



A systematic review and synthesis of qualitative and quantitative studies evaluating provider, patient, and health care system-related barriers to diagnostic skin cancer examinations

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Abstract

Melanoma-screening examinations support early diagnosis, yet there is a national shortage of dermatologists and most at-risk patients lack access to dermatologic care. Primary care physicians (PCPs) in the United States often bridge these access gaps, and thus, play a critical role in the early detection of melanoma. However, most PCPs do not offer skin examinations. We conducted a systematic review and searched Ovid MEDLINE, EMBASE, and the Cochrane Library from 1946 to July 2019 to identify barriers for skin screening by providers, patients, and health systems following the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) reporting guideline. Of 650 abstracts initially identified, 111 publications were included for full-text review and 48 studies met the inclusion criteria. Lack of dermatologic training (89.4%), time constraints (70%), and competing comorbidities (51%) are the most common barriers reported by PCPs. Low perceived risk (69%), long delays in appointment (46%), and lack of knowledge about melanoma (34.8%) are most frequently reported patient barriers. Qualitative reported barriers for health system are lack of public awareness, social prejudice leading to tanning booth usage, public surveillance programs requiring intensive resources, and widespread ABCD evaluation causing delays in seeking medical attention for melanomas. Numerous barriers remain that prevent the implementation of skin screening practices in clinical practice. A multi-faceted combination of efforts is essential for the execution of acceptable and effective skin cancer-screening practices, thus, increasing early diagnosis and lowering mortality rates and burden of disease for melanoma.

Keywords Melanoma screening · Skin cancer screening · Early detection · Whole-body skin examination · Barriers to skin screening

Introduction

Melanoma is the fifth most common cancer in the US [3], responsible for an estimated \$3.5 billion annual productivity loss due to melanoma mortality [4]. Secondary prevention (i.e., early detection) offers particular opportunity for melanoma, as early diagnosis is associated with low melanoma mortality [5] and visual examination to detect melanoma is one of the most rapid, safe and cost-effective interventions in medicine [6]. While areas with higher dermatology density demonstrate lower melanoma mortality [7], dermatologist density is disproportionately concentrated in urban areas, resulting in low access to dermatology care in medically underserved areas [8]. In these under-resourced areas, primary care providers (PCPs) have an opportunity to perform skin examinations to support early melanoma diagnosis [9, 10].

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Despite potential benefits to early melanoma detection, barriers to skin examinations exist at the patient, provider, and health system levels. Identifying barriers and potential approaches to surmounting those barriers is an important step in developing, implementing, and disseminating early melanoma detection programs. Defining current skin examination practices among PCPs is challenging: 8–20% of patients report receiving skin examinations from their PCP [11, 12], while PCPs report performing skin examinations in 31–60% of patient encounters [10, 13, 14]. The INternet curriculum FOR Melanoma Early Detection (INFORMED), developed by a multidisciplinary team specifically to support PCP performance of skin examinations, generated improved confidence and diagnostic accuracy among those completing the program [15]. However, qualitative post-session discussions highlighted the reluctance of PCPs to proceed with practice change and integrate skin examinations into patient care, citing the need for additional education and provision of assistance with challenging cases encountered in practice [16].

Designing feasible, acceptable and cost-effective implementation strategies to optimize access to diagnostic skin cancer encounters requires identifying barriers to performing skin cancer diagnostic examinations among PCPs, requesting and accepting examinations among patients [2], and supporting examinations from healthcare systems [17]. We present a systematic literature review of documented barriers to skin cancer examinations experienced by primary care providers, patients, and health systems.

Methods

This systematic review followed the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) reporting guidelines [18]. Eligibility criteria included: studies that addressed quantitative and qualitative data regarding barriers for skin cancer-screening or diagnostic examinations by providers (physicians and advanced practice providers [i.e., Nurse Practitioners (NPs) and Physician Assistants (PAs)], patients or health systems. Publications were not limited by geography. The following bibliographic databases were searched from 1946 through July 10, 2019: MEDLINE, EMBASE, and the Cochrane Database of Systematic Reviews. The inclusion criteria included publication dates between January 1, 1990, and July 10, 2019 to present the most current and relevant studies, availability of full text in the English language and mention of at least one skin cancer-screening barrier in the full-text article. A medical librarian (D.P.F) developed and tested search strategies with input from our lead authors (M.N. and K.C.N). The search strategies contained a combination of controlled vocabulary (e.g., MeSH or Emtree) and keyword terms to

identify articles concerning skin cancer diagnostic examination barriers (Supplemental Table S1). The ability of the preliminary search strategies to achieve a pool of known, relevant citations tested search sensitivity. An EndNote library was created for managing the retrieved records and for de-duplication. Figure 1 demonstrates the study selection process for the final 48 publications selected for inclusion according to the PRISMA guidelines.

