Predictors of Success in Dental Hygiene Education: A Six-Year Review


Abstract: The purpose of this study was to examine the predictive reliability of incoming grade point average (GPA), incoming math/science GPA, and Scholastic Aptitude Test (SAT) scores in predicting success in dental hygiene education. Success in dental hygiene education was defined in terms of Dental Hygiene National Board score (N-BRD) and dental hygiene GPA at graduation (DH-GPA). Academic transcripts and admissions documents of 134 students comprising the Medical College of Georgia dental hygiene classes of 1996-2001 were reviewed. Incoming college GPA (I-GPA), incoming college math/science GPA (MS-GPA), total SAT score (T-SAT), verbal SAT score (V-SAT), math SAT score (M-SAT), N-BRD score, and DH-GPA were documented for each student. A forward, step-wise, multiple linear regression was used to analyze the data. I-GPA was the most significant predictor of success. Analysis showed that DH-GPA was best predicted by both the I-GPA (p<.001) and T-SAT (p<.004). Only the I-GPA (p<.001) was significant in predicting N-BRD scores. Data from this study will be used to evaluate the admissions process in dental hygiene at the Medical College of Georgia.

Ms. Downey is Assistant Professor, Department of Dental Hygiene, School of Allied Health Sciences; Ms. Collins is Assistant Professor and Chair, Department of Dental Hygiene, School of Allied Health Sciences; Dr. Browning is Associate Professor, Department of Oral Rehabilitation, School of Dentistry, all at the Medical College of Georgia. Direct correspondence and requests for reprints to Ms. Mary C. Downey, Department of Dental Hygiene, AD-3156, Medical College of Georgia, Augusta, GA 30912-0200; 706-721-2938 phone; 706-721-8857 fax; mdowney@mail.mcg.edu.

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A significant challenge for dental hygiene admissions committee members is selecting the most-qualified applicants. Qualified applicants are those who will successfully complete program requirements and licensing examinations to become competent, contributing, self-fulfilled health care providers. The American Dental Association’s Surveys of Allied Dental Education (1996/1997-1999/2000) list the following criteria used by dental hygiene programs in the admissions process: high school grades (science grade point average [GPA], non-science GPA, overall GPA, and other), college grades (science GPA, non-science GPA, overall GPA, and other), test scores (ACT, SAT, and other), manual dexterity exam, pre-admission interview, letters of recommendation, and dental office experience. Several studies using admissions criteria have been conducted to determine predictors of academic success in dental and allied health programs. There are reports indicating that there is a positive correlation between incoming and graduating grade point average. Surveys reveal that the majority of dental hygiene programs consider overall college GPA and college science GPA in the admissions process (Figure 1).

Performance on standardized tests, such as the Scholastic Aptitude Test (SAT), can be helpful in comparing the potential of students who have similar academic records but attend different institutions. Standardized test scores have been found to be significant predictors of academic success. However, there is concern regarding the validity of the SAT or similar standardized test scores in predicting the academic success of minority students. A 1995 survey by Scott et al. reported that standardized tests were rarely used in the selection process for allied health students. Since 1996, approximately 30 percent of the nation’s dental hygiene programs have used standardized tests in the admissions process.

Reports show variation in the value placed on applicant interviews in the admissions process. There has also been concern about the usefulness of references, because most respondents provide only positive recommendations. Written communication skills and personality characteristics can be assessed from an applicant’s written essay or biography. The essay has been found to be a valid predictor of academic success in several studies. But since 1996, only one-third of the nation’s dental hygiene programs
consider personal interviews and recommendation letters as admissions criteria.1-4

Outcomes assessment is an essential tool for evaluation of educational programs. Overall, success in dental hygiene programs is determined by the student’s ability to complete program requirements and pass national and clinical board examinations. Critical assessment of admissions criteria components and protocol is essential to ensure the selection of dental hygiene students who are most likely to graduate. As a part of an outcomes assessment endeavor and to ensure accountability in all facets of education, the Department of Dental Hygiene at the Medical College of Georgia initiated an examination of its admissions requirements and policies. The first step in this evaluation process was a retrospective review to determine the predictive reliability of current admissions criteria.

