

# PROPHECY® VALIDATION STUDY EXECUTIVE SUMMARY

*A validated holistic pre-employment test for nurses*



Between 2008 and 2011, three testing firms partnered with Saint Francis Medical Center and Frederick Memorial Hospital to conduct one of the largest and most comprehensive test validation research projects in the history of the nursing profession. Over 900 professionals were involved, including: 13 test development professionals, over 30 film professionals, 492 nursing staff from Saint Francis Medical Center, and 384 nursing staff from Frederick Memorial Hospital.

The research study investigated the effectiveness of three different types of pre-employment tests used for hiring nurses:

- **CLINICAL:** Written tests designed to measure *job knowledge* relevant to specific clinical practice areas (e.g., Labor & Delivery, Medical-Surgical).
- **SITUATIONAL:** Video-based, situational judgment tests designed to measure interpersonal competence in hospital-related situations. The test included 21 video scenarios that presented complex interpersonal situations that occur in hospital settings, such as interacting with patients, physicians, and other co-workers.
- **BEHAVIORAL:** Personality/behaviorally-based test designed to measure Conscientiousness, Tough-Mindedness, Conventional, Extroversion, Stability, Teamwork, and Good Impression.

The study was completed in five phases and took over three years to complete. Each phase is summarized below.

## Study Phase One: Defining and Rating Job Performance

The first phase involved the development of a Job Performance Rating Survey that included 19 critical aspects of nursing job performance, such as Problem Solving, Report Transitioning, Following Clinician Instructions, and Patient Care Plan Management (see Table 1). The 39 nurse supervisors (from both hospitals) who participated in the study used this Survey for providing job performance ratings on the 837 nurses who participated in the study.

Table 1. Job Performance Rating Survey Dimensions.

Job Performance Rating Survey Dimensions		
Honest & Conscientious	Conflict Resolution	Problem Solving
Verbal Communication	Accountability	Patient Care (calm & competent)
Administering Medications	Critical Thinking	Report Transitioning
Assertiveness	Multitasking	Continuous Observation
Change Adaptation	Following Clinician Instructions	Developing Patient Relationships
Patient Care Plan Management	Patient Customer Service	New Technique Application
	Delegating/Managing Patient Care	

Each of the 837 nurses in the study were rated on these 19 dimensions using a 1-10 rating scale. These ratings were then correlated to the nurse test scores from the Clinical, Situational, and Behavioral assessments to obtain a correlation coefficient. This correlation coefficient allows us to evaluate the strength of the relationship between test scores and job performance. Correlations range between a value of 0 (no relationship) to 1.0 (perfect relationship), with higher correlations indicating stronger relationships. In personnel testing research, finding correlations that range between .20 and .30 are desirable, but sometimes correlations lower than this can still provide beneficial utility for hiring situations. Correlations that exceed .30 are seldom achieved in test research, but are coveted when found.

The United States Department of Labor has established guidelines for interpreting the strength of correlation coefficients found when conducting personnel testing research:

Table 2. U.S. Department of Labor Guidelines for Interpreting Validity Coefficients.

U.S. Department of Labor Guidelines for Interpreting Validity Coefficients		
Coefficient Value	Interpretation	Percentage of Job Performance Explained
Above .35	Very beneficial	12.3%+
.21 - .35	Likely to be useful	4.4% - 12.3%
.11 - .20	Depends on circumstances	1.2% - 4%
Below .11	Unlikely to be useful	<1.2%

