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Behavior Change Counseling Curricula for Medical Trainees: A Systematic Review

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Abstract

Purpose—Unhealthy behaviors contribute to half of U.S. deaths. However, physicians lack sufficient skill in counseling patients to change behaviors. Characterizing effective published curricular interventions for behavior-change counseling for medical trainees would inform educators toward improved training.

Method—The authors conducted a systematic literature search of studies published 1965–2011 evaluating curricula on behavior change counseling for medical trainees. Included studies described: (1) behavior change counseling, (2) teaching interventions for medical trainees, and (3) assessment of interventions. The authors extracted eligible articles, rated outcomes for learners and patients using Kirkpatrick’s hierarchy, and determined study quality.

Results—Of 2,788 identified citations, 109 met inclusion criteria. Most studies were performed in the United States (98), 93 at a single institution, and 81 in primary care settings. Curricular topics for counseling included smoking (67 studies), nutrition (30), alcohol/drug use (26), and exercise (22). Although most studies did not include theoretical frameworks, 39 used the Transtheoretical Model of Change. Sixty-two studies involved eight or fewer hours of curricular time, and 51 spanned four or fewer weeks. The studies with highest-level outcomes and quality employed multiple curricular techniques and included practice of counseling techniques in either simulated or actual clinical settings.

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Conclusions—Existing literature suggests that trainees learn behavior change counseling through active, realistic practice and implementation of reminder and feedback systems within actual clinical practice settings. Multi-institutional medical education research on methods of teaching behavior-change counseling that influence patients' health outcomes are needed to ensure trainees' clinical competence and improve patient care.

Patients' health behaviors account for about half of all deaths in the United States.¹ Unhealthy behaviors, such as smoking, substance use, poor nutrition, lack of exercise, and violence, result in chronic illness and a significant number of physician visits² and hospital stays.³ Unfortunately, less than 5% of the more than \$2 trillion spent annually on health care in the United States is devoted to reducing behavioral and social risk factors.⁴ Physician counseling for unhealthy behaviors can prompt patients to adopt healthier lifestyles.⁵⁻⁷ Healthy lifestyle choices are important to the health of the population overall, and physician counseling has the potential to promote such choices, but clinicians do not adequately address these topics with their patients.⁸ Lack of awareness of the benefits of physician intervention and insufficient skill in providing behavioral counseling are barriers to widespread use of this technique.⁹

Medical educators have expressed concern that undergraduate and graduate curricula inadequately prepare medical trainees to engage in behavior counseling with their patients.⁹⁻¹¹ In 2004, the Institute of Medicine (IOM) released a report indicating that undergraduate medical education in the United States falls short of addressing critical health issues, including smoking, diet, alcohol, sedentary lifestyle, and accidents.¹² The IOM also found that the curriculum in most U.S. medical schools does not provide sufficient training about these behavioral and social risk factors, despite the fact that addressing them in patient care could significantly reduce mortality and morbidity.¹² Furthermore, the pace of clinical practice with multiple demands on physicians' time coupled with inadequate reimbursement for preventive services may lead physicians to prioritize other topics during patient visits.¹³

Medical training should include skills for behavioral-change counseling and methods to facilitate the implementation of these skills in a practice setting. In fact, patient-centered communication strategies and patient education are expected areas of competence for all U.S. graduate medical trainees, regardless of specialty.¹⁴ Although some studies and reviews have focused on strategies for improving practicing physicians' counseling skills^{15,16} or described curricula for improving trainees' counseling regarding particular behaviors,^{11,17} we have found no standardized or evidence-based approach to teaching behavioral-counseling skills with proven long-term effects on physicians' clinical behavior or patients' outcomes. Trainees are simultaneously developing skills and learning the value of addressing different topics during patient encounters, which may make them more amenable to training in behavioral counseling techniques.

We undertook a systematic review of the literature to characterize curricular interventions designed to teach medical trainees to counsel for behavior change and to determine the effectiveness of these curricular interventions. This information could inform medical educators on the design of curricular interventions that maximize trainees' abilities to affect patients' behavior change.

Method

Data sources

We systematically searched the literature for relevant English-language studies published between January 1965 and June 2011 in the PubMed, Education Resource Information Center (ERIC), PsycINFO, and Web of Science Citation Index databases. With the guidance

of a library science expert, we used combinations of terms related to education, curriculum, program evaluation, training (clerkship, internship, residency, and fellowship), clinical competence, counseling and patient education, shared decision making, and specific behavior-change topics, such as smoking, substance use, sexual activity, nutrition, and exercise. We performed the initial search in May 2010 and updated it in June 2011. We reviewed the reference lists of all included articles and relevant review articles. The full search strategy is available upon request.

Study selection

We included studies that described: (1) counseling for behavior change, (2) a curriculum or teaching intervention for medical trainees (medical students, interns, residents, fellows), and (3) assessment of the curriculum intervention. We excluded studies that did not include physicians-in-training, lacked a curricular intervention or assessment of that intervention, or both, and those without a full article available for review. Studies not available in English were also excluded.

