CMS tests were transformed into proficiency scores based upon the cut score study performed by ATI. For more information on the procedures used to derive the proficiency levels, as well as the specific cut scores for each assessment, the reader is directed to the executive summary for the RN Content Mastery Series standard setting study (ATI, 2007). For the Comprehensive Predictor, percentage correct scores were converted to a probability of passing NCLEX based on the expectancy table developed for the assessment (ATI, 2010).

*Seventy-eight percent of students who were successful on all 9 CMS tests were "highly likely to pass NCLEX."*

Correlations show that there is a moderate to strong relationship between scores on each of the CMS tests and the Comprehensive Predictor; the strongest zero-order correlation with CP is Adult Med-Surg ( $r=.577$ ) and the weakest is Community Health ( $r=.376$ ).

**CMS Proficiency Levels and Comprehensive Predictor achievement**

Because proficiency-level rather than percentage-correct scores are often used to inform faculty decisions, proficiency-level scores were examined in relation to Comprehensive Predictor scores. Specifically, for this analysis, success on a CMS assessment was defined as achievement at Level 2 or above. Individuals were then grouped according to the number of CMS tests on which they were successful (0 to 9), and the mean CP scores for each of these groups were compared (Table 2).

**RESULTS**

***Relationship between CMS and Comprehensive Predictor test scores***

In order to evaluate the relationship between scores on each of the Content Mastery Series tests and the Comprehensive Predictor, the correlation between each assessment and the Comprehensive Predictor was calculated, shown in Table 1.

*Table 1. Correlation between each CMS assessment and Comprehensive Pred*

<b>Assessment</b>	<b>r</b>
Adult Med-Surg	.577
Community Health	.376
Fundamentals	.487
Leadership	.507
Maternal Newborn	.527
Mental Health	.510
Nursing Care of Children	.505
Nutrition	.541
Pharmacology	.507

Note: All correlations significant,  $p<.001$ .  
N=2440

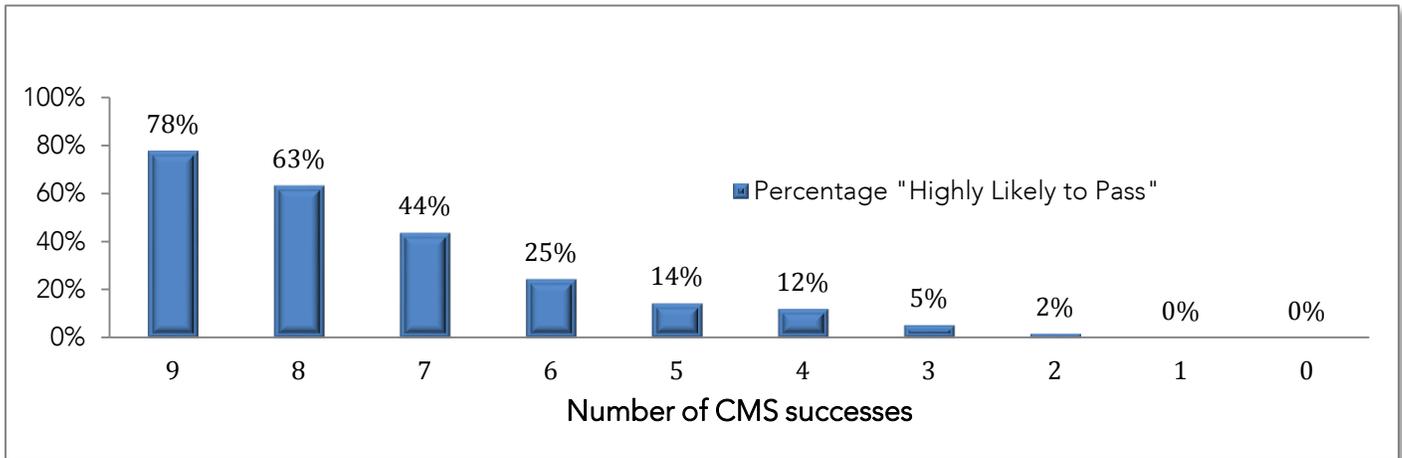
*Table 2. Comprehensive Predictor means by number of CMS test successes*

<b># of CMS Successes</b>	<b>n</b>	<b>Mean</b>
9	348	78.03
8	347	75.53
7	322	73.17
6	309	70.64
5	297	68.31
4	286	67.15
3	222	64.20
2	165	62.33
1	111	58.28
0	33	55.98

$F(9,2421)=260.1, p<.001$

The pattern of Comprehensive Predictor group means shows that the group with the highest mean score was successful (Proficiency Level 2 or above) on all 9 CMS tests. With each

Figure 1. Percentage of students in each CMS success group considered “highly likely to pass”



unsuccessful test score, the group mean drops an average of 2.45 points (range: 1.16-4.04). While this decline in mean Comprehensive Predictor scores is both statistically significant and meaningful, it may be difficult to interpret in terms of actual student outcomes. To facilitate a practical interpretation, students' CP scores were dichotomized on the basis of their associated predicted probability of pass. For the purposes of this analysis, students with a 96% or greater probability of passing NCLEX were classified as being “highly likely to pass.” This dividing point was intentionally set at a high score point in order to support the classification of “highly likely to pass,” and in no way suggests that institutions should set a similarly stringent benchmark for achievement on the Comprehensive Predictor. Figure 1 displays the percentage of students in each CMS success group who were classified as being “highly likely to pass.”

