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RESEARCH ARTICLE

Cancer Symptom Recognition and Anticipated Delays in Seeking Care Among U.S. Adults

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Introduction: Early stage diagnosis strongly predicts cancer survival. Recognition of potential symptoms of cancer may improve survival by reducing time to seeking care.

Methods: Telephone interviews with a population-representative sample of English-speaking adults (aged ≥50 years) in the U.S. (N=1,425) were conducted in 2014 using an instrument adapted from the International Cancer Benchmarking Partnership Awareness and Beliefs about Cancer survey. Anticipated time to seeking care for four cancer symptoms (persistent cough, rectal bleeding, mole changes, and breast changes) was assessed, and delay was defined as waiting >2 weeks. Recognition of symptoms as potential cancer signs was assessed dichotomously. Multivariate logistic regression models were used to assess associations between symptom recognition and anticipated delay, adjusting for demographics, cancer experience, self-reported health, and healthcare access. Analyses were weighted and conducted in 2017.

Results: Symptom recognition varied but was relatively high across all symptoms (76.9%−95.5%). Anticipated delay varied by symptom and was highest for persistent cough (41.2%) and lowest for rectal bleeding (9.1%). For rectal bleeding (AOR=2.65, 95% CI=1.31, 5.36) and mole changes (AOR=3.30, 95% CI=1.48, 7.33), anticipated delay was more likely among individuals who did not recognize the symptom as a warning sign. Adults with lower education levels ($p<0.05$) and African Americans ($p<0.05$) were less likely to delay for some symptoms.

Conclusions: Lack of symptom recognition was associated with anticipated delay in seeking care for some cancer symptoms. Differences in recognition and delays by symptom could be driven partly by screening messaging or by ambiguity and functional impact of each symptom.
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INTRODUCTION

Early stage at diagnosis is a strong predictor of survival for most cancer types.[1] Population-based screening programs are designed to detect cancers before the onset of symptoms and therefore play a key role in the early detection of cancer. However, even in countries such as the U.S. and the United Kingdom (UK) with population-based screening, most cancers are not detected through screening.[2,3] Many adults do not receive adequate screening and, even among those who are screened, cancers go undetected and interval cancers occur. Consequently, most diagnoses are made incidentally or following symptomatic presentation by the patient. To the extent that

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most cancers are not symptomatic until later stages, diagnoses resulting from symptomatic presentation often have worse prognoses.[2,4] Ensuring prompt care seeking is therefore key to reducing cancer morbidity and mortality, yet delays in presentation are common and have been linked to individual, social, and structural factors, including age, education, marital status, and failure to recognize early warning signs of cancer.[5–7]

Several international studies have sought to understand the relationship between cancer symptom awareness and care-seeking behaviors at the individual and population level.[8–10] As part of the International Cancer Benchmarking Partnership (ICBP), the Awareness and Beliefs about Cancer (ABC) survey was administered in 2011 across six countries to investigate how individuals' symptom awareness, cancer beliefs, and care-seeking behaviors might contribute to international differences in cancer survival.[11,12] This work expanded upon studies from the UK documenting lack of symptom awareness as a common reason for delaying care among patients with cancer[13,14] and low prevalence of cancer symptom awareness,[10,15,16] particularly among underserved groups.[16] Although differences in symptom awareness did not explain international differences in cancer survival,[17] anticipated delay was associated with lack of symptom awareness across the six countries[9] and within the UK.[10,18] Quaife and colleagues[18] found relationships between the lack of recognition of the symptoms of lung, breast, and colorectal cancers and increased likelihood of delay by patients in seeking care; these relationships were consistent, independent of demographics and perceived healthcare access. Subsequent research has associated lower symptom awareness with regional differences in cancer survival[19] and documented the preliminary impact of symptom awareness campaigns on reducing stage at diagnosis.[20] In the U.S., little research has examined cancer symptom awareness and care seeking.[19] To date, no population-based studies have examined U.S. cancer symptom awareness and care seeking across a range of cancer symptoms. Using population-based survey data modeled after the ICBP ABC instrument, this study builds upon international work by examining associations between cancer symptom recognition and anticipated time to seeking care in the U.S.

