Do US medical students report more training on evidence-based prevention topics?

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Received on March 15, 2011; accepted on May 15, 2012

Abstract

Little is known about the extent to which evidence-based prevention topics are taught in medical school. All class of 2003 medical students (n = 2316) at 16 US schools were eligible to complete three questionnaires: at the beginning of first and third years and in their senior year, with 80.3% responding. We queried these students about 21 preventive medicine topics, concerning the extent of their training and their patient counseling frequency at some of these time points. At the beginning of the third year, self-reported extensive training was low for all preventive medicine topics (range 7–26%). USPSTF-recommended topics received more curricular time (median for topics: 36% if recommended versus 24.5% if not, P = 0.025), as did topics addressed through testing rather than through discussion (median for topics: 37% for testing and 25% for discussion, P = 0.005). Extensive training was always associated with higher counseling frequency, and intention to go into primary care, female gender, a positive attitude toward prevention and positive personal health habits were associated with higher counseling frequency. Although some bemoan the overall low levels of US medical students’ prevention-related training and practice, we demonstrate that at least they are preferentially evidence-based, a novel and encouraging finding for preventionists.

Introduction

Physician training in preventive counseling and health promotion occurs in undergraduate, graduate and continuing medical education. At the undergraduate level, US accreditation standards include preventive medicine [1], encouraging integrating clinical epidemiology into medical schools’ pre-clinical curricula [2, 3] and in the clinical years [3, 4]. The Association of Teachers of Preventive Medicine and the US Health Resources and Services Administration jointly established the Prevention Curriculum Assistance Program in 1994 to assess the quality of undergraduate level preventive medicine education. According to their 1997 status report, 96% of medical schools expected students to be able to correctly identify screening tests, prevention counseling, immunizations and chemoprophylaxis regimens, but only 31% reported satisfaction with the quality of outcomes evaluation [5]. Multiple medical schools have opted to integrate preventive medicine training into the clinical and (to a lesser extent) into the pre-clinical years [6–9], but there exists no recent systematic evaluation of curricula to our knowledge. In addition, many US and Canadian medical schools offer combined MD-MPH programs [10–12] and the osteopathic model of medical education centers around the holistic ‘mind, body, spirit’ connection, fostering preventive medicine-centered knowledge, skills and attitudes in graduates [13].
In the US medical education system, the American College of Preventive Medicine (and its associated residency programs) was established in 1954; since dissemination of the Accreditation Council for Graduate Medical Education (ACGME) competencies standard [14] (encompassing principles of epidemiology and health promotion for achievement of medical knowledge and systems-based practice), many graduate and continuing medical education training programs have also adopted preventive medicine skills training [15–18]. Such programs have trained physicians in health promotion and disease prevention at the population level to bolster a preventive medicine clinical, research and public health-oriented workforce.

Although many organizations recommend that clinicians perform prevention-related activities, and that they do so based on the best available evidence, there is low uptake of these recommendations, and an imperfect understanding of the reasons for the low uptake. In addition, there is little known about whether having evidence-based prevention recommendations influences medical students’ clinical prevention practices. The first goal of this study was to examine whether topics with evidence-based recommendations (such as the United States Preventive Services Task Force (USPSTF) recommendations) were associated with higher levels of reported medical student training and prevention counseling. A related goal was to examine whether the topic’s strategy of prevention (discussion-based or examination/testing-based) would be associated with the level of reported training and prevention counseling. We also wished to explore whether, for each of 21 topics, the likelihood of frequent counseling was associated with having received more training, even after controlling for personal characteristics.

**Materials and methods**

**Study design**

All medical students in the class of 2003 at 16 US schools were eligible to complete three questionnaire administrations during their medical training: at freshman orientation (T1, summer/fall 1999), the beginning of students’ hospital experiences (T2, summer 2001, at ‘entry to wards’) and in their senior year (T3, summer 2002). School participation was encouraged by offering the summary use of school-specific data (de-identified aggregate data).