Title and abstract review

Two authors (K.E.H., J.S.) independently reviewed titles and abstracts of the articles identified in the initial search (Figure 1) to assess eligibility for full-text review. Of those, 179 were deemed appropriate for full-text review. When the authors disagreed about an article's eligibility, or an article had insufficient or absent abstract information, the full article was reviewed.

Study review and data extraction

We developed a data extraction form based on the Best Evidence in Medical Education (BEME) abstraction form.¹⁸ The information we extracted addressed study design, intended learning outcomes of the curriculum, learners, setting, behaviors and theoretical framework for behavior change, curriculum format and amount, and curriculum assessment. Two of the four authors independently reviewed every eligible article. We resolved differences in data extraction through consensus adjudication.

We extracted information on the outcomes of curricular interventions based on Kirkpatrick's hierarchy, which describes the highest outcome or level of effectiveness of an educational intervention.¹⁹ Our evaluation of a study's impact included the following: participation (learners' views on the learning experience, its organization, presentation, content, teaching methods, and aspects of the instructional organization, materials, quality of instruction), learners' self-assessed modification of attitudes/perceptions (changes in participants' attitudes or perceptions about the curricular intervention), modification of learners' knowledge/skills (trainees' acquisition of concepts, procedures, and principles; and thinking/problem-solving, psychomotor and social skills), behavioral change (trainees' transfer of learning to the workplace), or benefits to organizational practice (wider changes in the organizational delivery of care, attributable to an educational program) or patient care (any improvement in patient health as a direct result of an educational program).¹⁹

For each study, we determined a strength-of-finding rating to summarize the overall study quality by incorporating features of the study's design and sampling, use of a theoretical or conceptual framework, type of outcome data, data analysis, and outcomes. We rated studies' strength of findings on a five-point scale (1 = no clear conclusions can be drawn, 3 = conclusions can probably be based on the results, 5 = results are unequivocal).^{20,21} All authors discussed criteria for strength of findings and applied them together to six manuscripts to ensure that all authors used the scale consistently for the remaining studies. For each study, the two authors who had extracted the particular study rated the study using

an aggregate impression based on the specified features of study quality. The two authors discussed discrepancies until consensus; each author paired with another author for the data extraction and study rating process.

Data synthesis and analysis

We entered data from the final completed extraction forms into a database and used this information and descriptive statistics to characterize the types of studies included in our review. We analyzed the data to determine which studies appeared to result in the most meaningful changes in both learner performance and, when available, patient outcomes. We could not conduct a meta-analysis due to study heterogeneity.

Results

Search results and article overview

We reviewed 2,788 studies (2,763 initial citations and 25 from the reference lists of identified articles), and, of these, 109 met inclusion criteria after title, abstract, and full article review (Figure 1). The 109 studies evaluated 106 educational interventions; three interventions were described in two included studies, each evaluating different components.²²⁻²⁷

Study participants and evaluation designs

As illustrated in Table 1, most studies occurred in the United States (n = 98) at single institutions (n = 85). The majority of studies (n = 81) occurred in primary care disciplines, including internal medicine (n = 36), family medicine (n = 30) and pediatrics (n = 15). About a third (n = 34) did not specify a discipline, mostly because they occurred in pre-clerkship curricula for medical students. Sixty-one studies described interventions for medical students, 46 described interventions for residents, one study addressed both students and residents, and one targeted fellows.

The most prevalent study design was a pre-post design. Only 23 studies used a randomized controlled design, although five used a quasi-randomized design, such as block randomization.

A minority of studies (n = 43) specifically mentioned IRB approval for study of the curricular intervention.

Curricula

Most curricular intervention studies were designed to improve trainees' communication skills regarding counseling for behavior change (n = 101). Fifty-two also intended to enhance trainees' attitudes or awareness about the need for behavior change for the specified behaviors. Some studies had multiple intended effects (e.g., improved communication skills and attitudes).

The most commonly addressed topic for behavior change was smoking and tobacco use (n = 67 studies) followed by nutrition (n = 30), alcohol and drug use (n = 26), and exercise (n = 22). Theoretical frameworks were not commonly used to justify curricular interventions. Thirty-nine studies drew on the Transtheoretical Model of Change,²⁸ and 28 of those addressed smoking cessation.

Overall, 62 studies involved eight or fewer hours of curricular time. Fifty-one delivered the curriculum over a period of four or fewer weeks. Physicians were included as instructors in 45 studies, with other health providers and educators also commonly serving this role.

Commonly used teaching methods included didactics (n = 58 studies) and small group work (n = 71). Fewer curricula incorporated learners observing clinicians interacting with standardized, trained, or videotaped patients (n = 17 studies), or actual patients (n = 11). In some studies, learners practiced skills with peers or health providers (n = 42), standardized patients, (n = 32), and actual patients (n = 28).

