Oral Health Promotion Through an Online Training Program for Medical Students

Ednalva de Sousa Eskenazi, M.Sc., Ph.D.; Milton de Arruda Martins, M.D., Ph.D.; Mario Ferreira Jr., M.D., Ph.D.

Abstract: The objective of this study was to compare the impact on knowledge and counseling skills of face-to-face and Internet-based oral health training programs on medical students. Participants consisted of 148 (82 percent) of the 180 invited students attending their fifth academic year at the Faculty of Medicine, University of São Paulo, Brasil, in 2007. The interventions took place during a three-month training period in the clinical Center for Health Promotion, which comprised part of a clerkship in Internal Medicine. The students were divided into four groups: 1) Control Group (Control), with basic intervention; 2) Brochure Group (Br), with basic intervention plus complete brochure with oral health themes; 3) Cybertutor Group (Cy), with basic intervention plus access to an Internet-based training program about oral health themes; and 4) Cybertutor + Contact Group (Cy+C), the same as Cy plus brief proactive contact with a tutor. The impact of these interventions on student knowledge was measured with pre- and post assessments, and student skills in asking and counseling about oral health were assessed with an objective structured clinical examination (OSCE). Multivariate logistic regression models were applied to identify the odds ratios of scoring above Control’s medians on the final assessment and the OSCE. In the results, Cy+C performed significantly better than Control on both the final assessment (OR 9.4; 95% CI 2.7–32.8) and the OSCE (OR 5.6; 95% CI 1.9–16.3) and outperformed all the other groups. The Cy+C group showed the most significant increase in knowledge and the best skills in asking and counseling about oral health.

Dr. Eskenazi is an ondontologist and collaborator, Center for Health Promotion, Department of Medicine, Faculty of Medicine, University of São Paulo; Dr. Martins is Professor of General Internal Medicine, Department of Medicine, Faculty of Medicine, University of São Paulo; and Dr. Ferreira is Coordinator, Center for Health Promotion, Department of Medicine, Faculty of Medicine, University of São Paulo. Direct correspondence and requests for reprints to Dr. Mario Ferreira Jr., Hospital das Clínicas da Faculdade de Medicina da USP, Prédio dos Ambulatórios, PAMB, 4º andar, Bloco 6, Avenida Dr. Enéas de Carvalho Aguiar, 155, CEP 05403-000, São Paulo, Brasil; 55-11-3069-7691 phone/fax; mariofj@uol.com.br.

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Oral Health in America is a report of the U.S. surgeon general that states the importance of oral health to systemic health and wellness. Chronic conditions such as coronary artery disease, certain cancers, diabetes mellitus, and oral disorders have common risk factors (e.g., unbalanced diet, excess sugar intake, and alcohol and tobacco consumption) that can be assessed preventively. The relationship between medical and dental disorders emphasizes the relevance of medical education in oral health promotion (OHP); however, the lack of good information about oral health among the general population may be an indicator that this issue has not been addressed adequately in medical schools and residencies. Mouradian et al. warned of the adverse social, individual, and economic consequences of the separation between medical and dental sciences. In 2005, Mouradian et al. developed an oral health curriculum for medical students based upon five themes: oral public health, decay, periodontal disease, oral cancer, and oral-systemic interactions. These same authors, after evaluating the results of this elective curriculum, observed significant improvement in medical students’ attitudes, knowledge, and self-confidence with respect to oral health promotion.

The Association of American Medical Colleges (AAMC) has recently released a report advocating changes in medical curricula with a view towards graduating medical professionals capable of addressing disparities in public oral health. To this end, the U.S. Preventive Services Task Force (USPSTF) and the Canadian Task Force on Preventive Health Care (CTFPHC) issued evidence-based recommendations on preventive primary care procedures for oral health that could comprise a part of these curricula. Oral health promotion can take place in a primary care practitioner’s office, but medical providers often lack relevant training.

Medical educators and researchers have studied the application of modern communication and information technology in medical education. The published results of these initiatives in several fields of medical sciences as well as the results of studies conducted in Brazil suggest that the
use of Internet-based computer-assisted learning in medical education is reliable and could be helpful in the teaching of complementary interdisciplinary issues of basic medical education. Problematically, however, in the specific case of oral health training programs for medical students, there is a paucity of studies evaluating face-to-face courses, and data on the impact of Internet-based computer-assisted programs are unavailable. The present study therefore had the objective of measuring the effects of face-to-face and Internet-based training programs on fifth-year medical students’ knowledge and skills in asking and counseling about oral health.