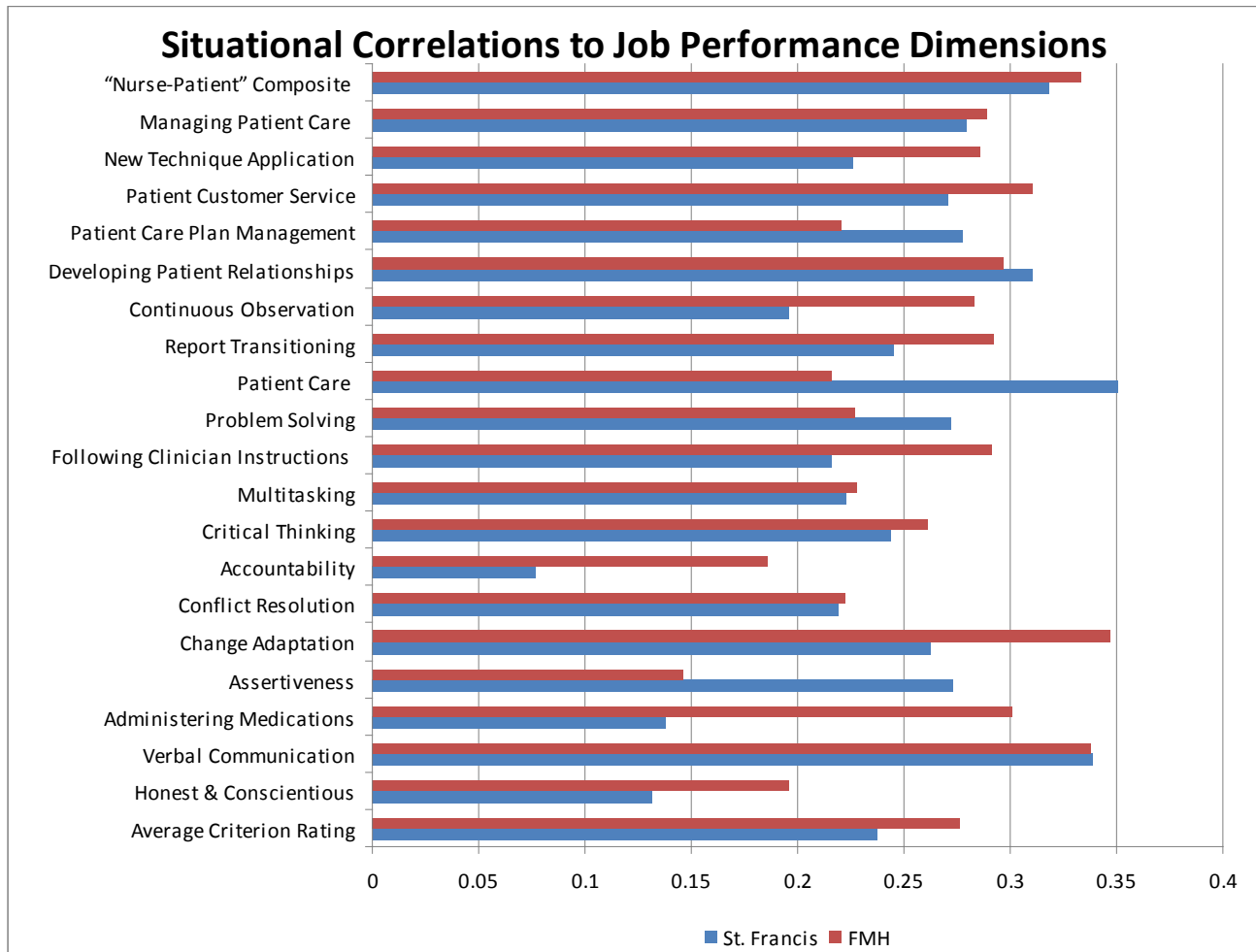
Source: U.S. Department of Labor (2000), *Testing and Assessment: An Employer's Guide to Good Practices* (p. 3-10).

Notice that correlations that range between .21 and .35 are "likely to be useful" because they explain between 4.4% and 12.3% of the variability that occurs with job performance. For example, a correlation of .30, when squared, results in a figure of 9%, so a test with a correlation at this level to job performance would explain about 9% of the variance that occurs with job performance in the workforce. Using such a test in the hiring process would provide strong leverage for selecting employees who will have substantially higher job performance levels. Our research study revealed correlations of this level (and higher) for several of the tests and job performance criteria that were evaluated.

## Study Phase Two: Situational Test Development

The video-based Situational test was developed during the second phase of the study by using job analysis and validation input from nursing staff at Saint Francis Medical Center. The team developed over 30 videos that are designed to measure interpersonal competence using complex scenarios that typically occur in hospital settings. A team of nurse subject-matter experts developed 4-5 possible response alternatives for each video, then a panel of 50 nurse supervisors ranked the alternatives from “most effective” to “least effective.” Finally, the final test was cross-validated and refined through a study conducted at Frederick Memorial Hospital, and reduced to a final set of 21 videos. The resulting test battery demonstrated significant correlations to job performance ranging between .20 and .33, with the highest correlations observed in the areas of Developing Patient Relationships and Patient Customer Service.

