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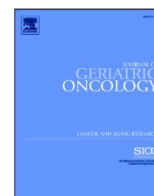
Review Article

A scoping review of ageism towards older adults in cancer care

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ABSTRACT

Introduction: Ageism towards older adults with cancer may impact treatment decisions, healthcare interactions, and shape health/psychosocial outcomes. The purpose of this review is twofold: (1) To synthesize the literature on ageism towards older adults with cancer in oncology and (2) To identify interventions that address ageism in the healthcare context applicable to oncology.
Materials and methods: We conducted a scoping review following Arksey and O'Malley and Levac methods and Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. We conducted an exhaustive multi-database search, screening 30,926 titles/abstracts. Following data abstraction, we conducted tabular, narrative, and textual synthesis.
Results: We extracted data on 133 papers. Most (*n* = 44) were expert opinions, reviews, and letters to editors highlighting the negative impacts of ageism, expressing the need for approaches addressing heterogeneity of older adults, and calling for increased clinical trial inclusion for older adults. Qualitative studies (*n* = 3) described healthcare professionals' perceived influence of age on treatment recommendations, whereas quantitative studies (*n* = 32) were inconclusive as to whether age-related bias impacted treatment recommendations/outcomes or survival. Intervention studies (*n* = 54) targeted ageism in pre/post-licensure healthcare professionals and reported participants' improvement in knowledge and/or attitudes towards older adults. No interventions were found that had been implemented in oncology.
Discussion: Concerns relating to ageism in cancer care are consistently described in the literature. Interventions exist to address ageism; however, none have been developed or tested in oncology settings. Addressing ageism in

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oncology will require integration of geriatric knowledge/interventions to address conscious and unconscious ageist attitudes impacting care and outcomes. Interventions hold promise if tailored for cancer care settings. 249/250.

Ageism, as defined by the World Health Organization (WHO), refers to situations in which people are treated with discrimination, prejudice, and stereotypes because of their age [1]. In the late 1960s ageism was first described by Butler as prejudice towards one age group by another age group, later comparing sexism and racism as parallel forms of prejudice. Ageism towards older adults (typically defined as those over age 65) is prevalent, often socially accepted, and unchallenged in predominantly youth-centric societies [2]. The WHO specifies that ageism towards older adults may include how we think, feel, and act towards people based on their age, but it is also acknowledged to be an 'invisible phenomenon' [3]. Ageism may manifest through rationing care, patronizing **behaviors**, and in how older adults may self-limit behaviour in response to internalized devaluing due to ageism [2]. Furthermore, older adults are often assumed to be frail and lack agency, which may in part lead to systemic discriminatory policies, and, in turn, impact healthy aging.

Previous research demonstrates that there are negative effects of ageism on health [4], whether it occurs structurally via policies implemented throughout societies or at the individual level [5,6]. In a recent systematic review of the global impact of ageism on older adults' health, researchers found that ageism led to worse health outcomes across studies in 45 countries related to eleven health domains [7]. The effects of ageism are intersectional in nature, with more negative age-related health outcomes noted in underdeveloped countries and **among** older adults who were less educated. The COVID-19 pandemic exposed open conversations about the disparities in care faced by older adults worldwide, as they have experienced the harshest effects of COVID-19 related to the infection itself, secondary mental health implications of isolation, and the perceived devaluing due to rationing care [8,9].

In the context of cancer care, ageism is important as it can impact how and whether older adults receive appropriate cancer care [10]. Cancer is prevalent **among** older adults because age is a strong predictor for the development of cancer [11]. Prior research demonstrates systematic and deliberate exclusion of older adults from clinical trials [12], thereby exposing them to either over- or undertreatment related to the lack of data on their responsiveness to treatment and risk of toxicities, which, in turn, can lead to poor cancer outcomes and reduced survival [13–15]. Ageism has also been shown to be linked to higher depression scores and lower quality of life in older adults with cancer [16].

1. Purpose

The primary purpose of this scoping review is to synthesize the published literature on ageism in cancer care. The secondary purpose is to identify interventions to address ageism in the healthcare context that may inform strategies to address ageism in cancer care. Identifying knowledge gaps and synthesizing research in this area will provide clinicians and researchers with insight into the implications of ageism on the older adult population with cancer and indicate areas where future research and interventions are warranted.

2. Design and method

We followed the Arksey and O'Malley [17] approach to scoping reviews and subsequent extensions by Levac and colleagues [18]; the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (*PRISMA*) scoping review guidelines (PRISMA-ScR) [10]; as well as the PRIMSA-S guidelines for reporting literature searches [19]. This is an appropriately rigorous methodological approach to map the core concepts related to the scope and breadth of the literature on ageism

towards older adults in cancer care. This methodology is especially suitable as *the purpose is not to draw conclusions, but to scope the nature of the literature and provide directions for future work.*

Following development of our a priori protocol, we worked with a health sciences librarian (KBR), and designed a comprehensive search of relevant databases to identify literature referring to ageism or age-related bias, in the population of older adults, and situated in the context of cancer care. We conducted a secondary search for interventions related to ageism, again related to the population of older adults, regardless of healthcare context. We searched the following databases from their inception to August 7, 2020: Ovid MEDLINE(R) (including In-Process & Other Non-Indexed Citations from 1946 to August 7, 2020); Ovid Embase and Embase Classic (1947 to August 7, 2020); APA PsycInfo on Ovid (1806 to August Week 1 2020); Ageline on EBSCO (1978 to August 7, with select coverage from 1966 **to** 1977); CINAHL on EBSCO (1937 to August 07, 2020); Cochrane Central Registry of Controlled Trials (1996 to August 07, 2020) and Cochrane Database of Systematic Reviews (1995 to August 07, 2020) in the Cochrane Library; and ISI Web of Science (1900 to August 07, 2020). We also used secondary search strategies to identify additional relevant studies by scanning the reference lists of relevant papers identified at the full text screening stage. Using the PRESS guidelines checklist [20], the MEDLINE search strategy was reviewed by a second health sciences librarian not affiliated with this study. The MEDLINE search is attached in Supplement 1.

Results were stored and managed using Endnote X9 reference management software and deduplicated using the Bramer method, a procedure validated for systematic reviews in Endnote [21]. Once deduplicated, the results were transferred to Covidence where they underwent title and abstract and full text screening.

2.1. Inclusion criteria

We included peer-reviewed articles published in English, Spanish, French, Italian, German, or Dutch reporting on ageism or bias towards adults aged ≥65 in the oncology context. The definition of ageism we used as inclusion criteria was consistent with the WHO definition, which includes references to age-based discrimination, prejudice, or stereotypes [22]. We also included studies investigating solutions/interventions targeting healthcare professionals, or that were healthcare-specific, to address ageism.

2.2. Exclusion criteria

We excluded interventions outside of the healthcare realm, such as community, church, or adolescent education.

We moved literature and systematic reviews from the screening phase into forward citation searching and checked all references for potential articles. This process of hand-searching yielded an additional fifteen articles included in the full-text review.

Data extraction instruments were developed for the purpose of the study dependent on article type. Data on each article was extracted by two reviewers into excel spreadsheets dependent on the article type. All extraction was reviewed by, and disagreements resolved by, the first two authors. Authors of papers were contacted to request additional data, where required.

3. Analysis

We analyzed data based on study or article type, using tabular and

Fig. 1. PRISMA diagram.

Identification of studies via other methods

Records identified from:
Websites (n =0)
Organisations (n =0)
Citation searching (n =25)
etc.

