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Rates of Screening for Breast, Colorectal, and Cervical Cancers in Older People With Cognitive Impairment or Dementia: A Meta-Analysis

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Abstract

Purpose: Cancer screening may not be appropriate for some older people. We compare the likelihood of screening for colorectal, breast, and cervical cancers in older people with versus without cognitive impairment or dementia. **Method:** Systematic search of MEDLINE, Embase, and PsycINFO (to March 9, 2018) for articles reporting screening for colon, breast, and cervical cancers in patients with and without cognitive impairment or dementia. Studies were summarized quantitatively (random effects meta-analysis), according to Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. **Results:** Studies reported data 1989-2008. The rate of screening for breast cancer by mammography was lower in women with cognitive impairment or dementia compared with those without (pooled odds ratio [OR] = 0.81, 95% confidence interval [CI] = [0.71, 0.91], p = .0007, six studies, N = 18,562). The rates of screening for cervical cancer by Pap smear (pooled OR = 0.88, 95% CI = [0.71, 1.08], p = 0.22, five studies, N = 409,131) and colorectal cancer by fecal occult blood test (pooled OR = 0.87, 95% CI = [0.55, 1.38], p = .55, two studies, N = 2,718) were not significantly lower in people with cognitive impairment or dementia. **Conclusion:** These historical rates provide a baseline for discussions around the need for more specific guidance to assist with decisions to discontinue screening. The study also identifies a gap in reported knowledge with respect to screening under current guidelines.

Keywords

cancer, Alzheimer's/dementia, prevention, public health/public policy

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Introduction

Cancer is a leading cause of mortality worldwide, with approximately 14 million attributable deaths in 2012, an estimate expected to increase to 22 million per year over the next few decades (Prince et al., 2015). Some (Bibbins-Domingo et al., 2016; Moyer, 2012; Nelson et al., 2009; Siu, 2016; Tarraga Lopez, Albero, & Rodriguez-Montes, 2014) but not all (Brauner, Muir, & Sachs, 2000; Stewart & Wild, 2014) studies report that early screening and detection may reduce cancer mortality, even in older adults. Both American and international clinical practice guidelines recommend regular screening for breast cancer in those aged 55 years and older, cervical

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cancer up to age 65, and colorectal cancer in individuals aged 50 years and older (Supplementary Table 1).

There is some evidence to suggest that screening for cancer in older individuals with cognitive impairment is associated with survival benefit (Mehta, Fung, Kistler, Chang, & Walter, 2010; Robb, Boulware, Overcash, & Extermann, 2010); however, some patients with dementia may not benefit from screening due to a reduced life expectancy (Kua et al., 2014), or they may be unnecessarily harmed by the burden of screening procedures (Raik, Miller, & Fins, 2004; Torke, Schwartz, Holtz, Montz, & Sachs, 2013). In light of an expected increase in the prevalence of dementia over the next few decades (Prince et al., 2015), it is increasingly important to ensure that clinical practice guidelines adequately reflect the needs of these patients (Brauner et al., 2000).

Studies have raised concerns about the rates of cancer screening in those with cognitive decline and dementia (Marwill, Freund, & Barry, 1996; Walter & Covinsky, 2001), but there remains a lack of consistent evidence to identify an actual health services utilization gap in this population, and the appropriateness of screening in patients with dementia. This systematic review and meta-analysis is intended to provide an estimate of the difference in likelihood of screening for colorectal, breast, and cervical cancers between older people with and without cognitive impairment or dementia.

Method

Data Sources

Following Preferred Reporting Items for Systematic Reviews and Meta-Analysis Protocols, PRISMA-P (Moher, Liberati, Tetzlaff, & Altman, 2010), we identified research articles reporting screening for colorectal, breast, and cervical cancer in patients with dementia or cognitive impairment in late adulthood. The search strategy was developed by two librarians (co-authors A.P.A. and E.L.), and translated into command language and search fields appropriate for each database queried. MeSH terms, EMTREE terms, APA thesauri terms, and textwords were used for the search concepts of dementia, screening, and cancer. The three concepts were combined with a Boolean "AND." Searches were limited to English language and humans (Supplementary Table 2). The following databases were searched: Articles in PsycINFO from 1806, Embase from 1947, and MEDLINE from inception until the time of the search were included. Final searches were completed on March 9, 2018, and additional studies were searched by from the reference lists of relevant studies included in the full-text review (Figure 1).