Study characteristics data were extracted and coded, including the including cohort from which barriers were identified, specific identified barriers, and the presence or absence of quantitative data. All identified barriers were assessed using thematic analysis to group barrier themes; quantitatively coded barriers were grouped based on identified themes with application of heatmap-based coding to identify relative barrier frequency across studies.

Results

We identified 650 records through database searches and 8 records through other sources. After removal of 90 duplicate records, two authors (M.N. and K.C.N.) analyzed the remaining 568 records independently and excluded 456 records on basis of title and abstract review. In the event of differences, consensus was reached through discussion. One hundred and twelve full-text articles were assessed for eligibility, and of these 112 articles, 64 were excluded after a single reviewer evaluation (M.N.).

The 48 publications selected for inclusion were classified as: (1) 28 publications addressing patient barriers alone [1, 2, 19–44]; (2) 10 publications addressing physician barriers alone [10, 13, 16, 17, 45–50]; (3) 3 publications addressing both physician and patient barriers [14, 51, 52]; (4) 1 publication addressing physician and public health barriers [53]; (5) 1 publication addressing barriers for patients, physicians, and public health [54]; and (6) 5 publications addressing barriers for advanced practice providers (4 NP [55–58] and 1 PA [59]).

Most of the included publications were structured as qualitative surveys conducted online, in person, or via telephone or mail. Our review includes responses from at least 8967 patients, 2775 PCPs, and 922 APPs. Fishbone diagrams of all qualitatively or quantitatively described barriers are provided for PCPs (Fig. 2a), APPs (Fig. 2b), patients (Fig. 2c), and health systems (Fig. 2d). Among quantitatively reported barriers the three most frequently cited provider PCP (Table 1a) and APP (Table 1b) barriers to skin cancer diagnostic examinations include: time constraints, competing patient comorbidities, and lack of training in skin cancer diagnostic examinations. The three most frequently cited patient barriers (Table 1c) include: lack of knowledge, low perceived risk, and long delays in obtaining