Reports sought for retrieval
(n =15)

Reports assessed for eligibility
(n =15)

Identification of studies via databases and registers

Records identified from*:
Databases (n = 30,926)
Registers (n =0)

Records removed *before screening*:
Duplicate records removed
(n =1466)
Records marked as ineligible
by automation tools (n =0)
Records removed for other
reasons (n =0)

Records screened
(n =29,458)

Records excluded**
(n =29,133)

Reports sought for retrieval
(n =325)

Reports not retrieved
(n =6)

Reports assessed for eligibility
(n =319)

Reports excluded:
81 Concerned neither ageism in oncology,
   or interventions towards ageism
59 abstract only
14 Non-peer reviewed
7 duplicate
8 Wrong setting
4 Wrong patient population
3 Wrong study design
3 language
2 Wrong intervention
2 Wrong outcomes
2 editorial
1 Wrong comparator

Studies included in review
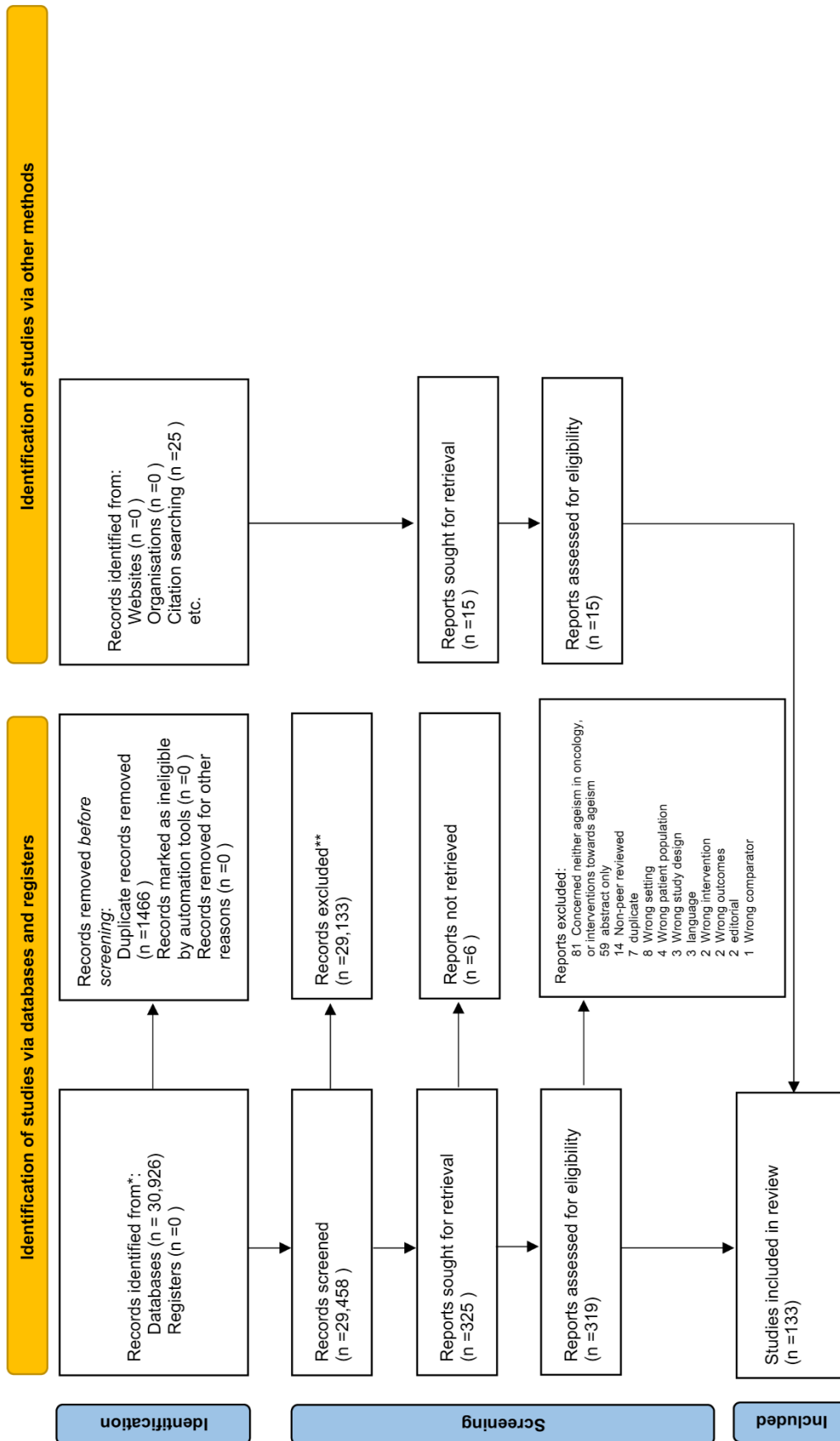(n =133)

Identification

Screening

Included

Table 1
Opinions, Editorials, and Reviews.

First Author/ yr	Article type	Country	Purpose/Aim	Profession of focus	Key points of articles	Recommendations
Adelman 2019 [23]	NO	USA	Summarizes literature on communication between OA and medical professionals in cancer care, and address (1) ageism; (2) screening; (3) treatment; (4) fourth, end of life (EoL) care	MED	OA prefer clinicians incorporate health status to individualize screening decisions; some OA don't consider life expectancy to be an important factor in screening. OA often agree with oncologists' treatment recommendations but want to be involved in the decision-making process.	OA are not a homogenous group need to have an individualized approach to care. Medical professionals must understand patients' goals and values and involve them in shared decision-making and preparation for EoL.
Ayres 2004 [24]	NO	USA	To provide an overview of cancer and aging with an emphasis on areas of assessment for healthcare professionals	MDT	Concerns that OA are at risk of receiving inadequate treatment (both too much and not enough). Lack of knowledge about OA and their experiences with cancer including cancer treatments, and the impact of comorbidity	Treating OA with cancer is complex and requires cooperation of multiple disciplines to look beyond chronological age CGA should be used to evaluate patients based on actual physiological function and capacity rather than age alone.
Balducci 2014 [25]	NO	USA	To establish which factors hinder the participation of older individuals in clinical trials and examine possible solutions.	MED	Benefit of systemic cancer treatment may decrease with age, and risks may increase due to reduced life expectancy and reduced tolerance of stress in OA	A multipronged approach is recommended for clinical studies in OA, including phase 2 studies limited to persons >70 years, stratification by life expectancy and predicted treatment tolerance in phase 3 studies, and registration studies to establish predictive variables for treatment-related toxicity in older individuals.
Barta 2017 [26]	NO	USA	To provide an overview of lung cancer in OA	MED	OA make up >2/3 of new cases of NSCLC each year. This cohort is at particularly high risk for both undertreatment and overtreatment. Chronologic age and performance scores alone are limited in their capacity to predict older patients' ability to tolerate standard of care cancer therapies	GA is an essential part of choosing an appropriate therapeutic strategy to optimize the balance of treatment harms and benefits
Berkam 1994 [27]	NO	USA	Discuss age-related myths among OA and clinicians and how these impact patient outcomes.	MDT	Health care professionals are susceptible to ageism/negative attitudes towards OA because lack of training in caring for OA. Ageist myths among clinicians and OA impede high quality care. They include: OA participate in less screening; Cancer-related pain is under-treated and poorly managed; Cancer-treatment tolerability among OA is poorly understood; Culturally bound myths impact quality treatment for OA	Rehabilitation is a means to address existing vulnerability Healthcare professionals need to be aware of the limitations of their training related to providing high quality care for OA Education and communication can reduce the number of myths and fears rt. age.
Bernardi 2006 [28]	LTE	Italy England	To discuss the evolution of treating cancer in OA	MED	Many things have changed in the last decades and a number of studies conducted in OA cancer patients has increased. New "OA friendly" drugs have been added, and we have better supportive treatments to reduce toxicity. Despite the perceived barriers to including OA cancer patients in clinical trials, there are few data to support excluding them.	Increasing use of a complete geriatric assessment can lead to a more individualized patient treatment plan. Implementation of prospective trials is strongly recommended to assess properly the quality of life of OA patients undergoing chemotherapy.
Bouchardy 2007 [29]	NO	Switzerland	To present data on treatment practices of older women with BC and GC and on the consequences of undertreatment on patient outcomes and reasons and validity of suboptimal care in OA	MED	Few studies evaluate consequences of nonstandard approaches on cancer-specific mortality, taking into account other prognostic factors and comorbidities. These studies clearly showed that undertreatment increased disease-specific mortality for breast and ovarian cancers. Objective reasons for undertreatment: higher prevalence of comorbidity, lowered life expectancy, absence of data on treatment efficacy in clinical trials, and increased adverse effects of	Undertreatment in older cancer patients is a well-documented phenomenon responsible for preventable cancer deaths. Treatments are still influenced by unclear standards and have to be adapted to the older patient's general health status, but should also offer the best chance of cure

