Dental Students’ Glucometer Experience and Attitudes Toward Diabetes Counseling, Monitoring, and Screening: A Comparative Study


Abstract: The objectives of this study were to compare glucometer experience and attitudes toward counseling, monitoring, and screening for diabetes between two classes of graduating students at one dental school to determine if there were differences by experience and year of graduation. Dental students graduating in 2010 and 2013 completed a survey about their experience with use of a glucometer as well as their attitudes toward and perceived barriers to performing glucose monitoring, screening, and counseling. Response rates for the two classes were 100 percent and 95.7 percent, respectively. Students in the two classes were in general agreement that activities related to glucose monitoring and counseling of patients with diabetes are within the scope and responsibility of the dental profession. Examination of their attitudes toward diabetes monitoring and counseling activities by level of glucometer experience indicated that students with more experience using a glucometer were more likely to consider these activities to be within the scope of dental practice and less likely to perceive barriers to such activities compared to those with little or no experience. In addition, regardless of experience, there was significantly higher endorsement for monitoring of patients who had already been diagnosed than for screening of patients who had not been diagnosed. This study suggests that any strategy to encourage dental students’ and dentists’ involvement in nontraditional health promotion activities should include ample direct clinical experience with these activities.

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As the dental profession continues to evolve toward full recognition of oral health as an integral component of systemic health and well-being,1 there are increasing calls for dentists to provide services that until recently would have been thought outside the scope of dental practice. Recommendations range from the use of mid-level dental providers for less complex procedures, so that dentists can serve as oral physicians to provide limited preventive primary care including screening for chronic diseases,2 to the endorsement of medical-dental co-management of patients with chronic diseases.3,4

Diabetes is one chronic condition that lends itself to this type of co-management because of its close relationship to oral health.4,6 Recent recommendations have included perioperative monitoring of patients diagnosed with diabetes to decrease risk of adverse hypoglycemic events.7,8 as well as screening of patients with periodontal disease9 and those with risk factors but no diagnosis.10,11 Screening for diabetes has been promoted as an integral component of dental practice.12 While recommendations vary, it is clear that the dental profession is changing and that tomorrow’s practice will require dentists to be more collaborative with their medical colleagues and be more familiar with procedures related to monitoring and possibly screening for chronic diseases including diabetes.

The pathophysiology and management of patients with diabetes were integral parts of the didactic dental curriculum when members of the Class of 2010 began their education at the University at Buffalo, but clinical use of glucometers was just being initiated. At that time, student training began on the use of two commercially available glucometers: OneTouch UltraMini Blood Glucose Monitoring System (LifeScan, Inc., Milpitas, CA) and McKesson TRUEresult Blood Glucose Meter (McKesson, San Francisco, CA). The models were similar, easy to use, and made readily available in all clinical areas. More recently, the clinical component of our educational
program has placed an increased emphasis on the use of glucometers for monitoring of diabetic control. The first purpose of this study was to determine whether glucometer usage had increased from 2010 to 2013. The second purpose was to determine if there were differences in attitudes toward diabetes counseling, monitoring, and screening by experience, as measured by use of a glucometer and year of graduation. Finally, student attitudes were examined to ascertain whether a previously reported distinction between monitoring and screening would be detected in the more recent graduates.

Materials and Methods

This study was approved by the Institutional Review Board of the State University of New York at Buffalo. Graduating students from the University at Buffalo School of Dental Medicine Classes of 2010 and 2013 were recruited during the exit process to participate in a survey as part of a larger study of student attitudes toward health promotion. Information was obtained anonymously, and voluntary completion of the questionnaire was taken as informed consent to participate. The instrument gathered demographic data including age, gender, and race/ethnicity as well as information concerning personal and family history of diabetes. A total of seventeen items regarding attitudes toward diabetes counseling, monitoring, and screening as well as perceived barriers to success for diabetes counseling in a dental setting were included. Scores on each item ranged from 1=low endorsement to 5=high endorsement. The psychometric properties of the instrument were established during a previous study that examined attitudes of first- and fourth-year dental students but did not consider glucometer experience. Development of this instrument was described previously.

Student experiences with the use of a glucometer were compared by year of graduation using a chi-square test of association. Underlying dimensions within the attitude variables were determined using exploratory factor analysis on the Class of 2010 data. This factor analysis determined a three-factor solution: scope and responsibility, barriers, and glucometer use. Scale scores using these dimensions were calculated as a mean of the item scores within each factor. Mean differences on these scales were examined by year of graduation and experience using a glucometer with a two-way multivariate analysis of variance. Finally, a paired t-test was performed to determine if previously reported differences in attitudes between monitoring (diagnosed patients) and screening (undiagnosed patients) for the Class of 2010 would be reproduced for the Class of 2013.

Results

Surveys were completed by eighty-six fourth-year dental students in 2010 (100 percent) and eighty-eight fourth-year students in 2013 (95.7 percent) for a total of 174 responses. The sixteen members of the Class of 2013 two-year International Dentist Program were excluded from the study because of differing curricular experiences.

The majority of the total students were white (75.7 percent), followed by Asian/Pacific Islander (19.7 percent). The Class of 2010 had significantly more males than the class of 2013 (69.4 percent vs. 51.1 percent, p<0.05). Only two students, both in the Class of 2010, reported a personal history of diabetes; this variable was not included in any further analyses. Mean age was 27.67 (SD 3.21) years in 2010 and 26.98 (SD 3.19) years in 2013 and was not statistically different by year of graduation. There was also no statistically significant difference between the two classes in family history of diabetes, with thirty-five (2010) and thirty-six (2013) students reporting one or more family members with diabetes.