We selected our convenience sample of schools [19] to reflect all US allopathic medical schools in terms of age (freshman average = 24 years old versus 24 nationally), school size (average students per school = 563 versus 527 nationally), National Institutes of Health medical school research ranking (school average = 64 versus 62 nationally), private/public school balance (51% private schools versus 41% nationally), under-represented minorities (13% Blacks, Hispanics and Native Americans versus 11% nationally), gender (45% women versus 43% nationally) and geographic distribution [20–23]. A 17th school was excluded in 2002 due to protocol non-adherence.

Students’ responses were linked across time using a unique identifier consisting of mother’s initials at her birth and father’s first two initials. At freshman orientation, 2080 students were eligible to complete the survey and 1846 responded (88.8%); 1982 were eligible at entry to wards (typically at the beginning of third year) and 1630 responded (80.8%); 1901 were eligible at senior year and 1469 responded (77.3%). Of the 2316 students who provided responses, 71.6% (n = 1658) did so at more than one time point; 971 responded at three time points, 687 at two and 658 at one. Individual school response rates were 48–98%, including responses from the 17th, protocol-non-compliant school, yielding a conservative estimate of 80.3% responding overall. Not all students were eligible to respond at all three survey points—for example because of students leaving or returning from pursuing a complementary degree. Median item non-response rates were 3%.

The ‘Healthy Doc’ questionnaires were usually administered after semi-mandatory activities (e.g. after examinations, during orientation lunches or at the end of a class) to encourage participation. Students were informed that questionnaires were anonymous and confidential. Participation was
voluntary. At some schools with lower response rates, we used Dillman’s five-stage mailing process [24] to increase rates; these accounted for 5% of the senior year responses. Approximately one-quarter of the senior year questionnaires were filled out in the first half of the school year, while over half were completed toward the end of the school year (April to June). Three schools chose to administer the questionnaire in a mandatory rotation, collecting data throughout the year, while the remainder primarily collected their data on one or two dates. In addition, school participation was encouraged by offering school-specific data (without student identifiers) to school investigators.

**Description of variables**

Our primary outcomes were variables concerning medical students’ (i) self-reported frequency of counseling on 21 topics and (ii) self-reported training on these topics. Students were asked: ‘With a typical general medicine patient, how often do you actually perform this activity?’ ‘Talking to patients about’ (nutrition, exercise/physical activity, weight, smoking cessation [among smokers], alcohol, other substance abuse, domestic violence, firearm possession/storage, safe sex, sun-protective behavior, stress management and hormone replacement [for post-menopausal women]); ‘Ordering/performing/recommending’ a (cholesterol test, prostate-specific antigen test [for men aged >50 years], skin examination, stool guaiac for colorectal cancer [aged >50 years], digital rectal examination for prostate cancer [for men aged >50 years], clinical breast examination [for women patients], mammogram [for women aged 50–70 years], Chlamydia screening [for sexually active women ≤50 years], test to rule out bioterrorism-related diseases). For this same list, the training question asked: ‘How much training have you had on this topic?’ The possible responses for frequency were ‘never-rarely’/’sometimes’/ ‘usually always’ and for training ‘none’/’some’/’extensive’. The amount of training was queried at ward orientation and during senior year, while counseling frequency was queried only during senior year. We also queried personal characteristics and health attitudes and habits on some age-appropriate-related practices. Most questions were taken verbatim from widely used instruments, particularly the Centers for Disease Controls’ (CDC’s’) Behavioral Risk Factor Surveillance System, allowing direct comparisons with students’ same-age peers in the general population. Validity and reliability for many questionnaire items were also independently tested and confirmed in this medical student population [25, 26].

**Statistical analysis**

**Bivariate analyses**

Overall estimates of the percent reporting extensive training and the percent reporting counseling usually/always for the 21 topics were used in calculating the Wilcoxon rank-sum test of the hypothesis that there was an association between the outcome and USPTF recommendation (A/B/AB versus I/D/ none) and between the outcome and prevention strategy (discussion versus test). These overall estimates were also used to plot and test the correlation between percent training extensively and percent counseling usually/always.

**Modeling**

Repeated measurements were taken from students in multiple schools, resulting in lack of independence among the observations; we therefore adjusted variance estimates to account for the dependencies. For modeling, we used SUDAAN software designed for the analysis of clustered data, with students clustered within school.