Methods

Our study was approved by the Ethics Committee for Research Projects at the Faculty of Medicine of the University of São Paulo (FMUSP), reference number 1363/06. In 2007, the 180 students attending the fifth academic year of the FMUSP were invited to participate in the study. According to the normal procedure of the school, at the beginning of the year they were divided into four groups of forty-five students each, one group per trimester from January through December. Of the 180 students, 148 (82 percent) accepted the invitation to be part of the study, signed an informed consent form, and completed all the requirements of the study (see Table 1 and Table 2 for the number of students who ended up in each of the four groups). Interventions and data collection for each of the four groups occurred during the three-month training period at the Center for Health Promotion (CHP), a department within the Division of General Internal Medicine. The CHP is dedicated to conducting training in health promotion and clinical preventive services (screening, counseling, and chemoprophylaxis) for relevant health risk factors such as low or no physical activity; unbalanced diet; weight reduction and control; tobacco, alcohol, and other drug consumption; injury risk; sun radiation; sleep disorders; hygiene; stress; oral health; and certain chronic conditions (e.g., high blood pressure, lipid disorders, obesity, and diabetes mellitus).

Four interventions were carried out for each of the groups. The Control Group (Control) received basic written information about oral health promotion with a list of the recommendations of the USPSTF and CTFPHC and supervision by trained medical assistants during consultations with ambulatory patients at the CHP. The Brochure Group (Br) received the same basic information and supervision at the CHP and had in loco access to a brochure with a wealth of information pertaining to seven oral health themes (decay, periodontal disorders, dental fluorosis, oral-systemic interactions, oral hygiene, oral cancer, and public oral health), the selection of which was in accordance with the proposals of various authors of reference textbooks and scientific journals. The Cybertutor Group (Cy) received the same basic information and supervision at the CHP and had access to a virtual learning environment named Cybertutor that was developed to host an Internet-based computer-assisted course in oral health (accessed by means of a personal log-in and password) that featured online pages from selected texts on the seven oral health themes, enhanced by figures, photos, tables, hyperlinks, and hypertexts formatted in different colors and font types and situated beside abstracts highlighting the main points. Finally, the Cybertutor + Contact Group (Cy+C) also received the basic information, supervision at the CHP, and access to the Cybertutor course in addition to brief proactive contact (a few minutes every two weeks) with a dentist, the aims of which were to have students successfully log in and check their adherence to course modules. Figure 1 illustrates the interventions for each group.

Characteristics of the study population concerning gender, kinship with dentists, previous oral health education, and perception of knowledge about oral health subjects were self-reported before each of the interventions on the first day of the students’ training program at the CHP. At this time, students were invited to answer a questionnaire of thirty-three questions designed to objectively assess their baseline knowledge about oral health (baseline assessment). These questions were based on the seven themes presented in the brochure and the curriculum of the Internet-based course: decay, five questions; periodontal disorders, two questions; dental fluorosis, three questions; oral-systemic interactions, four questions; oral hygiene, six questions; oral cancer, two questions; and public oral health, eleven questions. The same questionnaire was administered at the end of each group’s training program to assess knowledge improvement (final assessment). Student responses were classified as correct or incorrect.

An objective structured clinical examination (OSCE) was performed at the end of each intervention to assess student skills in asking and counseling patients in matters of oral health. In accordance with the requirements of this examination technique,
students were observed during consultations with patient-actors playing predetermined characters with oral health issues. Trained physicians and dentists classified student performance as adequate or inadequate through the use of a checklist.