Outcome measures: outcome level

We classified each study according to the highest outcome achieved as described above:¹⁹ participation; modification of attitudes/perceptions or knowledge/skills; behavioral change; benefits to organizational practice or patient outcomes.

Measures commonly used to assess curricula included learners' impressions, such as satisfaction (n = 39 studies), confidence (n = 49), and change in learner attitudes (n = 42). In 31 studies, curricula assessed trainees' knowledge through questionnaires or exams. Forty-one used standardized patient examinations. Twelve studies showed actual benefit to patients or organizational practice. The studies that showed benefits to trainees' knowledge, skills, behaviors, or patient care, or to the organizational practice are shown in Table 2.

Seventy-seven studies documented improved learner performance. Four showed no effect on learners and thus had no rating for outcome of intervention.

Strength of findings: Study quality

The majority of studies (n = 73) scored low on the strength-of-findings scale (rated 1 or 2). Twenty-eight studies were rated 3 ("results can probably be based on conclusions"), and eight were rated 4 ("results are very likely to be true"). No studies were rated 5 ("unequivocal results").

We reviewed the features of curricula in the 36 studies with greatest strength of findings (3 or 4); these studies described 35 unique curricula, with one tobacco cessation curriculum described in two publications.^{26,27} Thirteen described curricula for medical students, 22 for residents, and one described a curriculum for fellows and attending physicians.

The majority of studies with greatest strength of findings had clear focus on a single topic, most commonly smoking or other substance use (n = 24). Eighteen of these studies were published since the year 2000.

Two-thirds (n = 24) of the 36 studies with greatest strength of findings examined a curriculum based on a theoretical framework to inform the intervention, most commonly the Transtheoretical Model (n = 16).

Twenty-one studies focused on interventions with durations of four hours or less. Curricula were delivered over variable timeframes. In 14 studies, curricula were delivered within one to two weeks, whereas in five studies the curricula were delivered over more than four months. The roles (e.g., demonstrating skills, delivering didactics) of the instructors, such as physicians or other health care providers, were variable and frequently not specified.

Intervention techniques in high-level outcome, high quality, studies

Review of the nine studies that met the criteria of both high-level outcome (demonstrated effect of the intervention on patients or larger organizational practice) and high quality (rated 3 or 4) revealed some common features. These studies typically based their interventions on existing frameworks for counseling, such as the National Cancer Institute (NCI) "5 A's" (Ask, Advise, Assess, Assist, and Arrange),²⁹ motivational interviewing/stages-of-change, or both. For example, in an outpatient clinic, residents learned to counsel

for smoking cessation through a didactic curriculum and individual role-plays based on motivational interviewing/stages-of-change with a faculty member who provided individual feedback.³⁰ In psychiatry, a similar smoking cessation intervention based on the NCI 5 A's and motivational interviewing also provided faculty education on tobacco treatment.³¹

All studies in this group employed multiple curricular methods. These curricula typically incorporated multiple active learning strategies that engaged learners in structured practice, included feedback to learners, and/or provided opportunities for learners to practice after receiving targeted feedback. Nearly all high-quality studies included opportunities for learners to practice counseling techniques with standardized patients³² or through role-plays.³⁰ For example, in a pediatric residency, training on tobacco counseling included didactics at noon conferences over two years, training on interviewing, and role plays regarding challenging situations, such as parental smoking, pressure on teens to smoke, and difficult counseling experiences.³³ Internal medicine residents learned a time-efficient model of physical-activity counseling through role-plays based on motivational interviewing and use of patient education materials.³⁴

Most high-quality, high-level outcome interventions occurred in continuity clinics, which can allow providers to follow up with patients to determine the outcome of behavior-change interventions.^{30,33,35-37} However, an intervention in the emergency department for alcohol abuse used similar strategies to those used in primary-care interventions, including a combination of didactics, role-play practice, and feedback, based on the motivational interviewing framework.³⁸

Successful high-quality and high-level outcome curricula used a systems approach.³⁶ Specific strategies included educating both patients and providers about the targeted behavior change^{34,35,38,40-42} and using point-of-care reminders, such as notes to providers on charts, to prompt discussions of behavior change during patient encounters.^{27,32,37,40,43} One study used an interprofessional co-counseling model in which a nutritionist and learner observed each other counseling patients.⁴³ The counseling was combined with clinic mobilization strategies of educational posters in waiting and exam rooms. Multiple studies emphasized the importance of time-efficient models for counseling during patient visits.^{34,37,38,40}

Discussion

To our knowledge, this is the first published systematic review that focuses on curricula designed to enhance trainee performance in addressing behavioral change to improve population health. This review identified multiple small, single-institution studies with varying degrees of effect on learner and patient outcomes. Most studies reported learner satisfaction or knowledge rather than performance outcomes. Despite these shortcomings in the literature, our review points to successful curricular strategies grounded in behavior-change frameworks, learning theory, and the mobilization of clinical systems to augment behavior-change interventions.