Each logistic model had counseling frequency (usually/always versus less) as the outcome and four independent variables: self-reported training in the topic, gender, intended specialty and attitude toward their responsibility to promote prevention with their patients. Other topic-specific personal behavior covariates were included when available. Model parameters were estimated with a SUDAAN procedure using generalized estimating equations with robust variance estimation. Model fit was assessed via the Hosmer–Lemeshow
goodness of fit test [27] and tested for problems with multicollinearity.

Results

Training

At orientation to wards (typically coincident with the beginning of the third year of medical school), the proportion of students reporting having received extensive training was a quarter or less for all topics and did not vary significantly by USPSTF recommendation or prevention strategy (Table I). By senior year, the range of extensive training went from one-tenth (for bioterrorism-related testing and firearm possession/storage) up to half (for cholesterol and stool guaiac testing). Training topics were more likely to receive extensive attention by senior year if they were recommended by the USPSTF (median for topics: 36% if recommended versus 24.5% if not, \( P = 0.025 \)) or if the prevention strategy was by examination/testing rather than through discussion/counseling (median for topics: 37% for examination/testing, 25% for discussion, \( P = 0.005 \)). A few topics stand out in contrast to this general result. Training was extensive for clinical breast examination (46%) and prostate-specific antigen (PSA) testing (42%), two USPSTF-non-recommended (but ACS and specialty society-recommended) examinations/tests and for discussion of safe sex (41%), while on the recommended topic of weight, only 28% reported extensive training.

Counseling

As shown in Table II, there was considerable diversity in the percent of senior medical students reporting never counseling on a topic, ranging from 3% to 77%, and, from 3% to 56%, usually/always counseling. Senior medical students reported more frequent counseling on preventive topics if they were USPSTF-recommended or if counseling was examination/test-based (median for topics: 32% if recommended versus 15.5% if not, \( P = 0.014 \); median for topics: 32% for examination/testing and 17% for discussion, \( P = 0.033 \)). Smoking cessation was the most frequently discussed of all topics, with 56% reporting usually/always discussing it and just 3% never doing so. Also of that 3% who reported never discussing smoking cessation, 32% reported light or infrequent tobacco use. Among USPSTF-recommended items, the newly recommended Chlamydia screening of sexually active young women was performed least frequently (21%). The proportion of students reporting frequent counseling was strongly positively associated with the proportion reporting extensive training on that topic (\( r = 0.84, P < 0.001 \)) and this association was true regardless of USPSTF recommendations or prevention strategy (Fig. 1a and b). Of note, 23% of these geographically distributed US senior medical students in 2002–03 reported that they had a patient tested to rule out a bioterrorism-related disease (test type not specified).

Multivariate analyses

In the multivariate analyses of each topic, based on the individual student level, the odds of frequently counseling were consistently over twice as high for those receiving extensive training compared with less, even after controlling for differences in intended specialty, gender, promotion prevention attitude and topic-related personal habit (Tables III and IV). Receiving at least some training had the greatest association (OR > 4) with performing counseling on firearm safety, sun protective behavior and testing to rule out bioterrorism-related disease.

In addition to training, we found that intended specialty, gender, attitudes towards prevention and personal health habits were often associated with counseling frequency. Those intending to go into primary care practice were more likely to frequently discuss nutrition, exercise, weight, smoking cessation, domestic violence, firearm possession/storage, safe sex, sun-protective behavior and hormone-replacement therapy (HRT) and to frequently perform examination/testing of cholesterol, skin examination, clinical breast examination, mammogram and Chlamydia screening. Females were more likely than males to counsel on smoking cessation, HRT, cholesterol, PSA, stool guaiac and Chlamydia
Table 1. US medical students reporting reception of extensive training on preventive counseling topics