Study Selection

Inclusion criteria were as follows: (a) studies that examined rates of screening for cervical, colorectal, or breast cancers; (b) inclusion of a cognitive impairment group, either by diagnosis or screening, including dementia, mild cognitive impairment, or reduced performance on a neuropsychological instrument; and (c) inclusion of a cognitively normal group.

Data Abstraction

Two independent reviewers (F.F. and S.D.) examined each article for eligibility. Any disagreements were settled by consensus between raters, and if necessary, other members of the review team (M.L., W.S., and A.L.). The "Methods" and "Results" sections for all studies that met inclusion criteria were analyzed, and adjusted odds ratios (ORs) and 95% confidence intervals (CI) were extracted onto a prespecified data extraction sheet. Population characteristics (age) and study variables (inclusion criteria as above, methodology items as per Table 1) were also extracted, and reporting quality and risk of bias items (Supplementary Table 3) were recorded for each study in the final inclusion set. Authors were contacted for any missing data.

Meta-Analysis

Inverse-variance weighted meta-analyses based on random effects models were performed for each cancer screening outcome using Review Manager 5.3 (RevMan; 2014). A random effects model was chosen as a more conservative method of calculating ORs, assuming appreciable variation due to different study methodologies. To account for effects of potential confounders, adjusted ORs were used in the meta-analysis if they were available. If adjusted ORs were unavailable, we used unadjusted ORs, or calculated them from the data provided (Altman, 1990). A planned sensitivity analysis was conducted to determine whether the calculated unadjusted ORs affected the outcome.

If a study examined multiple types of screening for the same cancer, only one OR, that of the more highly recommended test (e.g., mammogram over clinical breast exam), was included in the meta-analysis. For studies comparing multiple groups based on different severities of cognitive impairment to the same control group, only the larger of the two groups was included to avoid double-counting controls.

Heterogeneity between studies was summarized using Cochran's Q test and Higgins' I^2 statistic. Low, moderate, and high heterogeneity is defined as an I^2 statistic of 25%, 50%, and 75%, respectively (Higgins, Thompson, Deeks, & Altman, 2003). Heterogeneity was considered to be present if either the p value for the Q statistic was less than 0.1, or if the I^2 statistic was greater than 50%.

Reporting Quality and Risk of Bias

Reporting quality and risk of bias were evaluated using pertinent questions from the Agency for Healthcare

