Title

Attitudes and Practice Behaviors of Resident Physicians Surrounding Cancer Screening

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Conflict of interest

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Abstract

The early detection of cancer is widely acknowledged as crucial for saving lives. Screening programs have significantly reduced mortality rates associated with cervical, breast, and colorectal cancers over the past few decades. However, inconsistencies in screening guidelines among healthcare providers raise concerns about the uniformity of recommendations. This study investigates the practice behaviors, attitudes, and knowledge of cancer screening guidelines among medical residents in family medicine, internal medicine, and general surgery. A multi-institution survey was conducted, with 72 resident physicians participating. The study explores the sources from which residents acquire screening guidelines and evaluates their accuracy in recommending screening ages for colorectal, breast, and cervical cancers. Results indicate a preference for guidelines from the United States Preventive Services Task Force (USPSTF), although there are variations in recommendations among specialties. While residents demonstrate good knowledge of cervical cancer screening, they exhibit inconsistencies in breast cancer screening ages. Conflicting guidelines are perceived to impact patients' quality of care and confidence in the healthcare system. Residents primarily learn screening recommendations during medical school, highlighting the importance of early education. The study underscores the need for streamlined and consistent guidelines to mitigate confusion among providers and patients. Further

research is recommended to explore the objective impacts of guideline variability on screening practices and patient outcomes, especially in the context of advancing technologies like artificial intelligence.

Prevention Relevance

Cancer screening programs are proven for improving patient outcomes but are often inconsistent across the organizations making the recommendations. This inconsistency can create confusion and hurt the patients' and providers' trust relationships. This study explores the knowledge, consistency and perceptions of physician residents on cancer screening guidelines. This study provides context that can be used to improve cancer screening training for residents.

INTRODUCTION

It is a common consensus among healthcare professionals that early detection of cancer can save lives (1,2). Screening has helped lower death rates in the United States related to cervical, breast, and colorectal cancers for several last decades (3,4). This raises the question of whether healthcare providers in different specialties and even within the same specialty use the same resources when recommending preventative screenings for their patients. These statistics further illustrate the importance of creating unified cancer screening recommendations. There are inconsistent guidelines among varying governing bodies in the United States with variability in nearly all metrics in consideration (5). Moreover, when looking at a comparison of medical preventative service recommendations in Canada, France, and the United States, only 26% of these recommendations were in "strong agreement" suggesting inconsistencies among providers in similar nations. United States was the only country to demonstrate clear differences in terms of screening recommendations coming from national guideline committees, cancer societies, or specialty societies (6). Disagreement among nations may be due to cultural factors, but this would not explain variation within the United States.

To date, there is a small but significant body of literature on cancer screening guideline usage among US physicians (7–10) . Provider surveys are a frequently and effective way used to elucidate practice behaviors and resources utilized and to form a platform for exploring meaningful change (11–17). Lack of adequate knowledge of screening guidelines has been suggested as a contributing factor to underutilization of appropriate screening and other best practices, and it is plausible, but unexplored where providers learn their screening approach and perceived impact of differing guidelines on patient's and providers. Beyond these provider shortcomings, patients have also questioned screening guidelines, expressing uncertainty of financial motives by governing bodies and racial disparities inherently akin to these guidelines (18). On a larger scale, given varying degrees of health literacy, some patients may not even have knowledge of cancer, its risks, and the need for screening so would never prompt their physician in the first place (19). Personal and cultural beliefs also play roles in acceptance of screenings which may add an additional barrier for physicians seeking prophylactic care for their patients (20).

In the instance that resident physicians could be instructed on screening guidelines, it has been shown that there is a knowledge gap in provider best practices due to lack of feedback from attending to resident physicians (21,22). As mentioned above, it is under-explored how knowledge and practice gaps may be impacted by variability among cancer screening guidelines regardless of where and how they were acquired.

This study is a multi-institution survey that seeks the practice behaviors, attitudes, and knowledge of cancer screening guidelines in medical residents in multiple medical specialties (internal medicine, family medicine, general surgery). Additionally, the researchers plan to learn which resource is most used to obtain such guidelines. Finally, this study aims to describe the perceived impact different recommendations can have on a patient and provider.

