An Online Alcohol and Oral Health Curriculum for Dental Students

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Abstract: Regular heavy alcohol use can cause or worsen several oral health disorders and is associated with complications during and after dental procedures. Dental student education should provide detailed knowledge of these issues together with skills needed to detect and counsel patients with unhealthy drinking patterns. This project was designed to develop and evaluate a five-module, online program to teach dental students about alcohol and oral health, systemic and oral biological effects of heavy drinking, required changes to treatment protocols for heavy drinkers, reliable methods of alcohol screening, and ways to provide heavy drinkers with brief interventions. Results indicated that the online program resulted in significant changes in knowledge, attitudes, and behavior. This online format could easily be incorporated into an already crowded dental school curriculum, with students learning the material at their own pace and in their own available time.

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Keywords: alcohol, dental students, dental education, online education, public health

Submitted for publication 2/12/13; accepted 5/30/13

Online educational curricula can provide a feasible and time-efficient way for dental students to learn about the clinical management of patients who use alcohol to excess. Such programs have been developed for medical students and residents, but, unfortunately, online alcohol-related curricula for dental students are lacking. While Web-based and CD-ROM programs on tobacco use and eating disorders have been developed for dental students, no comprehensive alcohol-related educational programs are available. MedEdPORTAL, a free online international publication venue, includes a few oral health web-based programs that touch briefly on alcohol but none that provide a comprehensive detailed overview. Another MedEdPORTAL publication focuses on alcohol screening but provides no information on oral health risks or complications related to heavy alcohol use. In addition, lack of quantitative evaluation of these modules limits their utility.

Excessive alcohol use can cause or exacerbate a number of specific oral health conditions including oral and pharyngeal cancer, enamel erosion, salivary gland disease, and periodontal disease. In addition, heavy alcohol use is related to complications during and after dental procedures such as adverse drug reactions, excessive bleeding, and poor wound healing. This issue is not trivial in clinical practice since approximately 18 to 25 percent of dental patients exhibit problematic drinking. This prevalence is similar to that reported in samples of primary care patients. Increased knowledge of alcohol-related oral health conditions would assist dentists in their treatment of heavy drinking patients. Routine screening of patients for alcohol use would allow dentists to detect patients most at risk and plan treatment and patient counseling accordingly.

While a recent survey found that 90.9 percent (fifty-five of sixty-eight schools responding) of U.S. and Canadian dental schools addressed alcohol use and dependence in their predoctoral curricula, specific content was not reported. Furthermore, only 64.8 percent of those schools included behavior change skills in their curricula. Lectures were the primary mode of instruction, with fewer schools using small-group instruction, clinic and community-based instruction, and independent study (not online). Many of the educational sessions focused on personal experiences of addicted individuals. That study also found...
that total instructional time in contact hours per year varied from 2.63 hours in the third year to 4.44 hours in the fourth year. The investigators concluded that, because of limited time in overcrowded academic schedules, dental schools would welcome innovative instructional materials such as alcohol-related online curriculum resources tailored for predoctoral dental students.

In a pilot study, Miller et al. developed and tested one educational module focusing on alcohol screening with dental students. Significant improvements in student knowledge of screening methods, comfort in screening patients, and intention to screen future patients were found. Although this was a limited, preliminary study evaluating only one fifteen-minute educational module, the results demonstrated that online alcohol education is feasible.

The aim of our study was to develop the first evidence-based, comprehensive, online alcohol education curriculum for dental students that can be integrated into dental school curricula. The intent was to design online modules to assist dental students in identifying alcohol-related risk factors and complications, learning how to plan treatment around these conditions, and identifying and counseling heavy drinking patients. The overriding aim was to evaluate whether an online educational curriculum could provide a feasible and time-efficient way for dental students to learn about the clinical management of patients who use alcohol to excess.