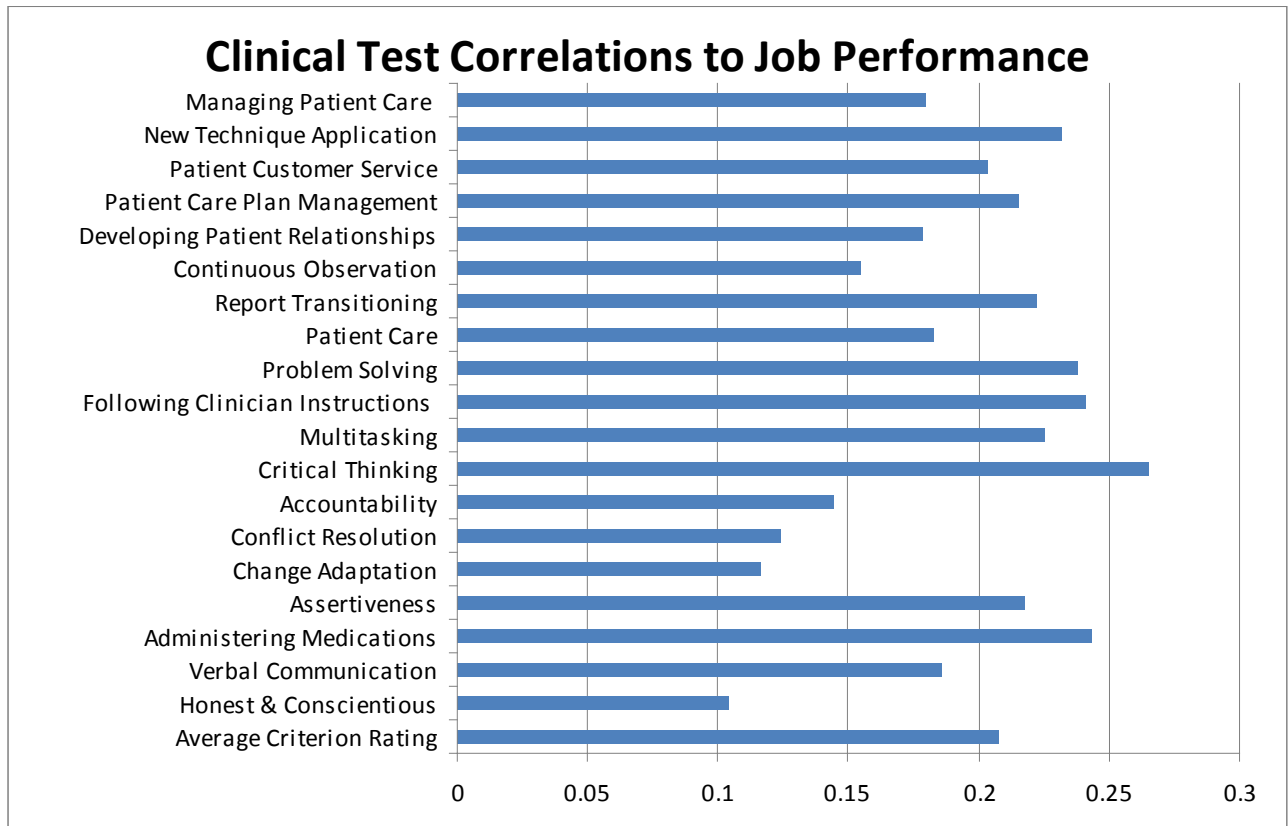
Figure 1. Situational Correlations to Job Performance Dimensions.



### Study Phase Three: Clinical Test Validation

The third phase involved evaluating the statistical validity of the Clinical Assessments, which included 12 written, multiple-choice tests designed to measure job knowledge mastery of various nurse practice area. While these tests are based on a content-validation strategy (where they are rationally connected to critical aspects of the job), they also demonstrated significant correlations to job performance (as high as  $r = .26$ ), with the highest relationships in areas that would be expected by using a written test (e.g., Critical Thinking, Problem Solving, and Report Transitioning).

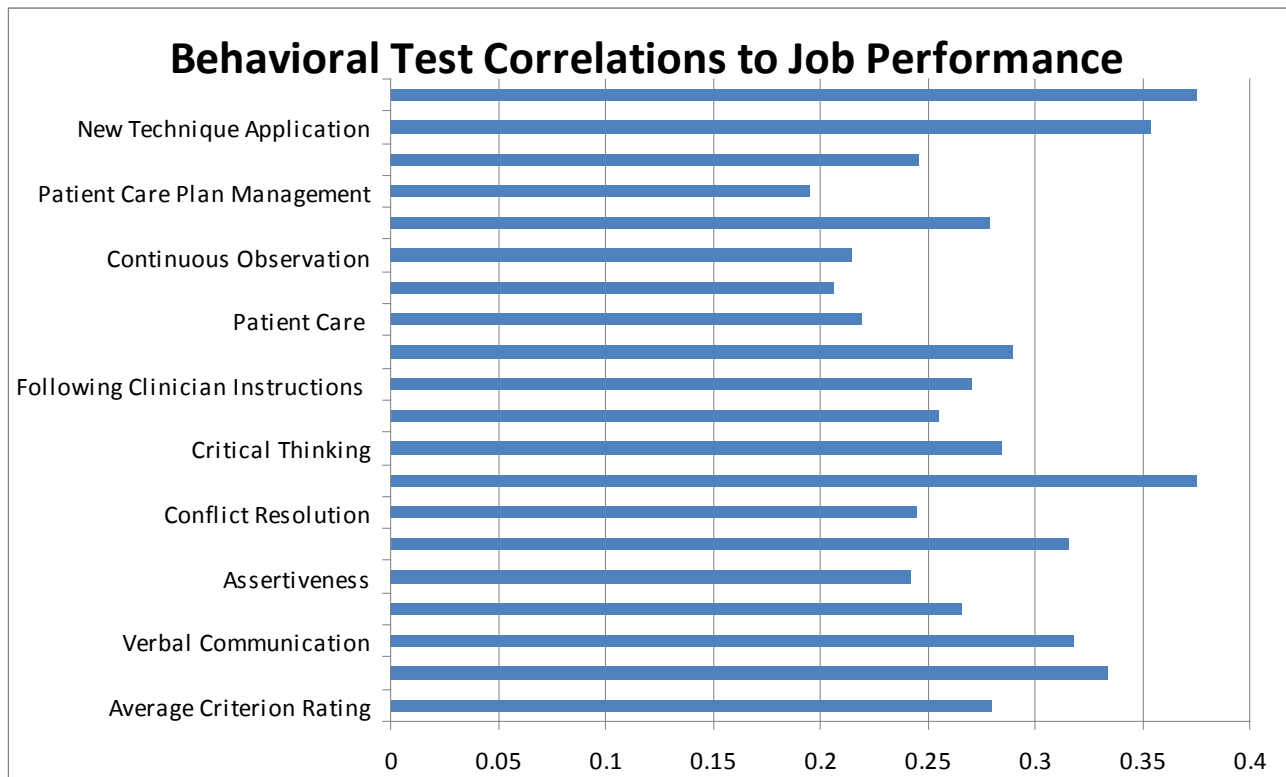
Figure 2. Clinical Test Correlations to Job Performance.