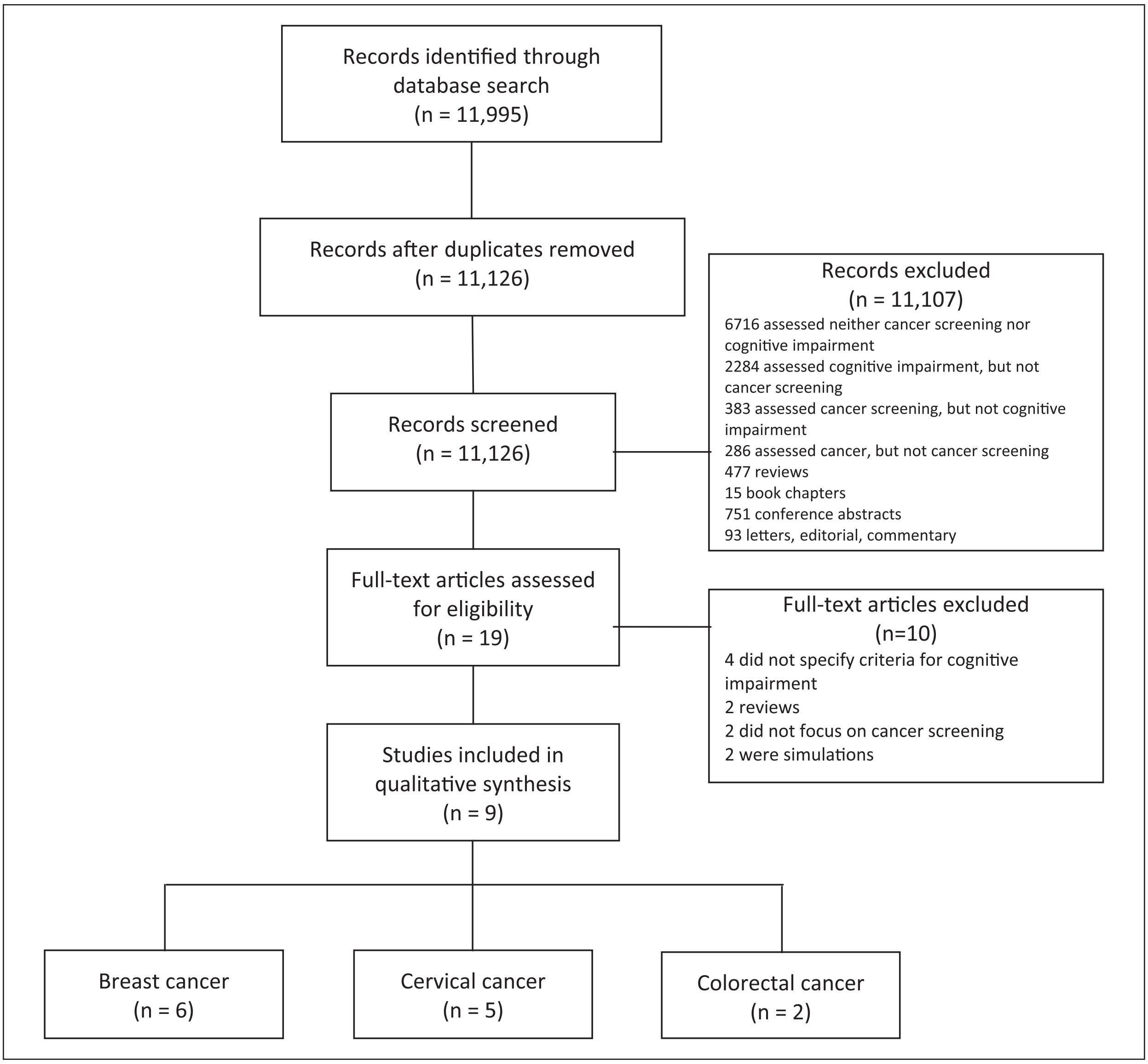

Figure 1. Flow diagram of selection of studies.

Research and Quality Item Bank of questions to assess risk of bias and confounding (Viswanathan, Berkman, Dryden, & Hartling, 2013), the Effective Public Health Practice Project (Armijo-Olivo, Stiles, Hagen, Biondo, & Cummings, 2012), and the Cochrane Collaboration Tool for Assessing Risk of Bias (Higgins et al., 2011). Studies were examined on six categories (Supplementary Table 3), and a score of low, uncertain, or likely risk of bias was assigned by two independent raters (S.D. and A.L.), and any discrepancies settled by consensus. Risk of publication bias was assessed as funnel plot asymmetry.

Results

The search strategy identified 11,126 unique articles, of which nine met inclusion criteria (Figure 1). The available studies reported data that were collected from 1989 to 2008. The study design elements and characteristics of the participants in the included studies are summarized in Table 1. The studies ranged in size and setting, from a single-center study investigating 248 individuals who received care at a geriatric care clinic (Heflin, Oddone, Pieper, Burchett, & Cohen, 2002), to a population-based study of more than 394,000 individuals identified from a national database (Persky & Burack, 1997).

Of the nine studies, six evaluated breast cancer screening as an outcome, five examined cervical cancer, and two examined colorectal cancer. To ascertain cognitive status, two studies (Heflin et al., 2002; Pfeiffer, 1975) used the Short Portable Mental Status Questionnaire (Daly, Levy, Joshi, Xu, & Jogerst, 2010), one study (Ives, Lave, Traven, Schulz, & Kuller, 1996) used the Clock Drawing Test, one study (Huang, Tsai, & Kung, 2012) used the Mini-Mental State Exam, two studies (Blustein & Weiss, 1998; Persky & Burack, 1997) used a recorded diagnosis of dementia, two

Table 1. Characteristics of Included Studies.