METHODS

Study Sample

Computer-assisted telephone interviews with a population-representative sample of English-speaking adults (aged ≥50 years) in the U.S. (N=1,425) were conducted using an instrument adapted from the ICBP ABC survey.[11] The original ICBP ABC survey underwent substantial cognitive testing and test–retest reliability checking.[11] For the U.S. version, minor changes were made to ensure language and response codes were appropriate for the U.S. context. For example, demographic questions on educational attainment and ethnic group were adapted to match U.S. census categories, and references to the National Health Service were removed. To account for the rising number of cell phone–only households,[21] landline and cell phone households were randomly sampled from regions across the U.S. using two approaches. For landline sampling, households were selected using plus-digit dialing, which systematically takes a random selection of telephone numbers from national telephone directories and replaces the last two digits with randomly generated numbers. This approach increases coverage of the population by including unlisted telephone numbers, resulting in better representativeness. Households were eligible if at least one person aged ≥50 years lived there. The Rizzo method was used to randomly select an individual in the household when more than one person was eligible.[22] For cell phones, it was not possible to use plus-digit dialing because of the restrictions on calling cellular numbers in the U.S. Therefore, telephone numbers were selected at random from a database of 1,000-block records held by Survey Sampling International. Data were collected by Ipsos MORI's Social Research Institute (a UK-based research company who administered the original ICBP ABC survey) from August to October 2014. All activities were reviewed for ethical approval by the National Cancer Institute's Office of Human Subjects Research Protections. To equalize selection probabilities and compensate for noncoverage and nonresponse, survey design weights and nonresponse weights were developed and applied to the survey data. Design weights accounted for probability of interview selection within the household. Nonresponse weights for key demographic variables (age, sex, region, highest level of education, and race) were applied using 2012 American Community Survey data to account for differences between the study sample and the U.S. population.

Measures

Anticipated time to seeking physician-based care for the following four cancer symptoms was assessed: persistent cough, rectal bleeding, breast changes (females only), and changes in mole appearance. Cancer prevention for each associated cancer is recommended in the U.S. (lung cancer, colorectal cancer, breast cancer, and skin cancer), and routine screening is recommended for all except skin cancer. Respondents were instructed to indicate for how long, from first noticing each symptom, they would wait to go to the doctor; responses were categorized as follows: immediately, up to 1 week, 1 to 2 weeks, 2 to 3 weeks, 3 to 4 weeks, more than a month, and would not contact doctor. To compare results with previous analyses in other countries, responses indicating seeking care from nonphysicians (e.g., pharmacists) were excluded (persistent cough: n=24, rectal bleeding: n=12, breast changes: n=6, and mole changes: n=9), and delay was defined as waiting ≥2 weeks to seek care.[10,18]

Recognition of the following four symptoms was assessed: persistent cough or hoarseness, unexplained bleeding, unexplained lump or swelling, and change in the appearance of a mole. For each symptom, the interviewer asked: *Do you think [insert symptom] could be a sign of cancer?* Responses were categorized dichotomously (*no/don't know* or *yes*), and refusals were coded as missing.

Data were collected on age (categorized by Medicare [federal health insurance program] eligibility: <65 years or ≥65 years), sex, partner status (single or married/cohabitating), race (white, black, or other), education (no bachelor's degree or bachelor's degree or above), cancer experience (none, friend/family member only, self), and self-reported health (very good/good/fair or poor/very poor). Following the original ABC survey,[11] ease of healthcare access was also assessed using the following question: *How easy, or difficult, is it for you to get to see a doctor if you have a symptom that you think might be serious?* Response options included *very good*, *good*, *fair*, *poor*, or *very poor*.

Statistical Analysis

Univariate and bivariate analyses were used to describe and explore predictors of anticipated delay and recognition of cancer symptoms. Multivariate logistic regression models were used to test associations between anticipated delay and recognition of the related cancer symptom, adjusting for all covariates. Analysis was modeled after the approach of Quaife et al.,[18] who examined care seeking in a sample of UK adults, to compare the context of the U.S. with the UK. All analyses were weighted for nonresponse and survey design and performed using Stata, version 13.1. All statistical tests were two-sided and a p-value of <0.05 was considered statistically significant. Data were analyzed in 2017.