Table 1 (*continued*)

First Author/ yr	Article type	Country	Purpose/Aim	Profession of focus	Key points of articles	Recommendations
					treatment. Subjective reasons were putative lowered benefits of treatment, less aggressive cancers, social marginalization, and physician's beliefs.	
Bourbineiere 2004 [30]	NO	USA	To reflect on expertise and evidence in other disciplines that might enhance understanding of nursing care for OA with cancer.	NSG	Authors highlight literature around cognitive decline, pain control, supportive care interventions, and cancer survivorship interventions. They note wide disparities in research design but that there are examples across nursing that might be transferable to OA with cancer.	The nurse–patient relationship is a touchstone of practice and focusing on the individual OA beyond chronological age and cancer diagnosis to understand that individual as having a previous life will improve assessment and mitigate ageism.
Boyle 1994 [32]	NO	USA	Narrative overview of nursing care of OA. Six realities to guide cancer care planning are described.	NSG	Cancer is a disease of aging but treatment and care decisions are often based o ageist attitudes. Non-cancer related factors effect planning and treatment outcome. Age often strengthens emotional endurance to cope with the cancer crisis. Formulating options for family support in OA w cancer requires deliberative assessment. Incidence and stage of cancer may be altered by OA participation in screening programs	Evaluate and correct misperceptions about old age. Treatment and decision-making should be based on biologic parameters rather than on chronology. Research is needed to better understand the experiences of OA and their families lived experience Integration or 'cross-training' between oncology and geriatrics is needed
Boyle 1992 [52]	PS	USA	To develop a position statement on cancer and aging.	NSG	Oncology nurses have a clear mandate and important position in addressing the needs of OA with cancer. The population in the USA is aging and nurses can play a key role in addressing the needs of older Americans when diagnosed with cancer.	The recommendations for nurses to: Recognize personal bias towards aging and OA that impact delivery of quality nursing care; Advocate prevention/detection activities for OA; Understand relationships between cancer and aging; Integrate CGA into practice; Assess OA support networks; Increase communication with colleagues related to OA across cancer continuum; Consider age-related factors to self-care activities; Maximize advocacy role and understand implications of policy.
Byers 2009 [33]	NO	USA	Addresses specific approaches to improving understanding of observational data on OA cancer prevention and screening.	MED	Guidelines for cancer screening are more based on age, than evidence i.e. RCTs demonstrating a benefit of mammography to reduce death from BC were largely confined to women aged 65 and younger but most BC diagnosed >65 years, whereas observational data shows equal benefit in women age 80–84.	In the clinic, despite age-related bias in screening trial enrollment, the patterns of stage-shift and life expectancy suggest that mammographic screening is effective well into the 80s, which is older than the ages at which screening is often stopped. Age-related bias is an ongoing challenge in counseling patients about accessing state-of-the-art cancer treatment
Davis 2010 [34]	RE	UK	Age discrimination in breast cancer treatment	NSG	Women >65 with BC face age discrimination which has impacting access to care and. Are less likely to receive standard treatments (i.e. chemotherapy, surgery, radiation). Surveys have shown that older women disproportionately receive less treatments compared to younger women, even though the risk of BC increases with age. Without guidelines on minimum standards of care, older patients are at risk of suboptimal treatment of early breast cancer	Evidence-based minimum standards for diagnosis, treatment and care of OA with BC should be incorporated in practice. More data from prospective research will allow clinicians to be confident to treating OA with appropriate curative therapy and make decisions based on clinical need rather than age, to give patients real and informed choices about their treatment care
Fuchshuber 2004 [35]	ED	USA	To explain and dissect the points of a study about cancer directed surgery in OA.	MED	Author discussed key points of a study by O'Connell highlighting potential challenges with the data including raising questions as to whether ethnic and racial differences are in part responsible for the observed differences in cancer surgery use in OA. Question whether lower surgery rates in OA relate to	Authors urge research to address increasing population of OA with cancer and costs of providing multimodality cancer treatment.

Table 1 (*continued*)

First Author/ yr	Article type	Country	Purpose/Aim	Profession of focus	Key points of articles	Recommendations
					evidence-based selection or discrimination based on age, ethnicity and tumor stage and whether any dataset will bear the answer to those of the question.	
Hamnet 2016 [36]	NO	UK	Provide overview of literature surrounding BC reconstruction in OA or reconstructive choices in women.	MED	Factors influencing reconstruction include effect of radiotherapy on reconstruction, effect of reconstruction on radiotherapy/ chemotherapy, local and systemic disease burden, and familial and genetic risk. Increased morbidity has been cited as a barrier to offering BC reconstruction. OA should be informed about option of reconstruction following mastectomy. In choosing mastectomy or breast-conserving surgery older women participated equally to younger women in the surgical decision-making process.	Outcomes following breast reconstruction equivalent in older women compared to younger counterparts. The importance of body image in this age group may also be underestimated
Jack 2019 [37]	NO	UK	Describe specific needs of older people in relation to communication.	MED	Three skills nurses can use to show they are listening attentively to what an older person is saying-Summarising, Paraphrasing and Clarifying. Communication with the older person can sometimes be difficult due to the effects of aging, including hearing and sight loss, but organisational, cultural and nurse-related barriers to communication can often be mitigated by changes to practice.	Ineffective communication can lead to older people feeling inadequate, disempowered and helpless. Central to effective communication is the ability of nurses to be self-aware, and monitor their thoughts and feelings about, for example, negative stereotypes associated with the aging process. Effective communication can sometimes be difficult to achieve due to the effects of aging, but nurses can overcome some barriers through thoughtful interventions.
Kagan 2017A [38]	ED	USA	A discussion of the language of aging and how best to talk about aging without being ageist.	NURS	Discusses how the use of language has stigmatizing impacts on OA.	The authors argue that nurses hold power and are in a position to change the discourse and language around aging in oncology.
Kagan 2017B [39]	ED	USA	To discuss impact of linguistics and language barriers when communicating with the OA within the nursing profession	NURS	Current language of aging tends not to reflect critical influences of education, mental and physical activity, and social engagement on living long and well, instead reinforcing outdated understandings and myths about what it is to grow old. Much language used today, despite being beneficent and protective, is nonetheless unintentionally ageist.	Recognising real language barrier in our aging societies smf eliminating pejorative words such as "elderly" from our vocabularies and choosing instead to speak truthfully of aging and being older.
Kagan 2008 [10]	NO	USA	To provide an overview of ageism, a review of its influence in cancer, and to outline implications for nursing and interdisciplinary practice	NURS	Age-based disparities emerge from negative ageism and enact treatment attenuation or rejection of curative treatment and are perceived as ageist by patients and family members. Research lacks sufficient breadth to make all forms of ageism and age-based disparities, beyond clinical trials enrollment, treatment attenuation, and substandard treatment, visible.	Attention in education to expose discrimination, correct misinformation, and re-form myth, especially as clinicians-in-training prepare to undertake care for an aging society. Research into aged-based disparities that disadvantage OA and lead to suboptimal outcomes must include evidence specific for care of OA as well as discrete analysis of ageism across the cancer trajectory.
Kanaski 2008 [40]	NO	USA	Presents two case studies to discuss role of nurses in ensuring good quality of life and shared decision making among OA with cancer.	NURS	Outlines evidence-based practice and interdisciplinary collaboration for achieving comprehensive patient- and family-centered care. The role of the critical care nurses in promoting quality of life in the care of the oncology geriatric patient in the acute care and critical care settings are emphasized as they relate to shared decision making.	Authors argues that critical care nurses play a critical role in ensuring quality of life among OA with cancer. Supporting shared decision making, which may include ending treatment.
Kazmierska 2013 [41]	NO	Poland	The analysis of barriers responsible for low recruitment of older patients	MED	Barriers to trial enrolment included: Comorbid illnesses; Polypharmacy and drug interactions; logistic issues:	Vital to including OA in ongoing trials preceded by a detailed and credible assessment of OA health