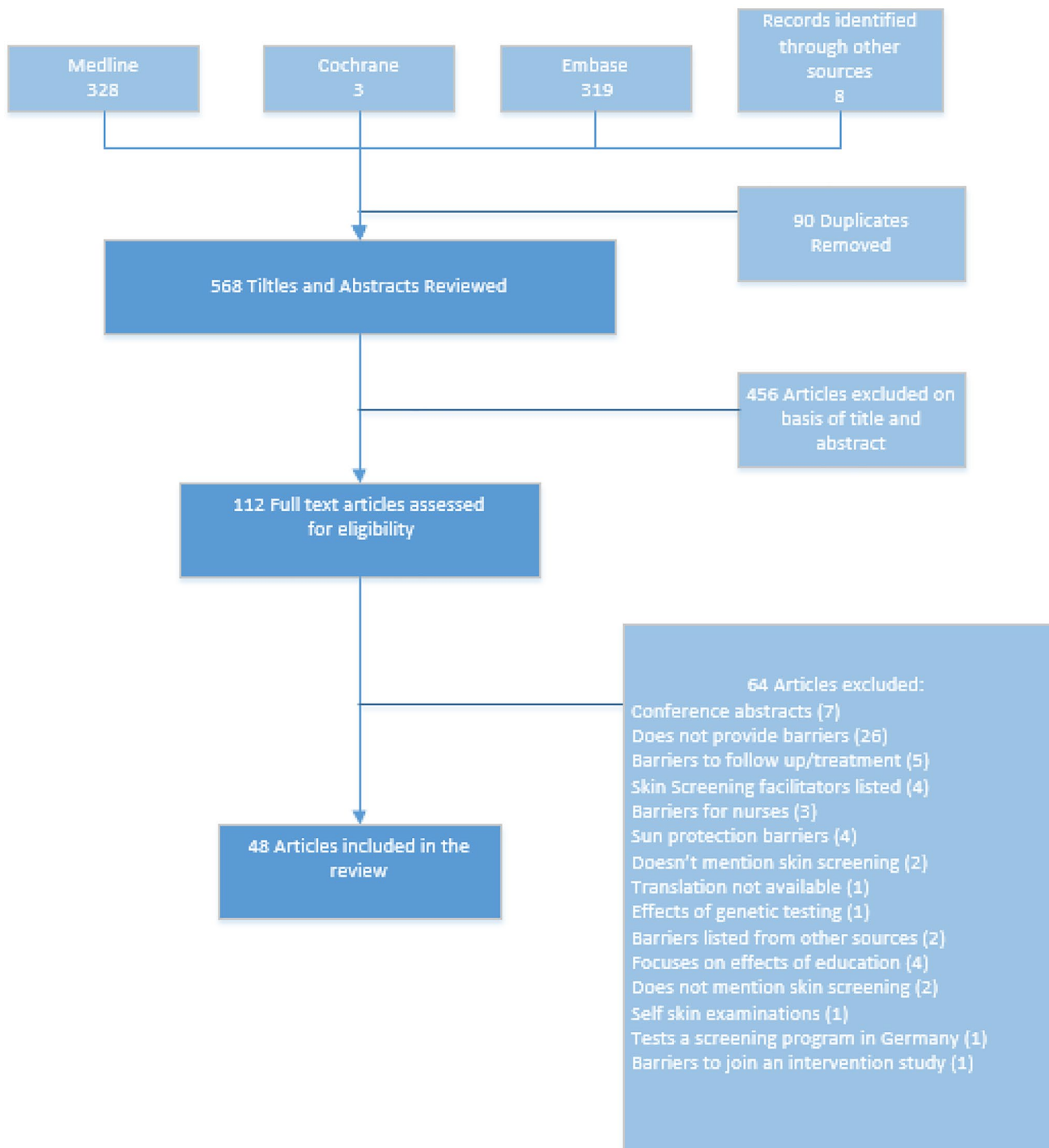


Fig. 1 PRISMA flow diagram of systematic search and study selection

an appointment. Only four public health barriers were identified: lack of public awareness, social prejudice leading to tanning booth usage, public surveillance programs requiring intensive resources, and widespread ABCD evaluation causing delays in seeking medical attention for melanomas that do not meet the ABCD criteria.

Discussion

Based on data analysis from 48 publications, our systematic review enumerates myriad barriers to skin cancer diagnostic examinations for both patients and providers. Identifying and defining these barriers will inform the development of

