

REVIEWS

Skin Cancer Education for Primary Care Physicians: A Systematic Review of Published Evaluated Interventions

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BACKGROUND: Early detection of melanoma may provide an opportunity to positively impact melanoma mortality. Numerous skin cancer educational interventions have been developed for primary care physicians (PCPs) to improve diagnostic accuracy. Standardized training is also a prerequisite for formal testing of melanoma screening in the primary care setting.

OBJECTIVE: We conducted a systematic review to determine the extent of evaluated interventions designed to educate PCPs about skin cancer, including melanoma.

DESIGN: Relevant studies in the English language were identified through systemic searches performed in MEDLINE, EMBASE, BIOSIS, and Cochrane through December 2010. Supplementary information was obtained from corresponding authors of the included studies when necessary.

APPROACH: Studies eligible for inclusion formally evaluated skin cancer education interventions and were designed primarily for PCPs. Excluded studies lacked a specified training intervention, used decision-making software, focused solely on risk factor identification, or did not directly educate or assess participants. Twenty studies met the selection criteria. Data were extracted according to intervention content and delivery format, and study outcomes.

KEY RESULTS: All interventions included instructions about skin cancer diagnosis, but otherwise varied in content. Curricula utilized six distinct educational techniques, usually incorporating more than one. Intervention duration varied from 12 min to over 6 h. Eight of the 20 studies were randomized trials. Most studies (18/20, 90%) found a significant improvement in at least one of the following five outcome categories: knowledge, competence, confidence, diagnostic performance, or systems outcomes. Competence was most commonly measured; no study evaluated all categories. Variability in study design, interventions, and outcome measures prevented correlation of outcomes with intervention characteristics.

CONCLUSIONS: Despite the development of many isolated educational interventions, few have been tested rigorously or evaluated under sufficient standardized conditions to allow for quantitative comparison. Improved and rigorously tested skin cancer educational interventions for PCPs with outcome measures focusing on changes in performance are needed.

KEY WORDS: primary care; medical education; melanoma; skin cancer. *J Gen Intern Med* 26(9):1027–35

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INTRODUCTION

The incidence of melanoma, in all thickness categories, has increased over the past several decades and has become a major public health concern^{1,2}. Survival from late stage disease remains poor despite significant research efforts on a variety of treatment options³. Primary prevention strategies, focusing on reducing unnecessary ultraviolet (UV) exposure and other UV protection behaviors, can be difficult to implement^{4–7}. Early detection, when melanoma is thin and confined

to the skin, may be the best chance to positively impact melanoma mortality and is feasible through simple visual inspection, which is paramount to effective secondary prevention strategies⁴.

Increased public education and awareness efforts are, in part, responsible for the escalating desire for skin cancer screening in the general population. Both dermatologists and primary care physicians (PCPs) must work together to meet these demands since the dermatology workforce shortage precludes dermatologists from adequately achieving this on their own⁸. PCPs often see patients with skin complaints, and they can serve as an important point of skin cancer diagnosis and triage for Americans, who make an average of 1.7 visits to PCPs each year^{9,10}. Of patients with melanoma, 87% had a regular physician, and 63% had seen their PCP in the year prior to diagnosis, but only 20% had a dermatologist^{11,12}. PCPs are thus well positioned to detect early melanoma and, not surprisingly, the initial presentation of melanoma is often to PCPs, who biopsy 1.4–13% of all melanomas¹³.

While the skin examination is the most frequently occurring diagnostic or screening service provided in office-based physician visits¹⁴, melanoma screening for the general population by PCPs is not formally recommended despite limited but important evidence that it is feasible and efficacious as a means of secondary prevention^{15–17}. Currently, the United States Preventive Services Task Force (USPSTF) concludes that for adults in the general population who are not high risk, “the evidence is insufficient to recommend for or against routine screening for skin cancer using a total-body skin examination”¹⁷. The USPSTF made this recommendation based on (1) the lack of quality evidence that links screening to improved health outcomes and (2) limited information about the ability of PCPs to perform adequate examinations in the context of usual care¹⁸. With regard to the latter, it has been suggested that PCPs may not be prepared or sufficiently trained to identify early skin cancer^{18–21}. An effective training program is essential prior to conducting a rigorous screening trial designed to ultimately determine the efficacy of clinician skin examination and its impact on melanoma mortality reduction.