Study	Population	Years	*N*	Study design	Screen type	Cognitive impairment criteria	Inclusion criteria	Exclusion criteria
Blustein and Weiss (1998)	Medicare Current Beneficiary Survey, United States	1991-1992	2,352	Retrospective cohort	Mammogram	Medical history of "Alzheimer's disease, dementia, or mental or psychiatric disorder"	Community-dwelling, aged ⩾75 years	History of breast cancer, member of a Medicare-qualified HMO
Bussiere, Le Vaillant, and Pelletier-Fleury (2015)	Health and Disability Surveys—Institutions Section, France	2008	1,059	Retrospective cohort	Pap smear	Cognitive limitation severity score developed for the study	Age 20-65 years, living in an institution for disabled adults, not currently pregnant, no hx of cervical cancer	Coma or vegetative state
Daly, Levy, Joshi, Xu, and Jogerst (2010)	Iowa Research Network, United States	2004	511	Cross-sectional	Colonoscopy	Abnormal Clock Drawing Test	Men and women, age 55-80 years	Had help completing clock-drawing test
Huang, Tsai, and Kung (2012)	Database of the Ministry of the Interior, Taiwan	2006-2008	394,239	Cohort	Pap smear	Coded as "dementia"	Women aged ⩾30 years with a disability	Persistent vegetative state
Heflin, Oddone, Pieper, Burchett, and Cohen (2002)	Piedmont, North Carolina, United States	1992	2,225	Cross-sectional	Mammogram, clinical breast exam, Pap smear, FOBT	Short Portable Mental Status Questionnaire	Age ⩾65 years	Diagnosis of breast, cervical, or colorectal cancer; incomplete data
Ives, Lave, Traven, Schulz, and Kuller (1996)	Rural Health Promotion Project, United States	1991-1992	2,205	Cohort	Mammogram, Pap smear	MMSE ⩽23	Rural, community-dwelling women; age 65-79 years; covered under Part B of Medicare	Institutionalized, bed-ridden, recent cancer diagnosis
Mehta, Fung, Kistler, Chang, and Walter (2010)	HRS, 2002 wave, United States	2002	2,131	Cohort	Mammogram	35-point instrument developed for the HRS; participants classified as normal (20-35), mild-moderate (11-19), and severe (⩽10)	Women; aged ⩾70 years	Medicare-managed care; history of breast cancer or had a breast neoplasm; first mammogram for nonscreening purposes
Ostbye, Greenberg, Taylor, and Lee (2003)	HRS, 1996 and 2000 waves; AHEAD, United States	1995, 2000	10,485	Cohort	Mammogram, Pap smear	35-point instrument developed for the HRS and AHEAD studies	Women; age 50-64 years (HRS), ⩾70 (AHEAD)	None
Persky and Burack (1997)	University of Michigan Turner Geriatric Clinic, United States	1989-1990	248	Cross-sectional	Mammogram	Short Portable Mental Status Questionnaire	Age ⩾55, line within 20 miles of the clinic	Mammogram after clinic visit, but before interview; severe dementia; breast disease; lost to follow-up; non-English-speaking

Note. HMO = Health Maintenance Organization; FOBT = fecal occult blood test; MMSE = Mini Mental State Examination. HRS = Health and Retirement Study; AHEAD = Asset and Health Dynamics Among the Oldest Old.

studies (Mehta et al., 2010; Ostbye, Greenberg, Taylor, & Lee, 2003) used other cognitive screening instruments, and one used a cognitive severity score developed for that study (Bussiere, Le Vaillant, & Pelletier-Fleury, 2015).

Most of the studies dichotomized participants by cognitive status (i.e., impaired or not impaired). All included studies provided adjusted ORs and CIs, except for one study (Ives et al., 1996) that reported an unadjusted OR for colorectal cancer screening, and one study (Persky & Burack, 1997) from which an unadjusted OR was calculated from screening rates reported in affected and unaffected groups. Most ORs were adjusted for demographic and socioeconomic variables, such as age, sex (when appropriate), ethnicity/race, education level, and income.