### Study Phase Four: Behavioral Test Validation

The fourth phase evaluated the validity of the Behavioral Assessments. A 70+ item behavioral/personality test was correlated to the 19 job performance dimensions to evaluate which personality traits effectively predict nurse performance. A final “Nurse Effectiveness Scale” was developed as a derivative of the 70+ available items using a split-half/hold-out validation study design. The resulting correlations exhibited strong relationships with job performance in the .20s to .30s in areas such as Honest and Conscientious (work practices), Accountability, and Managing Patient Care.

Figure 3. Behavioral Test Correlations to Job Performance.



### Study Phase Five: Combining the Tests

The fifth and final phase involved combining the datasets from all four study phases and using Structural Equation Modeling (SEM) techniques to derive a set of weights that can be applied in the scoring process when all three assessments are administered in hiring situations. This research revealed optimal weights of 26.4%, 32.9%, and 40.7% for the Clinical, Situational, and Behavioral Assessments, respectively. This research also revealed that the combined set of tests produces a (corrected) theoretical correlation to job performance of  $r = .67$ , which explains 45% of job performance variance.

Because personnel tests typically provide only limited correlations to job performance (often ranging in the .15 to .25 range for single tests), this level of validity (.67) explaining 45% of job performance (derived by squaring the .67 correlation) should be viewed as *outstanding*. In actual practice, only rarely do researchers encounter tests with correlations in this range (see Table 2 for U.S. Department of Labor guidelines that classify this validity level as *very beneficial*). Table 3 provides a ranked list of job performance dimensions that were predicted by each assessment.

Table 3. Top Six Ranked Performance Dimensions Predicted by Each Assessment.

Top Six Ranked Performance Dimensions Predicted by Each Assessment		
Clinical Assessment	Situational Assessment	Behavioral Assessment
Administering Medications	Patient Care (Calm & Competent)	Accountability
Problem Solving	Developing Patient Relationships	Honest & Conscientious
Report Transitioning	Verbal Communication	Conflict Resolution
Critical Thinking	Patient Customer Service	New Technique Application
Multi-Tasking	Patient Care Plan Management	Delegating/Managing Patient Care
Assertiveness	Conflict Resolution	Change Adaptation

We found it interesting that each different assessment type—the Clinical, Situational, and Behavioral—gravitated towards related areas of job performance. Figure 4 displays the ranked predictive effectiveness of each Prophecy Assessment, with the assessment logos closest to the center indicating stronger correlations with the specific job performance dimension noted.

Figure 4. The Prophecy Wheel (Displays Ranked Predictive Effectiveness of Each Assessment).