Methods

Our team created five modules, each corresponding to a specific alcohol core competency. The core competencies that we developed were as follows: 1) knowledge of the epidemiological and clinical evidence relating heavy alcohol use to oral health; 2) knowledge of the systemic and oral biological effects of heavy alcohol use; 3) knowledge of ways in which these effects require specific changes in dental treatment; 4) knowledge of and behavioral skills needed to successfully screen dental patients for alcohol use; and 5) knowledge of and behavioral skills needed to provide patients with oral health-related alcohol education, brief intervention, and, if appropriate, referral. These core competencies were based on an extensive review of the literature including the nationally recognized alcohol clinical guidelines developed by the National Institute on Alcohol Abuse and Alcoholism (NIAAAA).

The multimedia modules consisted of text, graphics, video segments, and voiceover, with each module taking approximately fifteen minutes to complete. Modules were designed to be informative and creatively interactive. The web design was attractive, simple to maintain, and quick to load in a user’s browser. The general elements or pages included a central navigation area, introduction, pretest, main presentation page, posttest, and resources (download) area for each instructional unit. The presentation ran freely, but the pace was under the control of the user. The modules were available online through the university’s Blackboard system, a course management tool allowing students access to online curricula and providing a method of outcome assessment. The online format was easily accessible to students and available at a time of their choosing.

Content of Modules

“Module One: The Effects of Alcohol on Oral Health” described the direct and indirect effects of alcohol on the oral cavity. Clinical photos combined with epidemiological data and text were used to demonstrate these effects. Sequelae included oral-pharyngeal cancers, vascular lesions, bacterial and fungal infections, oral signs of nutritional deficiencies, chemical erosion of dental structures, and salivary gland structure and function.

“Module Two: Systemic and Oral Biological Effects of Heavy Alcohol Use” described systemic changes that result from heavy alcohol ingestion, with an emphasis on those changes that affect dental treatments. Clinical pictures, diagrams, and tables were used to demonstrate this information. Particular emphasis was placed on those complications that may require additional precautions, and/or changes in the pre-, peri-, or postoperative protocols for these individuals. Topics covered included excessive bleeding due to clotting protein deficiencies and/or platelet dysfunction, altered drug metabolism, impaired wound healing, and adequate follow-up care.

“Module Three: Treating the Heavy Drinking Patient” focused on strategies in managing dental patients whose underlying health has been compromised due to alcohol use. Particular emphasis was placed on those complications that may preclude certain procedures or require specific timing or hospitalization in order to be completed safely. Selection of appropriate medications (anesthesia, antimicrobials, and analgesics) for individuals with alcohol-related liver disease was stressed. An explanation of the
preoperative laboratory values needed to determine adequate levels of hemostasis during invasive procedures was included. Because of increased risk of poor wound healing and infection, recommendations concerning adequate follow-up care were also made. Suggestions concerning oral health prevention strategies, selection of appropriate dental materials, and long-term care were addressed.

“Module Four: Alcohol Screening” reviewed the NIAAA alcohol screening guidelines.20 One video vignette of dentist-patient interactions related to alcohol screening was included. The actor demonstrated specific behavioral skills recommended by the guidelines.

“Module Five: Alcohol Brief Intervention and Referral” described brief alcohol intervention techniques as outlined in the NIAAA’s guidelines.20 Four video vignettes of dentists performing a brief intervention with patients were included. The module discussed and demonstrated “Rethinking Drinking,” NIAAA’s online resource for educating patients about heavy alcohol use. Finally, self-help and professional referral sources were described along with practical ways to access these resources and to motivate patients to seek help.

Participants
Participants were second-year predoctoral dental student volunteers enrolled in the College of Dental Medicine (CDM) at the Medical University of South Carolina (MUSC). Students were informed that participation in the project was strictly voluntary and outside of the regular dental school curriculum. A total of forty-eight students volunteered to review the modules in this first phase of the study. These participants received a payment of $25 each.

These students were then asked to volunteer additionally to participate in two standardized patient interactions to evaluate their communication skills with patients. Twenty-nine of the forty-eight volunteered for this second phase of evaluation, and twelve were randomly selected to participate in the behavioral skills evaluation. The twelve students who were videotaped during the standardized patient interactions signed an additional informed consent and received an additional $25 each. Payment was a requirement of the Institutional Review Board (IRB) of MUSC since Dr. Miller and Dr. Ravenel teach courses in the dental school. The IRB felt there may be perceived coercion and recommended that, in addition to informed consent, payment be provided to students for participation. With that provision, the IRB approved the study.