MATERIALS AND METHODS

Study design and participants

This exploratory study uses survey methodology for a descriptive and exploratory design. A convenience-based sample was used to select 20 residency programs in family medicine, internal medicine, and general surgery. Across Colorado, these 20 programs had 427 members. Residency programs contain members from a wide variety of regions across the United States, plausibly making the sample data more generalizable. All participants were physicians in residence over 18. The participants answered the survey questionnaire on their own time and voluntarily. No additional exclusion criteria were included. The Rocky Vista University Institutional Review Board (IRB) approved as exempt this research project (IRB # 2023-025).

Questionnaire and survey distribution

The questionnaire was designed by the investigators and improved for clarity and validity in collaboration with clinical faculty with experience teaching in medical schools and currently working with medical residents and using cancer screening guidelines. The questionnaire is available as **Supplementary File**. The questionnaire survey was electronically distributed using Qualtrics XM (Qualtrics International Inc., Provo, UT) to a point of contact at each of the 20 selected hospitals in the state of Colorado containing residency programs in family medicine, internal medicine, and general surgery. Responses were anonymous, with demographic data limited to age range and sex assigned at birth. Residency training specialty was identified with a question embedded in the survey, but no data was collected on the specific residency program. Incentives to participate in the study were completed ($10 gift card), were offered as an optional step. For this they had to submit their email address which was disconnected from responses. Data was collected over a 24-week period from April 2023 to September 2023. Follow-up emails were distributed monthly afterward until the 24-week window had closed. Each participant had one opportunity for submission. Response rates or specific answers were not communicated to specific programs and all questionnaires were returned electronically, and answers to the survey were only accessible by the investigators.

Response assessment and statistical analysis

Data was analyzed descriptively and was summarized by response type and compiled in tables for visualization. The accuracy of individual responses (recommended age at average risk and recommended age at high risk) was corroborated against the guidelines they cited These recommendations are available as a **Supplementary file.** Participants were asked to cite their top two guidelines used. If the recommended age agreed with their top two guideline sources, the recommendation was graded as correct, otherwise it was graded as incorrect. Some guidelines do not have high risk age recommendation, therefore if the participant recommended an age that was different for the average risk, it was graded as incorrect. Guidelines change over the years and for this study they were compiled at the time of participant response (April-September 2023). Associations were assessed using contingency tables and exact probabilities, this was because of cell containing low counts. Significance was declared when observed cell values deviated from expected cell values at a $P \leq 0.05$. All analyses were performed in SAS v.9.4 (SAS Institute Inc., Cary NC)

RESULTS

A total of 72 resident physicians participated in the study. Of these, 50 (69.44%) were Family Medicine residents, 15 (20.83%) were Internal Medicine Residents and 7 (9.72%) were General Surgery residents. Post graduate year (PGY) representation was 21 (29.17%) PGY1, 25 (34.72%) PGY2, 23 (31.94%) PGY3, 1 (1.39%) PGY4 and 2 (2.78%) PGY5+. Among all participants 42 (58.33%) were female and the age ranges were 14 participants (19.44%) between 18 and 28 years or age, 55 participants (76.39%) between the ages of 29-39 years and 3 participants (4.17%) over 40 years of age. The main source of learning participants cite as their guideline was medical school followed by their attending physician during residency, displayed in **Table 1**.

Table 1. Ranked response participants cited as their source of cancer screening guidelines.

Source	Rank First	Rank Second	Rank Third
Medical school	37	15	13
From their attending physician during medical school rotations	9	20	25

From their attending physician during residency	22	28	13
Experience prior to medical school	0	1	6
Personal experience with cancer diagnosis	0	3	3
Other	7	2	3

For colorectal cancers, the most frequently recommended age for average risk patients was 45 years (69.44%) followed by 50 years (18.06%). For high-risk patients, the most frequently recommended age was 40 years (65.22%) followed by 45 years (15.94%). For mammography's, the most frequent recommended age for average risk patients was 50 years (48.61%) followed by 40 years (43.06%). For high-risk patients, the most frequently recommended age was 40 years (66.27%) followed by 30 years (10.14%). And last for Pap smears, the most frequent recommended age for average risk patients was 21 years (88.73%) followed by 20 years (4.23%). For high-risk patients, the most frequently recommended age was 21 years (82.09%) followed by 18 years (8.96%). Frequency for specific organization guidelines referenced by participants is presented in **Table 2**.