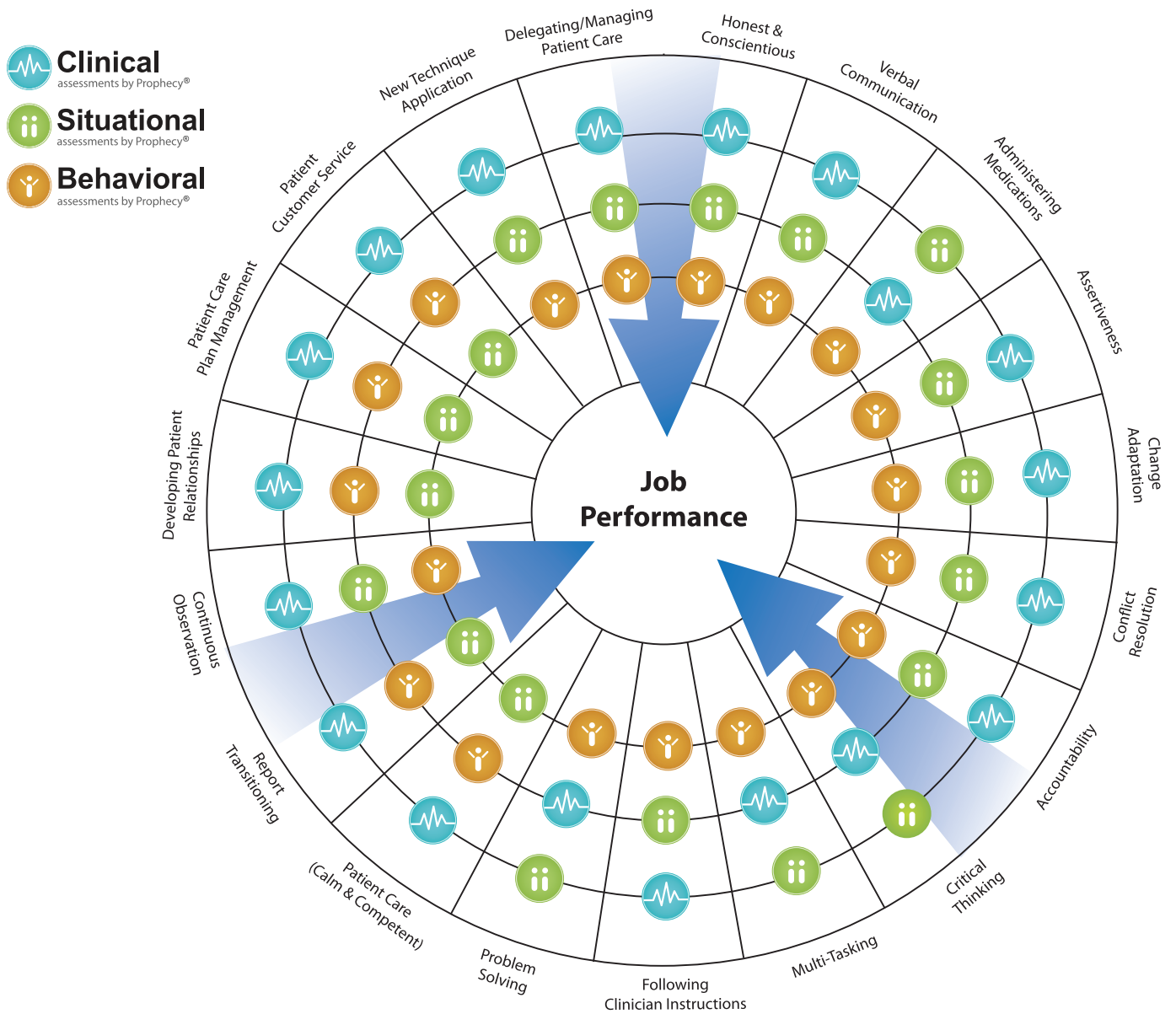
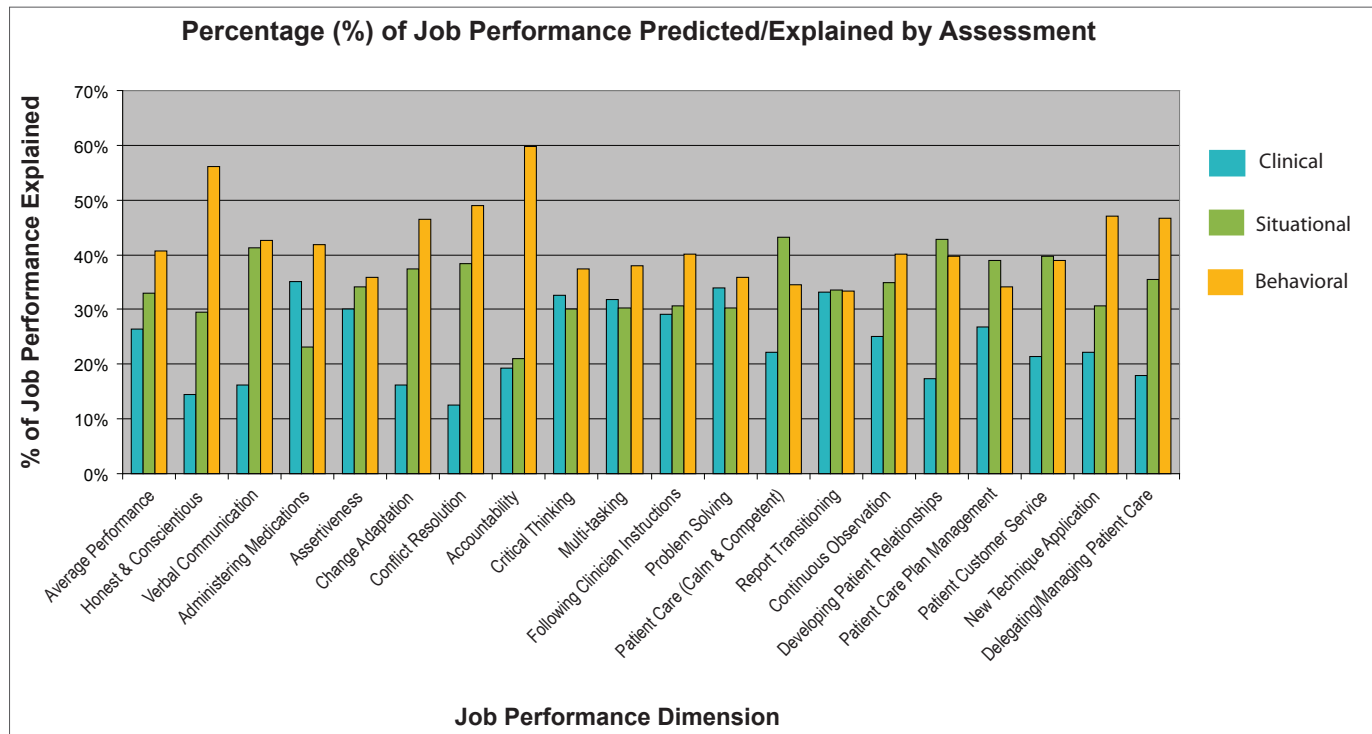




Figure 5 shows the power of each of the three tests to predict the 19 different dimensions of job performance.