Evaluation
After the five modules were developed and finalized, the thirty-nine second-year dental students who completed the review of the modules were evaluated in two ways. First, each module included a ten-item pre- and posttest, assessing knowledge of the specific information included in each module. Questions were written in a multiple-choice format with four choices for each item. For Module Four (Alcohol Screening), in addition to the ten knowledge questions in the posttest, two items were added to evaluate intention to screen (“If given the opportunity, how likely are you to ask dental patients about their alcohol use?”) and perceived comfort level in screening (“How comfortable would you feel asking dental patients about their alcohol use?”). For Module Five (Alcohol Brief Intervention and Referral), two items were added to evaluate intention to perform brief interventions (“If given the opportunity, how likely are you to advise and counsel dental patients about their alcohol use?”) and perceived comfort level in conducting brief interventions (“How comfortable would you feel advising and counseling dental patients about their alcohol use?”). Responses were in the form of a rating scale with seven choices ranging either from “extremely unlikely” to “extremely likely” or from “extremely uncomfortable” to “extremely comfortable.” To maintain anonymity, no personal identifiers were used. However, a unique identifier was used for each subject to permit repeated measures analysis of pre-/posttest data.

The twelve randomly selected student volunteers (30 percent of the sample) also participated in two standardized patient interactions to evaluate their communication skills with patients. The first interaction took place one week prior to their viewing the alcohol modules, and the second occurred one week after viewing the modules. All interactions were videotaped to allow for later behavioral ratings. Students were informed that they would be videotaped.

For these evaluations, we recruited and trained two standardized patients to act as dental patients. Standardized patients played the roles of heavy drinking dental patients who were new to the clinic. They were instructed not to volunteer information about their drinking but, if asked, to be initially hesitant when answering alcohol-related questions. Specifically, they were instructed to be vague about
Each item of the rating scale was taken directly, and in consecutive order, from the current NIAAA guideline booklet (“Helping Patients Who Drink Too Much”), following each step in the process from an initial prescreen (i.e., “Do you sometimes drink alcoholic beverages?”) to referral if necessary. A simple checklist as opposed to scaled judgments was used for counting the occurrence of ten elements of the screening and brief intervention process. Total score was the total number of “yes” ratings, indicating the occurrence of one element of the screening or brief intervention process.

Results

Forty-eight second-year predoctoral dental students consented to voluntary participation in this study. Of those, forty students enrolled, and thirty-nine completed (sixteen female, fourteen male, nine unreported). Enrollment was defined as answering at least one question on either a pre- or post-module assessment. Thus, the final sample consisted of thirty-nine students. The sample included three Asian students, twenty-five white students, and eleven students who chose not to report; two students were Hispanic and twenty-eight were not Hispanic; and nine did not disclose race/ethnicity (Table 1). No further demographic information was collected. There were no exclusionary criteria for study participation. One-quarter (twelve) of our initial consent group further volunteered to participate in the behavioral interview skill part of the study. All volunteers completed the study from pre- and post-module online assessments to each of two behavioral skills interviews.

Change in Knowledge

Students’ knowledge in the key content areas in each of the five modules was assessed prior to and following each related module. Knowledge was assessed with ten multiple-choice questions. Tests were study-specific (not standardized, validated instruments). Change in knowledge was examined with paired samples t-tests; Bonferroni correction was used to correct for inflated type I error rate (alpha per test=0.01).

Table 2 shows group mean scores (derived by adding number of questions answered correctly, range=0-10) for each module by pre- vs. posttest. For all modules, there was a significant increase in knowledge following the educational session, all p-values ≤0.001. The size of the change, as measured...
by $r^2$, revealed large effects. Conventionally, the interpretation (small, moderate, large) is based on Cohen’s recommendation regarding percentage of variance explained (which is reflected by $r^2$). Small effects reflect ~1-9 percent of variance explained ($r^2$ of 0.01 to 0.09); moderate effects are 10-24 percent; and large effects are ≥25 percent.