Table 1 (*continued*)

First Author/ yr	Article type	Country	Purpose/Aim	Profession of focus	Key points of articles	Recommendations
			in clinical trials and presentation of possible solutions		the necessary time and assistance required of another person; the necessity to undergo treatment in an academic centre far from their place of residence as well as discontinuation of the treatment by their "own", well known, primary oncologists; physicians' lack of knowledge about the availability of a suitable clinical trial, concern about excessive toxicity and comorbidities and logistics; and Treatment toxicity.	status. It is equally or maybe even more important to design trials dedicated exclusively to OA, taking into consideration functional, biological, and social factors.
Keraney 2000 [42]	NO	Scotland	Explores basic ethical assumptions regarding OA with cancer related to the ethical dilemmas of truth telling, consent and relationships, and power.	NURS	Highlights ethical issues in the care of OA with cancer related to delivery of cancer care, ethical dilemmas, disclosure of diagnosis, consent, and power.	To improve care for OA with cancer we first need to explore basic assumptions about aging and OA. Providing optimal care to OA should not be considered an ethical dilemma.
Klepin 2006 [43]	NO	USA	Discusses autologous transportation in the OA with multiple myeloma.	MED	Survival outcomes remain unacceptably low in OA with multiple myeloma despite an absence of differences in tumor biology although OA are more complex due to frailty, and multimorbidity. Recent data suggest that select older patients can be treated with high-dose chemotherapy effectively with similar toxicity and survival benefits compared to younger patients. Upper age limits for autologous transplantation are being challenged along with the definition of 'OA' but treatment standards can only be established by prospective randomized trials.	In designing new trials for autologous stem cell transplantation there is an opportunity to address ageism towards OA and the following issues need to be addressed, (1) develop and validate patient selection algorithms incorporating measures of comorbidity, cognitive function, physiologic reserve and psychosocial function (2) Consider prehabilitation and conditioning regimens to maximize benefit to risk ratio, (3) consider disability and quality of life measures in trials.
Kowdley 2012 [44]	NO	USA	Discuss salient points specific to the surgical care of the OA patient, including functional versus chronological age, ageism in decision making, and outcomes following cancer surgery.	MED	Assessment tools such as those included in PACE provide an appropriate and useful means to avoid ageism by basing recommendations on physiologic rather than chronologic age. An ideal screening test is safe, inexpensive, able to detect the cancer at an early stage, and able to do so accurately (with high sensitivity and specificity). Once the diagnosis of cancer has been made, treatment decisions have been shown to correlate with chronologic age	CGA significantly influenced the final cancer-related treatment decisions in 82% of the OA cancer patients. Physiologic age is so much more appropriate than chronological age in the evaluation of the oncogeriatric patient.
Langer 2002 [45]	NO	USA	Discusses the immense bias against treating OA with lung cancer.	MED	60% of those diagnosed with non–small-cell lung cancer are 60 years of age or older, the OA are often undertreated and those >70 are under-represented in clinical research trials. OA care impacted by bias, therapeutic nihilism and constrained societal/financial resources. Clear-cut benefit for fit OA patients to receive combined modality therapy versus chemotherapy alone. In advanced NSCLC, fit OA patients receiving platinum-based regimens do as well, as patients younger than age 70. No OA-specific trials address role of taxanes or platinum-based combination therapy versus non-platinum monotherapy or doublets. Limited data for patients older than age 80	Does not make recommendations. Cisplatin and carboplatin in combination with etoposide is the most commonly used regimen in small-cell lung cancer. non–small-cell lung cancer- older studies show no definite benefit for aggressive combined modality therapy, more recent studies appear to buck this trend. Hence, age alone should not exclude patients from combined.
Lawler 2014 [46]	ED	UK	Discusses ageism in cancer care and proposes changes to improve care for OA.	MED	Note the increasing number of OA, and disparities in function across those at the same age. Proposes a fundamental change in policy	Proposes a "geriacentric" strategy maximising clinical trial activity in older patients, making treatments more available, developing new

Table 1 (*continued*)