Unfortunately, most physicians have limited exposure to skin cancer and dermatology during medical school and residency^{22–26}. Lack of confidence and poor diagnostic skills are barriers to effectively performing skin cancer examinations, and many PCPs remain eager for education that can improve their diagnostic accuracy for skin cancer²⁷. Recent surveys of PCPs reveal increasing interest in dermatology courses and educational activities related to skin cancer^{28,29}. Interest in diagnostic aids for melanoma detection is also increasing among PCPs. In 2009, the American Academy of Family Physicians held the first dermoscopy course at their Annual Scientific Assembly Meeting (www.aafp.org accessed March 2, 2011). (See Online Appendix for a definition of dermoscopy.) The demand for this dermoscopy course has doubled, resulting in multiple dermoscopy sessions being offered at the annual meeting in 2010 (www.aafp.org accessed March 2, 2011 and personal communication, A.A. Marghoob, June 2010). In light of high demand and concerns about the adequacy of existing education, we undertook a systematic review of the literature to compare

components and outcomes of interventions that have been developed and tested for skin cancer education of PCPs. Awareness of previously developed educational interventions has the potential to impact the design and evaluation of future training efforts.

METHODS

We followed guidelines described by the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) statement in selecting and assembling publications for this review³⁰. The goal of the PRISMA statement is to help ensure clarity and transparency when reporting systematic reviews³⁰.

Eligibility Criteria

Studies eligible for inclusion in this review evaluated skin cancer educational interventions designed primarily for PCPs, including family practice physicians, internal medicine physicians, and general practitioners. Studies were excluded if they aimed to instruct exclusively residents, medical students, dermatologists, dermatology residents, nurses, or lay people about skin cancer. Skin cancer was defined as melanoma, basal cell carcinoma, and squamous cell carcinoma; interventions focusing exclusively on nonmelanoma skin cancers were excluded because melanoma is responsible for most skin cancer deaths³¹. Studies that involved surveys of prior dermatologic education, lacked a specified training intervention, addressed other types of cancer or dermatologic conditions other than skin cancer, used decision-making software, focused solely on identification of risk factors, or had no direct participant education or assessment with reported results were excluded. Studies whose main text was in a language other than English were excluded. Table 1 provides a summary of study inclusion criteria.

Data Sources and Study Selection

We performed a systematic search of articles published in peer-reviewed health care-related journals between 1966 and December 2010 using MEDLINE, EMBASE, BIOSIS, and

Table 1. Inclusion Criteria

Criteria	Requirement
Intervention	Study must have evaluated a replicable educational intervention with a curriculum, as opposed to solely instruction in the use of a tool or algorithm
Topic	Educational interventions directed at instruction in the diagnosis of skin cancer including, but not limited to, melanoma
Audience	Participants must have been primarily PCPs; however, studies were accepted if they also included non-dermatology residents, nurses, or medical students
Outcomes	Study participants were required to be evaluated for outcomes related to change in knowledge, competence, confidence, diagnostic performance, or systems outcomes
Language	Studies whose main text was in a language other than English were excluded

Cochrane. Three categories of terms were searched: (1) melanoma, skin cancer, pigmented skin lesions, skin malignancy, or melanocytic; (2) primary care doctor, primary health care, primary care provider, family physicians, family practice, general practitioner, internal medicine, or non-specialist; and (3) continuing medical education, training, instruction, teach, tutorial, or curriculum. In MEDLINE, Medical Subject Headings (MeSH) were used (skin neoplasms, melanoma, family practice, primary health care, family physicians, and continuing medical education). In EMBASE, Emtree terms were exploded (melanoma, skin cancer, family physician, family doctor, general practitioner, general practice, internal medicine, primary care, primary medical care, training, and curriculum). Cited reference searching, using Scopus and the Science Citation Index, on selected articles was also performed. Studies were selected for inclusion by three authors (JG, EQ, and SD), with SD providing the final decision in the event of disagreement (four studies required evaluation by SD and all were excluded).