The statistical analysis was based on the data collection from the 148 students who participated in the study. The self-reported data concerning gender, kinship with dentists, previous education, and self-perception of knowledge about oral health subjects were described, and the relative frequencies for each intervention were compared using the likelihood ratio test. The level of knowledge and skills regarding oral health promotion was measured by means of the percentage of correct responses during baseline and final assessments and the percentage of adequate asking and counseling performed during the OSCE. The baseline and final assessments for each study group were compared by Student’s t-test for paired samples. Multivariate logistic regression models were used to quantify the odds ratio of scoring above the Control group’s medians on the final assessment and the OSCE. The models were applied with the following variables as predictors: groups (Control, Br, Cy, and Cy+C), gender (male or female), kinship with dentists (yes or no), previous education in oral health (yes or no), and self-perception of knowledge about oral health subjects (adequate or inadequate). The software SPSS 15.0 was used for all statistical procedures. The p value 0.05 and the 95 percent confidence interval (95% CI) were adopted as limits to define significance.

Figure 1. Interventions for oral health promotion (OHP) performed by the four study groups
Results

Table 1 shows the characteristics of the study population regarding gender, kinship with dentists, previous education, and self-perception of knowledge about oral health at baseline. According to the likelihood ratio test, a significant statistical difference among the groups of students was identified only for gender (p<0.0001). The Control and Cy+C groups consisted primarily of males, while the Br and Cy groups were more balanced in gender. No significant differences were found for the other variables.

Table 2 shows the medians and respective ranges of the percentage of correct responses to the baseline and final assessments and the medians of the percentages of adequate asking and counseling exhibited by students during the OSCE. The level of knowledge about oral health, which was low in all groups at baseline (medians ranging from 18.2 percent to 24.2 percent), increased significantly by the end of all interventions (p<0.0001; medians ranging from 27.2 percent to 69.7 percent), and the Cy+C group showed the greatest improvement. Cy+C also had the best measurable performance on the OSCE.

Table 3 shows the results of the multivariate logistic regression with the odds ratio and 95 percent CI for each category of variable. Group Cy+C was the only significant predictor of scoring above the Control group’s medians on the final assessment and the OSCE. The performance of the Br and Cy groups was not statistically different from that of the Control group, and the other tested variables (gender, kinship with dentist, previous oral health education, and self-perception of oral health knowledge) were not related to student performance.

Table 1. Characteristics of study population (N=148) at baseline in relation to gender, kinship with dentists, previous education, and self-perception of knowledge about oral health, compared by groups by the likelihood ratio test

<table>
<thead>
<tr>
<th></th>
<th>Control (N=39)</th>
<th>Br (N=37)</th>
<th>Cy (N=41)</th>
<th>Cy+C (N=31)</th>
<th>p</th>
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<tbody>
<tr>
<td>Gender</td>
<td></td>
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<tr>
<td>Male</td>
<td>82%</td>
<td>51%</td>
<td>46%</td>
<td>93%</td>
<td>&lt;0.0001</td>
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<tr>
<td>Kinship with dentist</td>
<td></td>
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<td></td>
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<tr>
<td>Yes</td>
<td>35%</td>
<td>16%</td>
<td>19%</td>
<td>29%</td>
<td>0.179</td>
</tr>
<tr>
<td>Previous oral health education</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>28%</td>
<td>35%</td>
<td>17%</td>
<td>16%</td>
<td>0.174</td>
</tr>
<tr>
<td>Self-perception of oral health knowledge</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Adequate</td>
<td>7%</td>
<td>18%</td>
<td>4%</td>
<td>6%</td>
<td>0.139</td>
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</tbody>
</table>

Br=Brochure group; Cy=Cybertutor group; Cy+C=Cybertutor + Contact group

Table 2. Median values (ranges) of percentage of correct responses obtained on baseline and final assessments and percentage of adequately asking questions and providing counseling during objective structured clinical examination (OSCE)

<table>
<thead>
<tr>
<th></th>
<th>Control (N=39)</th>
<th>Br (N=37)</th>
<th>Cy (N=41)</th>
<th>Cy+C (N=31)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline Assessment</td>
<td>18.2% (6.0–36.3%)</td>
<td>21.2% (6.0–42.4%)</td>
<td>21.2% (6.0–42.4%)</td>
<td>24.2% (6.0–39.4%)</td>
</tr>
<tr>
<td>Final Assessment</td>
<td>27.2%* (3.0–51.5%)</td>
<td>30.3%* (9.1–57.5%)</td>
<td>33.3%* (6.0–96.9%)</td>
<td>69.7%* (12.1–90.9%)</td>
</tr>
<tr>
<td>OSCE</td>
<td>54.5% (27.3–70.4%)</td>
<td>56.8% (29.5–81.8%)</td>
<td>45.4% (20.4–100%)</td>
<td>72.6% (31.8–95.4%)</td>
</tr>
</tbody>
</table>

*Statistically significant difference (p<0.0001) compared to the respective baseline assessment on the basis of Student’s t-test for paired samples.