Among interventions that used a theoretical framework, the Transtheoretical Model of Change was most commonly employed. When theory informs curriculum design, the lessons learned may be more generalizable.⁴⁴ The Transtheoretical Model promotes motivational interviewing, which encourages providers to maintain a patient-centered focus, show empathy, and explore ambivalence to counteract patients' resistance to change.⁴⁵ Although motivational interviewing is a well established approach, it was developed for mental health professionals to use in treating addiction in 50-minute sessions.⁴⁵ We identified multiple studies that employed a briefer version of motivational interviewing in resident continuity

clinic settings with success. Although motivational interviewing can be applied to a range of behavioral and chronic illnesses,⁴⁶ whether learners transfer these skills from curricula to clinical counseling interventions is unknown.

We found that most studies assessed the effects of behavior-change counseling curricula using easily measured but less robust outcomes, such as changes in attitudes, self-reported behaviors, or knowledge. For example, although one study showed a correlation between self-reported behaviors and performance with standardized patients,⁴⁷ observing skills with patients would be more effective in assessing trainees' competence.⁴⁸ Refresher training would enhance ongoing application of skills and avoid decay in performance.⁴⁹

We found that the highest quality studies often focused on a single behavior, particularly smoking or alcohol. Although this focus on single behaviors may be appropriate for students early on, medical trainees will need to counsel many patients with multiple simultaneous unhealthy behaviors. Many smokers exhibit additional high-risk behaviors.⁵⁰ Similarly, people who abuse alcohol or drugs also commonly smoke.⁵¹ Smoking cessation among polysubstance users is associated with cessation of other substance use, a finding that reinforces the need for trainees to learn to counsel for multiple behavioral risk factors.⁵²

Although we focused our study on medical trainees to identify components of effective curricula, our findings parallel other literature on continuing medical education interventions. The superior effect of interactive formats over didactic presentations for learning has been shown in continuing medical education,⁵³ and in education in general.⁵⁴ However, many high-quality studies show that combining interactive and didactic formats may be better than either alone at changing physicians' practice performance.^{55,56} Three educational intervention components result in lasting changes in physician behavior:⁵³ (1) demonstrating the gap between their current behavior and optimal behavior, (2) addressing gaps in knowledge and performance in the practice environment, and (3) reinforcing change over time until the new behavior is well established. Creating a learning environment to foster these components is complex, but as important as basic science content in training physicians.

Successful curricula in our study used principles of behavioral theory, which emphasizes the need for learners to practice skills with instructors providing guidance and feedback. Standardized patients, a commonly employed instructional tool, offer opportunities for targeted skills practice compared to the random opportunities that may arise in clinical encounters. In addition, learners can receive immediate coaching from standardized patients to correct errors and improve performance. Repeated cycles of practice and feedback typify deliberate practice and result in skill mastery.⁵⁷

Cognitive theory emphasizes the importance of learners' understanding and processing of information. Didactic instruction was common in many studies, including high-quality, high-level outcome studies, as part of an intervention that also included active learning strategies. Knowledge of the risks of unhealthy behaviors, the benefits of behavior change, and strategies to apply this information during patient counseling techniques equip learners to conduct counseling. In contrast, an intervention introducing report cards for adherence to practice guidelines among internal medicine residents in continuity clinic did not include didactics and failed to change residents' behavior.⁵⁸

Future curricular interventions to promote behavior-change counseling skills among medical trainees should use both behavioral and cognitive theories grounded in best educational practices. Generalizability of findings would be improved with large, multi-institutional studies that confirm the effectiveness of curricular interventions shown to be effective in smaller studies. Studies grounded in a conceptual framework with rationale for methods

used to change physicians' behaviors are needed.^{44,59} We found no studies on intra-professional education in providing counseling, even though health care is increasingly moving toward team-based models of care.^{60,61}

This study has limitations. We confined our search to the peer-reviewed literature and excluded studies that did not assess effectiveness of a curricular intervention. We did not search meeting proceedings; publication bias could have limited identification of studies presented only in abstract form. However, studies with higher-level outcomes would have been more likely to proceed from abstract presentation to publication. In addition, the literature search was confined to English-language studies. Finally, we did not include studies that addressed non-physician behavioral counseling. It is possible that other strategies for achieving behavior change, such as counseling by non-physician professionals, may be more effective than physician counseling. The effectiveness of counseling for behavior change has been endorsed based on evidence for some behaviors (e.g., tobacco cessation), whereas for others (e.g., injury prevention with motor vehicle restraints) efficacy of any curricular intervention remains unproven.⁶²

Conclusions

We identified multiple studies of curricula to teach medical trainees to counsel patients to implement behavior change for healthier lifestyles. However, the findings of multiple small, single institution studies highlight the need for multi-center research to add new insights to the existing literature and show the generalizability of findings about outcomes. Successful curricular interventions combine multiple learning strategies with opportunities for practice and feedback. Interventions that target learners, patients and clinical practices show promise. Showing the long-term effect of curricular interventions as trainees progress through their careers is critical. Future studies should prioritize curricula grounded in theory and assessment of direct benefits to patients.