**Self-Reported Behavior Change**

The students were asked to report their likelihood of performing and comfort level for engaging in desired screening behaviors prior to and following instruction on modules related to behavior change (Modules Four and Five). All were rated on a five-point scale, from 0 (definitely not) to 4 (definitely so). The participants were also asked to rate the importance of asking dental patients about their alcohol use using the same scale. The data were analyzed to determine whether scores increased following training. As with analysis of knowledge change, Bonferroni correction was used to correct for inflated type I error rate (alpha per test=0.01).

Table 3 shows group means (SD) for each question, pre- vs. post-instruction. Results showed that, for all self-reported behaviors, there was a positive and significant change toward greater likelihood and comfort in engaging in alcohol screening and brief interventions (all $p$-values ≤0.01), with moderate effect sizes for all. Students also increased in their ratings of the importance of asking dental patients about their alcohol use ($p=0.01$) with a smaller effect size (likely due to ceiling effects).

**Observed Behavior Change**

For the twelve students evaluated on a behavioral measure to assess the extent to which actual screening and brief intervention behaviors were demonstrated, recordings of the behavioral interviews were reviewed independently by two reviewers (AL and ST). The total score for each participant reflects the number of desired behaviors scored as present (0-10). Prior to consensus, rates of agreement between reviewers on the total scores were acceptable: Intraclass Correlations (ICC) were 0.78 for pre-training total scores and 0.70 for post-training sum scores. Similarly, Pearson correlation coefficients were $r=0.63$ (pre-training) and $r=0.75$ (post-training). All reliability statistics were statistically significant ($p≤0.05$).

Where reviewers were discordant in their assessment of a student, they re-examined that student’s interview together to arrive at consensus. The two behaviors on which reviewers were most frequently discordant in their initial ratings were 1) asks prescreening alcohol question (e.g., do you drink alcohol?) and 2) asks heavy drinking question (e.g., how often do you drink more than four [males] or three [females] drinks in a sitting). The basis of discordance was when the standardized patient answered a question in such a way that made the explicit asking of these questions redundant (thus, one reviewer scored the student’s behavior as present because there was no need to exhibit it, while the other reviewer scored the student’s behavior as absent because the student did not explicitly exhibit the behavior). During consensus building, the reviewers agreed to follow the most conservative approach and score a behavior as present only if it was explicitly demonstrated. The final score used in the statistical analyses reflects unanimous decision by the reviewers.

The pre-training mean score was 3.17 (SD=1.95), with a range of 0 to 7. The post-training mean score was 6.17 (SD=1.64), with a range of 3

<table>
<thead>
<tr>
<th>Race</th>
<th>Male (n=14)</th>
<th>Female (n=16)</th>
<th>Unknown (n=9)</th>
<th>Total (n=39)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asian</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>White/Caucasian</td>
<td>12</td>
<td>13</td>
<td>9</td>
<td>25</td>
</tr>
<tr>
<td>Unknown/not reported</td>
<td>1</td>
<td>1</td>
<td>9</td>
<td>11</td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Hispanic</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Not Hispanic</td>
<td>13</td>
<td>15</td>
<td>0</td>
<td>28</td>
</tr>
<tr>
<td>Unknown/not reported</td>
<td>0</td>
<td>0</td>
<td>9</td>
<td>9</td>
</tr>
</tbody>
</table>

*Note: Other races available for indication were American Indian/Alaska Native, Native Hawaiian or Other Pacific Islander, black or African American.*
Discussion

This project was unique in that it resulted in the development and evaluation of a comprehensive multimedia online alcohol educational program specifically designed for dental students. While online educational programs are not uniquely innovative in and of themselves, the application of this easily accessible technology is novel and original. The online format can be incorporated into an already crowded dental school curriculum, with students learning the material at their own pace and in their own available time during evenings, weekends, or when they have patient no-shows in the clinic. The five modules can be viewed as a whole or separately, with different modules presented in different courses, thus...
enhancing the likelihood of their eventual adoption by dental schools.

