Perceived effectiveness of cancer screening among family medicine and internal medicine physicians in the United States

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1. Introduction

Cancer screening is critical for early detection, treatment, survival, and quality of life (Peterson et al., 2016). Certain types of cancer such as colorectal, lung, breast, prostate, and cervical can be detected early, often improving prognosis and reducing mortality rates (Schiffman et al., 2015). Despite its benefits, cancer screening remains underutilized (Bonafede et al., 2019). A key determinant of cancer screening is whether a primary care provider/physician recommends it to their patient. Physicians’ attitudes and beliefs towards screening can influence referral rates, and incorrect recommendations may result in missing potentially eligible patients.

Few studies have examined US physicians’ beliefs about the effectiveness of cancer screening in the last 10 years. For example, one study at a large academic medical center found that in 2013, 293 primary care providers rated perceived effectiveness (very or moderate) of colonoscopy as 99%, Papanicolaou smear 95.7%, mammography 92.9%, lung cancer screening 41.9%, and PSA testing 27.4%. Several studies have assessed perceived effectiveness of lung cancer screening and found varied perceived effectiveness, ranging from 42 to 87% (Khairy et al., 2018; Lewis et al., 2015; Raz et al., 2018), which may depend on differences across studies in geographic locale, practice setting, and...
physician specialty. Finally, primary care providers \( n = 1,281 \) within four healthcare systems in California, Washington, and Texas completed a survey in 2017–2018. For patients 50–74 (screening eligible), 82.9% of providers rated colonoscopy as very effective (Ghai et al., 2020). These prior studies had various limitations such as older data, a relatively small sample size, limited geographic reach, and/or focus on only one screening type. The current study updates and extends this work by assessing the perceived effectiveness of screening for colon, lung, breast, prostate, and cervical cancers among a relatively large national sample of family medicine and internal medicine physicians.

2. Methods

This study was part of a self-administered cross-sectional survey that focused primarily on physicians’ knowledge, attitudes, and communication about tobacco use and treatment (Schaer et al., 2021). A random sample of 750 physicians from each of four specialties (family medicine, internal medicine, obstetrics and gynecology, pediatrics) was drawn from the American Medical Association’s (AMA) Physician Masterfile. As the most comprehensive database of physicians, the Physician Masterfile contains data on more than 900,000 physicians, residents, and trainees from the United States. Physicians from this database include both AMA members and nonmembers of all medical specialties and practice types. To be eligible, physicians must have been board-certified in the target specialty and actively treating outpatients in the United States. Survey fielding occurred from April through June 2019. More detail is reported elsewhere (Delnevo et al., 2021; Delnevo and Singh, 2021; Schaer et al., 2021).

In brief, sampled physicians were mailed an invitation letter via UPS, inviting them to participate in the survey via web by providing a survey link and unique PIN for accessing the survey. If needed, a reminder postcard and a reminder letter were sent to physicians who had not responded; a fourth and final mailing included a paper copy of the survey and a prepaid return envelope. The American Association for Public Opinion Research’s Response Rate 3 was 59.1% and 59.3% for family medicine and internal medicine specialties, respectively (American Association for Public Opinion Research, 2016). Rutgers Institutional Review Board approved the study procedures, which met the institution’s guidelines for protection of human subjects concerning their safety and privacy.

Supplemental specialty-specific modules were included in the web-based survey; for internal and family medicine physicians, this was a module about cancer screening, given their likelihood of counseling patients on the variety of available cancer screening tests. As such, the analytic sample is restricted to 582 family medicine and internal medicine physicians who received the additional questions on perceptions of cancer screening tests.

2.1. Measures

For each of the cancer screening practices, providers were asked “How effective or ineffective do you believe the following screening practices are in reducing cancer-related mortality in the average, healthy individual for whom they are recommended?” with response options of 1 = not effective to 4 = very effective. The cancer screening tests included colonoscopy for colon cancer, low-dose computed tomography (LDCT) for lung cancer, mammography for breast cancer, prostate specific antigen (PSA) for prostate cancer, and Pap smear for cervical cancer. Participants answered questions on their demographic characteristics, including age, gender, race, graduation year, and medical specialty (family or internal medicine).

2.2. Data analysis

The final analyses included only participants who responded to the screening perception questions. Descriptive statistics were calculated to describe the analytic sample. Bivariate chi-square statistics were computed to assess relationships between perceiving cancer screening tests as ‘very effective’ and each of the physician characteristics. All analyses were conducted using SAS software version 9.4 (SAS Institute, Cary, NC, USA) with a significance level of 0.05.