Two studies differentiated the effects of mild–moderate versus severe cognitive impairment on cancer screening rates (Mehta et al., 2010). In one study (Mehta et al., 2010), while any impairment was associated with a lower likelihood of being screened, women with severe cognitive impairment had an even lower likelihood of mammogram screening for breast cancer (OR = 0.46, 95% CI = [0.3, 0.8], p = .002) than those with mild–moderate impairment (OR = 0.82, 95% CI = [0.6, 1.1], p = .02). In the second study (Bussiere et al., 2015), only the “high” cognitive limitation group was significantly less likely to receive cervical cancer screening (OR = 0.57, 95% CI = [0.35, 0.93]) compared with those with no cognitive limitations.

Assessment of Reporting Quality and Risk of Bias

Assessment of risk of bias according to prespecified criteria (Supplementary Table 3) are illustrated in Table 2.

Of the nine studies, two studies were found to have significant methodological differences from the other studies; specifically, there were geographical differences (Taiwan or France vs. USA), systematic medical services disparities (screening provided above age 30), and methodical differences (inclusion of records from anyone above 30 years of age, [Huang et al., 2012], or ages 20-65 [Bussiere et al., 2015]). Screening rates were determined by medical chart or Medicare review for the majority of included studies.

Risk of selection bias was low among included studies although one study (Ostbye et al., 2003) was considered to be of uncertain risk as it did not explicitly state inclusion and exclusion criteria. One study (Huang et al., 2012) was considered to be at high risk of allocation bias because the population of interest was individuals with disabilities; that study differs from others included in that the comparator group was comprised specifically of women with physical or cognitive disabilities or mental health issues. With regard to assessment bias, two studies (Daly et al., 2010; Heflin et al., 2002) were considered to be of high potential risk because screening rates were based on self-report. Six studies (Daly et al., 2010; Heflin et al., 2002) were considered to be of uncertain risk of reporting bias, as they did not report whether they attempted to use stratification or matching to balance the groups. Three studies were considered to be at high risk of confounding bias; two (Daly et al., 2010; Heflin et al., 2002) because the available analyses did not fully account for potentially confounding variables (i.e., present ORs adjusted for important demographics), and the third (Blustein & Weiss, 1998) accounted only for age. No studies were considered to be at high risk of detection bias. Visual inspection of the funnel plot did not suggest risk of small study bias (Supplementary Figure 1).

Breast Cancer

Breast cancer screening by mammography was examined in six studies (Blustein & Weiss, 1998; Heflin et al., 2002; Ives et al., 1996; Mehta et al., 2010; Persky & Burack, 1997), one of which also reported results of clinical breast exam screening (Heflin et al., 2002). In that study, the adjusted OR of screening with a clinical breast exam in individuals with cognitive impairment compared with cognitively normal individuals was 0.83 (95% CI = [0.58, 1.19]). The results of the studies assessing mammogram rates were combined by meta-analysis. For the study that examined two severities of cognitive impairment (Mehta et al., 2010), the larger of the cognitively impaired groups (i.e., the mild to moderate group) was used.

Women with cognitive impairment were significantly less likely to be screened using mammography than cognitively normal women (pooled OR = 0.81, 95% CI = [0.71, 0.91], p = .0007; Figure 2). Visual inspection of a funnel plot did not suggest risk of small study bias (Supplementary Figure 2). Low heterogeneity was found ($Tau^2 < 0.01$, Q = 5.92, df = 5, p = .31; I^2 = 16%); therefore, potential sources of heterogeneity were not investigated. In a sensitivity analysis including only studies that reported adjusted ORs, the results were consistent with the original estimate (pooled OR = 0.84, 95% CI = [0.73, 0.97], p = .02) and heterogeneity remained low ($Tau^2 <$ .001, Q = 4.37, df = 4, p = .36; I^2 = 8%).

Cervical Cancer

Five studies estimated rates of screening for cervical cancer by Pap smear procedures in patients with cognitive impairment versus a control group (Bussiere et al., 2015; Heflin et al., 2002; Huang et al., 2012; Ives et al., 1996; Ostbye et al., 2003). Women with cognitive impairment did not have a significantly lower likelihood of screening than those who were cognitively normal (pooled OR = 0.88, 95% CI = [0.71, 1.08], p = .22; Supplementary Figure 3). However, there was significant heterogeneity (Tau^2 = 0.03, Q = 11.80, df = 4, p = .02; I^2 = 66%), which was further investigated.