Figure 5. Percentage of Job Performance Predicted/Explained by Assessment (Graphical Representation).

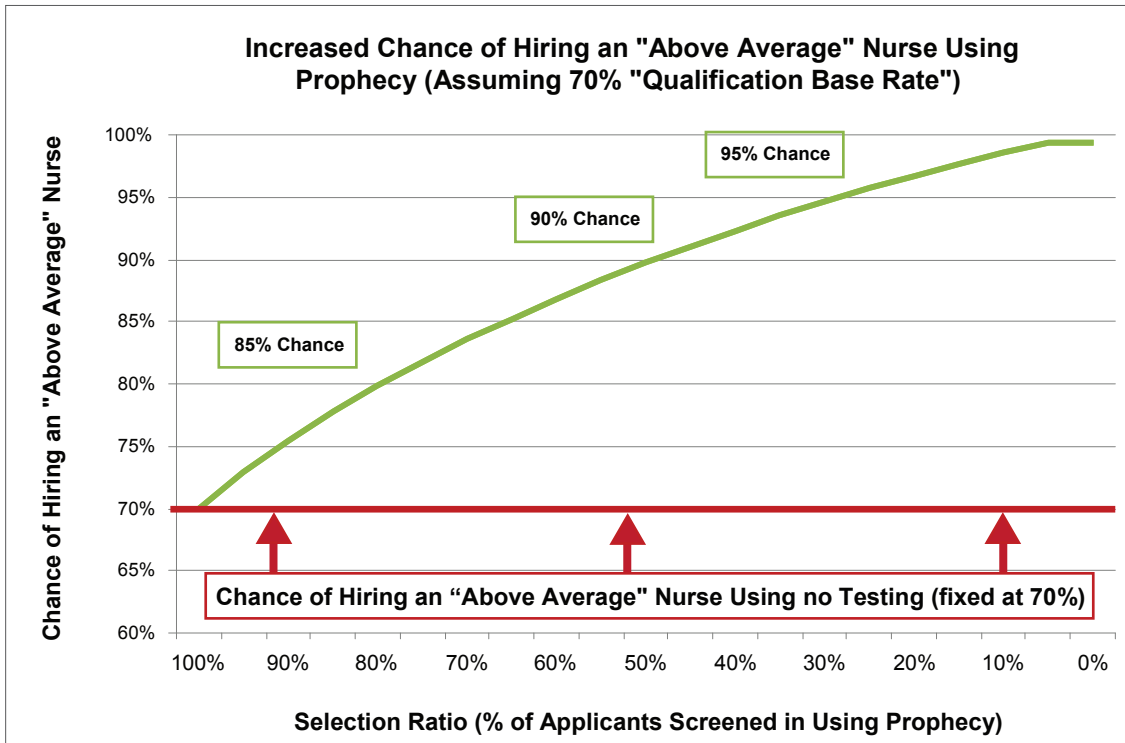


### Practical Implications for Hospitals Using the Prophecy Assessments

Using a test that has shown significantly high correlations to job performance *practically guarantees* an improved workforce. The correlation coefficient of a test can be used for modeling hiring scenarios that will have different outcomes with the resulting workforce. Modeling such scenarios requires making various assumptions regarding two factors: the Base Rate and the Selection Ratio. The Base Rate refers to the percentage of the applicant pool that is qualified at the desired level. For example, medical facilities that draw from a highly-qualified nurse applicant pool may have high Base Rates, with as much as 70% of the nurse applicants showing up with the desired skill levels. The Selection Ratio simply refers to the percentage of nurse applicants who will be tested and subsequently hired. For example, a 50% Selection Ratio indicates that about half of the tested nurse applicants will be hired.

These factors can be used along with the correlation coefficient from a study (in this case,  $r = .67$ ) to model hiring outcomes that will emerge from using the combined test in different settings. For example, if a test with a .67 correlation coefficient is used for screening in the top 50% of nurse applicants (i.e., a 50% Selection Ratio) in a situation where the Base Rate of qualified nurse applicants is 70%, a **20% improvement** in the newly hired workforce will emerge. That is, rather than 70% of the incoming nurses possessing the desired skill levels, 90% of the nurses will enter the workforce with the desired skill levels. This is because the test battery optimized the screening process and effectively separated high-potential job performers from low-potential job performers. Figure 6 shows how the combined Prophecy Assessment will result in various outcomes based on different Base Rate and Selection Ratio scenarios.

Figure 6. Chances of Hiring an "Above Average" Nurse Using Prophecy.