3. Results

The sample was 54.7% female and 63.5% non-Hispanic white with median age of 51 years (Table 1). A substantial majority of physicians perceived colonoscopy (83.8%) and Pap smear (82.9%) to be very effective (Table 2). About 60% of physicians perceived mammography to be very effective compared to 35% of them perceiving LDCT to be very effective. About 18% of physicians perceived PSA to be very effective.

Physician specialty was not significantly associated with perceiving any screening test as ‘very effective’ (Table 3). Women were less likely to endorse LDCT and Pap smear but more likely to endorse PSA. Younger and more recent graduates were less likely to perceive PSA as ‘very effective’. Non-Hispanic Black or African-American physicians were more likely to perceive mammography as ‘very effective’ than other groups.

4. Discussion

This study provides important information about beliefs among American family medicine and internal medicine physicians regarding effectiveness of various types of cancer screening. Overall, the rates of perceived effectiveness were lower than other reports in the last decade (Ghai et al., 2020; Khairy et al., 2018; Lewis et al., 2015; Raz et al., 2018), perhaps related in part to the fact that the current data are more recent and from a national sample. Results suggest that a majority of physicians support colonoscopy for colorectal cancer screening, which is consistent with previous studies and recommendations (Brown et al., 2015). Use of colonoscopy has been associated with a 65% reduction in mortality risk in the right colon and a 75% reduction in mortality risk for rectal cancers (Doubeni et al., 2018). Colon cancer screening, including colonoscopy and other methods, has been rated by the United States Preventive Services Task Force (USPSTF) with a Grade A risk–benefit ratio for ages 50–75 years and Grade B for ages 45–49 (USPSTF, 2021).

More than 80% of respondents also perceived Pap smear to be very effective. Current evidence recommends Pap smear be used in combination with human papillomavirus testing in individuals aged 25 to 65

Table 1

Sample Descriptives (N = 582).

|                      | n     | %   |
|----------------------|-------|-----|
| Age, years          | 51 [15.00] |
| Gender              |       |     |
| Females             | 309   | 54.7 |
| Male                | 256   | 45.3 |
| Race/Ethnicity      |       |     |
| White, Non-Hispanic | 359   | 63.5 |
| Black/African American, Non-Hispanic | 26 | 4.6 |
| Hispanic            | 27    | 4.8 |
| Asian/Pacific Islander | 81 | 14.3 |
| South Asian         | 43    | 7.6 |
| Other               | 29    | 5.1 |
| Graduation year     | 1995 [15.00] |
| Specialty           |       |     |
| Family Medicine     | 334   | 57.4 |
| Internal Medicine   | 248   | 42.6 |

*Imputed for 2 respondents as median age within same specialty and graduation year.

†Imputed for 17 respondents as median year within same specialty and age. Frequencies may not total 582 due to item nonresponse.
recent (Krist et al., 2021) and less disseminated in the healthcare and LDCT could be due to the evidence for the LDCT test being more 2011). The difference in perceived effectiveness between mammogram cancer mortality by 20% (National Lung Screening Trial Research Team, 2017; Bennett et al., 2018). It was not surprising that younger or recent graduates were less likely to perceive PSA to be ‘very effective’ because of recent USPSTF recommendations against its use. Non-Hispanic Black or African-American physicians tended to perceive mammography to be very effective, potentially because of the significant racial disparities in breast cancer survival and mammography barriers that racial minority women face (Miller et al., 2019).

Unfortunately, the current study did not evaluate screening referral rates or to what extent these rates may be related to perceived effectiveness. It is likely that perceived effectiveness is associated with, but not identical to, screening referral rates. For example, one study found that 82.9% of primary care providers rated colonoscopy as very effective (Ghai et al., 2020), and 77.9% recommended colonoscopy to patients.