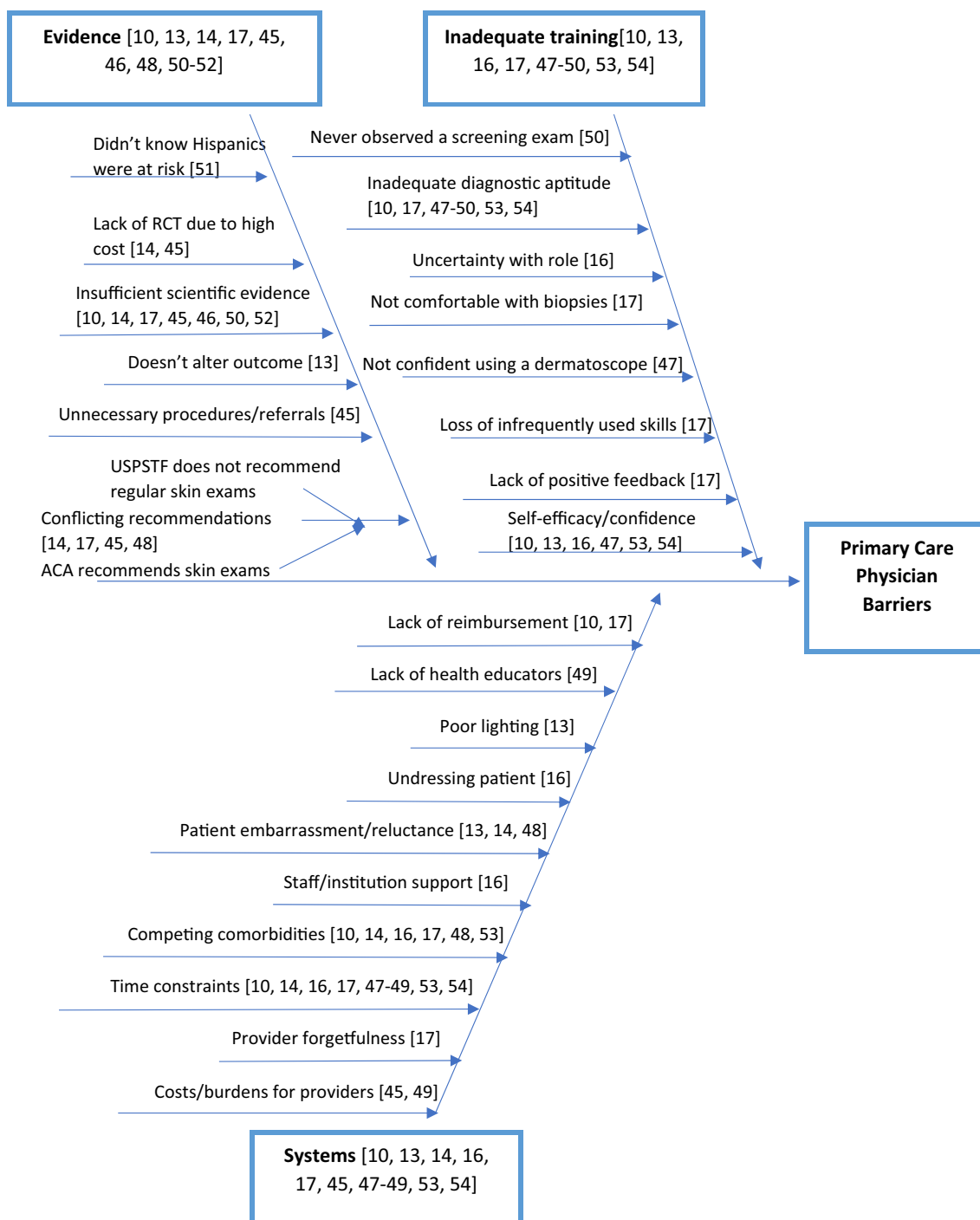


Fig. 2 a Fishbone diagram of barriers to PCP performance of skin cancer-screening examinations. **b** Fishbone diagram of barriers to advanced practice provider (APP) performance of skin cancer-screen-

ing examinations. **c** Fishbone diagram of patient barriers to receiving skin cancer-screening examinations. **d** Fishbone diagram of public health-based barriers to skin cancer-screening examinations

multilayered approaches to facilitate early melanoma-screening initiatives.

The existence of barriers to PCPs performing skin cancer screenings is not unexpected as PCPs provide front-line health care for millions of patients [60]. However, the

front-line service simultaneously offers enormous opportunity for access to diagnostic skin cancer examinations [53]. Time constraints, competing patient comorbidities, and lack of training in performing skin cancer-screening examinations were the most frequently reported barriers for