Notice that the highest benefit from using the combined Prophecy score occurs with the lower Selection Ratios, or the higher cutoff scores. However, even if only the bottom 20% of the applicants are screened out (an 80% Selection Ratio), a 10% workforce improvement gain is realized (compared to hiring using no test, or an ad hoc interview process).

### Financial Implications for Hospitals Using the Prophecy Assessments - Improving Job Performance

Finally, using validated assessments in your facility's nurse hiring program can lead to substantial financial returns. While it is difficult to pin a certain dollar value with nurse job performance, some studies suggest using a formula around the typical average nurse compensation (say \$70,000/year) and the typical standard deviation of job performance (in dollars, say \$20,000). Using these assumptions along with our example above (a 50% Selection Ratio and 70% Base Rate), a 1,000 nurse hospital that uses Prophecy to replace only their natural attrition (14% is the current national average<sup>1</sup>), will receive a \$10,271,167<sup>2</sup> financial benefit over the typical tenure (5.3 years) of the newly-hired nurses.<sup>3</sup> This "shift" occurs in the workforce as the "typical" incoming nurse (who has a 70% likelihood of performing at the desired levels) is replaced with inbound nurses who have a 90% likelihood of exceeding performance expectations.

1 2012 National Healthcare & RN Retention Report. NSI Nursing Solutions, Inc. ([www.nsinursingsolutions.com](http://www.nsinursingsolutions.com)); Raphael, T. (June 8, 2011). Nurse Turnover in Hospitals (<http://www.ere.net/2011/06/08/nurse-turnover-in-hospitals/>).

2 Cascio, W., Boudreau, J. Investing in People: Financial Impact of Human Resource Initiatives (2nd ed.). Upper Saddle River, NJ: FT Press. (2010).

3 For demonstration purposes, this includes an estimated annual testing fee of \$42,000 and a 30% payroll burden added to the SD of job performance.

## Financial Implications for Hospitals Using the Prophecy Assessments - Reducing Performance-Related Turnover

The nursing literature is replete with studies and findings regarding typical nurse turnover rates and costs. Recent estimates put the average national turnover rate for nurses at about 14% and the typical turnover cost at 1.2–1.3 times the average salaries for all organizational nurses at a given hospital.<sup>4</sup> Nurse turnover is a complex issue that involves organizational, environmental, and individual nurse factors that are oftentimes complex and inter-related. However, some of the turnover that occurs is due to the performance levels of the incoming (and existing) nursing staff. Like turnover rates and costs, studies also vary when it comes to estimating the percentage of turnover that may arise from performance-related factors at the individual-nurse level.

We conducted our own investigation into this phenomenon by compiling the “involuntary” turnover rates and reasons of six mid- to large-size healthcare institutions. This study included over 5,000 turnovers and dozens of various “turnover reasons” offered in each institution’s workforce database. Our study revealed that between 10% and 30% of the turnover that occurs each year is due to performance-related reasons (errors, teamwork conflict, interpersonal issues, etc.). We also learned that some of the turnover that occurs is sometimes categorized as “other reasons” (e.g., “left for personal reasons”) that may actually be performance related.

Going back to the situation discussed above (a hospital with 1,000 nurses and Prophecy is used to select the top 50% of the incoming nurses with a 70% Base Rate), assume that 25% of the turnover is “performance related” (20% “reported” and 5% “unreported”). In this situation, 90% of the hospital’s new hires will be “qualified,” which is 20% over the 70% Base Rate. This 20% improvement in the performance levels of the incoming nursing staff reduces the performance-related turnovers by 66% the first year, 63% the second, and 58% the third. This translates to savings of \$1,612,590 in year 1, \$1,402,371 in year 2, and \$1,184,938 in year 3, or a combined savings of about \$4.2 million over three years (see Table 4).

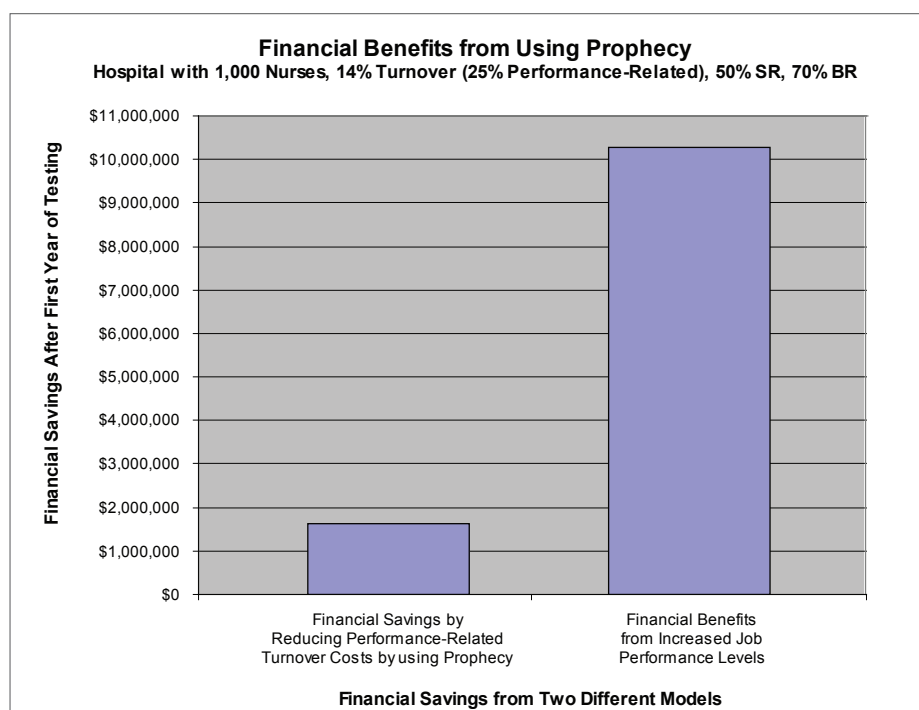
Table 4. Cost Savings by Reducing Performance-Related Turnover by Using Prophecy.