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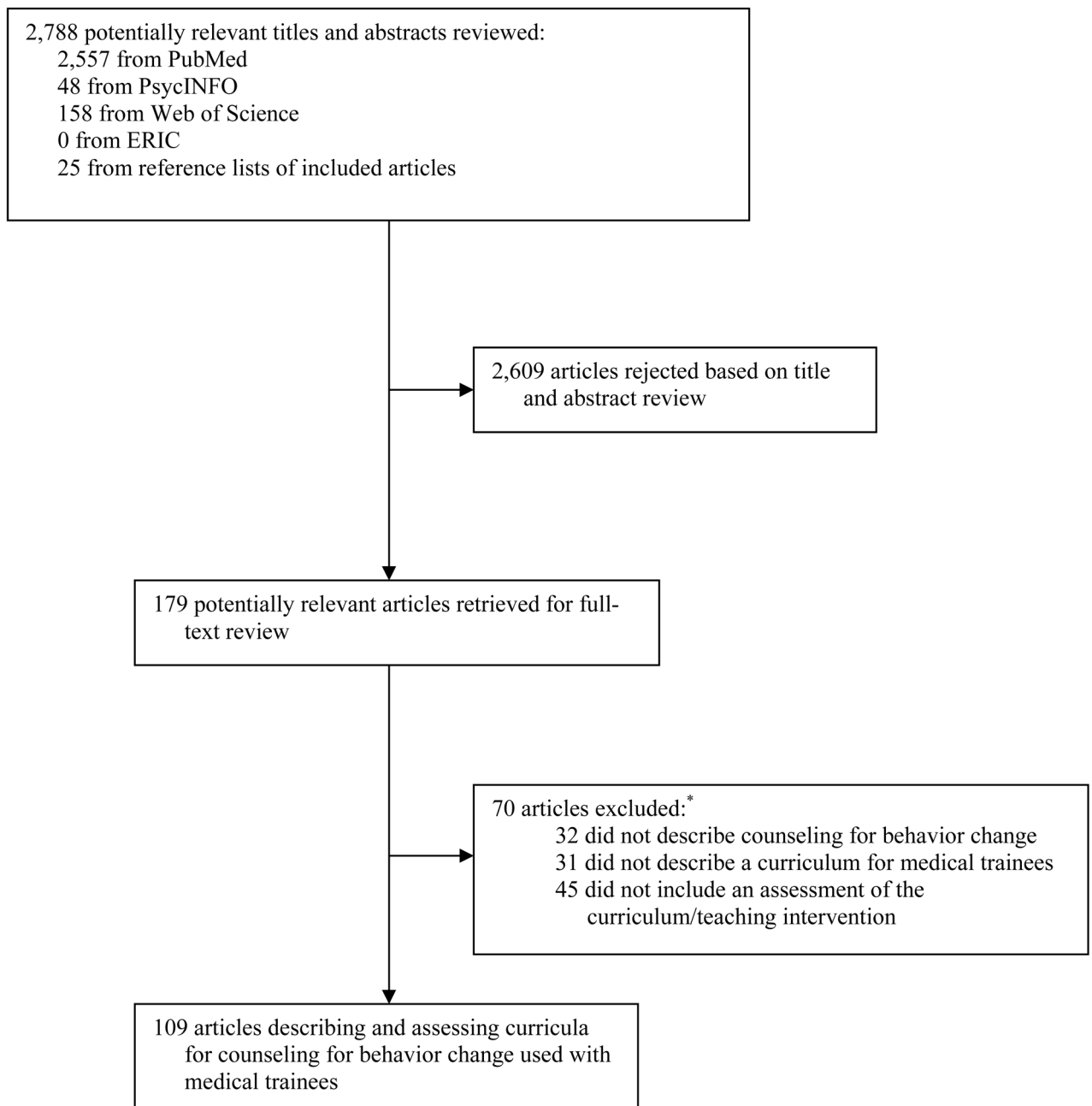


Figure 1. Literature search and selection process for articles published January 1965 through June 2011 describing curricula for medical trainees on behavior-change counseling for patients
*Some articles were excluded for multiple reasons and therefore were counted twice.

Table 1

Characteristics of 109 Studies Included in a Review of the Literature (1965–2011) Evaluating Curricula for Teaching Medical Trainees to Counsel Patients for Behavior Change

Study characteristics	No. of studies
Type of study*	
Randomized controlled trial	23
Prospective cohort with historical control	11
Prospective cohort with pre/post comparison	64
Prospective cohort without baseline	15
Retrospective cohort	1
Other [†]	28
IRB approval mentioned	43
Expected learning outcomes*	
Interpersonal communication	101
Personal behavior change	8
Change in trainee attitude/awareness	52
Other outcomes [‡]	8
Country	
United States	98
Other	11
Single/multi institution	
Single institution	93
Multi institution	16
Learner level*	
MS1 [§]	22
MS2	17
MS3	28
MS4	9
MS other or unspecified	7
PGY1 [¶]	26
PGY2	24
PGY3	22
PGY4	4
PGY unspecified	17
Fellow	1
Specialty*	
Internal medicine	36
Not specified/other ^{**}	44

Study characteristics	No. of studies
Family medicine	30
Pediatrics	15
Psychiatry	5
Surgery	3
Emergency medicine	2
Obstetrics–gynecology	2
Multi-disciplinary	1
Neurology	1

* More than one answer was possible in the category.