The purpose of this study was to examine the predictive reliability of admissions data in predicting student success in dental hygiene education. This exploratory process will help the department delineate criteria by which applicants should be evaluated and identify areas in which the admissions process can be enhanced. It will also provide a composite profile of recent classes that will be helpful in recruitment efforts.

**Method**

The study population consisted of 134 individuals comprising the 1996-2001 dental hygiene graduating classes of the Medical College of Georgia. Subjects ranged from nineteen to forty-five years of age, with a mean age of twenty-three. One hundred twenty-seven (95 percent) of the students were female, and seven (5 percent) were male. One hundred fourteen (85 percent) of the students were white, eight (6 percent) were black, four (3 percent) were Hispanic, and eight (6 percent) were Asian/Pacific Islander. Forty (30 percent) had earned a certificate or degree in another area at the time of matriculation in the dental hygiene program. A total of twelve students (9 percent) were enrolled in the associate degree dental hygiene program; the remaining 122 (91 percent) were enrolled in the baccalaureate degree dental hygiene program. The associate degree students were included in the study because the dental hygiene course content in the two degree programs was almost identical and all associate degree students had completed the majority of their liberal arts courses prior to enrollment. The Associate Degree in Dental Hygiene was discontinued by the Medical College of Georgia in 1998. A composite academic profile revealed that dental hygiene students enrolled from 1996 to 2001 had an average incoming college GPA of 3.14, an average incoming college math/science GPA of 2.83, and an average total SAT score of 902.

Approval to conduct the study was obtained from the institution’s Human Assurance Committee. Program success or success in dental hygiene education was defined by two variables: Dental Hygiene National Board score (N-BRD) and dental hygiene grade point average at graduation (DH-GPA). Five cognitive admissions criteria variables were identified as potential predictors of dental hygiene success: incoming college grade point average (I-GPA),
incoming math/science college grade point average (MS-GPA), total SAT score (T-SAT), verbal SAT score (V-SAT), and math SAT score (M-SAT). Entry age, ethnicity, gender, prior degree(s), and type of program were also recorded for each student. All data, collected from admissions forms and academic transcripts, were documented by two investigators on a spreadsheet using nontraceable identifiers.

Results

A forward, step-wise, multiple linear regression was used to analyze the data. In predicting DH-GPA, the most efficient model included I-GPA (p<.001) and T-SAT (p<.004). This model justified the following observations:

- Knowledge of T-SAT in addition to the I-GPA added significantly to the ability to predict the DH-GPA.
- Knowledge of non-math/science GPA in addition to the math/science GPA added significantly to the ability to predict the DH-GPA.
- Knowledge of V-SAT in addition to the M-SAT added significantly to the ability to predict the DH-GPA.

The dependent variable DH-GPA can be predicted from the following probability model for dental hygiene students at the Medical College of Georgia:

$$\text{DH-GPA} = 1.689 + (\text{incoming college GPA} \times 0.375) + (\text{total SAT score} \times 0.000603)$$

The most efficient model to predict Dental Hygiene National Board performance at this institution included only the I-GPA. T-SAT did not add significantly to the ability to predict performance on the National Board. This study justified the following observation:

- Knowledge of non-math/science GPA in addition to the math/science GPA added significantly to the ability to predict performance on the Dental Hygiene National Board Examination.

The dependent variable N-BRD can be predicted from the following probability model:

$$\text{National Board Score} = 65.545 + (\text{incoming college GPA} \times 5.984)$$

Discussion

In this study, five cognitive variables included in admissions criteria were examined to determine the most reliable predictors of success in the dental hygiene program. Several of these variables are highly correlated or measure similar outcomes. For example, grades comprising the incoming math/science college GPA (MS-GPA) also influence the overall incoming college GPA (I-GPA) of a student. Similarly, a student’s score on the verbal or math portion of the SAT obviously impacts her or his overall performance on the standardized test. While the ratio of math/science courses to the total number of courses taken has an effect on the total GPA, it is unlikely that a student will have a high MS-GPA and a low total GPA.