TURNOVER COST FACTOR	FINANCIAL OUTCOMES FROM REDUCED TURNOVER		
	Year 1	Year 1+2	Year 1+2+3
Turnover Cost from Performance-Related Issues	\$2,450,000	\$4,900,000	\$7,350,000
% of Turnovers from Performance-Related Issues that can possibly be reduced by Prophecy	66%	63%	58%
	Year 1	Year 2	Year 3
Year-by-Year Cost Savings	\$1,612,590	\$1,402,371	\$1,184,938
Cumulative Cost Savings from Performance-Related Issues that can possibly be reduced by Prophecy	\$1,612,590	\$3,014,961	\$4,199,899

4 See Li, Y. and Jones, C. B. (2012), A literature review of nursing turnover costs. *Journal of Nursing Management*. doi: 10.1111/j.1365-2834.2012.01411. This study cites Jones (2005, cited below), noting that this method “falls near the middle of the standardized ratios recommended by both McConnell (1999) and Phillips (1990).” (Jones C.B. (2005) The costs of nurse turnover, part 2: application of the nursing turnover cost calculation methodology. *Journal of Nursing Administration*, 35 (1), 41–45; McConnell C.R. (1999) Staff turnover: occasional friend, frequent foe, and continuing frustration. *Health Care Manager*, 18 (1), 1–13; Phillips J.D. (1990). The price tag on turnover. *Personnel Journal*, 69 (12), 58–61).

Figure 7. Financial Benefits from Using Prophecy.

The financial benefits from these two models (increasing job performance and reducing performance-related turnover) are not likely additive because they both hinge on overlapping changes that emerge from improving the performance levels of the incoming nursing staff. However, considering either model demonstrates that substantial financial gains can be realized by using Prophecy (see Figure 7). Hospitals with fewer than 1,000 nurses can easily estimate these financial benefits by reducing them by the size of their nursing staff relative to 1,000 (e.g., a hospital with 500 nurses would likely realize 50% of these financial benefits).



*Disclaimer: The projections and estimates described in this brochure are not guaranteed at individual hospitals. The actual benefits realized by healthcare institutions depends on a myriad of local factors.*

## The Partners

A brief bio about each study partner is provided below:

- **Prophecy Healthcare.** Prophecy Healthcare is a private organization that provides assessment services to the healthcare industry. Prophecy Healthcare, formerly NurseTesting, was founded in 2004 to create a standardized system of testing for nurses and healthcare professionals seeking employment at healthcare facilities and staffing agencies. Prophecy Healthcare exclusively provided the Clinical (written) Assessment content included in this study, and the Situational Assessment content through partnership with Biddle Consulting Group, Inc.
- **Biddle Consulting Group, Inc. (BCG)** specializes in Equal Employment Opportunity (EEO) consulting, litigation support, personnel testing software development, and Affirmative Action Plan (AAP) outsourcing and software. Since 1974, when known under the name Biddle & Associates, BCG has worked with thousands of employers in these areas, as well as providing litigation support as consultants or experts in over 200 state, federal, and circuit court of appeal EEO cases involving statistics and/or job-relatedness (test validity) analyses. BCG has developed and validated personnel tests in hundreds of situations that are used by thousands of employers. BCG's role in the partnership was to oversee the validation study and jointly develop the Situational Assessments.
- **PeopleClues.** PeopleClues is an international test publishing firm that provides modern, validated behavioral assessments through an online platform specifically designed for the commercial market. PeopleClues Assessments are used by thousands of companies to hire, train, and promote applicants and incumbents. PeopleClues multi-faceted personality test item bank ("Clues") including 70 personality/behaviorally based personality items and a timed, seven-minute cognitive ability test were included as part of this study.
- **Saint Francis Medical Center** (located in Cape Girardeau, Missouri) is a 258-bed facility serving more than 650,000 people throughout Missouri, Illinois, Kentucky, Tennessee, and Arkansas.
- **Frederick Memorial Hospital** (located in Frederick, Maryland) is a large medical facility that employs 2,700 medical professionals, including 375 doctors and several hundred nurses.