First Author/ yr	Article type	Country	Purpose/Aim	Profession of focus	Key points of articles	Recommendations
					towards OA with cancer based on function.	approaches that are well tolerated in older people, and developing and applying geriatric decision -making tools.
Lu 2015 [47]	LTE	Taiwan	Responds to an article about treating OA with prostate cancer and highlights need for future research in this area.	MED	In response to an article regarding treating locally advanced prostate cancer, the author offers that the study is imperfect and notes that there is a paucity of clinical trial data including OA and while RT is the best treatment for locally advanced PC, the recommended does is inconvenient and costly.	Treatment decisions are not one size fits all. OA need an accurate understanding of the natural course of their disease, life expectancy, and expectation of treatment toxicity. Future, prospective studies of decision making are needed.
McDougall 2000 [48]	NO	UK	Describes controversies in prostate screening among OA.	NSG	Discusses approaches to screening and treatment of prostate cancer among OA. Emphasize that in the absence of evidence, treatment decisions are more informed by attitudes and preferences which may be biased against OA.	Authors argue that more research is needed and for practitioners to have more education about normal versus abnormal physiology in aging.
Miller 1999 [49]	NO	USA	Describes the increasing number of OA with cancer and the pervasive ageism towards OA.	NSG	Discusses ageism and cites ONS framework to treat OA appropriately. Identifies diagnosis and early detection, treatment variations, and exclusion from clinical trials.	Health promotion and early detection, treatment and rehabilitation, and education for health professionals are critical to enhancing care for OA w cancer.
Moulias 2009 [50]	LTE	FR	Describes the importance of incorporating medical ethics into decision-making for OA with cancer.	MED	Caring for OA is complex and requires clinicians consider objective differences related to comorbidities and functional variations but must also consider subjectivities related to quality of life. Despite these differences those who do participate in treatment do well. The culture that prioritizes youth over elderly may have negative implications for OA and impact cancer decision making.	Clinicians need to offer OA cancer care on a case-by-case basis when they have cancer rather than adopting an ageist culture that is prevalent in medical settings. Progress cannot be made without contributions of clinical/biological research on the diseases, in-depth reflection on the ethical dimension of the problem are also needed.
Muss 2001 [51]	ED	USA	Calls for steps to overcome the bias and barriers against offering potentially beneficial chemotherapy to OA	MED	Older patients who are in good health tolerate commonly used chemotherapy regimens as well as younger patients. Age remains a major barrier to treatment. Even after accounting for comorbidity, older patients receive less of the aggressive care that could lengthen survival Clinical trials remain the cornerstone of therapeutic advances in oncology. Historically, OA were excluded from many clinical trials. Although age restrictions have now been abandoned, the representation of older patients in clinical trials is still woefully inadequate.	Age alone should not be used to deny potentially beneficial treatment to any patient with cancer. Appropriate financial and social support for clinical trials in older patients must be provided. More research is needed on the effects of comorbidity on tolerance and outcomes of treatment. The National Cancer Institute and the National Institute on Aging have provided funding initiatives for much-needed research in this area.
Oncology Nursing Society 2004 [52]	PS	USA	Aims to develop a position statement to shape practice which acknowledges the unique needs of OA and the nature of cancer in OA and their implications for an aging society	NSG	OA with cancer are underserved and cancer is a disease of OA who are heterogenous and can not be defined by age alone. There is a paucity of evidence around the unique needs of OA with cancer. Care of OA with cancer must focus on more than disease-free survival and include comorbidity, function and quality of life.	Nurses in oncology should have an awareness of principles of geriatrics to provide optimal care and reduce bias. Age should be assessed physiologically not chronologically. Oncology settings should incorporate geriatric assessment to optimize treatment planning and patient outcomes Nurses should work to eradicate ageism in research, care, and public policy as it stands against core American values of autonomy and choice
Parent 2008 [53]	LTE	Belgium	Aims to query the appropriateness of an upper age limit in regular free screening for breast cancer.	MED	Substantial numbers of older women are not included in targeted mammography screening programmes and limits of the target age for such screening in the EU do not extend beyond 75 years in many Member States. Evidence suggests that the benefits of regular	Recognition of age as a factor contributing to health inequalities including access to breast cancer screening for all women, regardless of age; Raise awareness of the lack of breast cancer screening for older women; enhanced understanding by both the medical profession and the

Table 1 (*continued*)

First Author/yr	Article type	Country	Purpose/Aim	Profession of focus	Key points of articles	Recommendations
					mammography increase with age, whereas the likelihood of harms from screening (false positive results, unnecessary anxiety, biopsies, and cost) diminishes from ages 40–70 years. The balance between benefits and potential harms therefore grows more favorable as women age. Older women not receiving reminders for screening is discrimination.	general public that ageism manifests itself in the way that medical prognosis and care is delivered.
Penson 2004 [54]	EDU	USA	Calls for discussion in multidisciplinary rounds focused on age bias, drug toxicity, life prolongation, and symptom relief, with the role of the caregiver, and the relationship to the patient, being pivotal.	MDT	Despite frequent contact with the OA, clinicians are often influenced by ageist views and deep-seated biases. As a result, the OA are often undertreated, or treated differently, for many common diseases without consideration for their physiologic, rather than their chronologic, age. The OA are more likely than younger patients to be treated with substandard therapy for cancer, which is only partially explained by the higher prevalence of comorbidities in the OA population. Most of the literature suggests that OA cancer patients do favour symptom relief over life prolongation. Caregivers' and patient's active participation is mutually beneficial.	Clinicians must learn how to balance their personal and professional beliefs with the needs and preferences of their patients in order to provide their patients with optimum care. OA should not be denied adequate treatment simply on the basis of age alone.
Pritchard 2007 [55]	LTE	UK	*Re*-examination of the life expectancy of women in their 70s today and argue that comparable treatment should be offered.	MED	Most studies of breast cancer therapy worldwide have specifically excluded women >70 or even 65, in itself a form of ageism. Physicians tend to underestimate life expectancy in OA women. With the availability of effective conservative surgery including breast conserving surgery, and sentinel node dissection with nodal sampling, even OA require minimal hospitalisation if offered appropriate homecare support following their surgery.	To approach women in their 70s without seriously considering potential positive benefit of appropriate surgery including complete tumor resection and axillary sampling, and consideration of radiation therapy, as well as adequate systemic therapy, would seem ageist. What would be appropriate for the 50-year-old may be equally appropriate for the 70-year-old.
Raik 2004 [56]	NO	USA	To review the current age-related controversy about mammography	MED	Women aged 75 and older are much less likely to have mammograms. For frail and severely cognitively impaired women, there is a greater risk of harm and reduced benefit of a mammogram. Cancer screening decisions in frail older patients should be individualized, in which potential benefits and burdens are understood and an individual's values and preferences are considered.	Clinicians who care for these patients must be cognizant of subtle biases that may lead to ageism or the devaluing of individuals because of their diminished ability to reason and remember. With the exception of otherwise healthy women with mild dementia, mammography should not be recommended. In women with moderate dementia and few comorbid conditions, the burdens and benefits are balanced. Patient's preference should guide the decision as long as she or her surrogate is aware of the risks. Families of patients with severe dementia should be advised that screening mammography is more harmful than beneficial.
Ramesh 2005 [57]	NO	UK	To educate surgeons about epidemiology, physiologic changes, performance status and comorbidities in surgical oncology in the OA, and patterns of care and ways to improve them.	MED	Age frequently affects overall cancer treatment plan, including surgeon's view towards surgery, and multimodal treatment plan, including the utilization of neoadjuvant therapy. OA receive much less informational support than younger counterparts, yet OA patients seem more satisfied with communication by doctors concerning cancer and therapy than younger patients. A comprehensive geriatric assessment (CGA) has	The focus should be providing optimal preoperative and postoperative care to prevent these complications, rather than on declining cancer surgery on the basis of chronological age. More progress could be achieved in optimizing surgery for cancer in the OA when validated tools capable of predicting early postoperative outcomes are available. Clinical trials should be specifically developed for oncogeriatric series, and OA cancer

Table 1 (*continued*)