Table 2
Perceived effectiveness of various cancer screenings among a sample of internists and family physicians, N = 582.

| Cancer Screening          | Not effective | Minimally effective | Moderately effective | Very effective | Average Score* |
|---------------------------|---------------|---------------------|----------------------|---------------|----------------|
| Colonoscopy for colon cancer screening | 0 | 0.0 | 2 | 0.4 | 92 | 15.9 | 485 | 83.8 | 3.83 | 0.38 | 4.00 | 0.00 |
| Pap smear for cervical cancer screening | 0 | 0.0 | 8 | 1.4 | 91 | 15.7 | 480 | 82.9 | 3.82 | 0.42 | 4.00 | 0.00 |
| Mammography for breast cancer screening | 1 | 0.2 | 23 | 4.0 | 207 | 35.6 | 351 | 60.3 | 3.56 | 0.58 | 4.00 | 1.00 |
| LDCT for lung cancer screening | 4 | 0.7 | 85 | 14.6 | 286 | 49.2 | 206 | 35.5 | 3.19 | 0.70 | 3.00 | 1.00 |
| PSA for prostate cancer screening | 54 | 9.3 | 236 | 40.6 | 187 | 32.1 | 105 | 18.0 | 2.59 | 0.89 | 3.00 | 1.00 |

Frequencies may not total 582 due to item nonresponse.

Table 3
Prevalence of perceiving screening tools as ‘very effective’ by demographic characteristics, N = 582.

| Screening Tool          | Colposcopy | LDCT | Mammography | Pap Smear | PSA Test |
|-------------------------|------------|------|-------------|-----------|----------|
| Age, years a            |            |      |             |           |          |
| Younger than 50 years   | 203        | 82.5 | 151         | 198       | 292      |
| 50 years or older       | 264        | 84.4 | 185         | 154       | 221      |
| Gender                  |            |      |             |           |          |
| Female                  | 255        | 82.8 | 185         | 245       | 292      |
| Male                    | 214        | 84.3 | 154         | 221       | 186.3    |
| Race/Ethnicity          |            |      |             |           |          |
| White, Non-Hispanic     | 295        | 82.9 | 198         | 292       | 186.3    |
| Black/African American, Non-Hispanic | 23 | 88.5 | 21 | 80.8 | 25 |
| Hispanic                | 72         | 88.9 | 58          | 69        | 69.3     |
| Asian/Pacific Islander  | 24         | 88.9 | 16          | 20        | 20.7     |
| South Asian             | 33         | 76.7 | 29          | 35        | 24.1     |
| Other                   | 25         | 86.2 | 18          | 20        | 14.8     |
| Graduation year b       |            |      |             |           |          |
| 1995 or later           | 237        | 83.8 | 168         | 236       | 183.4    |
| Before 1995             | 230        | 83.3 | 168         | 229       | 183.0    |
| Specialty               |            |      |             |           |          |
| Family Medicine         | 279        | 83.8 | 209         | 278       | 183.5    |
| Internal Medicine       | 206        | 83.7 | 142         | 202       | 82.1     |

a Chi-square.

b Age was imputed for 2 respondents as median age within same specialty and graduation year.

c Graduation year was imputed for 17 respondents as median year within same specialty and age.

years (Fontham et al., 2020). Cervical cancer screening, including Pap smear, has been rated Grade A by the USPSTF.

The USPSTF recommends biennial mammography for women aged 50 to 74 years, USPSTF Grade B, and that for women under 50, mammography should be an individual decision (Siu on behalf of the USPSTF, 2012), which as of 2018 is rated USPSTF Grade C for men ages 55–69 years and Grade D for men 70 and older (USPSTF, 2018). Findings of a recent meta-analysis show that prostate cancer screening does not affect overall mortality and at best, may only lead to a small reduction in mortality risk (Ilic et al., 2018).
Additionally, it is well-known that screening recommendations or referrals do not necessarily translate into actual screening completion. More research is needed in this area.

This study has important implications. Results highlight the need to address provider-level beliefs about and barriers to cancer screening tests. American physicians’ beliefs were largely aligned with USPSTF grades, except for LDCT. Educational and organizational efforts that have targeted physicians regarding shared decision-making with their patients for LDCT screening have had some preliminary success in modifying physician knowledge, attitudes, and screening behavior. These approaches have included a digital awareness campaign (Jespup et al., 2018), electronic eligibility form for patients (O’Brien et al., 2017), lectures and group-based learning (Ortmeyer et al., 2020), and a decision aid (McDonnell et al., 2018). Due to the lack of evidence regarding effectiveness of certain screening tests such as PSA, physicians should thoroughly discuss with patients the individual benefits versus the overall risks of screening.

Funding

This work was supported by grant R01CA190444 and P30CA072720 from the National Cancer Institute. The content of this manuscript is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

CRediT authorship contribution statement

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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