RESULTS

The total sample size was 1,425 adults, block-sampled from five U.S. regions (unweighted sample: Northeast, 19.1%; Midwest, 22.0%; South, 36.2%; West, 10.9%; California, 11.8%). Of the 5,397 landline numbers where eligibility was confirmed, 1,839 households had at least one member aged ≥50 years, of whom 1,325 agreed to participate, 462 refused, and 52 only partially completed the survey (interview rate 72.1%). Of the 1,284 cell phone numbers where eligibility was confirmed, 156 individuals were aged ≥50 years, of whom 100 agreed to participate, 44 refused, and 12 only partially completed the survey (interview rate 64.1%). Compared with population estimates based on census data, the unweighted sample had greater representation of older women (23.9% vs 16.3%), college-educated adults (46.8% vs 28.7%), and non-Hispanic white adults (84.3% vs 76.0%), which were balanced in analysis using nonresponse weights.

Recognition of early warning signs of cancer was high across all symptoms but greatest for unexplained lump (95.5%), followed by changes in mole appearance (93.4%), unexplained bleeding (89.6%), and persistent cough (76.9%). Across all four symptoms of cancer, in bivariate models, higher education was significantly associated with symptom recognition (Table 1). African Americans were significantly less likely than other racial groups, in bivariate models, to identify unexplained lump (p<0.01) or change in mole appearance (p<0.01) as potential symptoms of cancer. Women were more likely to recognize unexplained bleeding (p<0.01) or change in mole appearance (p<0.05) than men in bivariate models. No significant relationships were found between self-reported health or healthcare access and recognition of any cancer symptom. Table 1 provides full details of the bivariate correlates of cancer symptom recognition.

The prevalence of anticipated delay (>2 weeks) varied across symptoms and was the highest for persistent cough (41.2%), followed by mole changes (33.1%), breast changes (14.7%), and rectal bleeding (9.1%). For all symptoms except rectal bleeding, there were significant associations in bivariate models between higher education and greater anticipated delay (Table 2). Adults who reported difficulty accessing a doctor had significantly higher odds of anticipated delay in seeking care for rectal bleeding (p<0.05) and breast changes (p<0.05). These adults also more commonly reported delays in seeking care for mole changes, but this association was not statistically significant. Older adults reported fewer anticipated delays for all symptoms except breast changes (Table 2). There were no significant associations between self-reported health or cancer experience for any symptoms. Table 2 provides full details of bivariate correlates of anticipated delays.

Figure 1 shows that for each cancer symptom, anticipating delay (>2 weeks) for care seeking was more common among those adults who did not recognize the symptom as a potential warning sign of cancer. These differences were statistically significant for rectal bleeding (p<0.05) and mole changes (p<0.01). In multivariate analyses, the likelihood of anticipated delay in care seeking was significantly greater among those individuals who did not recognize the symptom as a potential sign of cancer, after adjusting for potential confounders, for rectal bleeding (AOR=2.65, 95% CI=1.31, 5.36) and mole changes only (AOR=3.30, 95% CI=1.48, 7.33). Across all symptoms except breast changes, African Americans were significantly less likely to delay than other races (Table 3). Adults with a college degree or higher were significantly more likely to delay care seeking for persistent cough (AOR=1.41, 95% CI=1.04, 1.92) and mole changes (AOR=1.46, 95% CI=1.07, 1.99). For rectal bleeding and breast changes only, those who reported difficulty accessing a doctor were significantly more likely to delay care seeking than those who reported ease in accessing a doctor (rectal bleeding: AOR=2.44, 95% CI=1.09, 5.47; mole changes: AOR=2.97, 95% CI=1.41, 6.25).

DISCUSSION

To the authors' knowledge, this was the first population-based study in the U.S. to examine associations between recognition of potential cancer symptoms and anticipated

Table 1. Weighted Bivariate Correlates of Recognizing That a Specific Symptom Might Indicate Cancer