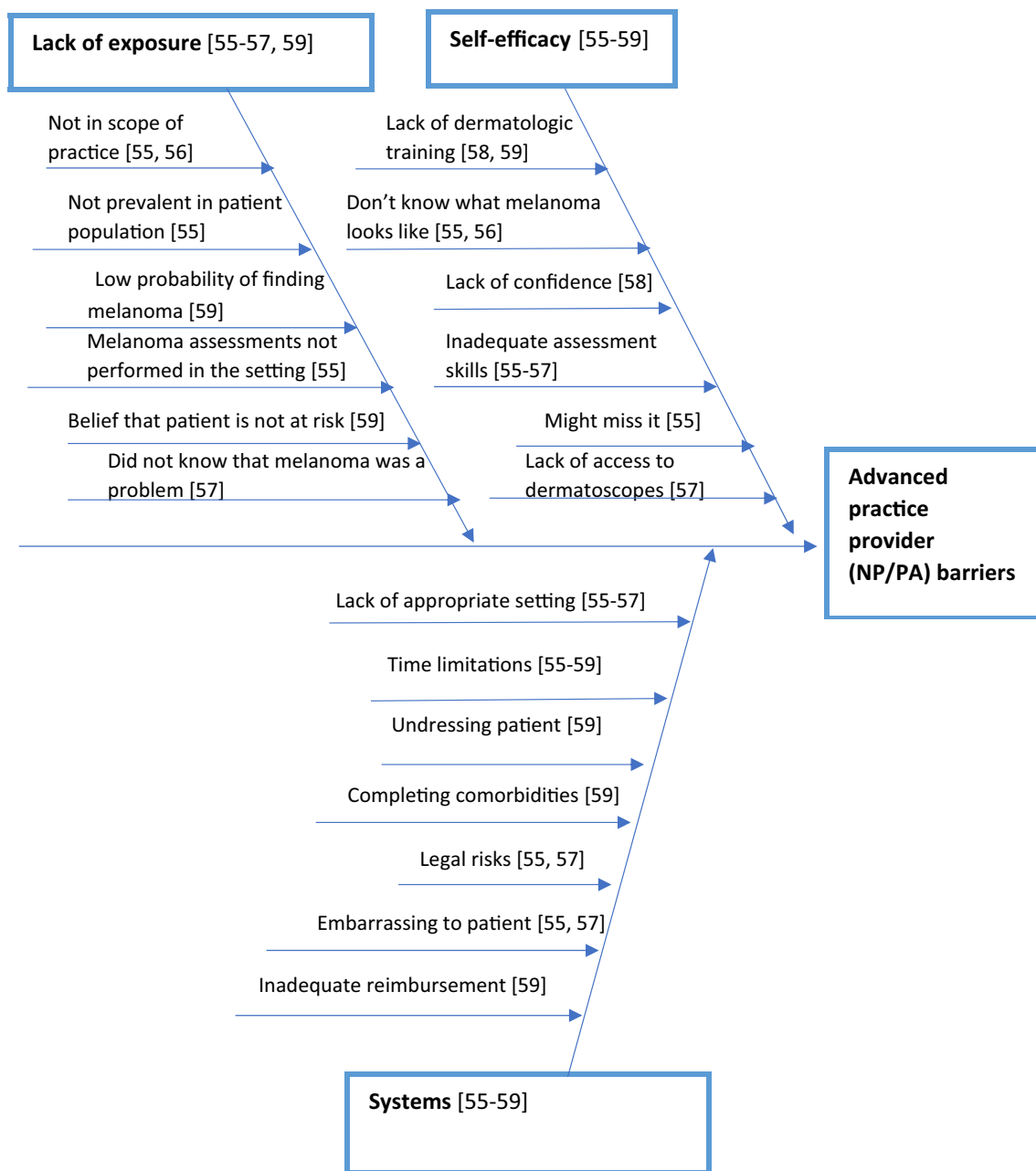


Fig. 2 (continued)

both PCPs and APPs. Time constraints can be alleviated by clinical operations-based implementations, including pre-emptive identification of patients eligible for skin examinations and a structured plan to introduce the examination concept and prepare the patient to minimize provider delays. An Integrated Skin Examination approach, with examination of the skin coordinated with other planned diagnostic physical actions, can minimize additional provider examination time, while facilitating structured examination of the skin [61]. Competing comorbidities is a significant barrier for PCPs as they manage patients with multiple active medical

conditions; prioritizing diagnostic skin examinations for patients at the highest risk of melanoma mortality (Caucasian men older than 50 years) can focus examination efforts to the patient cohort likely to experience the greatest benefit and reduce provider burden [60].

Insufficient diagnostic aptitude for skin cancer may be mitigated through provider educational interventions such as INFORMED [16], Visual Perception Training [62], and mastery level training [63]. While all interventions generate improved knowledge and diagnostic accuracy among participants, unless providers also achieve appropriate self-efficacy