The findings indicated that, after exposure to five online modules of fifteen minutes each, dental students significantly increased their knowledge of alcohol-related oral health conditions and ways of dealing with them. Students also increased their reports of being more likely to screen and counsel patients for alcohol use after viewing the modules compared to before viewing them. Self-reports of comfort level in screening and counseling also increased. Rating of the importance of alcohol screening also increased from pre to post viewing but not as much as with likelihood of and comfort with screening. This appeared to be a ceiling effect since ratings of the importance of screening and counseling were fairly high even prior to viewing. While these self-reports can be useful, such data have obvious limitations and can be influenced by extraneous factors such as social desirability.

Most importantly, our findings indicated significant improvements in behavioral skills related to alcohol screening and brief intervention with standardized patients. Behavioral ratings of student performance with standardized patients showed clinically relevant improvements: increases from a mean of 3.17 to a mean of 6.17 on a 0 to 7 scale. Students showed particular improvements in the behavioral skills of asking about alcohol use and quantity/frequency of alcohol use, stating concern over the patient’s heavy drinking, discussing the oral health effects of heavy alcohol use, and advising the patient to reduce drinking.

Fewer increases were observed in asking questions related to a possible alcohol use disorder and referring patients to either an online resource or an addiction professional for further evaluation. A list of items is involved in detecting alcohol use disorders, and students may not have remembered this more complex information. In addition, these omissions may have been due to time limits since students were given only ten minutes for this exercise.

Certain limitations of this study should be noted. Since the participants were volunteers, there is a possibility of selection bias in which students who volunteered may be systematically different from those who did not volunteer. The absence of a control group certainly limits the conclusions. Also, immediate pre/post testing does not provide information on the sustainability of knowledge or behavioral skills over time. While observation of students’ behaviors with standardized patients provides a test of their screening and brief intervention skills, it does not indicate how students may react in routine clinical practice. Students were also aware of the fact they were being videotaped. While there are obvious advantages to unobtrusive observation, IRB requirements would not allow the use of this methodology. Because of the practical need to limit the amount of time that each student was in the videotaping session, the students were informed that the standardized patients represented an alcohol challenge. Knowing this information in advance may have primed students to ask alcohol-related questions. The influence of social desirability factors (influenced by payment and volunteerism) in priming students to perform well on the behavioral tasks could also be an issue. However, a goal of this study was to evaluate specific

<table>
<thead>
<tr>
<th>Behavior</th>
<th>Percentage Demonstrating Behavior Prior to Training</th>
<th>Percentage Demonstrating Behavior Following Training</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asks prescreening question</td>
<td>58%</td>
<td>92%</td>
</tr>
<tr>
<td>Asks heavy drinking day question</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Asks quantity/frequency questions</td>
<td>83%</td>
<td>100%</td>
</tr>
<tr>
<td>Asks alcohol use disorder questions</td>
<td>33%</td>
<td>33%</td>
</tr>
<tr>
<td>States concern about drinking level</td>
<td>33%</td>
<td>83%</td>
</tr>
<tr>
<td>Discusses oral health effects</td>
<td>33%</td>
<td>92%</td>
</tr>
<tr>
<td>Advises to cut down</td>
<td>33%</td>
<td>67%</td>
</tr>
<tr>
<td>Gauges readiness to change</td>
<td>8%</td>
<td>67%</td>
</tr>
<tr>
<td>Helps with plan</td>
<td>8%</td>
<td>50%</td>
</tr>
<tr>
<td>Refers to “Rethinking Drinking” and/or referral</td>
<td>25%</td>
<td>33%</td>
</tr>
</tbody>
</table>

Mean (SD) total score: 3.17 (1.95) to 6.17 (1.64)
screening and brief intervention behavioral skills as opposed to whether or not students initiated an alcohol discussion. Social desirability by itself would not have influenced whether students had actually mastered such skills.

Now that this five-module online alcohol educational program has been developed and tested, it can be evaluated with appropriate control groups in a multi-site study. Part of the evaluation should include observation of student behavior in actual clinical situations. Once fully evaluated, this online program could provide a time-efficient and effective way to teach dental students (and practicing dentists via continuing education courses) about alcohol-related health conditions and the detection of at-risk alcohol use.

Acknowledgments
This project was funded by the National Institute on Alcohol Abuse and Alcoholism (NIAAA) through grant R25 AA019647.

REFERENCES