Data Extraction

Two authors (JG and EQ) reviewed all studies and independently collected data. In the event of discrepancy, a collaborative review and agreement occurred. Data were extracted according to criteria most useful for intervention comparison (Table 2), such as components of curriculum (diagnosis, epidemiology, counseling, management, dermoscopy, and detection algorithm) and delivery format (live, literature, multimedia, feedback, interactive, web-based), as well as funding source(s). Data were also extracted according to the evaluation of the intervention, which included study design, number of participants, and outcomes (knowledge, competence, confidence/attitudes, diagnostic performance, and systems outcomes). Complete definitions for the study variables pertaining to curriculum, delivery format, and outcomes can be found in Table 2 and were derived from study variables used in a recent meta-analysis of Internet-based learning in health professions³².

Supplemental Information from Corresponding Authors

All included studies provided results for the outcomes investigated for the educational intervention, but the details of the actual educational component were not always specified. Information often absent included length of the instructional component and the topics covered in the curriculum. A study assessment query form was developed to obtain the characteristics of each training program, based on the study variables described above. Corresponding authors were identified, and e-mail information was obtained from a number of studies. If the corresponding author did not have updated contact information, was deceased, or could not be reached, a co-author was queried. The query form consisted of 14 multiple-choice or short answer questions and three open-ended questions. The query form concluded with a request to share any educational materials used for the study. Authors were also e-mailed a preliminary compilation of relevant studies and educational

Table 2. Definitions of Study Variables

Criteria	Specifics	Definition
Curriculum	Diagnosis	Basic principals of differentiating benign from malignant skin lesions for melanoma alone or melanoma, squamous cell carcinoma, and basal cell carcinoma
	Epidemiology	Provided background information on rates of skin cancer, high-risk skin types, family history, etc.
	Counseling	Instructed participants on photoprotection, skin self-examination, follow-up, and/or other prevention strategies
	Management	Emphasis on determining a plan of action (i.e., observation, referral)
	Dermoscopy	Instructed participants on basic patterns of dermoscopy and/or how to incorporate it into a skin examination
	Algorithm	Used a novel or pre-existing [i.e., ABCD (E)] algorithm as a learning tool to aid in triage of skin lesions
Delivery format	Live	Speaker gives presentation, whether in large lecture format or small group
	Literature	Educational books, pamphlets, posters, cards, etc.
	Multimedia	CD-ROM, video, other audio-visual aids; excludes web-based applications
	Feedback	Either simultaneous or delayed feedback
	Interactive	Requires cognitive engagement for participation. Ranges from intermittent practice quizzes to participant-guided learning
Outcomes	Web-based	Online tutorials, often including audio and visual information that is meant to be in place of a live lecture. Interventions are often interactive
	Knowledge	Subjective or objective report of conceptual understanding
	Competence	Subjective or objective report of clinical skills learned
	Confidence/attitudes	Subjective report of confidence in, attitude towards, or beliefs about skin cancer intake and examination
	Diagnostic performance	Objective assessment of diagnostic abilities in a clinical practice setting through audit or expert evaluation
Systems outcomes	Subjective or objective assessment of behaviors in practice and/or effects on patients	

interventions in tabular format. This enabled authors to verify the details listed for their study.

RESULTS

We retrieved 1,980 citations, of which 66 (51 from literature review and 15 from reference searching) were reviewed in full, and 20 met inclusion criteria. Information about the studies identified and excluded is summarized in Figure 1. We included 20 studies in our review. The 20 studies evaluated 13 educational interventions; 7 interventions were evaluated once, 5 were evaluated twice, and 1 was evaluated 3 times. Characteristics of each intervention are summarized in Table 3