First Author/ yr	Article type	Country	Purpose/Aim	Profession of focus	Key points of articles	Recommendations
					proven to be useful in predicting mortality and morbidity in several clinical settings.	patients should be encouraged to enroll with the same vigour as directed towards their younger counterparts.
Repetto 2000 [58]	NO	Italy	To discuss measurement of comorbidity and propose a reliable prognostic evaluation system, to account for the diversity OA.	MED	CGA allows identification of frail patients at high risk for treatment-related complication. The frail OA appear to most likely benefit from CGA.	More participation of OA patients in clinical trials. There is a need for education to overcome a diffuse ageist prejudice that prevents adequate management of older cancer patients. Application of CGA in daily oncological practice to assessment of life expectancy, prediction of treatment tolerance, and definition of frailty.
Schroyen 2014 [59]	NO	Belgium	To report on ageism and note the value of drawing on interventions from other disciplines.	PSYC	Suggestions for countering ageism through interventions in other domains at the individual and professional level. The authors also suggest practical applications of intervention data in clinical practice including CGA to ascertain the level of aging rather than judging based on age and then potential for specialized training in geriatric oncology.	To counter ageist stigmas, we can apply interventions from social psychology, like "intergenerational contact, activation of positive stereotypes, self- affirmation". Interventions may improve opinions of aging among OA people, as well and health care professionals, and create positive impact on patient health
Shunway 2015 [60]	LTE	USA	Comment on study by Bekelman regarding treatment variations in OA with prostate cancer.	MED	Much of the public discourse relating to prostate cancer emphasizes overtreatment of low-risk prostate cancer in men who are least likely to die as a result of prostate cancer. Given weight of evidence favoring addition of RT to androgen-deprivation therapy (ADT) for high-risk disease, one must question why, in the population analyzed, 49% of men older than age 65 years with locally advanced or high-risk prostate cancer were treated with ADT monotherapy, a rate that increased to 61% in those aged 75 years or older.	In OA men who are sufficiently healthy to tolerate ADT, careful consideration should be given to also treating with RT, which is associated with substantial improvements in disease-specific and overall survival and can be delivered with minimal morbidity using modern treatment techniques.
Strohschein 2018 [61]	RE	Canada	Based on a 2015 workshop that supporting the development of a CANO Oncology and Aging Special Interest Group (SIG)	NSG	Clinical concerns related to the provision of oncology nursing for OA include: concerns in three domains: ageism; sub-optimal treatment outcomes; as well as ethical issues concerning treatment and care decisions.	To support our initial objectives and priorities, we have developed a website for SIG members within the CANO web platform, providing access to shared resources and a group feed, to which members can post comments or questions to all members.
Swaminathan 2015 [62]	NO	UK	Summarizes current concerns regarding OA management and treatments utilised for management of cancer in OA, and discuss impact of under-treatment.	MED	Fear associated with surgical outcomes in addition to a lack of guidelines leads to surgical options being inadequately considered, resulting in under-treatment of OA. Medical management of oncology in OA should not be dismissed purely on an impression of ability to tolerate side effects, as this can lead to under-treatment within this population. Evidence suggests than any benefits of radiotherapy appear to decrease as age increases. The factor of age alone cannot be just justified as the reason for treatment selection or dismissal.	The use of tools enabling geriatric and frailty assessment, such as the CGA, helps to surpass exclusion of treatment due to any age discrimination. Every patient should be educated about all available treatment options to allow them to make an informed decision to make this informed decision and consent. Assumptions should never be made regarding capacity based on age and it should be presumed that every patient has capacity until proven otherwise. OA should be fully informed about treatment and no information should be withheld or overlooked on the basis of their age. Such presumptions and perceived lack of capacity can lead to under-treatment.
Turner 1999 [63]	NO	UK	Review published reports on the investigation and treatment of cancer in OA .	MED	Routine breast cancer screening with no upper age limit may save lives. Breast examination is often not performed in OA women, although most would be willing to undergo this. Some OA patients may not accept recommended investigations/ interventions. Others are as likely to	Need answers on how best to manage common cancers in old age, especially BC, CRC, lung, and PC. This must include data on disability, handicap, health related quality of life, and psychological well-being as well as physical outcome measures.

Table 1 (*continued*)

First Author/ yr	Article type	Country	Purpose/Aim	Profession of focus	Key points of articles	Recommendations
					agree to chemotherapy as their younger counterparts, though there are differences in their assessment of risk-benefit ratios for more toxic regimens. Ageist attitudes persist among healthcare staff. There is reduced referral to specialists with increasing age, though the rationale behind this is not clear. Doctors are poor at judging the health- related quality of life of OA patients, and they frequently grade this lower than patients do themselves.	
Wildiers 2005 [64]	NO	Belgium	Aims to summarize current knowledge and provide guidelines for use of adjuvant chemotherapy in OA with BC.	MED	Most data are extracted from large multicenter trials with upper age limits of 65 or 70 years. Limited confidence of medical oncologists with cytotoxic chemotherapy administration to the OA and a lack of both prospective studies and shared guidelines for decision making in this subpopulation are the main factors. Increasing awareness among clinicians, who should learn to integrate absolute benefit, life expectancy, and tolerance of chemotherapy in their clinical decisions.	Discrimination on the basis of older age alone is no longer acceptable.
Wilson 2015 [65]	NO	UK	To discuss the needs of older people requiring care for substance misuse and how to meet their needs within clinical services.	MDT	The assessment of older people with substance misuse is complex, largely owing to the wide variety of presentations, many of which are either masked by other co-morbidities or else atypical in their presentation. An integrated approach is required to involve joint assessment from professionals with skills in assessing both older people and substance misuse, to offer a seamless approach to care to improve both health and social outcomes in older people.	Staff treating older people should be adequately trained so that they are comfortable screening patients and asking them about substance issues, as well as having knowledge about the relationship between signs and symptoms of disease and the range of substances people might take. Specific validated tools for older people should be help readily available from appropriate specialists for mental and physical health needs. Patients should be encouraged to engage with continuing treatment and follow-up is required.

MED: Medicine.
MDT: Multidisciplinary team.
NSG: Nursing.

narrative analysis for quantitative, qualitative, and intervention studies and textual and tabular synthesis for the opinion and editorial papers. Two authors (KH, SS) were responsible for the narrative analysis with support from the senior author (MP) and consensus was reached **among** all authors through an iterative process.

We present characteristics of the included studies and articles via tabular display and a narrative description aligned with the objective of this scoping review. First, the narrative description of the scope, nature, and extent of the literature related to ageism in cancer care of the included editorials, reviews, narrative overviews, qualitative, and quantitative studies is presented (Question 1). We also report narrative descriptions of interventions which have been used to address ageism against older adults in all healthcare contexts (Question 2).

4. Results

We screened 30,926 titles and abstracts, and of those 29,458 were excluded (see Fig. 1 PRISMA flow for detailed summaries), with a total of 319 included in full-text review plus an additional fifteen articles through handsearching, which yielded 133 studies included in the data abstraction phase.

The majority of articles were published in the United States (USA),

followed by the United Kingdom (UK), and Canada. Study designs and article types varied considerably given the breadth of our search; therefore, we grouped the findings into three sub-types: (1) opinions, editorial pieces, reviews or clinical guidelines ($n = 44$) [10,23–65]; (2) studies investigating ageism in oncology ($n = 35$) including both qualitative ($n = 3$) and quantitative designs ($n = 32$); and (3) ageism interventions pre-licensure ($n = 47$) [66–112]and post-licensure ($n = 5$) [113–117] (See Tables 1, 2, 3, 4, and 5 for article details). Narrative and tabular synthesis of our findings are presented below.

5. Opinions, editorials, and overviews

We included a total of 44 papers which substantively discussed ageism in oncology, predominantly in narrative overviews of the literature ($n = 28$) [24–26,28–30,34,35,38,39,41,43–48,50,52,53,55,58, 60–62,65,118,119], letters to the editor ($n = 6$) [31,49,56,59,64,120], position statements ($n = 2$) [30,54], reports of conference or other activities ($n = 2$) [36,121], editorials ($n = 5$) [10,37,40,42,51], and one educational paper ($n = 1$) [57]. Twenty-five of these articles were published by a lead author with an affiliation in the USA [10,24,26,28–30,34,35,37,40–45,48,52–54,57,60,64], and the remainder were in the UK ($n = 10$) [25,36,38,39,50,51,58,65,118,120],

Table 2
Overview of quantitative studies included.