† Includes quasi-randomized (comparison of non-randomized individuals in groups), studies with multiple designs listed above, or designs that do not fit a category above.

‡ Self-confidence, self-efficacy, increased knowledge, patient outcomes.

§ MS = Medical Student

¶ PGY = Post Graduate Year

** Includes pre-clerkship curricula, ambulatory care outside of a single discipline, subspecialty practice

Table 2

Description of Curricula for Teaching Medical Trainees to Counsel Patients for Behavior Change in Studies With Highest Strength of Findings* in a Review of the Literature, 1965–2011

Study author and year	Specialty	Behavior addressed with intervention	Framework	Curriculum format	Curriculum hours	Period of time curriculum delivered	How curriculum was assessed	Documentation of improvement	Impact of intervention [†]
Curricula for medical students									
Haist et al, 2003 ⁶³	Internal medicine	Domestic violence	None	Seminar, standardized patient (SP) practice	1–4	1–2 weeks	Written exam, SPs, other	<ul style="list-style-type: none"> Knowledge: written exam Communication/counseling: simulation 	2b
Haist et al, 2004 ⁶⁴	Internal medicine	Sex behavior	None	Seminar, role play, SP practice	1–4	1–2 weeks	SPs	<ul style="list-style-type: none"> Communication/counseling: simulation 	2b
Martino et al, 2007 ⁶⁵	Psychiatry	Exercise, medication adherence, nutrition, smoking, substance use, general behavior	Transtheoretical ²⁸	Didactic lecture, role play, SP practice, other	1–4	1–2 weeks	Satisfaction, confidence, attitudes, written exam, other	<ul style="list-style-type: none"> Knowledge: written exam Communication/counseling: written exam Trainees' attitudes: self assessment Trainees' confidence: self assessment 	2b
Leong et al, 2008 ⁶⁶	Family medicine	Smoking	National Cancer Institute 5 A's (ask, advise, assess, assist, and arrange) ²⁹	Didactic lecture, SP practice, actual patient practice, other	1–4	3–4 weeks	Satisfaction, confidence, attitudes, written exam	<ul style="list-style-type: none"> Knowledge: written exam Communication/counseling: self assessment Trainees' attitudes: self assessment Trainees' confidence: self assessment 	2b
Allen et al, 1990 ⁶⁷	Family medicine	Smoking	Transtheoretical	Didactic lecture, seminar, role play, actual patient practice, SP observe	1–4	1–2 weeks	Confidence, attitudes, SPs	<ul style="list-style-type: none"> Communication/counseling: simulation Communication/counseling: self assessment Knowledge: written exam Communication/counseling: simulation Communication/counseling: self assessment 	2b
Bell and Cole, 2008 ⁶⁸	Internal medicine	General behavior	Transtheoretical	Didactic lecture, seminar, role play	5–8	3–4 weeks	Satisfaction, confidence, self report counseling, written exam	<ul style="list-style-type: none"> Trainees' attitudes: self assessment 	2b
Leone et al, 2009 ⁶⁹	Internal medicine	Smoking	Transtheoretical	Seminar, SP practice	5–8	3–4 weeks	Confidence, attitudes, self report counseling, SPs	<ul style="list-style-type: none"> Knowledge: self assessment Communication/counseling: self assessment 	2b