Br=Brochure group; Cy=Cybertutor group; Cy+C=Cybertutor + Contact group
Discussion

The relationship between oral health, global health risk factors, and systemic chronic diseases has been the topic of many reports in recent years, which is indicative of the scientific community’s growing interest in this subject. Some studies also call attention to the development of medical professionals in oral health promotion, a matter of concern among medical education representatives.

The goal of interprofessional education is to bring various professional groups together in the educational environment to promote collaborative practice and improve the health care of patients. According to Greene and Greene, the most relevant oral health issues to be addressed by non-dental health professionals are already available in the USPSTF and CTFPHC recommendations for periodic health care and these recommendations could be incorporated into the training programs for medical students and physicians. In fact, some studies indicate that specific training programs in oral health promotion have elicited enthusiastic attitudes and positive interest from medical students and an increase in dental caries diagnosis and fluoride varnish applications reported by pediatric care providers. Despite the importance of this subject and the existing evidence of good initiatives in oral health education in medical schools, however, there is still a huge challenge to be faced: how to include attractive and effective training programs about oral health in the congested medical curriculum.

In our study, face-to-face and Internet-based interventions in oral health promotion were evaluated among fifth-year medical students. According to our results, the baseline self-report of adequacy concerning oral health knowledge revealed that 91 percent of the students considered this inadequate (Table 1). This finding was confirmed by the baseline assessment for which the medians of percentage of correct responses were similarly low for all study groups (Table 2). In corroboration with these findings, some authors have found inadequate professional development among American family doctors and pediatricians—59 percent of whom had no training in oral health and 85 percent of whom had attended less than two hours of training programs about oral health during their professional lifetime. This lack of training represents a critical situation because the general population is supposed to have more access to pediatricians and family doctors than to dentists.

We observed an increase in knowledge among the four groups by the end of all interventions (Table 2). Remarkably, the median of group Cy+C was 2.5 times higher than that of the Control group on the final assessment. A similar effect was demonstrated by the OSCE, which revealed that the median value of group Cy+C was 1.3 times higher than that of the Control group. Finally, the multivariate logistic regression

<table>
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<th>Table 3. Odds ratio (95% CI) of relevant predictors of student performance on final assessment and objective structured clinical examination (OSCE) obtained by multivariate logistic regression</th>
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<tr>
<td>Final Assessment</td>
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<tr>
<td>Group</td>
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<td>Gender</td>
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<td>Previous oral health education</td>
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<td>Self-perception of oral health knowledge</td>
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Note: Significant values (p<0.0001) are highlighted in bold.
Br=Brochure group; Cy=Cybertutor group; Cy+C=Cybertutor + Contact group
in asking and counseling about oral health promotion significantly increased knowledge and the best skills trained to specialists (group Cy+C) presented the most program in addition to brief proactive contact with a students who had access to the Internet-based training learned. The way to fill this gap. It is fair to remark that the tasks of study, which involved the inclusion of personal contact with a tutor, assistance accessing the online material, operational support, and biweekly checks on student adherence to course modules.

These results strongly emphasize that combining technology and human factors can be highly useful in medical education. The use of modern technology of information and communication to achieve low-cost, high-quality learning programs is a useful tool in the complementary interdisciplinary education of medical students and physicians because it respects personal timetables, available places to study, and individual profiles. Furthermore, the online availability of the course itself may provide insufficient motivation for students, and the human contact of a tutor or monitor could be an effective way to fill this gap. It is fair to remark that the tasks performed by the specialist in this study were quite simple and operational with no didactic, tutorial, or mentor purpose regarding the core matters to be learned.

In conclusion, the group of fifth-year medical students who had access to the Internet-based training program in addition to brief proactive contact with a trained specialist (group Cy+C) presented the most significant increase in knowledge and the best skills in asking and counseling about oral health promotion in comparison to the other groups. Combining both technological and human factors could be a low-cost, high-quality way to introduce and spread oral health knowledge in medical schools.

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