Table 2. Assessment of Risk of Bias.

Study	Selection bias		Allocation bias	Assessment bias		Reporting bias	Confounding bias	Detection bias
	Do the inclusion/exclusion criteria vary across the comparison groups?	Does the strategy for recruiting patients differ across groups?	Is the selection of comparison group appropriate, considering feasibility and ethics?	Was the outcome assessor blinded to intervention or exposure status of participants?	Were the measures used valid, reliable, and consistently implemented?	Was there any attempt to balance the allocation between the groups?	Were all important confounding variables accounted for?	Were statistical methods used the primary outcome appropriate?
Blustein and Weiss (1998)	+	+	+	+	–	+	?	+
Bussiere, Le Vaillant, and Pelletier-Fleury (2015)	+	+	+	+	?	+	+	+
Daly, Levy, Joshi, Xu, and Jogerst (2010)	+	+	+	–	+	?	–	+
Heflin, Oddone, Pieper, Burchett, and Cohen (2002)	+	+	+	–	+	?	+	+
Huang, Tsai, and Kung (2012)	+	+	–	+	+	?	+	+
Ives, Lave, Traven, Schulz, and Kuller (1996)	+	+	+	?	+	?	+	+
Mehta, Fung, Kistler, Chang, and Walter (2010)	+	+	+	?	?	+	+	+
Ostbye, Greenberg, Taylor, and Lee (2003)	?	+	+	?	?	?	+	+
Persky and Burack (1997)	+	+	–	+	+	?	–	+

Note. + = low risk of bias; ? = uncertain risk of bias; – = likely risk of bias.

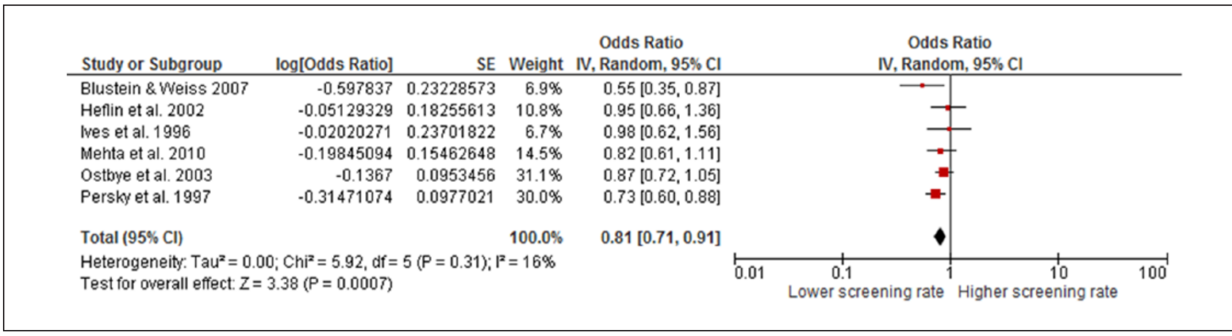

Figure 2. Mammogram screening rates in patients with cognitive impairment compared with cognitively normal individuals in a meta-analysis of cohort and cross-sectional studies.
Note. CI = confidence interval.

Two studies examined potentially different populations (Bussiere et al., 2015; Huang et al., 2012). Huang et al. (2012) examined rates of Pap smear testing in women in Taiwan, a country whose National Health Insurance program provides one Pap smear annually for all women above the age of 30 years, and Bussiere et al. (2015) report data from adults in France. The age range differed in these studies, in that younger women were included (aged ⩾30 years, or 20-65, compared with at least aged 50 in other studies). The populations of interest in those studies were adults with disabilities; therefore, although women with dementia may have been compared with women who did not have dementia, many had other disabilities that may have affected screening. A sensitivity analysis was conducted to determine whether these studies were significant contributors to heterogeneity, and once they were excluded, there was no longer significant heterogeneity in the meta-analysis ($Tau^2 = 0.01$; Q = 2.66, $df = 2$, $p = .26$; $I^2 = 25\%$). The results remained nonsignificant, though numerically lower, in those with cognitive impairment (pooled OR = 0.86, 95% CI = [0.69, 1.08], $p = .19$).