Study author and year	Specialty	Behavior addressed with intervention	Framework	Curriculum format	Curriculum hours	Period of time curriculum delivered	How curriculum was assessed	Documentation of improvement	Impact of intervention [†]
Roche et al, 1996 ⁷⁰	Not specified	Smoking	None	Didactic lecture, seminar, role play, other	1-4	Not specified	SPs	<ul style="list-style-type: none"> • Trainees' attitudes: self assessment • Trainees' confidence: self assessment • Communication/counseling: simulation 	2b
Yedidia et al, 2003 ⁷¹	Internal medicine, surgery, neurology, family medicine, pediatrics, psychiatry, OB/gyn, other specialty	Nutrition, sex behavior, smoking, substance use, general behavior	None	Didactic lecture, SP practice, SP observe, other	Not specified	>4 months	SPs	<ul style="list-style-type: none"> • Communication/counseling: simulation 	2b
Zweifler et al, 1998 ⁷²	Internal medicine	Other behavior	None	SP Practice, other	Not specified	1-2 weeks	SPs	<ul style="list-style-type: none"> • Knowledge: written exam • Communication/counseling: simulation 	2b
Carson et al, 2002 ⁷³	Other specialty	Nutrition, obesity	None	Seminar, other	1-4	3-4 weeks	Confidence, attitudes, self report counseling, written exam, patient outcomes	<ul style="list-style-type: none"> • Knowledge: written exam • Communication/counseling: real patient • Communication/counseling: self assessment • Trainees' confidence: self assessment 	3
Feddock et al, 2009 ⁷⁴	Internal medicine	Exercise, nutrition, sex behavior, smoking, substance use, other behavior	None	Seminar, SP observe	1-4	1-2 weeks	Written exam, SPs, other	<ul style="list-style-type: none"> • Knowledge: written exam • Communication/counseling: simulation 	2b
Haist et al, 2008 ⁷⁵	Internal medicine	Sex behavior	None	Seminar, SP practice	1-4	1-2 weeks	Written exam, SPs	<ul style="list-style-type: none"> • Knowledge: written exam • Communication/counseling: simulation 	2b
Curricula for residents									
Davis et al, 2008 ⁴¹	Internal medicine	Obesity	Social Learning, Health Beliefs ⁸³	Seminar, SP observe, other	1-4	Not specified	Focus group of patients, actual patients, other	<ul style="list-style-type: none"> • Communication/counseling: real patient environment 	4b
Allen et al, 1998 ⁷⁶	Internal medicine, surgery, family medicine, other specialty	Smoking	None	Didactic lecture, role play, actual patient practice, SP observe	1-4	1-2 weeks	Focus group of patients, patient outcomes	<ul style="list-style-type: none"> • Communication/counseling: real patient environment 	3

Study author and year	Specialty	Behavior addressed with intervention	Framework	Curriculum format	Curriculum hours	Period of time curriculum delivered	How curriculum was assessed	Documentation of improvement	Impact of intervention [†]
Comuz et al, 1997 ³⁰	Internal medicine	Smoking	Transtheoretical	Seminar, role play, other	1-4	1-2 weeks	Confidence, self report counseling, focus group of learners, patient outcomes	<ul style="list-style-type: none"> Communication/counseling: real patient environment Communication/counseling: self assessment 	4b
Evans et al, 1996 ³⁵	Internal medicine	Nutrition	None	Other	1-4	Not specified	Confidence, attitudes, self report counseling, focus group patient, written exam, patient outcomes, other	<ul style="list-style-type: none"> Communication/counseling: real patient environment Communication/counseling: self assessment Trainees' attitudes: self assessment Trainees' confidence: self assessment 	4b
Fox et al, 1998 ³⁶	Family medicine	Exercise, nutrition, other behavior	Continuous quality improvement ⁸⁴	Other	Not specified	>4 months	Other	<ul style="list-style-type: none"> Communication/counseling: real patient environment 	3
Gray et al, 1988 ⁴³	Family medicine	Nutrition	None	Didactic lecture, actual patient practice, actual patient observe	>12	Not specified	Patient outcomes	<ul style="list-style-type: none"> Communication/counseling: real patient environment 	3
Hymowitz et al, 2001 ³³	Internal medicine, pediatrics, psychiatry	Smoking	Transtheoretical, 5 A's	Didactic lecture, seminar, role play, other	5-8	>4 months	Self report counseling, patient outcomes, other	<ul style="list-style-type: none"> Communication/counseling: real patient environment Communication/counseling: self assessment 	4b
Katz et al, 2008 ³⁴	Internal medicine	Exercise	Transtheoretical, Pressure System Model ³⁴	Seminar, role play	5-8	>4 months	Patient outcomes	<ul style="list-style-type: none"> Communication/counseling: real patient environment 	3
Kogan et al, 2003 ³⁸	Internal medicine	Exercise, nutrition, obesity, sex behavior, smoking, substance use	None	Other	1-4	Not specified	Other	None	3
Mellvain et al, 1992 ⁴⁰	Family medicine	Smoking	Transtheoretical	Seminar, role play, SP observe, other	1-4	3-4 weeks	Satisfaction, attitudes, self report counseling, written exam	<ul style="list-style-type: none"> Communication/counseling: real patient environment 	3
Pololi and Potter, 1996 ⁷⁷	Internal medicine	Exercise, smoking	Transtheoretical	Seminar, SP practice	5-8	Not specified	Confidence, attitudes, SPs	<ul style="list-style-type: none"> Communication/counseling: simulation Trainees' attitudes: self assessment Trainees' confidence: self assessment 	2b