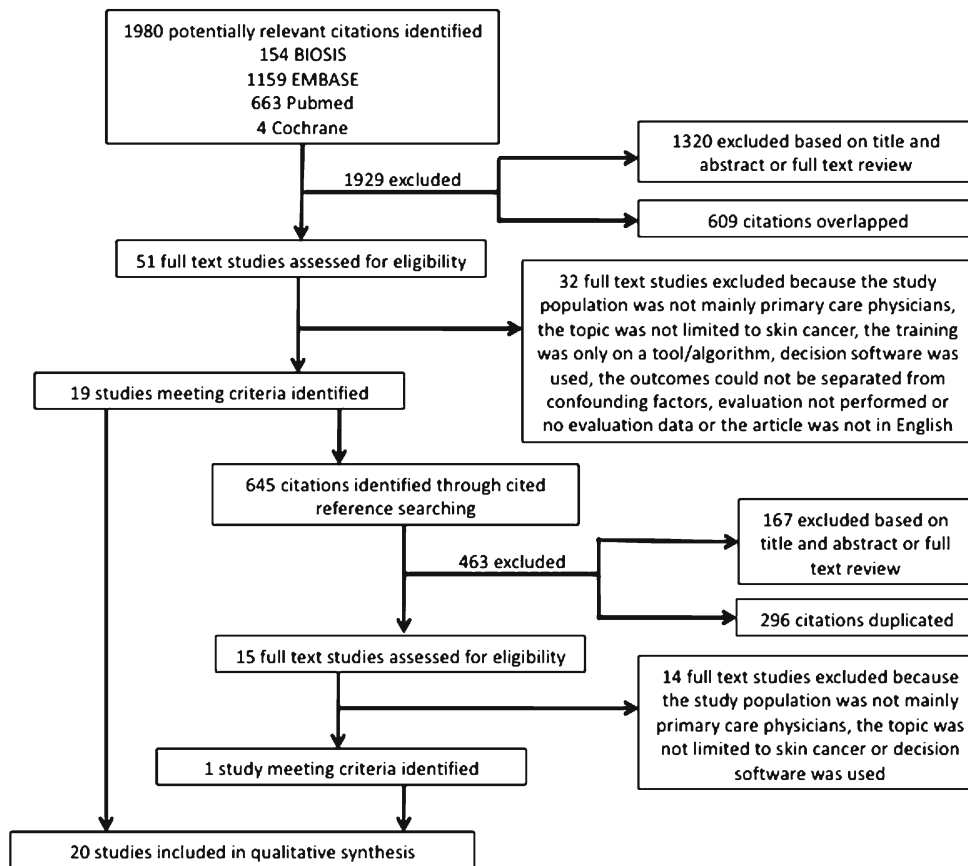


Figure 1. Flow diagram depicting the study selection process with reasoning.

and are considered according to the study variables defined in Table 2. The study assessment survey instruments were completed by corresponding authors from 12 of the 20 studies, including 8 of the 13 interventions; each completed survey provided information or clarification beyond what appeared in the publication.

Curriculum

Each of the 13 interventions included instruction in diagnosis of melanoma and possibly other skin cancers, and 12 (92%) presented additional relevant information. This additional instruction included epidemiology in ten (77%) interventions, management in eight (62%), and counseling in eight (62%). A detection algorithm was used in six (46%) interventions, with ABCD(E) (defined in the Online Appendix) being most commonly taught ($n=4$). Instruction on dermoscopy was included for two (15%) interventions. Only one (8%) intervention utilized a needs assessment during curriculum development^{33,34}.

Delivery Format

Live format was used in nine (69%) interventions, literature in eight (62%), interactive format in six (46%), multimedia in three (23%), feedback in three (23%), and web-based in two (15%). Single-format delivery strategies were used in three (23%) of the interventions, two-format strategies were used in

six (46%), and multifaceted educational strategies (three or more formats) were used in four (30%). Excluding one intervention that delivered instruction over several weeks to months, interventions for which length was specified averaged 2.3 h in duration; however, there was a wide range (12 min to over 6 h).