<table>
<thead>
<tr>
<th>USPSTF rating</th>
<th>Other guidelines</th>
<th>Prevention/screening item</th>
<th>Prevention mode</th>
<th>Orientation</th>
<th>Senior year</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Widely recommended</td>
<td>Smoking cessation</td>
<td>Discussion</td>
<td>25</td>
<td>42</td>
</tr>
<tr>
<td></td>
<td>Recommended by ACS</td>
<td>Stool guaiac (&gt;50 years)</td>
<td>Test</td>
<td>20</td>
<td>52</td>
</tr>
<tr>
<td></td>
<td>CDC STD treatment guidelines [43]</td>
<td>Chlamydia (sexually active women ≤25 years)</td>
<td>Test</td>
<td>NA</td>
<td>35</td>
</tr>
<tr>
<td>AB</td>
<td>ADA, ACS</td>
<td>Cholesterol</td>
<td>Test</td>
<td>23</td>
<td>49</td>
</tr>
<tr>
<td>B</td>
<td>ADA</td>
<td>Weight</td>
<td>Discussion</td>
<td>18</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Alcohol</td>
<td>Discussion</td>
<td>19</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td>Recommend by ACS[44] and ACOG[45]</td>
<td>Mammogram (women aged 50–70 years)</td>
<td>Test</td>
<td>17</td>
<td>36</td>
</tr>
<tr>
<td>I</td>
<td>Recommended by ACS</td>
<td>Nutrition</td>
<td>Discussion</td>
<td>15</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Exercise</td>
<td>Discussion</td>
<td>19</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Substance abuse</td>
<td>Discussion</td>
<td>15</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>Recommended by ACS</td>
<td>Sun-protective behavior</td>
<td>Discussion</td>
<td>16</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Domestic violence</td>
<td>Discussion</td>
<td>14</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>Recommended by ACS and ACOG</td>
<td>Clinical breast examination (women)</td>
<td>Test</td>
<td>25</td>
<td>46</td>
</tr>
<tr>
<td></td>
<td>Recommended by ACS and AUA</td>
<td>PSA (men &gt;50 years)</td>
<td>Test</td>
<td>21</td>
<td>42</td>
</tr>
<tr>
<td></td>
<td>Recommended by AAD, ACS</td>
<td>Skin examination</td>
<td>Test</td>
<td>13</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>Recommended by ACS/AUA</td>
<td>DRE for cancer (men &gt;50 years)</td>
<td>Test</td>
<td>19</td>
<td>37</td>
</tr>
<tr>
<td>D</td>
<td>Recommended by ACOG[46]</td>
<td>HRT (menopausal women)</td>
<td>Discussion</td>
<td>17</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td>Not addressed by USPSTF</td>
<td>Stress management</td>
<td>Discussion</td>
<td>12</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>Recommended by CDC and ACOG</td>
<td>Safe sex</td>
<td>Discussion</td>
<td>26</td>
<td>41</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Firearm possession/safety</td>
<td>Discussion</td>
<td>7</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Test to rule out Bioterrorism-related disease</td>
<td>Test</td>
<td>NA</td>
<td>10</td>
</tr>
</tbody>
</table>

Wilcoxon rank-sum test P-values\(^b\) for the comparisons (added for the comparisons):

Recommended by USPSTF or not 0.120 0.025
Prevention strategy (discussion versus test) 0.187 0.005

\(^a\)USPSTF ratings as of 2003, the time of survey. Discussion: ‘With a typical medicine patient, how often do you actually perform this activity: talk to patients about (topic)?’
Test: ‘With a typical medicine patient, how often do you actually perform this activity: ordering/performing/recommending a (examination or test)?’

\(^b\)The topic of bioterrorism was not included in the analysis.
NS = Not significant; OR = Odds ratio.
screening. Female students were more likely than males to counsel on clinical breast examinations and mammogram only if they had recently received a clinical breast examination. Among the topics based on patient discussion, having a positive attitude toward physicians’ responsibility to promote prevention was only associated with more frequent discussion of smoking cessation. However, a positive attitude about physicians’ health promotion responsibility was positively and significantly associated with higher odds of frequent use of all screening tests except skin examinations (NS) and bioterrorism-related testing (an arguably non-prevention topic, with significantly lower odds shown).

Personal habits that were associated with more frequent counseling on related topics were as follows: higher fruit and vegetable consumption, exercising in accordance with CDC guidelines, not using tobacco products, trying to practice safe sex, practicing sun protection, making stress management a high priority, having had a clinical skin examination and, for females, having had a clinical breast examination within the past 2 years.