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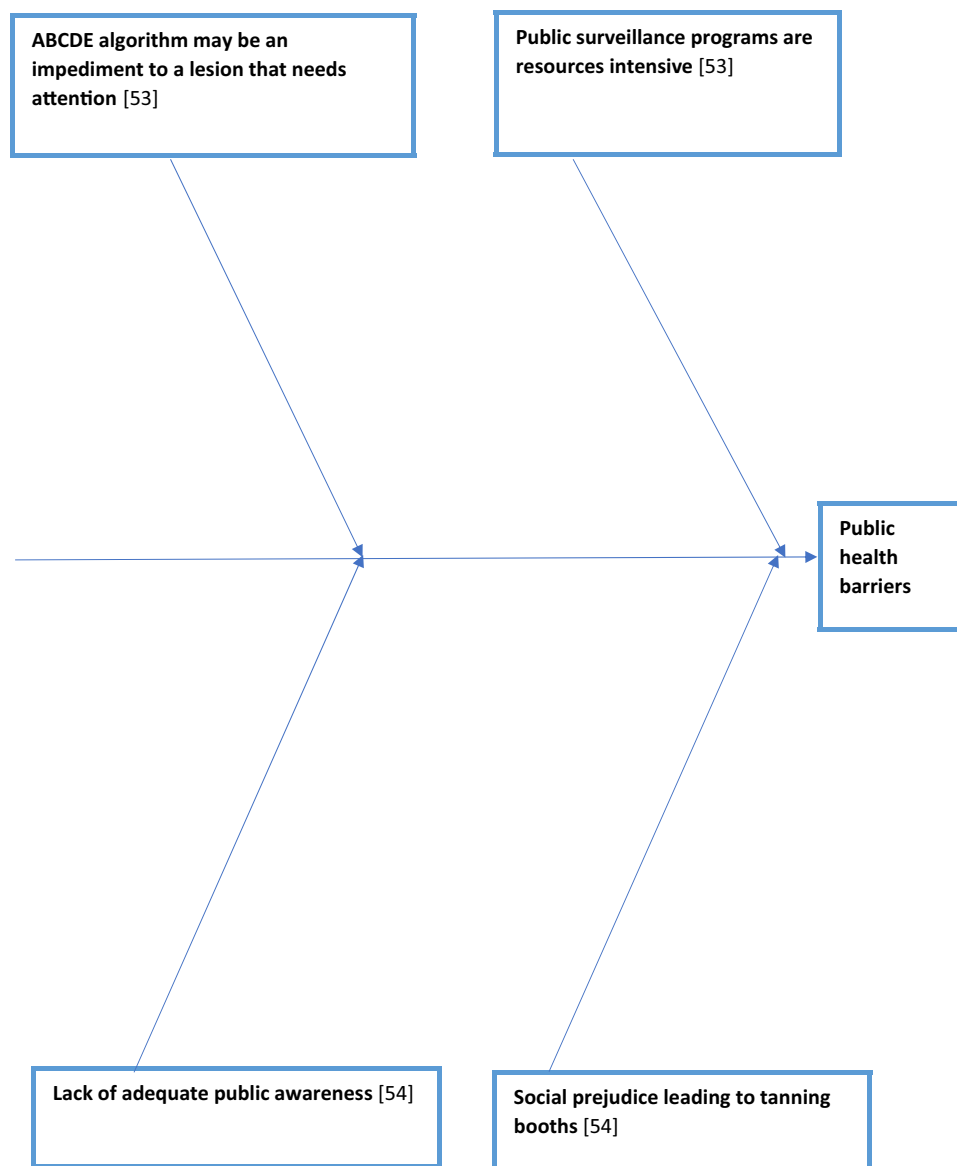


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in their newly acquired skill, they are unlikely to incorporate skin cancer diagnostic examinations into practice, thus, limiting direct patient benefit.

The three most frequently cited patient barriers to skin examinations included lack of knowledge, low perceived risk, and long delays in obtaining appointments for evaluation. PCPs can mitigate patient-based lack of knowledge and low perceived risk through providing office-based information on melanoma risk factors and examination procedures; this information may also address patient embarrassment, another frequently reported patient barrier [23–25, 29]. In one study, family (spouse or children) and relatives identified 50% of self-detected melanomas and provided encouragement to seek medical attention, supporting a potential role

for general population education to improve overall detection of melanoma [37]. Awareness and risk campaigns targeting adult patients and family members can be accomplished through radio, television, and newspaper interventions [32], and social media platforms such as Instagram can be used to target adolescents and young adults [64]. Excessive waiting times to receive skin cancer diagnostic examinations by dermatologists were another frequently reported barrier [30]; PCP educational interventions have the opportunity to increase access to skilled diagnostic examinations.