Colorectal Cancer

Two studies compared screening for colorectal cancer between older adults with cognitive impairment and those without. One study reported utilization of fecal occult blood tests (FOBT; Heflin et al., 2002) and the other reported utilization of colonoscopy (Daly et al., 2010). Individuals with cognitive impairment were not significantly less likely to receive colorectal cancer screening than those who were cognitive normal (pooled OR = 0.87, 95% CI = [0.55, 1.38], $p = .55$; Supplementary Figure 4). Heterogeneity was detected between these two studies ($Tau^2 = 0.08$; Q = 3.11, $df = 1$, $p = .08$; $I^2 = 68\%$).

Discussion

This systematic review found that older adults with cognitive impairment or dementia have been historically less likely to be screened for breast cancer than cognitively normal adults, although data reflecting current practice are lacking. In studies with data collected between 1986 and 2008, women with cognitive impairment were approximately 20% less likely to be screened with a mammogram than those with no impairment. Although these rates may be appropriately lower, they may also reflect a gap in the provision of guideline recommended screening procedures. Fewer studies reported rates of screening by clinical breast exam, possibly because their use is not currently recommended by the American Cancer Society due to lack of evidence of benefit and a high risk of false positives (Oeffinger et al., 2015). ORs for cervical and colorectal cancer screening were not significant, although there were a small number of studies and a high impact of heterogeneity within these comparisons.

There remains considerable debate concerning the most appropriate age ranges and frequencies of breast cancer screening; however, breast cancer incidence continues to rise until ages 75 to 79 (Howlader et al., 2016). Some current guidelines for mammograms from the American Cancer Society (Oeffinger et al., 2015) recommend women begin annual mammograms at the age of 45, and biennial mammograms starting at age 55, only discontinuing when life expectancy drops below 10 years. Other guidelines have suggested that there is limited benefit in screening if life expectancy is less than 5 years (Walter & Covinsky, 2001). It is likely that many of the cognitively impaired participants in these studies may be included in this category, as patients with dementia often have a reduced life expectancy (Xie, Brayne, & Matthews, 2008); however, given highly variable ages of onset of cognitive impairment, and difficulty in predicting life expectancy in many of these individuals, patients, caregivers, and health care providers may need more specific guidance. The recently updated U.S. Preventive Services Task Force guidelines acknowledge insufficient evidence to assess the harm–benefit balance of breast cancer screening in women above 75 years of age (Siu, 2016), which would apply to many with dementia. More evidence might be needed to establish actual harms versus benefits, with attention to individual patient factors such as dementia.

While life expectancy may explain differences between those with dementia and healthy elderly, most ORs in the included studies were adjusted for age, and this should not account for the discrepancy seen in earlier stages of cognitive decline, such as mild cognitive impairment. Ostbye et al. (2003) found a significant association between cognitive impairment and lower likelihood of mammogram utilization controlling for subjective life expectancy, although subjective estimates may have been unreliable, particularly in patients with cognitive impairment. In a large study, Raji, Kuo, Freeman, and Goodwin (2008) found that 33.3% of people previously diagnosed with dementia died within 6 months of a cancer diagnosis as compared with 8.5% without dementia. In that study, 16.4% of the excess mortality due to breast cancer in people with dementia could be attributed to stage at diagnosis, as could 13.6% the excess mortality due to colon cancer. Although the majority of excess mortality in dementia patients after cancer diagnosis was due to noncancer causes, those results suggest that differential screening rates might translate into increased mortality. Moreover, Raji et al. (2008) found that the effect of dementia on stage at diagnosis was highest for breast cancer, highlighting the importance of the significantly lower rates of mammography found in the present analysis.