**Discussion**

At orientation to wards, a quarter or fewer students reported extensive training for any individual topic,
and this did not vary significantly by USPSTF recommendation or by prevention strategy (discussion versus testing). Our findings show that these US medical students report receiving little prevention training in their first 2 years and that the training they do remember receiving may not be markedly evidence-based. We believe that the low amounts of pre-ward prevention training occur because the first 2 years of American medical school are typically more oriented toward basic sciences than clinical medicine. Explaining the lack of emphasis on evidence is more conjectural, but we believe it may be because students bring personal beliefs about prevention that predate the rigor of medical school training. Our findings suggest schools’ curricular content should be examined for the timing, evidence base, quality, quantity and effectiveness for behavior change of preventive counseling training.

During senior year, preventive topics that were evidence based had more students reporting having had training. This is particularly striking when comparing widely recommended smoking cessation with stress prevention (42% versus 12% of seniors reporting extensive training). In addition, topics with evidence-based recommendations were observed to have greater proportions of students reporting more frequent counseling (e.g. 56% of seniors reported usually performing smoking

Fig. 1. (a) Association of training and counseling frequency for 21 prevention topics (senior year) by (a) USPSTF recommendation and (b) strategy.

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Fig. 1. (a) Association of training and counseling frequency for 21 prevention topics (senior year) by (a) USPSTF recommendation and (b) strategy.
Table III. Characteristics associated with medical students' self-reported frequency of discussing prevention topics with typical patients

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Nutrition</th>
<th>Exercise</th>
<th>Weight</th>
<th>Smoking cessation</th>
<th>Alcohol</th>
<th>Substance abuse</th>
<th>Domestic violence</th>
<th>Firearm possession/storage</th>
<th>Safe sex</th>
<th>Sun protective behavior</th>
<th>Stress</th>
<th>HRT</th>
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</thead>
<tbody>
<tr>
<td>Training (extensive versus less)</td>
<td>2.2</td>
<td>2.5</td>
<td>2.3</td>
<td>2.4</td>
<td>2.3</td>
<td>3.1</td>
<td>4.5</td>
<td>3.2</td>
<td>5.4</td>
<td>3.8</td>
<td>3.5</td>
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<td></td>
<td>(1.5–3.2)**</td>
<td>(1.7–3.7)**</td>
<td>(1.7–3.2)**</td>
<td>(1.8–3.2)**</td>
<td>(1.6–3.4)**</td>
<td>(1.5–3.4)**</td>
<td>(1.8–5.4)**</td>
<td>(2.1–9.6)**</td>
<td>(2.0–5.1)***</td>
<td>(2.2–14)**</td>
<td>(2.4–6.2)*****</td>
<td>(2.5–4.9)*****</td>
</tr>
<tr>
<td>Specialty (primary versus non-primary)</td>
<td>2.2</td>
<td>1.9</td>
<td>1.8</td>
<td>1.3</td>
<td>1.0</td>
<td>1.8</td>
<td>2.6</td>
<td>2.1</td>
<td>1.7</td>
<td>1.5</td>
<td>2.0</td>
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<tr>
<td></td>
<td>(1.4–3.3)</td>
<td>(1.3–2.7)**</td>
<td>(1.3–2.6)**</td>
<td>(1.0–1.7)*</td>
<td>(0.7–1.4)</td>
<td>(0.6–1.4)</td>
<td>(1.0–3.1) *</td>
<td>(1.0–3.1)***</td>
<td>(1.0–2.9)*</td>
<td>(0.9–2.4)</td>
<td>(1.5–2.7)*****</td>
<td></td>
</tr>
<tr>
<td>Gender (females versus males)</td>
<td>1.0</td>
<td>1.2</td>
<td>0.9</td>
<td>1.4</td>
<td>1.1</td>
<td>1.2</td>
<td>1.2</td>
<td>0.8</td>
<td>1.3</td>
<td>1.3</td>
<td>1.6</td>
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<tr>
<td></td>
<td>(0.8–1.3)</td>
<td>(0.9–1.8)</td>
<td>(0.7–1.2)</td>
<td>(1.0–1.8)*</td>
<td>(0.8–1.5)</td>
<td>(0.9–1.6)</td>
<td>(0.7–2.3)</td>
<td>(0.3–1.8)</td>
<td>(0.9–1.8)</td>
<td>(0.6–1.4)</td>
<td>(0.7–2.5)</td>
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<tr>
<td>Responsibility to promote (agree versus neutral/disagree)</td>
<td>1.9</td>
<td>1.3</td>
<td>1.6</td>
<td>2.2</td>
<td>1.5</td>
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<td>(0.8–4.3)</td>
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<td>(0.8–3.3)</td>
<td>(1.0–4.8)*</td>
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<td>(0.6–2.5)</td>
<td>(0.4–3.3)</td>
<td>(0.3–2.0)</td>
<td>(0.5–5.2)</td>
<td>(0.4–2.6)</td>
<td>(0.5–3.4)</td>
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<tr>
<td>Topic-specific covariates</td>
<td>1.1</td>
<td>1.4</td>
<td>1.4</td>
<td>1.4</td>
<td>0.8</td>
<td>1.7</td>
<td>2.1</td>
<td>2.0</td>
<td>1.5</td>
<td>2.2</td>
<td>1.5</td>
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<td></td>
<td>(1.1–1.2)** ***</td>
<td>(1.1–1.9)*</td>
<td>(1.0–1.05)</td>
<td>(0.5–1.1)</td>
<td>(0.8–0.9)**</td>
<td>(0.7–3.9)</td>
<td>(1.5–8.8)</td>
<td>(0.6–6.9)</td>
<td>(1.5–2.3)*</td>
<td>(1.5–3.3)**</td>
<td>(1.5–4.8)*****</td>
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</table>