Public health efforts to enhance melanoma awareness may empower patients to correctly identify and seek medical attention for melanoma at more curable stages [44]. Public awareness and advocacy campaigns that highlight

Table 1 Heatmap representation of quantitatively reported barriers to skin cancer-screening examinations, barriers for PCPs; green 0–24%; yellow 25–49%; red 50–100%

BARRIERS FOR PCPs	[13]	[14]	[10]	[49]	[47]	[50]
LACK OF EVIDENCE						
Does not alter outcome	4					
Insufficient scientific evidence			3			
INADEQUATE TRAINING						
Self-efficacy / confidence	50		7			
Lack of expertise			15	77.14	89.4	75.8
Not confident educating patient for self-exam					73.2	
Never observed a skin cancer screening exam						55.3
Not confident using a dermatoscope					95.2	
SYSTEMS						
Lack of reimbursement			10			
Poor lighting	19					
Competing comorbidities		51	12			
Costs for both PCPs and patients				70.15		
Time constraints		54	70			
PARTICIPANTS(n)	191	1669	380	70	123	342

BARRIERS FOR APPs (PA and NP)	[55]	[56]	[57]	[59]
LACK OF EXPOSURE				
Not in scope of practice	18	11		
Not prevalent in the patient population	37			
Low probability of melanoma diagnosis				27
Skin screening not performed in the setting	37			
Belief patient is on at risk				23
Did not know melanoma was a problem			2.9	
SELF-EFFICACY				
Lack of dermatologic training				27
Does not know what melanoma looks like	23	18		
Inadequate assessment skills	44	24	25	
Might miss it	44			
Lack of access to dermatoscopy equipment			33.1	
SYSTEMS				
Time limitations	69	39	46.3	87
Competing comorbidities				53
Inadequate reimbursement				23
Embarrassing for patients	26		2.6	70.2
Legal risks	14		1.8	
Lack of appropriate setting	47		30.9	
Undressing patient				17
PARTICIPANTS(n)	93	66	272	30

Table 1 (continued)

BARRIERS FOR PATIENTS	[42]	[1]	[2]	[21]	[37]	[32]	[28]	[29]	[23]	[25]	[24]	[27]	[41]	[39]	[30]	[33]	[43]
LACK OF KNOWLEDGE																	
Uninformed re: pros/ cons of screening	22.8																
Unaware of skin screening		12.3															
Does not think screening is effective			2.1														
Misinformation/ confusion			2.3														
Did not know how to look for early signs			1.6														
Being unsure what to do				22													
Not aware of urgency					34.8												
Did not think it was a problem				13													
Do not need a skin exam if no skin issues						14											
LACK OF COMFORT																	
General aversion to going to the doctor		9.5															
Generally don't go to the doctor	24.6																
Little faith in physicians							4										
Not confident in PCP ability to diagnose								20									
Opposite sex									16.3	2							
Uncomfortable about the exam	1.8	8															
Being worried about the exam		5.7															
Embarrassed to receive a skin exam								8	15	8	10						
LOW PERCEIVED RISK																	
I protect myself sufficiently	28.1																
Not worried about detecting skin cancer								69									
I am not at risk												11.6					
Absence of skin alterations/moles	63.2	18.2											0.3				
Decided to wait and see							13										
Lesion was benign and unimportant															63.5		
BARRIERS FOR PATIENTS																	
LOW PERCEIVED RISK																	
Had other medical priorities															24		
Not serious/would clear up							49										
Mole was not important																64	
Being under 35	3.5	6.5															
Feeling healthy	59.6					6											
Don't have symptoms of skin cancer												22.5					
Absence of systemic signs					39.3												
Feeling healthy																	20.9
Forgetful			0.2				4						3				
Did not get around to visiting a doctor				11													
PSYCHOLOGICAL AND MONETARY COSTS																	
Worried about potential cancer diagnosis	5.3	4.1															
Did not want to think about symptoms							4										
Afraid of diagnosis														9.9			
Monetary costs			0.2	33													
Lack of time	15.8	15.2					14						15.4				
Inconvenience				0.5													
Too busy														6.9			
Excessive distance															25		
Long wait times															46		
I'd rather not know if I have cancer						5											
POOR ACCESS																	
Not having a physician close to home	26.3																
No doctor/dermatologist available				1													
PARTICIPANTS(n)	57	1527	574	185	201	100	77	3100	201	251	473	1117	298	233	184	36	353