Variable	Total sample, *n* (%) (N=1,425)	Persistent cough, *n* (%)	Unexplained bleeding, *n* (%)	Unexplained lump (females only), *n* (%)	Change in mole appearance, *n* (%)
Recognized as cancer symptom	—	1,147 (76.9)	1,305 (89.6)	905 (95.5)	1,359 (93.4)
Sex					
Female	942 (53.5)	764 (78.6)	**876 (92.6)**	—	**907 (95.7)**
Male	483 (46.5)	383 (74.9)	**429 (86.2)**	—	**452 (90.7)**
Age, years					
50–64	687 (56.0)	551 (75.5)	631 (89.2)	410 (95.4)	663 (93.6)
65–99	736 (43.9)	595 (78.7)	673 (90.1)	494 (95.7)	694 (93.1)
Marital status					
Single	684 (36.9)	538 (74.4)	618 (88.4)	**487 (92.7)**	644 (91.0)
Married/Cohabiting	726 (62.3)	597 (78.3)	674 (90.5)	**410 (97.5)**	700 (94.7)
Race					
White	1,185 (77.3)	961 (78.1)	1,083 (90.1)	**757 (96.7)**	**1,143 (95.6)**
Black	119 (9.7)	92 (75.0)	109 (85.2)	**80 (86.0)**	**108 (87.3)**
Other	92 (10.5)	69 (66.7)	85 (89.9)	**52 (96.3)**	**79 (81.5)**
Education					
No bachelor's degree	734 (69.3)	**569 (75.2)**	**662 (88.9)**	**501 (94.3)**	**688 (92.6)**
Bachelor's degree or above	667 (28.9)	**562 (82.1)**	**623 (93.5)**	**390 (99.1)**	**652 (97.3)**
Cancer experience					
None	235 (17.5)	**159 (58.5)**	210 (85.8)	**138 (89.1)**	**214 (85.9)**
Yes, but not self	882 (62.2)	**727 (80.5)**	812 (90.6)	**577 (96.6)**	**856 (95.7)**
Yes, self	299 (19.9)	**253 (81.1)**	276 (89.9)	**185 (95.7)**	**281 (92.8)**
Accessing doctor					
Very/Somewhat easy	1,226 (82.9)	986 (76.7)	1,129 (90.5)	790 (95.7)	1,177 (94.5)
Very/Somewhat difficult	175 (14.7)	143 (79.7)	158 (89.5)	99 (93.9)	160 (89.7)
Self-reported health					
Fair/Good/Very good	1,309 (90.0)	1,054 (76.1)	1,200 (89.5)	835 (96.0)	1,253 (93.4)
Poor/Very poor	110 (9.5)	87 (82.4)	99 (89.6)	64 (90.2)	100 (92.8)

Note: Totals vary because of missing data. Design-adjusted *F* statistics were used to assess the association between care seeking for a specific symptom and correlate for each model. Categories reflect the specific wording of the survey item. All percentages are weighted. Boldface indicates statistical significance ($p<0.05$).

time to seeking care. Similar to previous studies in other countries,[9,10,18] the results of this study indicated that for some, but not all, symptoms of cancer, lack of symptom recognition was associated with anticipated delay in seeking physician-based care. Many other factors could affect symptom recognition and rapid care seeking, including the level of public messaging for different types of cancer and cancer prevention, the impact of the symptom on daily life, or the specificity (or ambiguity) of the symptom. For example, for breast changes, there has been substantial public health messaging around potential warning signs and screening. Therefore, it was not surprising to see higher rates of knowledge for this symptom and lower anticipated delay.

Although rates of symptom recognition were relatively high across the population and similar to the UK,[18] prevalence of anticipated delays in seeking care varied greatly depending on the symptom. Anticipated delays for rectal bleeding were the lowest across symptoms, which partly may be driven by the functional impact on daily life, whereas delays in care seeking for persistent cough may be shaped more by the ambiguous, or seemingly trivial,[23] nature of the warning sign. Coughing can indicate other health problems, such as the common cold, and may therefore not be perceived as a health issue in need of urgent physician care but rather amenable to self-management.[24] In addition, although routine cancer screening for a variety of cancers is recommended in the U.S.,[25] many people continue to be underscreened, especially in lung cancer for which screening uptake is estimated to be <5% across the eligible population.[26] Regardless of the status of these other, variably influential factors, symptom identification and prompt care seeking will continue to be important. Campaigns and interventions to increase public awareness of symptoms and reduce barriers to rapid care are needed. Finally, similar to some studies outside the U.S.,[8,27] this study found that anticipated delay was associated with

Table 2. Weighted Bivariate Correlates of Anticipated Delay to Care Seeking If Experiencing Specific Symptom