Table 2. Specific organization guidelines referenced by participants from which they base their recommendations.

	Colorectal cancer		Mammography		Pap smear	
	Rank first	Rank second	Rank first	Rank second	Rank first	Rank second
American Association of Family Physicians	3	20	0	14	0	1
American Cancer Society	4	19	6	17	2	9
American College of Family Physicians					0	1
American College of Gastroenterology	0	1				
American College of Obstetrics and Gynecology			4	11	9	27
American College of Osteopathic Family Physicians	0	3			2	4
American College of Physicians	2	5	3	2	1	4
American College of Radiology			0	1		
American Society for Colposcopy and Cervical Pathology					1	0
National Comprehensive Cancer Network	3	3	1	3	1	0
Society of General Internal Medicine	1	1				
U.S. Multi-society Task Force on Colorectal Cancer	1	1				
U.S. Preventative Task Force	63	3	60	7	59	6
Emergency Medical Record Suggestion	1	5	0	4	0	4
I don't know					1	0

Grading of participant recommendations is presented in **Table 3**. The proportions of correct recommendations vary by screening but are more often incorrect when recommending a mammography. In contrast the recommendations are more often correct for pap smears. When evaluating subsets, general surgery residents significantly made more incorrect recommendations on both average and high-risk pap smears (P=0.0134 and P=0.0014 respectively). There was also a gender discrepancy in their average risk colorectal cancer screening recommendations (P=0.0436). A discrepancy in PGY4 was also evident (P=0.0444) for pap smear recommendations. Last age group

differences were observed in high-risk mammography recommendation and average risk pap smear recommendations (P=0.0171 and P=0.0377 respectively).

Table 3. Grading of recommendations against the respective guidelines cited by participants.

	Colorectal cancer		Mammography		Pap smear	
	Average risk Correct	High risk Correct	Average risk Correct	High risk Correct	Average risk Correct	High risk Correct
Full dataset	47 (65.28%)	41 (59.42%)	29 (40.28%)	18 (26.09%)	62 (87.32%)	54 (80.60%)
By Specialty						
Family Medicine	33 (66.00%)	26 (55.32%)	19 (38.00%)	10 (21.28%)	47 (94.00%)	43 (91.49%)
Internal Medicine	10 (66.67%)	11 (73.33%)	7 (46.67%)	7 (46.67%)	11 (78.57%)	9 (64.29%)
General Surgery	4 (57.14%)	4 (57.14%)	3 (42.86%)	1 (14.29%)	4 (57.14%)*	2 (33.33%)*
by gender						
Female	23 (54.76%)*	24 (60.00%)	15 (35.71%)	9 (22.50%)	39 (92.86%)	33 (82.50%)
Male	24 (80.00%)*	17 (58.62%)	14 (46.67%)	9 (31.03%)	23 (79.31%)	21 (77.78%)
By PGY						
PGY1	13 (61.90%)	12 (60.00%)	12 (57.14%)	9 (42.86%)	18 (85.71%)	14 (73.68%)
PGY2	14 (56.00%)	14 (56.00%)	9 (36.00%)	6 (25.00%)	24 (96.00%)	20 (83.33%)
PGY3	17 (73.91%)	13 (61.90%)	7 (30.43%)	2 (9.52%)	19 (86.36%)	19 (86.36%)
PGY4	1 (100.0%)	1 (100.0%)	1 (100.0%)	0 (0.00%)	0 (0.00%)*	0 (0.00%)
PGY5+	2 (100.0%)	1 (50.00%)	0 (0.00%)	1 (50.00%)	1 (50.00%)	1 (50.00%)
By age						
18 to 28 years	7 (50.00%)	10 (71.43%)	8 (57.14%)	8 (57.14%)*	12 (85.71%)	10 (71.43%)
29 to 39 years	37 (67.27%)	30 (57.69%)	21 (38.18%)	9 (17.31%)	49 (90.74%)	43 (84.31%)
40 years or older	3 (100.0%)	1 (33.33%)	0 (0.00%)	1 (33.33%)	1 (33.33%)*	1 (50.00%)