Outcomes

We categorized the study outcomes regarding the education interventions as pertaining to knowledge, competence, confidence, diagnostic performance, or systems outcomes. Table 4 summarizes the outcomes of the studies regarding each intervention according to the measure and method of evaluation. Outcome measures found in Table 4 are simplified to facilitate comparison and may not reflect the full extent of outcome measures assessed in the study (a more detailed version of Table 4 can be found online). If the study reported a statistically significant improvement for a measure in an outcome category, it was given a “plus” for that measure. Results denoted by a “minus” did not have a statistically significant positive impact. An intervention was considered positive overall if at least one measure in one study of the intervention earned a “plus.” Of the 13 educational interventions, change in knowledge was assessed after five (38%) interventions, of which five were positive. Competence was assessed after nine (69%) interventions, of which seven were positive. Confidence was assessed after seven (54%) interven-

Table 3. Characteristics of Skin Cancer Education Interventions for Primary Care Physicians

No.	Training resource	Curriculum*											Funding source				
		Epidemiology	Diagnosis	Dermoscopy	Counseling	Management	Algorithm (list)	Live	Literature	Multi-media	Feedback	Interactive		Web-based	Length (approx.)		
1	Newcastle Melanoma Unit GP Training Course ^{65,66}	X	X		X	X		X	X							>6 h [†]	Lion's International ⁶⁶
2	Algorithm and instant camera intervention ^{67,68}		X		X	X	Photo-assisted		X							1 h ^{67†} , >6 h ^{68†}	University of Queensland's Mayne Bequest Fund and Queensland Cancer Fund ⁶⁷ ; Commonwealth Department of Health and Aged Care ⁶⁸
3	Not specified ⁶⁹	X	X		X	X		X								2 h	Robert H. Lurie Cancer Center of Northwestern University
4	Skin triage intervention ^{70,71}	X	X		X	X		X ⁷⁰	X							>3 h [†]	National Cancer Institute
5	The Early Recognition and Management of Melanoma ³⁷ , Melanoma Education for Primary Care ^{38,39}	X	X		X ^{38,39}	X	ABCD, Glasgow, seven-point checklist; ABCDE ^{38,39}		X							1 h	National Cancer Institute
6	Primary Care Part of skin watch ^{33,34}	X ³⁴	X	X ³⁴		X	ABCDE ³⁴ , photo-assisted	X ³³	X							3 weeks ³³ , 6 months ^{34†}	Queensland Cancer Fund and Queensland Health ³⁴
7	Recognition of skin cancer (Harland 1995) ⁷²		X					X	X							Not specified	Not specified
8	Basic skin cancer triage course ^{55,56}	X	X		X	X	Act, reassurance, track	X	X							2 h	Agency for Health Care Research Quality and National Institutes of Health ³⁵
9	Health Education Program East Flanders ⁷³	X	X		X	X		X	X							2 h	Fund for Scientific Research-Flanders (Belgium)
10	Not specified ⁷⁴	X	X		X	X		X								12 min	Not specified
11	Not specified ⁷⁵	X	X		X	X		X								4 h	Not specified
12	Not specified ⁷⁶	X	X	X			ABCD, three-point checklist	X	X	X						4 h	La Roche-Posay, 3Gen, Erwin Schrodinger
13	Reseau Melanome Ouest ⁷⁷	X	X		X	X	ABCDE									2 h	Fellowship FWF, Austrian Science Fund, Fondo de Investigaciones Sanitarias, National Cancer Institute
								X									INCa, URCAM, La Roche-Posay

Key

*Superscript denotes publications in which interventions were studied; within curriculum and format superscripts highlight components of an intervention by study

†Represents minimum time to complete course; open-ended component not defined

*Educational intervention given as audit-based feedback during the listed time periods

Table 4. Summary of Outcomes for Skin Cancer Education Interventions for Primary Care Physicians, Print Version