Variable	Persistent cough, *n* (%)	Rectal bleeding, *n* (%)	Breast changes (females only), *n* (%)	Mole changes, *n* (%)
Anticipated delay	611 (41.2)	128 (9.1)	143 (14.7)	461 (33.1)
Recognize as cancer symptom?				
No	131 (45.6)	**20 (18.6)**	5 (16.1)	**32 (57.0)**
Yes	478 (40.0)	**108 (8.1)**	137 (14.6)	**429 (31.7)**
Sex				
Female	411 (41.2)	78 (8.4)	—	**277 (28.9)**
Male	200 (41.2)	50 (9.9)	—	**184 (38.0)**
Age, years				
50–64	311 (41.2)	**69 (10.8)**	68 (13.9)	**264 (37.0)**
65–99	300 (41.3)	**58 (6.7)**	75 (15.7)	**196 (28.1)**
Marital status				
Single	285 (40.2)	63 (8.9)	76 (15.1)	199 (29.1)
Married/Cohabiting	315 (41.3)	64 (9.2)	66 (14.4)	259 (35.3)
Race				
White	**544 (45.3)**	112 (9.4)	123 (14.8)	394 (33.8)
Black	**22 (17.3)**	4 (2.0)	4 (6.7)	25 (20.9)
Other	**35 (31.2)**	10 (14.2)	10 (20.9)	32 (37.5)
Education				
No bachelor's degree	**287 (38.4)**	53 (8.3)	**68 (13.0)**	**222 (30.6)**
Bachelor's degree or above	**318 (47.6)**	74 (11.2)	**72 (19.8)**	**234 (38.5)**
Cancer experience				
None	89 (35.6)	19 (7.8)	27 (17.3)	76 (39.3)
Yes, but not self	383 (40.7)	77 (8.8)	90 (14.7)	287 (32.4)
Yes, self	135 (47.7)	32 (11.1)	24 (12.7)	94 (30.3)
Accessing doctor				
Very/Somewhat easy	527 (41.7)	**102 (7.5)**	**117 (12.8)**	392 (32.1)
Very/Somewhat difficult	76 (37.7)	**24 (16.1)**	**25 (26.9)**	63 (38.5)
Self-reported health				
Fair/Good/Very good	564 (42.2)	115 (8.7)	132 (14.9)	421 (32.9)
Poor/Very poor	46 (33.3)	13 (13.4)	11 (14.7)	40 (36.7)

Note: Totals vary because of missing data. Design-adjusted *F* statistics were used to assess the association between care seeking for a specific symptom and correlate for each model. Categories reflect the specific wording of the survey item. All percentages are weighted. See Table 1 for the total sample. Boldface indicates statistical significance ($p<0.05$).

higher educational attainment and nonminority groups. The counterintuitive association between higher education and delay might reflect higher levels of perceived ability to interpret symptoms and seek information online before seeking medical care.[28] With regard to race, other studies have shown that although minority populations might report lower levels of anticipated delay,[16] this association does not necessarily remain when actual time to care is examined. Actual time to care is influenced by a range of external barriers, such as health insurance, or other cancer-related factors, such as cancer fatalism or illness perception, that may impact care seeking when actual symptoms occur.[29,30]

Although most people recognized mole changes as a warning sign of cancer, lack of recognition was nevertheless associated with greater delay in care seeking, which indicates that additional public health campaigns may be needed to further increase public knowledge. This finding aligns with studies showing skin cancer knowledge to be associated with greater sun protection behavior.[31] However, even among those who did recognize the importance of mole changes, close to one third anticipated delaying care seeking. This low level of concern about the symptom suggests that additional factors may also be important influencers of care seeking for mole changes. For instance, people may know that change in the appearance of a mole is a potential sign of cancer but may not perceive the sign as serious or needing immediate attention.[32,33] Moreover, structural factors may promote delay, such as access to a dermatologist, which may be an out-of-pocket expense, particularly for patients without access to health insurance. Geographic density of dermatologists varies widely,[34] meaning access may be more limited for those not living near many, or