Author (year)	Study Design	Location	Sample & Population	Data source	Sampling Approach	Cancer Site	Purpose	Analysis	Findings
Alibhai (2003) [123]	Retrospective	Canada	n = 379	Cancer registry	Stratified random sampling	Prostate	Evaluate the influence of age, comorbidity, tumor grade, and remaining life expectancy on treatment received for localized prostate carcinoma.	Logistic regression	Men older than 70 were less likely to receive radical prostatectomy, and potentially curative treatment OR 0.02 (95% CI 0.00–0.07).
Audisio (2004) [140]	Cross-sectional	UK	n = 350	Survey	NR	Breast	To report on perception of elderly breast cancer patient's needs in the UK.	Descriptive analysis	44% respondents stated age is not most relevant factor in identifying a patient as "elderly" or offering surgical management (98%) and dealing with the axilla (75%). Reported that decision-making process based on multiple factors to tailor the most appropriate treatment
Austin (2003) [124]	Retrospective	UK	n = 15,299	Cancer registry and administrative database	N/A	Colorectal cancer	Examined care of CRC pts. in Scottish hospitals to determine differences by age could be justified on clinical grounds	Logistic regression model	The percentage of patients receiving definitive (i.e., potentially curative) surgery (p < 0.001) or chemotherapy (p < 0.001) decreased with age.
Dharma-Wardene (2002) [133]	Retrospective	Canada	n = 1979	Cancer registry	Random sampling	Rectal	Study relationship between age at Dx and use of surgery plus multimodality therapy for patients with invasive rectal carcinoma in Alberta, Canada.	Descriptive analysis	Patients aged over 75 were less likely to receive multimodallity therapy than younger patients (p = 0.008). Conversely, they were more likely to receive surgery only or non-surgical treatment (p = 0.001).
Di Rosa (2018) [120]	Retrospective	Italy	n = 49	Administrative database	N/A	Breast	Determine if patient age is a factor influencing the type of surgical treatment of breast cancer in Italy.	Logistic regression	Older patients with lower clinical severity were more likely to have undergone a radical operation than younger women (p < 0.001)
Estrella (2005) [125]	Case control study	Spain	n = 76 with breast CA; 78 with colon CA	Medical record	Convenience sampling	Breast and CRC	Investigate whether chronological age influences treatment for breast or colorectal neoplasms.	Logistic regression model.	Colon cancer group, younger patients were more frequently treated with curative-adjuvant therapy (OR = 2.69, 95% CI 1.04 to 6.94), curative chemotherapy (OR = 5.3, CI 95% 3.0 to 9.5), or with palliative chemotherapy (OR = 7.8, 95% CI 1.6 to 37.7) than those aged >75 years old. Breast cancer group, younger women more frequently received curative chemotherapy (OR = 28.6, 95% CI 7.3 to 112.7) and curative radiotherapy (OR = 3.2, 95% CI 1.2 to 8.5) than patients aged >75 years old.
Giovanazzi-Bannon (1994) [121]	Retrospective	USA	n = 687	Cancer registry	N/A	All cancer	Investigate relationship between age and treatment-related factors in elderly cancer patients treated on ICC phase II clinical trials	Descriptive comparative analysis	As age increased, the number of patients who received no dose escalations also increased (p = 0.005).
Greenfield (1987) [132]	Retrospective	USA	n = 420	Medical record	Random sampling	Breast	To determine whether physicians took patient's physiological rather than chronological age into account in determining cancer management.	Descriptive statistics comparing age groups	Significant effect of age on physician treatment of patients with breast cancer. Even when older patients were vigorous, healthy, and presented with **localized** breast cancer, physicians were less likely to give them the benefit of optimal standard treatment. This effect started from 65 years of age (P < 0.001).

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Table 2 (*continued*)

Author (year)	Study Design	Location	Sample & Population	Data source	Sampling Approach	Cancer Site	Purpose	Analysis	Findings
Guadagnoli (1997) [119]	Retrospective	USA	$n = 746$	Medical record	NR	Breast	To assess whether use of adjuvant systemic therapy in postmenopausal women with early-stage breast cancer is influenced by patient age.	Regression analyses were performed separately for patients with positive and negative lymph nodes.	Increasing age (≥70) is a predictor of declining likelihood of receiving any systemic therapy (OR 0.37; 95% CI 0.19–0.69).
Hamaker (2014) [150]	Systematic Review	USA	$n = 39,376$	N/A	N/A	Hematological malignancies	Determine the characteristics of currently recruiting clinical trials with hematological patients to assess their inclusion and exclusion of elderly patients.	Chi-square test, or a trend test (linear-by-linear) when levels were ordered.	5% of trials focused exclusively on elderly or unfit patients, 69% of trials explicitly or implicitly excluded older patients. 27% Excluded based on age.
Johnson (2017) [131]	Retrospective	USA	$n = 17,636$	Administrative database	N/A	Prostate	To assess for an age-dependent bias, we examined patterns of care and compared overall survival (OS) between men treated with ADT or RT + ADT.	Univariate, multivariate, and subset OS analyses using chi-squared test, logistic regression,	Despite randomized evidence supporting use of RT + ADT, RT is often omitted in treatment for older men (1 in 5); and this approach is associated with a 2-fold risk of death.
Kaplan (2005) [137]	Cross-sectional	USA	$n = 97,373$	Administrative database	N/A	Breast	To examine whether declines in breast cancer in the oldest-old women correspond with declines in the use of cancer testing.	Descriptive analysis	The use of mammographic screening increases between the ages of 40 and 60. Beginning at age 75, there is a significant decline in the use of mammography that parallels decline in incident cases of CIS.
Kearney (2000) [145]	Cross-sectional	UK	$n = 197$	Survey	N/A	All	To determine attitudes of oncology healthcare to older adults, and if differences exist in attitudes towards elderly between physicians, nurses and radiographers.	Descriptive comparative analysis	oncology health professionals hold attitudes more negative than neutral towards elderly people (mean KOP score of 81 versus the neutral reference score of 102). No statistically significant difference was detected between gender, profession, clinical experience or specialist education.
Kendal (2018) [122]	Analysis of observational studies	Canada	$n = 279,064$	N/A	N/A	Prostate	Compare influence of time from diagnosis (TFD) and age at diagnosis plus TFD on survival estimates between radical prostatectomy, radiotherapy, and conservative mgt of locoregional prostatic cancer.	Kaplan-Meier analysis to contrast overall survival based on TFD (Time from diagnosis and attained	Prostatectomy cohort averaged 9–12 years younger than radiotherapy/conservative management cohorts ($P <$ 0.001). Hazard ratios for prostatectomy and radiotherapy relative to conservative management were 0.353 ($P < 0.001$), and 0.667 ($P < 0.001$), respectively, suggesting a major survival advantage with prostatectomy
MacCormick (1990) [134]	Clinical scenarios	Canada	$n = 58$	Primary data collection	NR	NR	Patient age and socio-economic status were examined as independent variables in treatment decision making	NR	Bias towards offering treatment options to younger patients was detected among medical students ($P < 0.001$).
Madan 2001a [130]	Cross-sectional	USA	$n = 116$	questionnaire	Convenience sampling	breast	This study investigated bias based on age (ageism) among physicians-in-training in their treatment recommendations for breast-conserving procedures	Chi-square tests	MD students recommended breast-conservation therapy (BCT) for sig higher % of younger patients than older patients and recommended modified radical mastectomy (MRM) to 34% of older patients versus 14% of younger patients. MD Students recommended breast reconstruction after MRM to a sig higher % of younger patients than older patients.
Madan 2001b [129]	Cross-sectional	USA	$N = 97$	questionnaire	convenience sampling	Breast	To investigate age-based bias among internal medicine and surgical residents in their treatment recommendations for breast-conserving procedures and breast reconstruction	Chi-square tests	Modified radical mastectomy (MRM) was recommended for 38% of older (age > 59) and 11% of younger (age < 31) patients. Breast reconstruction was recommended for 98% of younger patients versus 70% of older patients ($p = 0.01$).