No.	Study characteristics			Outcomes				
	Author, year, location	Participants [‡]	Design [†]	Knowledge	Competence	Confidence/ attitude	Diagnostic performance	Systems outcomes
1	Girgis, 1995, Australia ⁶⁵	24, 17	B/A, C		+	+	-	+
	Burton 1998 Australia ⁶⁶	31, 32	A, C		-			
2	Del Mar 1995 Australia ⁶⁷	53, 52	RCT by city				+	
	English 2003 Australia ⁶⁸	245, 228	RCT by practice				-	+
3	Dolan 1997 USA ⁶⁹	46, 36	RCT	+	-	-		+
4	Gerbert 1998 USA ⁷⁰	26, 26	RCT		+			
	Gerbert 2002 USA ⁷¹	27, 19	RCT		+	+		
5	Harris 1999 USA ³⁷	17	B/A	-	+	+		
	Harris 2001 USA ³⁸	354	B/A	+	+	+		
	Harris 2001 UK ³⁹	150	B/A	+	+	+		
6	Raasch 2000 Australia ³³	23, 23	RCT			-	-	+
	Youl 2007 Australia ³⁴	16	B/A				+	
7	Bedlow 2000 UK ⁷²	17	B/A		+			
8	Mikkilineni 2001 USA ³⁵	22	B/A			+		+
	Mikkilineni 2002 USA ³⁶	23	B/A	+	+	+		
9	Brochez, 2001 Belgium ⁷³	146	B/A		+	+		
10	de Gannes 2004 Canada ⁷⁴	10, 17	RCT	-	-		-	-
11	Carli 2005 Italy ⁷⁵	41	B/A		+			
12	Argenziano 2006 Italy, Spain ⁴⁰	36, 37	RCT				+	
13	Peuvrel 2009 France ⁷⁷	210	A	+				+

Key

†Statistically significant improvement as a result of intervention for any measure in a given outcome category

-Impact of intervention not statistically significant for any measure in a given outcome category

†*Positive outcome reported but no statistical analysis and/or comparison group

Footnotes:

†Design categories as follows: B/A=before and after, A=after only, C=controlled, RCT=randomized controlled trial (randomized by participant unless noted)

‡If participants divided into intervention and control, then two numbers listed, first is intervention group

tions, of which five were positive. Diagnostic performance was assessed after five (38%) interventions, of which three were positive. Systems outcomes were assessed after seven (54%) interventions, of which six were positive.

DISCUSSION

We systematically reviewed the literature on skin cancer education for PCPs. Our results demonstrate that a multitude of interventions have been implemented, evaluated, and published, many of which have shown significant improvements in provider knowledge, competence, confidence, diagnostic performance, or systems outcomes. Curricular components were fairly consistent across educational interventions. All interventions provided instruction on skin cancer diagnosis. The majority included instruction on epidemiology and management. Of note, two-thirds (62%) included training on patient counseling. Curricular components were more or less emphasized depending on the perceived role of targeted PCPs in skin cancer detection and care, which can vary by specialty and geographic location. For example, instruction on management options ranged from triage and specialist referral to biopsies and definitive surgical management. The Basic Skin Cancer Triage course, Skin Watch program, and the Melanoma Education for Primary Care program were notable for including five of six curricular components, presenting very thorough descriptions of the educational components, and undergoing repeated evaluation³³⁻³⁹. The aforementioned

interventions each received funding on a national level or from large independent funds.

Dermoscopy is a recent and novel addition to a PCP skin cancer curriculum, being a component of the curriculum for only two interventions and first appearing as part of an intervention in 2006^{34,40}. The decision to introduce dermoscopy to non-dermatologists and the best method to teach it have been debated, given that it is difficult to learn without formal training⁴¹. Use of dermoscopy as a triage tool for suspicious lesions has been advocated⁴². The Three-Point Checklist, a dermoscopic algorithm (described in the Online Appendix), has been shown to improve the ability of PCPs to triage suspicious lesions^{40,43-47}. Several studies have demonstrated improved diagnostic accuracy when teaching dermoscopy to non-dermatologists, supporting that dermoscopy may be a valuable addition to a skin cancer education curriculum^{44,47,48}.

The delivery format has proven to be very important in medical education, and various techniques have evolved over the years. Techniques range from the use of didactic programs, opinion leaders, and information distribution to interactive education, audit and feedback, and outreach⁴⁹. Traditional passive learning based on didactic presentations is generally not effective in changing professional behavior^{49,50}. Better results have been obtained with multifaceted and interactive interventions incorporating multiple methods, such as interactive workshops or didactic presentations combined with application workshops⁴⁹⁻⁵². This is consistent with adult learning approaches, which suggest that physicians learn best in

response to perceived relevant problems⁵³. As a specific type of interactive technique, personalized feedback has been increasingly incorporated into successful education programs in many fields and has been shown to enhance learning^{54,55}. Internet-based educational interventions provide the opportunity for interactivity and have grown rapidly in number across all health professions⁵⁶. Some studies suggest interactive Internet-based continuing medical education (CME) can achieve comparable or superior results compared with traditional methods; however, data from a recent meta-analysis are inconclusive as to whether this approach is more efficacious than traditional methods^{32,56}.