With the proportion of basic and clinical sciences required in the dental hygiene curriculum at this institution, it was thought that the MS-GPA would be a more reliable predictor of success than the overall I-GPA. This was not the case. The multiple regression analysis identified that the most efficient model for predicting the graduating dental hygiene GPA (DH-GPA) involves use of the I-GPA. In other words, knowledge of the non-math/science GPA in addition to the math/science GPA added significantly to the ability to predict DH-GPA. These findings support those of Berchule that overall I-GPA is a more effective variable in the admissions process than a subject component GPA, such as science or math/science.

Figure 1 shows that the national trend for dental hygiene programs is to use incoming college science GPA and overall incoming college GPA (I-GPA) in admissions criteria. From 1996/1997 to 1999/2000 approximately 80 percent of programs used I-GPA and 72 percent used incoming science GPA as factors in the admissions process. Our institution differs from the national trend in that a combined math/science GPA, rather than the science GPA alone, is used as a factor in the admissions process. This study concluded that the most efficient models for predicting success in dental hygiene include the I-GPA but not the math/science GPA alone.

In recent years, faculty within the department have debated the usefulness of T-SAT in the admissions process, since applicants have completed approximately two years of college study prior to matriculation in this program. When examining the reliability of the SAT in predicting academic success, the study revealed that knowledge of the T-SAT was helpful in predicting the student’s DH-GPA, but did not add significantly to predicting performance on the National Board Dental Hygiene Examination (N-BRD). It could be argued that verbal skill, prob-
lem-solving, and critical thinking are needed to complete different sections of the SAT. Emphasis on effective communication, problem-solving, and critical thinking in the curriculum could explain why T-SAT is a reliable predictor of DH-GPA at our institution.

Results of our study would seem to contradict Woodham and Taube’s findings that V-SAT by itself can be a valuable predictor of performance on a health professions national examination. Statistical modeling seeks to find the most efficient probability model that explains the data. In the analysis, when used independently, the V-SAT demonstrated a significant correlation with Dental Hygiene National Board scores. However, the most efficient model did not include V-SAT. Knowledge of V-SAT, M-SAT, or T-SAT did not add significantly to the ability to predict performance on the National Board Examination. Instead, the use of I-GPA proved to be a better predictor of success.

Based on the results of this study, the probability model $1.689 + (\text{incoming college GPA} \times 0.375) + (\text{total SAT score} \times .000603)$ was developed to predict a student’s graduating dental hygiene GPA at this institution. For example, an entering dental hygiene student with an I-GPA of 3.0 and a T-SAT of 950 could be predicted to have a DH-GPA of 3.4. Results of the study also determined that the following probability model could be used to predict student performance on the National Board Dental Hygiene Examination: $65.545 + (\text{incoming college GPA} \times 5.984)$. Using this model, a dental hygiene student attending this institution with an I-GPA of 3.0 could be predicted to score 83 on the National Board Examination.

One limitation of this study is that probability models generated from the results can not be used by other dental hygiene programs. Faculty must statistically analyze admissions variables from their individual institutions to derive models that would predict success at their institution.

**Conclusion**

This study provides data to support the use of college I-GPA and T-SAT as dental hygiene admissions criteria at this institution. Models to predict DH-GPA and N-BRD can be used during recruitment and for admissions selection as well as for initial counseling sessions with entering students. Subsequent outcome assessments can compare results from the current prediction models to actual DH-GPA and N-BRD scores. The biographical essay, letters of recommendation, and student interviews are noncognitive admissions criteria that can be examined for use in a future probability model.

**REFERENCES**