Students were asked if they had ever used a glucometer to obtain a blood glucose reading on a patient, with response options of no, one time, and more than one time (Table 1). Approximately 24 percent of students in 2010 reported never having used a glucometer, compared to 3 percent in 2013. Likewise, in 2010, 57 percent of students reported using a glucometer more than once, compared to 94 percent in 2013. A chi-square test of association indicated significantly greater glucometer use for the Class of 2013 than for the Class of 2010 (p<0.005). Because of small sample sizes, the no and one time categories were collapsed for the subsequent analysis.

<table>
<thead>
<tr>
<th>Experience with Glucometer</th>
<th>Class of 2010 (N=86)</th>
<th>Class of 2013 (N=88)</th>
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<tbody>
<tr>
<td>Never</td>
<td>21 (24.4%)</td>
<td>3 (3.4%)</td>
</tr>
<tr>
<td>Once</td>
<td>16 (18.6%)</td>
<td>2 (2.3%)</td>
</tr>
<tr>
<td>More than once</td>
<td>49 (57.0%)</td>
<td>83 (94.3%)</td>
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Chi-square=33.128, p<0.005
Means and standard deviations for the three scale scores (scope and responsibility, barriers, and glucometer use) by year of graduation, experience using a glucometer, gender, and family history of diabetes are shown in Table 2. Scale scores were relatively high for scope and responsibility (mean scores ranging from 3.90 to 4.34) and glucometer use (3.42 to 3.83) and in the middle range for barriers (2.22 to 2.82). This suggests that students, on average, viewed diabetes counseling, monitoring, and screening activities to be within the scope of dental practice and did not necessarily see barriers to such activities to be a deterrent. There were no significant differences on the three scale scores by either gender or family history, so these variables were not included in further analyses.

A two-way multivariate analysis of variance examining differences in scale scores by year of graduation and glucometer experience revealed a significant multivariate main effect for glucometer experience, Wilks’ $\lambda=0.953$, $F(3, 168)=2.75$, $p=0.045$. There was no significant effect for year of graduation, Wilks’ $\lambda=0.987$, $F(3, 168)=0.74$, $p=0.53$, and no significant interaction effect, Wilks’ $\lambda=0.994$, $F(3, 168)=0.36$, $p=0.78$. Univariate main effects for experience using a glucometer indicated a significant main effect for scope and responsibility, $F(1, 170)=7.04$, $p=0.009$, and a trend toward significance for barriers, $F(1, 170)=3.547$, $p=0.061$. There was no significant difference by experience for the glucometer scale, $F(1, 170)=1.168$, $p=0.16$.

Examination of means indicated higher mean scores on scope and responsibility for those with more than one experience using a glucometer than for those with either no or one experience, indicating that students with greater experience were more likely to consider activities related to diabetes counseling, monitoring, and screening to be within the scope of practice. There was also a trend toward those with more glucometer experience being less likely than those with little or no experience to perceive barriers to such activities. Finally, a paired t-test revealed that students in the Class of 2013 had significantly more positive attitudes toward monitoring of blood glucose in patients with diabetes ($\bar{x}=4.45$) than screening for diabetes ($\bar{x}=2.97$) $t_{87}=11.424$, $p<0.005$, paralleling earlier results from the Class of 2010.

**Discussion**

The main findings of this study were that the students’ attitudes toward activities related to diabetes counseling, monitoring, and screening were generally positive and were more positive for those students who had greater experience using a glucometer. We failed to find differences by year of graduation, suggesting that differences in attitude are the result of different amounts of experience with glucometer use rather than differences in curricular emphasis.

Direct experience plays an important role in attitude formation. Research has shown that an

<table>
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<tr>
<th>Table 2. Dental students’ mean (SD) scores by year of graduation, glucometer experience, gender, and family diabetes history</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class</td>
</tr>
<tr>
<td>2010 (n=86)</td>
</tr>
<tr>
<td>2013 (n=88)</td>
</tr>
<tr>
<td>Experience using a glucometer</td>
</tr>
<tr>
<td>None or once (n=42)</td>
</tr>
<tr>
<td>More than once (n=132)</td>
</tr>
<tr>
<td>Gender</td>
</tr>
<tr>
<td>Female (n=69)</td>
</tr>
<tr>
<td>Male (n=104)</td>
</tr>
<tr>
<td>Family diabetes history</td>
</tr>
<tr>
<td>No family members have diabetes (n=103)</td>
</tr>
<tr>
<td>At least one family member has diabetes (n=70)</td>
</tr>
</tbody>
</table>

Note: Scores on each item ranged from 1=low endorsement to 5=high endorsement. Multivariate ANOVA (year and experience using a glucometer) indicated a statistically significant difference in scope and responsibility by glucometer experience.
attitudes will persist as students enter independent practice. The challenge will be to develop strategies that influence attitudes and behaviors in a manner that is sustainable beyond dental school and into the realm of practice.

Conclusion

In this study, dental students’ attitudes toward activities related to diabetes counseling, monitoring, and screening were generally positive and were more positive for those students who had greater experience using a glucometer. The students endorsed monitoring of blood glucose in patients diagnosed with diabetes more strongly than screening for diabetes in patients who have not been diagnosed. Our data suggest that strategies to encourage involvement in nontraditional health promotion activities should include ample direct clinical experience with these activities.

REFERENCES