We expected to see a time-related trend towards the development of interventions with delivery formats utilizing feedback, interactivity, and based in the Internet. However, we did not identify any delivery formats that trended with time. Interestingly, in our review we found that since 2001, there have been no published evaluations on web-based interventions. It should be noted that web-based programs are being developed for dermatology, but were not captured in our review because of lack of published evaluation according to our search methods. Lack of standardized evaluation has been problematic among online education programs^{57,58}. This may also be the case with recently developed CME courses or other educational programs, which are incorporating more novel delivery formats, but have not yet been formally evaluated. To assess which delivery formats are most effective in skin cancer education programs, interventions that incorporate novel delivery formats, especially those using the Internet, should be formally studied.

Although curriculum components were similar across studies, the specific outcomes (knowledge, competence, confidence, diagnostic performance, systems) studied were less consistent (Table 4). The Accreditation Council for Continuing Medical Education recommends that educational activities be linked to changes in competence, performance, or patient outcomes⁵⁹. In order to determine the general efficacy of an intervention for the purposes of our review, we determined the positive or negative result for each outcome studied. In our descriptive analysis, the majority of outcomes studied showed a significant positive effect for at least one measure, and therefore most interventions were determined to be positive. Notably, systems outcomes, which are important to assess but are often considered difficult to change, produced positive measurements^{60,61}. While studies evaluating knowledge were most likely to have a significant positive outcome, studies looking at diagnostic performance were least likely to have a significant effect, suggesting that improvements in competence, the most commonly studied outcome, may not translate into improvements in practice^{50,62,63}. No study looked directly at patient outcomes; only intermediaries for patient health outcomes were evaluated. The ultimate determination of an educational program's success is measured by patient outcomes (such as melanoma-associated morbidity and mortality); however these studies are difficult to design and execute, and require large sample sizes and long-term follow-up.

It is difficult to compare the effects of different curricular and delivery variables on outcomes across these studies because of their variable study designs. Studies of medical education programs are often subject to biases and confounding factors resulting in great heterogeneity across studies because of variation in learners, instructional method, outcome measures, and other aspects of the educational context⁶⁴. As shown in our

review, a wide and inconsistent variety of outcome measures and methods of evaluation were employed when studying the interventions. Therefore, we are unable to draw conclusions about specific aspects of interventions that were more or less likely to result in a positive assessment.

Our search was limited to peer-reviewed health care-related journals, which generally publish studies with significant results, thus generating a biased sample of studies. We recognize the existence of many programs that were not captured in our review because of lack of evaluation and reported elements such as program designs, web-based tutorials, CME programs, and physician workshops. Due to the variability among the reviewed studies, meta-analysis was not possible⁶⁴.

CONCLUSION

While it is commendable that many interventions instructing PCPs on skin cancer detection have been created, implemented, and published, we found that lack of uniformity across interventions and outcome assessments precluded direct comparison of efficacy. The absence of similarity among interventions may impede dissemination of optimal interventions. This is particularly problematic when dealing with the detection of potentially fatal cancers. Improved and standardized methods of assessment are important for ultimately studying the effects of educational interventions conducted on a larger scale. Understudied areas include dermoscopy as a curricular component and the use of feedback, interactive components, and web-based strategies. We should move towards effectively and efficiently training large numbers of clinicians using an easily reproducible, generalizable, and accessible format. We suggest that future interventions be designed to measure change in participant diagnostic performance and patient outcomes, so that the efficacy of clinician skin examination and its impact on melanoma mortality reduction can be determined. We believe effective educational interventions are part of the solution to the challenge of early detection; while much has been done in an effort to improve early detection of melanoma and other skin cancers, still much remains to be done.

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