Current guidelines do not take into account dementia or cognitive impairment specifically, although the discussion of risks and benefits, and ethical considerations around providing versus forgoing screening may be different in this population (Raik et al., 2004). Ethical concerns might include increased risks and potential harms of providing mammograms to someone who may not understand why it is happening (Walter & Covinsky, 2001), or on someone who does not receive the same sense of relief that a cognitively normal person may receive when presented with a negative result (Ransohoff & Harris, 1997). In cases where capacity is diminished or in question, the decision to undertake cancer screening may lie with a caregiver or physician, who must balance potential benefits with patient burden, in the absence of specific guideline recommendations (Smyth, 2009; Torke et al., 2013). The present analysis shows that screening has been less likely to occur in those with dementia or cognitive impairment, suggesting a possible need to offer more specific guidelines to assist with ethical considerations faced by decision makers.

Despite varied populations and methods of defining cognitive impairment, low heterogeneity was found between mammography studies, justifying their aggregation by meta-analysis. Studies where cognitive impairment was screened as opposed to diagnosed were included in this meta-analysis to allow for a more representative sample of community cases. Although this introduces diagnostic uncertainty (e.g., dementia type and stage), cognitive impairment was assessed on a continuum in only one study and it was rarely diagnosed according to established criteria in the extant literature.

Previous studies have suggested additional barriers to screening that may underlie the present findings. In some cases, people with dementia or cognitive impairment may have required more complex management, and therefore screening may have been overlooked in some cases, though most studies controlled for comorbidities or health status. In such cases, raising awareness among physicians may help to reinforce guideline adherence and to improve screening rates. In other cases, attitudes of caregivers, physicians, and patients may have played a role. A focus group study found that caregivers generally preferred to stop screening, citing concerns about burden of screening and wanting to focus on quality of life, rather than quantity (Torke et al., 2013). Another study found that caregivers saw screening as "relatively unimportant" compared with other health issues, finding that likelihood of screening also decreased with increasing severity of cognitive impairment (Smyth, 2009). Physicians' recommendations may also play a role; one study examined at physicians' attitudes toward breast cancer screening in older women, finding that physicians were less likely to recommend screening for older patients (Levin et al., 2008). On the contrary, some studies identified a patient preference in favor of continued screening; in one study, face-to-face interviews with patients in long-term care facilities found that 66% believed that patients with Alzheimer's disease should continue to be screened for cancer (Lewis et al., 2006). In another study, older patients saw continuation of screening as automatic, whereas cessation of screening was considered to be a big decision (Torke et al., 2013). A review of the ethics of providing cognitively impaired elderly women with mammograms noted that any clinical decision needs to balance the benefits of screening with factors such as the burden of testing and treatment, and life expectancy (Raik et al., 2004), although life expectancy may be difficult to forecast in many cases. From a health economics perspective, Messecar conducted a decision analysis of mammography using Quality of Adjusted Life Years (QALYs) in women with and without cognitive impairment and found that screening increased QALYs for everyone, regardless of cognitive status; however, those with cognitive impairment had a consistently lower increase in QALYs (Messecar, 2000). Balancing these considerations on an individual basis continues to pose difficulties to geriatricians and other medical professionals.

This meta-analysis was limited by a small number of studies that could be included, with few studies reporting colorectal and cervical screening outcomes. An inconsistent definition of cognitive impairment or dementia between studies might have been expected to contribute to inconsistencies in the outcomes; however, inconsistency was not detected among the mammography studies nor was there an appreciable impact of study heterogeneity in the meta-analyses. Few studies were specifically designed to examine the relationship between cognitive impairment and cancer screening, therefore, relevant covariates, such as severity of cognitive impairment or caregiver burden, were not taken into account. As a broader limitation, these data have been relatively infrequently reported in the literature.

In conclusion, women with cognitive impairment have been less likely to receive mammograms for breast cancer screening. These rates may be appropriately lower, yet in some cases, inconsistent with practice guidelines. Specific recommendations may be needed to inform screening decisions in this vulnerable, growing, and heterogeneous population, since highly variable life expectancies might make the recommendations of certain guidelines ambiguous. This systematic review identifies a significant gap in knowledge with respect to provision of cancer screening under current guidelines, and an absence of historical reports stratified by important subgroups (e.g., those with diminished life expectancy), between which guideline recommendations may vary.

Authors' Note

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Declaration of Conflicting Interests

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Supplemental Material

Supplemental material for this article is available online.

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