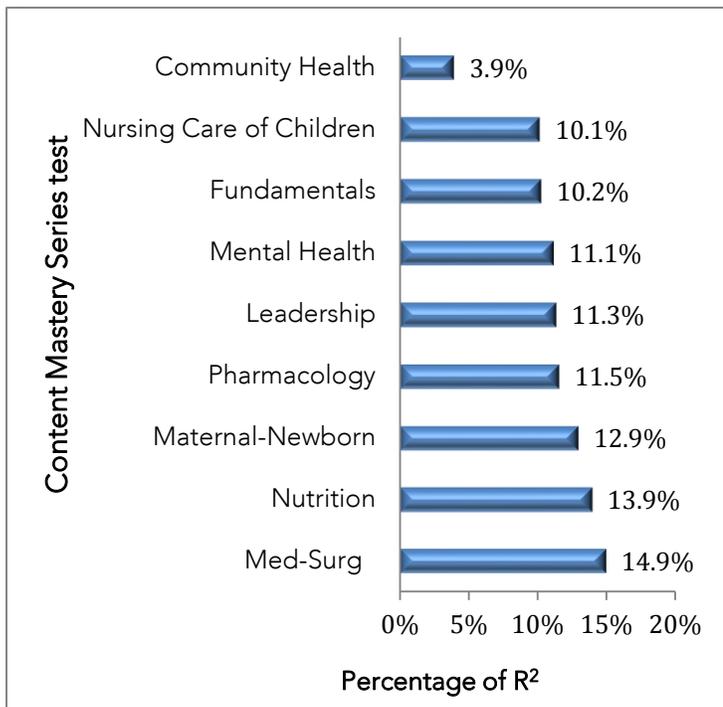
Seventy-eight percent of students who were successful on all 9 CMS tests were “highly likely to pass NCLEX.” This percentage dropped to 63% for students successful on eight CMS tests, and to 44% for students successful on seven. The percentage of students in the “highly likely to pass” category continued to decrease with each additional unsuccessful CMS test.

### ***CMS scores as predictors of Comprehensive Predictor achievement***

While Figure 1 shows the impact of CMS test failure on the classification of “highly likely to pass,” it does not explain the contribution of individual content area tests to the prediction of achievement on the Comprehensive Predictor. Regression analysis of the data showed that, taken together, the set of 9 Content Mastery Series exams explains 56% of the variability in Comprehensive Predictor scores ( $R^2 = .563$ ,  $p < .01$ ). In order to examine the relative contribution of each exam in a set of highly correlated predictors, a relative weights analysis (Tonidandel & LeBreton, 2011) was performed. Figure 2 shows the percentage of accounted-for variance attributed to each of the CMS tests.

An examination of the relative weights shows that the three CMS tests that contribute the most to prediction of CP performance are Med-Surg, Nutrition, and Maternal-Newborn (14.9%, 13.9%, 12.9% of  $R^2$  accounted for, respectively), while Community Health makes the least contribution (3.9%). With the exception of Community Health, all of the CMS tests make substantial contributions toward the prediction of CP performance.

Figure 2. Relative contribution of CMS tests to prediction of CP score



## CONCLUSION

These analyses of the Content Mastery Series assessments show that they are a powerful source of information about students as they progress through the program.

Group Comprehensive Predictor means show that as students fail to achieve Proficiency Level 2 or above on even one CMS test, the percentage of students classified as “highly likely to pass NCLEX” (96% or above) drops dramatically. For educators, this should translate into a bias toward action. While it can be tempting to excuse poor performance on a single test as “a bad day” or a “fluke,” these data show that doing poorly on even one test significantly impacts students’ performance on the Comprehensive Predictor. As a result, educators should not hesitate to provide assistance and remediation opportunities to students at the first sign of lagging CMS performance.

Additionally, the relative weights analysis provides evidence that eight of the Content Mastery Series tests contribute substantially to

the prediction of Comprehensive Predictor performance. While Med-Surg, Nutrition, and Maternal-Newborn contribute the most, even those ranked at the bottom (with the exception of Community Health), still explain at least 10 percent of the accounted-for variance in CP scores. Thus, although conventional wisdom may argue that Pharmacology or Med-Surg are better predictors of ultimate program success, the data here suggest that all of the tests have valuable information to contribute to our understanding of student mastery.

Programs not currently using all of the Content Mastery Series exams may find that they are losing valuable information by not administering the full battery of available assessments. And, when programs must administer a subset of tests due to constraints on time or resources, this relative weights analysis can help them choose assessments that are most useful in identifying student needs.

## REFERENCES

- Assessment Technologies Institute. (2007). *RN Content Mastery Series 2007 national standard setting study: executive summary*. Stilwell, KS: ATI.
- Assessment Technologies Institute. (2010). *RN Comprehensive Predictor 2010 and NCLEX-RN readiness*. Stilwell, KS: ATI.
- Commission on Collegiate Nursing Education. (2009). Standards for accreditation of baccalaureate and graduate degree nursing programs. Retrieved May 29, 2012, from [http://www.aacn.nche.edu/ccne\\_accreditation/standards09.pdf](http://www.aacn.nche.edu/ccne_accreditation/standards09.pdf).
- Dunham, M., McKee, J., & Nash, B. (2012, April). *Standardized testing and educational outcomes: recent research findings*. Paper presented at the ATI National Nurse Educator Summit, Scottsdale, AZ.
- National League for Nursing Accrediting Commission, Inc. (2011). 2008 edition of the NLNAC accreditation manual. Retrieved May 29, 2012, from <http://www.nlnac.org/manuals/NLNACManual2008.pdf>.

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