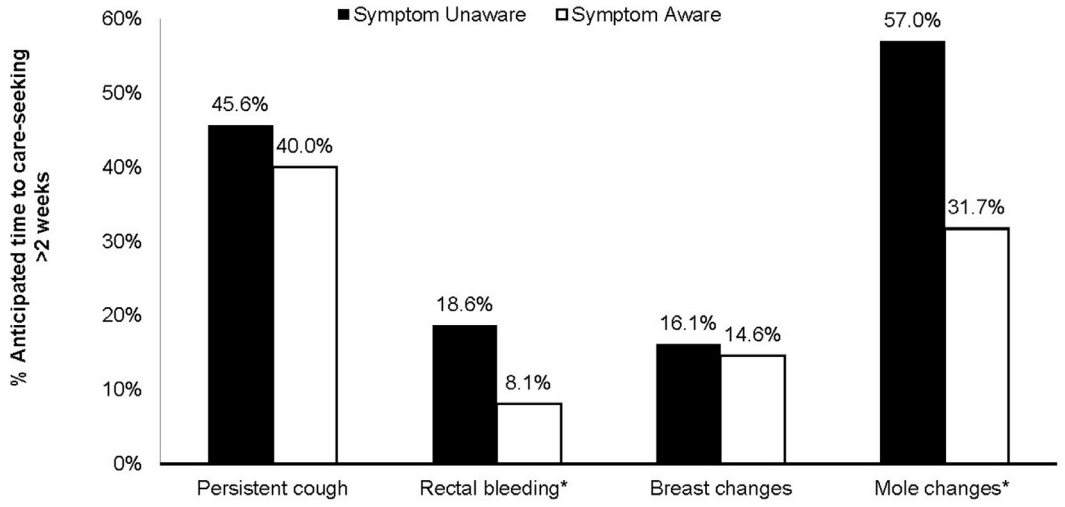

Figure 1. Recognition and anticipating delay >2 weeks before care seeking for each related cancer symptom.
Note: Asterisk indicates a significant difference between symptom aware and unaware at $p<0.05$. White bar indicates symptom unaware; black bar indicates symptom aware.

Table 3. Weighted Multivariate Correlates of Anticipated Delay Before Seeking Care for Potential Cancer Symptom

	Persistent cough (*n*=1,268)		Rectal bleeding[a] (*n*=1,265)		Breast changes (*n*=848)		Mole changes (*n*=1,294)	
Variable	**AOR (95% CI)**	***p*-value**	**AOR (95% CI)**	***p*-value**	**AOR (95% CI)**	***p*-value**	**AOR (95% CI)**	***p*-value**
Recognize as cancer symptom?								
Yes	1.00 (ref)		1.00 (ref)		1.00 (ref)		1.00 (ref)	
No	1.42 (0.93, 2.16)	0.10	**2.65 (1.31, 5.36)**	**0.007**	1.45 (0.47, 4.49)	0.51	**3.30 (1.48, 7.33)**	**0.003**
Sex								
Female	1.00 (ref)		1.00 (ref)		—	—	1.00 (ref)	
Male	0.88 (0.63, 1.23)	0.44	0.94 (0.55, 1.59)	0.81	—	—	1.18 (0.85, 1.64)	0.32
Age, years								
50–64	1.23 (0.88, 1.72)	0.22	**2.03 (1.25, 3.32)**	**0.005**	0.75 (0.44, 1.30)	0.31	**1.55 (1.10, 2.18)**	**0.01**
65–99	1.00 (ref)		1.00 (ref)		1.00 (ref)		1.00 (ref)	
Marital status								
Single	1.20 (0.86, 1.67)	0.28	1.27 (0.78, 2.09)	0.34	1.17 (0.71, 1.93)	0.53	0.86 (0.61, 1.20)	0.37
Married/Cohabiting	1.00 (ref)		1.00 (ref)		1.00 (ref)		1.00 (ref)	
Race								
White	1.00 (ref)		1.00 (ref)		1.00 (ref)		1.00 (ref)	
Black	**0.24 (0.12, 0.50)**	**<0.001**	**0.16 (0.05, 0.54)**	**0.003**	0.41 (0.10, 1.63)	0.20	0.45 (0.21, 0.93)	0.03
Other	0.52 (0.27, 1.02)	0.06	1.35 (0.54, 3.41)	0.52	1.33 (0.45, 3.91)	0.60	0.87 (0.46, 1.65)	0.67
Education								
No bachelor's degree	1.00 (ref)		1.00 (ref)		1.00 (ref)		1.00 (ref)	
Bachelor's degree or above	**1.41 (1.04, 1.92)**	**0.03**	1.55 (0.97, 2.47)	0.07	1.57 (0.98, 2.53)	0.06	**1.46 (1.07, 1.99)**	**0.02**