Study author and year	Specialty	Behavior addressed with intervention	Framework	Curriculum format	Curriculum hours	Period of time curriculum delivered	How curriculum was assessed	Documentation of improvement	Impact of intervention [†]
Prochaska et al, 2008 ³¹	Psychiatry	Smoking	Transtheoretical, Rx for change, ³¹ 5 A's	Didactic lecture, seminar, actual patient practice	1-4	Not specified	Satisfaction, confidence, attitudes, self report counseling, self report counseling, written exam, patient outcomes	<ul style="list-style-type: none"> Knowledge: written exam Communication/counseling: real patient environment Communication/counseling: self assessment Trainees' attitudes: self assessment Trainees' confidence: self assessment 	3
Saitz et al, 2003 ⁷⁸	Other specialty	Substance use	Transtheoretical	Other	Not specified	Not specified	Focus group of patients	<ul style="list-style-type: none"> Communication/counseling: real patient environment 	4b
Seale et al, 2005 ⁷⁹	Family medicine	Substance use	None	Didactic lecture, other	1-4	1-2 weeks	Other assessment	<ul style="list-style-type: none"> Communication/counseling: real patient environment 	4a
Vinacor et al, 1987 ⁴²	Internal medicine	Nutrition, obesity, other behavior	None	Seminar, other	9-12	3-4 weeks	Patient outcomes	<ul style="list-style-type: none"> Communication/counseling: real patient environment 	4b
Lee et al, 2004 ⁸⁰	Pediatrics	Smoking	Transtheoretical, 5 A's	Didactic lecture, seminar, role play, other	1-4	4-8 weeks	Confidence, written exam, SPs	<ul style="list-style-type: none"> Knowledge: written exam Communication/counseling: simulation Trainees' confidence: self assessment 	2b
Cornuz et al, 2002 ²⁶	Internal medicine	Smoking	Transtheoretical	Seminar, role play, SP practice, SP observe, other	5-8	1-2 weeks	Confidence, focus group patient outcomes	<ul style="list-style-type: none"> Communication/counseling: real patient environment Trainees' confidence: self assessment 	4b
Strecher et al, 1991 ³⁷	Internal medicine, family medicine, pediatrics	Smoking	None	Didactic lecture, seminar, SP observe, other	1-4	1-2 weeks	Confidence, attitudes, self report, focus group of learners, patient outcomes	<ul style="list-style-type: none"> Communication/counseling: real patient environment Communication/counseling: self assessment Trainees' attitudes: self assessment Trainees' confidence: self assessment 	3
Wilk and Jensen, 2002 ⁸¹	Internal medicine	Substance use	National Institute on Alcohol Abuse and Alcoholism 3 A's (ask, assess, advise) ⁸⁵	Seminar, SP practice	1-4	1-2 weeks	Satisfaction, written exam, SPs	<ul style="list-style-type: none"> Communication/counseling: simulation 	3

Study author and year	Specialty	Behavior addressed with intervention	Framework	Curriculum format	Curriculum hours	Period of time curriculum delivered	How curriculum was assessed	Documentation of improvement	Impact of intervention [†]
D'Onofrio et al, 2002 ³⁸	Emergency medicine	Substance use	Social Learning	Didactic lecture, seminar, role play, other	1-4	3-4 weeks	Satisfaction, confidence, attitudes, self report counseling, written exam, other assessment	<ul style="list-style-type: none"> Knowledge: written exam Communication/counseling: real patient environment Communication/counseling: self assessment Trainees' attitudes: self assessment Trainees' confidence: self assessment 	3
Humair et al, 2003 ²⁷	Internal medicine	Smoking	Trans theoretical, Brief Negotiation Interview ⁸⁶	Seminar, role play, SP practice, SP observe	5-8	1-2 weeks	Satisfaction, confidence, self report counseling, patient outcomes	<ul style="list-style-type: none"> Communication/counseling: real patient environment Communication/counseling: self assessment Trainees' confidence: self assessment 	4b
Hymowitz et al, 2007 ⁸²	Pediatrics	Smoking	Trans theoretical, 5 A's	Seminar, role play, SP practice, other	Not specified	>4 months	Confidence, attitudes, self report counseling, other assessment	<ul style="list-style-type: none"> Communication/counseling: simulation Communication/counseling: self assessment Trainees' attitudes: self assessment Trainees' confidence: self assessment 	2b

* All studies listed in this table were determined to have strength of findings of 3 ("conclusions can probably be based on the results") or 4 ("results are clear and very likely to be true") on a five-point scale (1 = no clear conclusions can be drawn, 5 = results are unequivocal).

[†] Outcomes of intervention: 1 = Participation (covers learners' views on the learning experience, its organization, presentation, content, teaching methods, and aspects of the instructional organization, materials, quality of instruction); 2a = Modification of attitudes/perceptions (changes in the reciprocal attitudes or perceptions between participant groups toward intervention/curriculum); 2b = Modification of knowledge/skills – (for *Knowledge*, the acquisition of concepts, procedures, and principles; for *Skills*, the acquisition of thinking/problem-solving, psychomotor, and social skills); 3 = Behavioral change – (documents the transfer of learning to the workplace or willingness of learners to apply new knowledge and skills); 4a = Change in organizational practice (wider changes in the organizational delivery of care, attributable to an educational program); 4b = Benefits to patient (any improvement in the health and well being of patients as a direct result of an educational program)