* Binge versus abstain. ^Drinks but no bingeing versus abstain. ¥Yes, high versus not trying. €Yes, low priority versus not trying. Adjusted Wald F-test; *P < 0.05; **P < 0.01: ***P < 0.001; ****P < 0.0001; bold: P < 0.05.
cessation counseling versus only 8% stress management counseling). This finding has been previously noted with regards to preventive counseling in primary and emergency care [28–30].

Seniors were more likely to have received extensive training and to perform clinical preventive practices more frequently if the strategy of prevention was by examination/testing rather than through discussion. These findings suggest a predilection for faster (ordering a test versus taking time to counsel) and more reimbursable prevention activities.

Traditionally, allopathic medical training has stressed history-taking and physical examination praxis over counseling skills. It is only in the past few decades that behavioral counseling, motivational interviewing and preventive counseling teaching have become more emphasized in medical education [31], and most medical students have little role modeling on lifestyle counseling and few incentives to change this [32].

Across all preventive topics and both strategies, students’ counseling frequency is strongly positively associated with several other variables, including female gender [33, 34] and positive prevention-related attitudes [28, 35–37]. As positive counseling frequency is also associated with both female gender and positive prevention-related attitudes [28, 35–37], as positive counseling frequency is also associated with several other variables, including female gender and positive prevention-related attitudes [28, 35–37].

A student’s counseling frequency is also associated with several other variables, including female gender and positive prevention-related attitudes [28, 35–37].

Table IV. Characteristics associated with medical students’ self-reported frequency of ordering, performing or recommending screening tests