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Table 3. Weighted Multivariate Correlates of Anticipated Delay Before Seeking Care for Potential Cancer Symptom (*continued*)

	Persistent cough (*n*=1,268)		Rectal bleeding[a] (*n*=1,265)		Breast changes (*n*=848)		Mole changes (*n*=1,294)	
Variable	**AOR (95% CI)**	***p*-value**	**AOR (95% CI)**	***p*-value**	**AOR (95% CI)**	***p*-value**	**AOR (95% CI)**	***p*-value**
Cancer experience								
None	1.00 (ref)		1.00 (ref)		1.00 (ref)		1.00 (ref)	
Yes, but not self	1.25 (0.78, 1.90)	0.36	1.15 (0.51, 2.58)	0.74	0.92 (0.43, 1.95)	0.83	0.74 (0.46, 1.19)	0.21
Yes, self	**1.96 (1.14, 3.38)**	**0.02**	1.55 (0.63, 3.79)	0.34	0.86 (0.35, 2.11)	0.74	0.73 (0.43, 1.25)	0.26
Accessing doctor								
Somewhat/Very easy	1.00 (ref)		1.00 (ref)		1.00 (ref)		1.00 (ref)	
Somewhat/Very difficult	0.92 (0.55, 1.53)	0.74	**2.44 (1.09, 5.47)**	**0.03**	**2.97 (1.41, 6.25)**	**0.004**	1.42 (0.88, 2.30)	0.15
Self-reported health								
Fair/Good/Very good	1.00 (ref)		1.00 (ref)		1.00 (ref)		1.00 (ref)	
Poor/Very poor	0.85 (0.48, 1.48)	0.56	0.99 (0.36, 2.71)	0.99	0.91 (0.40, 2.07)	0.83	1.06 (0.59, 1.89)	0.85

Note: Sample sizes are different across models because of missing data. Breast changes model includes females only. Boldface indicates statistical significance ($p<0.05$).
[a]Rectal bleeding model fit ($F_{9,1275} = 5.105$, $p>0.001$); no indication of poor model fitness for other models.

any, dermatologists. Given the rising incidence of melanoma among older adults,[35] and the unlikelihood of rapid changes in the availability of dermatologists, more research is warranted to identify modifiable factors that influence delay in care seeking for mole changes.

Limitations

This study, which has a cross-sectional design, is limited in its ability to make causal conclusions about the relationship between symptom awareness and delay in help seeking. There are limitations to measuring anticipated delay rather than actual time to care. Though studies examining actual time to care seeking for cancer symptoms also show that lack of symptom recognition is associated with a greater delay,[14] anticipated delays may be shorter than actual delays.[8] Indeed, the processes of noticing a symptom, appraising it as a potential sign of cancer, and then deciding to seek medical care are likely to be more complex than recognizing a symptom in the research context.[23] For example, there is some mixed evidence from the UK that although those with lower education anticipate less delay, they may be less likely to associate a symptom with cancer.[27,28] Thus, additional research is needed to examine the effect of symptom recognition on actual, rather than anticipated, care-seeking behaviors for different U.S. groups. Strengths of this study include the large population-based sample and assessment of recognition of specific symptoms (rather than general symptom awareness) and anticipated delay for each, which may be more accurate given the known variability in care seeking across different symptoms. In addition, a strength of this study is that it allows for direct international comparisons about cancer symptom awareness and delays across countries rather than indirect comparisons because the study team administered the ABC survey.

CONCLUSIONS

Because most cancers are diagnosed symptomatically, in the U.S. as in other countries,[2] identifying modifiable factors to reduce delay in care seeking for potential symptoms of cancer is important for promoting earlier diagnoses and better outcomes. This study provides the first evidence that the U.S. population recognizes symptoms of cancer as well as the populations of countries with national healthcare systems. In addition to the recognition of warning signs of cancer, future studies should examine other factors, such as beliefs about cancer[9] and specific barriers to care[36] that are likely to influence care seeking for potential symptoms of cancer. Public health interventions focused on increasing awareness of timely care for symptoms of cancer may also be necessary.

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