* Significantly different proportion from expected proportion under H0

Participants expressed their concern on conflicting guidelines in terms of quality of medical care, patients' confidence in the healthcare system and their own personal confidence of the healthcare system. These concerns are presented in **Figure 1**. Because participants are aware of the discrepancies in guidelines, they were asked to refer to their preferred sources for informing their own practice approach for screenable cancers. They referred to organization publications more often followed by their attending recommendation and then to their own clinical experience too.

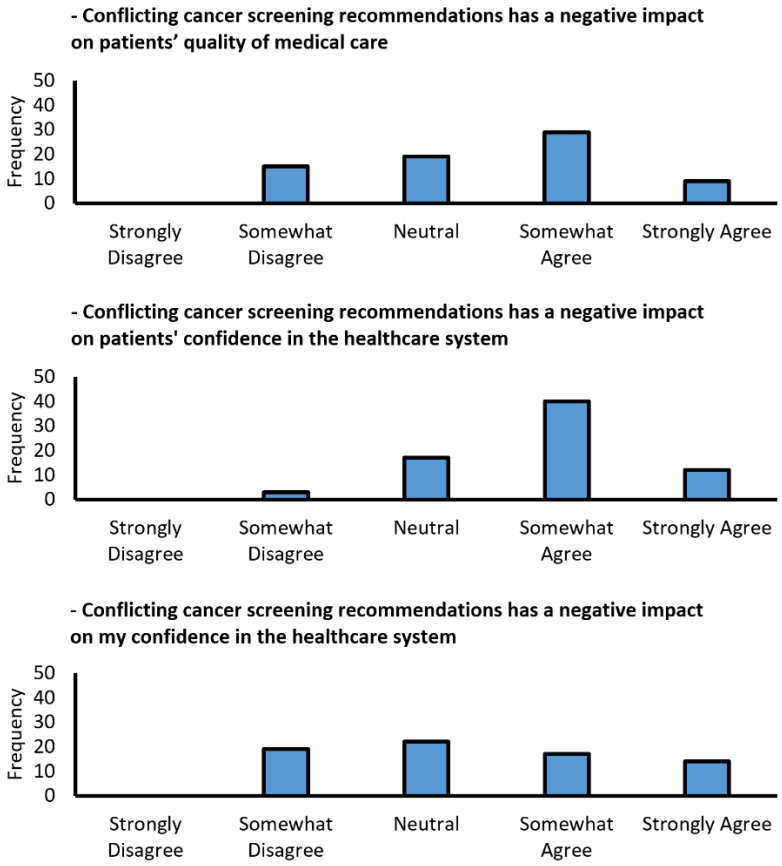

Figure 1. Response concerns on conflicting guidelines in terms of quality of medical care, patients' confidence in the healthcare system and their own personal confidence of the healthcare system.

DISCUSSION

While other studies have investigated which resource was the most widely used (7–10) this study is the first of its kind to investigate not only what resources are used and patterns of screening behavior, but additionally where they learned, their current practice approach and their perceptions on the impact of conflicting recommendations for patients and for themselves. We sought to learn behaviors within a small geographic area to see how different resident physicians would recommend when to screen for colorectal, breast and cervical cancers. The differing responses around guidelines and where they were learned alone gives insight into the larger public health issue of inconsistencies in screening recommendations.