skin cancer risks, targeted to high-risk patients (and their families) [37, 39, 60], with a suggested action of requesting PCP examination of concerning skin lesions [10] may offer the greatest mortality benefit. Public melanoma surveillance programs, such as the SCREEN study in Germany, have demonstrated the feasibility of skin cancer screening to detect melanomas at treatable stages [65]. However, this benefit must be balanced by the resources required to fund intensive initiatives, potentially through efforts to target specific high-risk patient demographics [37, 43]. Reduced exposure of young adults to tanning beds can be accomplished both through health policy interventions to mitigate social expectations of beauty, similar to efforts of the tobacco health policy movement, and through public policy interventions [54]. Finally, public melanoma awareness campaigns have been fairly directed to the ABCD warning signs: Asymmetry, irregular Border, multiple Colors, and Diameter more than 6 mm, respectively. These criteria, however, may prompt false reassurance for nodular (frequently presents as a smooth-bordered, single-colored papule, with high metastatic potential even at diameters < 6 mm) and amelanotic (clinically subtle tumors with pink/light brown pigmentation) melanomas. Therefore, any new or changing skin growth should prompt patients to request physician evaluation regardless of whether the growth meets the ABCD criteria [53].

Limitations

As with most systematic reviews, the main limitation of this review is the quality of published data. Other limitations are choice and number of databases used and the proper use of all potential keywords. Therefore, high-quality publications addressing our topic may have been inadvertently excluded from the search strategy. Possible biases include language bias (we utilized full-text articles available in the English language) and the inclusion of studies with methodological bias (possibility of sampling and selection bias during original research study). As researcher influence inherently impacts the analysis of qualitative data, participant-reported data are subject to reviewer interpretation (original authors and ours), introducing potential risk for misinterpretation. There was somewhat limited reporting of quantitative data: many studies only qualitatively identified barriers and quantitative data did not always quantify the relative effects of barriers or the number of respondents citing specific barriers as being of concern. Finally, barriers were assessed in different health systems, including the US, Germany, France, and Australia; given the varied respective sociocultural and economic backgrounds, barriers may not translate across international health systems.

Conclusion

Melanoma diagnosed at advanced stages demonstrates a strong propensity for metastatic spread; while immunotherapy and targeted therapies have reduced global melanoma mortality, these interventions are not without significant financial burden and risk of therapeutic adverse events. Conversely, melanoma diagnosed at early stages carries the potential for cure with a straight-forward therapeutic excision, yet access to skilled diagnostic examinations can be challenging in areas of low dermatology density. PCPs have the potential to serve as critical melanoma detection resources in regions without dermatology access, yet the 2016 US Preventive Services Task Force (USPSTF) Updated Systematic Evidence Review for Screening for Skin Cancer in Adults [66] states “the current evidence is insufficient to assess the benefits and harms of using a whole-body skin examination by a primary care clinician”. The USPSTF recognizes evidence to be adequate that skin screening examinations have modest sensitivity and specificity for detection of melanoma, and early detection by a clinician reduces morbidity and mortality. However, the potential for harm, such as misdiagnosis, overdiagnosis, and cosmetic adverse effects from biopsy and potential overtreatment, warrants further research.

Future early melanoma detection initiatives can address the evidence gaps as highlighted by the USPSTF’s assessment but must be structured based on a firm understanding of the barriers to skilled diagnostic examinations encountered by providers, patients, and public health systems. Supporting providers in developing and sustaining skilled diagnostic examination skills will mitigate potential patient harm by reducing benign biopsies performed to identify one melanoma (quantified as the number needed to biopsy, or NNB [67]). More clearly defining the enhanced risk cohort for targeted screening will help focus patient and family awareness messaging, while reducing the screening burden for PCPs, and enhancing the incidence rate for the screened population, also resulting in fewer benign biopsies and fewer patients screened to identify one melanoma [60]. A multifaceted combination of efforts is essential for the implementation of acceptable and effective skin cancer-screening practices thus increasing early diagnosis and lowering mortality rates and burden of disease for melanoma.

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reviewing. KCN: principal investigator, data collection, writing, and editing.

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Data availability The authors confirm that the data supporting the findings of this study are available within the article and Mendely data at URL: <https://data.mendeley.com/datasets/x3bdz66w7s/draft?a=40da4e93-a33b-452b-925e-45896d674456>.

Declarations

Conflict of interest None to disclose.

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