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Cholesterol test</th>
<th>PSA</th>
<th>Skin examination</th>
<th>DRE for prostate cancer</th>
<th>Stool guaiac</th>
<th>CBE</th>
<th>Mammogram</th>
<th>Chlamydia screening</th>
<th>Test to rule out bioterrorism-related disease</th>
</tr>
</thead>
<tbody>
<tr>
<td>Training (extensive versus less)</td>
<td>3.2 (2.5–4.1)*****</td>
<td>3.1 (2.4–4.0)*****</td>
<td>3.9 (2.7–5.7)*****</td>
<td>3.1 (2.3–4.2)*****</td>
<td>2.5 (1.9–3.3)</td>
<td>2.6 (1.9–3.5)*****</td>
<td>3.6 (2.9–4.4)*****</td>
<td>3.2 (2.2–4.6)*****</td>
<td>8.3 (5.6–11.1)*****</td>
</tr>
<tr>
<td>Specialty/primary versus non-primary</td>
<td>1.5 (1.1–2.1)*</td>
<td>1.1 (0.9–1.4)</td>
<td>1.5 (1.0–2.3)*</td>
<td>1.1 (0.8–1.4)</td>
<td>1.1 (0.9–1.4)</td>
<td>1.8 (1.3–2.4)*****</td>
<td>1.6 (1.1–2.2)**</td>
<td>2.0 (1.5–2.7)*****</td>
<td>1.0 (0.8–1.3)</td>
</tr>
<tr>
<td>Gender (females versus males)</td>
<td>1.3 (1.1–1.7)*</td>
<td>1.4 (1.0–1.8)*</td>
<td>1.2 (0.8–1.8)</td>
<td>1.3 (0.9–1.8)</td>
<td>1.3 (1.0–1.7)*</td>
<td>1.7 (1.3–2.3)*****</td>
<td>0.7 (0.6–1.0)*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Responsibility to promote prevention (agree versus neutral/disagree)</td>
<td>2.2 (1.2–3.8)*</td>
<td>3.4 (1.7–6.8)**</td>
<td>1.9 (0.7–5.1)</td>
<td>3.0 (1.5–5.8)**</td>
<td>3.4 (1.8–6.6)**</td>
<td>2.4 (1.1–5.3)*</td>
<td>2.2 (1.1–4.3)*</td>
<td>1.9 (1.0–3.6)*</td>
<td>0.3 (0.2–0.5)*****</td>
</tr>
<tr>
<td>Topic-specific covariates</td>
<td>Had cholesterol test within the past 2 years? (Yes versus no)</td>
<td>1.0 (0.8–1.3)</td>
<td>1.9 (1.4–2.6) **</td>
<td>1.0 (0.8–1.3)</td>
<td>1.9 (1.4–2.6) **</td>
<td>1.4 (1.0–2.0)*****</td>
<td>1.2 (0.8–1.7)*****</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Adjusted odds ratio for ever versus never testing. **Yes (female versus male). ***No (female versus male). Adjusted Wald F-test; *P < 0.05; **P < 0.01; ***P < 0.001; ****P < 0.0001; bold P < 0.05.
screening, which are essential areas for future examination. Additional limitations are that we do not specify type of training, nor do we account in our analysis for some external factors that may influence preventive counseling frequency, including availability of community resources and referrals [38], or whether stronger evidence increases counseling by motivating more patient requests for help.

In summary, we and others have already established that unhealthy personal behaviors and negative attitudes toward preventive strategies may lead to lack of credibility in patient care, personal job dissatisfaction and poor patient outcomes [36, 39–41]. However, as the late Ronald Davis, MD, MPH (Past President, American Medical Association; Director, Center for Health Promotion and Disease Prevention, Henry Ford Health System) suggested [42], an early impediment to promoting health in health systems lies in undergraduate medical education. Based on the 2006–07 LCME Medical Student Questionnaire data, Davis argued that medical school curricula offer insufficient time to cover evidence-based preventive practice and behavioral modification training. It is promising that evidence-based preventive strategies receive more attention in medical school curricula and that students also counsel on these areas more frequently. However, our findings suggest that prevention overall is under-utilized and that there is a further gap between medical students’ use of discussion and action-based preventive topics. Neglect of time-consuming discussion-based strategies in favor of more costly preventive strategies will likely have long-term economic and health implications. In light of the increasing relevance of the USPSTF in healthcare reform, and consistently shifting recommendations, our data provide an important baseline for comparison. Future work should emphasize not only universal standards of preventive counseling but also the financial and public health implications of less-publicized preventive strategies, especially behavioral medicine-based strategies (e.g. obesity counseling). We have an imperative to continue examining and strengthening the impact of prevention-based behavioral medicine training on patient-level outcomes.

Funding

American Cancer Society, CDC and the Canada Research Chair program.

Conflict of interest statement

None declared.

References