Overall residents choose to rely on recommendations from governing bodies, such as the United States Preventative Services Task Force (USPSTF) but show statistically significant differences in the ages they begin screening for cancers. This contrasts from past work, where USPSTF recommendations have been rated as less influential than recommendations by the ACS, ACOG, or AAFP by internal medicine and family practice physicians for breast and cervical cancer screening (7). When it came to the source or governing body of choice USPSTF was consistently chosen as the first reference for resident physicians regardless of the type of cancer being screened for and the specialty the physician belonged to. This study demonstrated an 87.5% preference for referencing USPSTF before any other resource when it came to colorectal cancer recommendations. When it came to breast and cervical cancer, residents chose USPSTF as their primary reference 83.3% and 81.9% of the time, respectively. For context, the next closest for primary reference was American Cancer Society for colorectal and breast cancer, and

American College of Obstetrics and Gynecology for cervical cancer A preference towards using the USPSTF has shifted from previously being the ACS in studies done in 1998 and 2000. These studies showed that the guidelines put out by the ACS were most well-known by physicians and the public (9) and that 89% of primary care physicians in Colorado rated the ACS guidelines as moderately to highly influential compared to 33% rating USPSTF (10). Recent articles support this study's finding of the shift to using USPSTF preferentially over ACS guidelines (7,8). There could be differences appreciated between the most chosen sources among the three specialties in the study. When it came to colorectal cancer recommendations family medicine residents chose USPSTF first then referred to AAFP or ACS. Internal medicine residents referred to USPSTF first then ACS. General surgery residents chose USPSTF first then National comprehensive cancer network. The same trends can be seen with each of the specialties for breast cancer screening, but when it came to cervical cancer all three specialties first referred to USPSTF then secondly to ACOG.

Residents were less able to recall the precise timing for screening for breast cancer in comparison to cervical cancer. In fact, less than half of the residents correctly identified the age for screening based on their primary resource. For average risk patients 40% of residents were correct on their age recommendation based on their primary source (compared to 65% in colorectal and 87% in cervical). For high-risk patients only 26% of residents were correct on their age recommendation (compared to 59% in colorectal and 80% in cervical). This can be due to breast cancer recommendations changing a month into data collection. In May of 2023, the USPSTF issued new recommendations for breast cancer screening that lowered the age women should begin screening from 50 to 40 years old (23). Cervical cancer recommendations were last changed by American Cancer Society (ACS) in 2020 and by the USPSTF in 2018 (24). Colorectal cancer screening recommendations were last changed by the USPSTF in 2021 (25). However, the recent change in breast cancer guidelines does not explain the discrepancies in the other screening ages. Other interesting comparisons included correct answers of when to screen based on specialty, gender, and age. As mentioned in the results section, general surgery residents made more incorrect recommendations with only about half answering with the correct age for screening based on their chosen resource, which may be explainable by general surgery interacting with cancer diagnosis and treatment, but not being a primary care specialty. Additionally, when it came to sex assigned at birth, males answered correctly 80% of the time for average risk colorectal screening compared to females at 54.7%. When looking at their answers for pap smears females answered correctly 92.86% of the time compared to males who answered correctly 79.31% of the time. For mammography males answered correctly 46.67% of the time compared to females answering correctly only 35.71% of the time. Females might be expected to know when to screen for breast and cervical cancer better than males since they are the sex that gets screened. However, this data shows that is not always the case. Despite sex assigned at birth, teaching should continue to be uniform, and providers should be held to the same standards regardless of their sex.

Residents agree that conflicting cancer screening recommendations negatively impact patients' quality of care and confidence in the healthcare system. We found that 47% of physicians believe conflicting recommendations impact the quality of care; compared to 23% that don't believe it has any effect. This finding is corroborated by another study that surveyed patient perceptions of multiple screening recommendations (18). This survey stated patients were skeptical of data supporting the recommendations and that differing recommendations were viewed as a reflection of limitation in data. A report (19) stated that a clear understanding of what is recommended is made more difficult due to inconsistencies between the recommendations of the various organizations. The authors speculate the primary mission or objective of each governing body may hold some bearing on the broad direction of their recommendations. For example, USPSTF has a mission to improve the health of people nationwide by making evidence-based recommendations on effective ways to prevent disease, promote health and prolong life (26). While the ACS has a mission more directed at improving the lives of people with cancer

(27). However, these missions should not impede the evidence that surrounds the best age to begin screening for these cancers. Patients agree that streamlined guidelines could help avoid confusion and would allow for a more universal message (18). Our data shows 70.8% of residents surveyed believe multiple recommendations affect patients' confidence in the healthcare system. However, residents were very split across the board when answering if multiple resources impacted their confidence in the healthcare system with 40.5% answering somewhat or strongly disagree and 28.3% answering somewhat or strongly agree. This data suggests providers would like to see more streamlined guidelines to prevent patient confusion rather than their own.

Additionally, 56% of residents state they learned cancer screening recommendations during their first 2 years of medical school education compared to what their attending physicians in 3rd or 4th year medical school and residency taught them. This suggests that teaching cancer screening guidelines early in undergraduate medical education may significantly impact residents' screening practice, and upmost diligence should be used in the curriculum. A study done at the University of Pittsburgh showed the impact of exposing medical students to radiology more frequently during preclinical years can change their perceptions and interests towards the field (28). This same idea can be inferred regarding preventative screening emphasizing the need for more focus on cancer screening in preclinical years. The subsequent frequently selected source where they first acquired the screening guidelines was their attending during residency, followed by the attendings they rotated with in medical school.

Lastly, the data from this study show 86% of family medicine and 60% of internal medicine residents don't adjust age of pap tests based on onset of sexual activity. However, results differed for general surgery residents with 57% saying they do adjust the age for beginning pap tests based on onset of sexual activity. This can be attributed to the age demographics within each specialty, as general surgery residents tend to fall within the older age brackets. Recommendations in 2003 issued by the USPSTF, ACS, ACOG and the International Agency for Research on Cancer stated women should begin annual cervical cancer screening within 3 years of sexual initiation or by age 21 whichever comes first (29). It wasn't until 2008 that some governing bodies began to move to the current recommendation of beginning screening at 21 years of age regardless of the age of their first sexual encounter. A study done in 2013 stated that before 2012 ACOG, ACS and USPSTF differed on age to begin screening and how often to screen. In 2012, however, all three organizations agreed on current recommendations (30). The study also observed that in 2010 52.5% of women aged 18-20 were still getting their pap tests before age 21. This implies there is a lag in when recommendations are released to when they are implemented in physicians' practice. Given this change not uniformly occurring until 2012 and the knowledge that there is a lag in the recommendations and when they are implemented suggests residents may have learned older recommendations in medical school, or even in their practice, and have a lapse in when they learn and implement the updated guidelines. We state earlier in this paper that medical school is where most residents were initially taught these recommendations making that a critically influential time in medical education on this matter.

We had a response rate of 18% for usable data which limits representation of the study population. However, prior research has found lower response rates (compared to higher) did not change survey results, particularly among physicians (31). While the survey was sent to all the residents at each site, we only received responses from PGYs 1-3. Although this survey was sent to residents in family medicine, internal medicine, and general surgery we received higher responses from family medicine residents. Lastly, this study was just conducted at residency programs in Colorado due to the convenient sample population. Moving forward studies should be done surveying residents across the United States to view trends in knowledge of cancer screening recommendations, preferences on where they reference these recommendations and their perception of confidence in the health care system. Additional research should investigate perceptions of how non-uniform cancer screening may affect treatment of cancer patients and to consider the use with the development of AI (Artificial Intelligence).

The sources AI/ChatGPT uses when asked guidelines may significantly influence patient and provider information. The future direction of cancer recommendations will be something to closely watch and technology progresses.

Conclusion

In conclusion, this study found that USPSTF was the most favored resource for family medicine, internal medicine, and general surgery residents. Fewer than half of the residents accurately identified the age for breast cancer screening according to their primary resource. Residents concur that contradictory cancer screening recommendations have an adverse effect on patients' quality of care and confidence in the healthcare system. There is also a broad range of places practice approach is learned, however, many residents trended towards learning screening recommendations in medical school. It is plausible that there is meaningful negative impact to providers and patients and further investigation into more objective impacts to screening practice and patient behaviors is warranted.

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