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Table 2 (*continued*)

Author (year)	Study Design	Location	Sample & Population	Data source	Sampling Approach	Cancer Site	Purpose	Analysis	Findings
Matsumoto (2019) [126]	Retrospective	Japan	$n = 990$	Cancer registry and medical records	N/A	EC	To review and compare treatment modalities and outcomes of younger/older patients diagnosed with EC in one institution.	Chi-squared or Fisher's exact tests and Kaplan-Meier method	Older patients (≥70) were more likely to undergo radiotherapy alone ($n = 24$, 6.7%) or BSC ($n = 48$, 22%) compared with younger patients ($P < 0.01$). Older patients with locally advanced (stage II and III) EC were more likely to undergo chemoradiotherapy rather than esophagectomy. Older patients with locally advanced (stage II and III) EC were less likely to undergo surgery ($P < 0.01$). The disease-specific survival rate of the older patients (stage II and III) was significantly lower compared with that of the younger patients ($P < 0.015$), which was likely due to the less intense treatment modalities applied.
Nadella (2003) [127]	Retrospective	USA	$n = 480$	Administrative database and medical record	NR	Breast	To illuminate true relation between age and chemotherapy use by controlling for factors that obscure this relation	Chi-square and Wilcoxon rank sum tests for univariate analyses and logistic regression	Older women (age 50–65 and age > 65) with ER-positive breast carcinoma had a 6 (OR, 6.4; 95% CI, 3.1–13.3; $P < 0.001$) and 62 (OR 62.4; 95% CI, 21.8–178.7; $P < 0.001$) times greater odds of not receiving chemotherapy than those <50 years, after adjusting for stage, tumor size, progesterone receptor status, and lymph node involvement and estrogen receptor [ER] status. Odds of not receiving chemotherapy for women >65 years with ER-negative breast carcinoma were 7 times greater (OR, 6.7; 95% CI, 1.5–30.6; P 0.013) than the odds for women age < 50 years.
Oszvald (2012) [142]	Prospective	Germany	$n = 361$	Primary data collection	Consecutive	Brain	To analyze whether age influences outcome of patients with glioblastoma and whether elderly patients with glioblastoma can tolerate same aggressive treatment as younger patients.	Chi-square or Fisher exact test and Kaplan-Meier estimates, unpaired t-test multivariate analysis using Cox proportional hazards model.	Age was a negative prognostic factor in patients undergoing biopsy (4.0 ± 7.1 vs 7.9 ± 8.7 months; $p = 0.007$), but not in patients undergoing tumor resection. Overall survival of elderly patients was significantly lower than younger patients ($p < 0.001$). Pt age did not play a role in decision-making process.
Pasetto (2007) [141]	Cross-sectional	Italy	$n = 175$	Survey	Convenience	Colorectal	To evaluate differences of treatment and chemotherapy related-toxicity in elderly colorectal cancer (CRC) patients in different medical oncology units.	Descriptive statistics	Multidimensional Geriatric Assessment (MGA) was not routinely used. 54.3% of CRC underwent adjuvant chemotherapy and 45.7% received palliative chemotherapy. Only 5.5 and 9.7% of these patients reported very bad or bad tolerability, respectively. CRC treatment was adequate and not compromised by age discrimination in this study.

Table 2 (*continued*)

Author (year)	Study Design	Location	Sample & Population	Data source	Sampling Approach	Cancer Site	Purpose	Analysis	Findings
Peake (2003) [144]	Prospective	UK	$n = 1652$	Survey	Convenience sampling	Lung	A prospective audit of lung cancer care and outcome in UK hospitals	Chi-squared test Kaplan-Meier survival curves were constructed by age group for all cases	Significant inverse correlations between age and histological diagnosis, any active treatment and survival, even when corrected for case-mix factors and non-cancer causes of death. Overall mortality rates at 6 months ranged from 42% in patients under 65 to 58% in over 75 s.
Plavc (2019) [138]	Retrospective	Slovenia	$n = 1053$	Cancer registry and medical record	NR	Breast	To assess and explain variation in quality of care in breast cancer patients and estimate its impact on disease outcomes.	Multivariate logistic regression Kaplan–Meier method and Cox models.	Younger age (OR 0.98 [95% CI 0.97–0.99], $p = 0.003$) was associated with increased odds ratios for receiving quality care*. Not receiving quality care resulted in an increased risk of dying [hazard ratio (HR) 1.68; 95% confidence interval (CI) 1.06–2.66; $p = 0.026$] Comorbidity and age bias in delivering quality breast cancer care could be medically justifiable.
Protiere (2010) [148]	Cross-sectional	France	$n = 565$	Survey	Convenience	Breast	To determine if discriminatory practices exist (based on horizontal equity: same treatment for similar patients) among French medical oncologists and radiotherapists	Pearson's $\chi2$ tests, Student's t-test or the Mann–Whitney U test and Multivariate analysis	Significant differences in treatment choice depending only on patient's age were observed ($P < 0.001$). The respondents did not agree about the age at which patients are perceived as being elderly (range: 60–90 years, average 73.3 years) whereas the great majority of the physicians (85.6%) agreed that there is a need for therapeutic trials specifically designed for elderly populations
Provencio (2009) [143]	Cross-sectional	Spain	$n = 1653$	Database of 6 clinical trials	N/A	Lung	To discern whether clinical characteristics, toxicity, response rate, treatment and survival differ between NSCLC patient enrolees aged 70 and older with those in younger NSCLC patients	Kaplan-Meier Curves for survival; log-rank test for comparisons (<70y vs > or = 70y; Fisher's Exact for response rates	Treatment received: no significant difference between older / younger patients; Toxicity: older patients more likely to experience high grade G3/4 neutropenia (26% vs 20%), febrile neutropenia similar in both groups; Response and survival: no significant differences of response, disease free progression, OS or relative survival rates at 1 and 2 year
Pulte (2014) [176]	Retrospective	UK & USA	$n = 122,689$	Cancer registry	N/A	Hematological	To compare survival by age, in patients with HL, NHL and myeloma in the US and UK, as a preliminary investigation of the extent of which health system factors affect survival from **hematological malignancies**	General linear models to determine excess hazard ratios (EHR)	5-year relative survival lower for older patients diagnosed with HL, NHL and Myeloma in both countries. Greatest age-related inequality observed for pts. with HL, lower inequality for pats with NHL and myeloma based on EHR.

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Table 2 (*continued*)

Author (year)	Study Design	Location	Sample & Population	Data source	Sampling Approach	Cancer Site	Purpose	Analysis	Findings
Rocha Lima (2002) [151]	Retrospective assessment of 2 randomized trials	USA	$n = 515$	N/A	N/A	Lung	To assess performance of older patients with lung ca on NCI-approved cooperative group trials:	Kaplan-Meier curves for survival; log-rank for comparison across age cohorts; Chi-square test and Wilcoxon rank sum test	Neither trial had an upper age limit to accrual. However, no patients age > 80 years included despite their potential eligibility. No significant differences detected in response, continuation of treatment, and survival based on age cohort.
Schechterly (2000) [136]	Cross-sectional	USA	$n = 296$	Survey	Random sampling	n/a	To investigate knowledge about physical and behavioral aspects of aging and attitudes **towards** elderly among selected oncology registered nurses in the United States.	Descriptive and interferential statistics.	Oncology nurses' mean scores of Kogan's Old People Scales (KOP) fell into the higher ranges, indicating more positive and supportive attitudes **towards** older adults. (positive mean of 3.020 and a negative mean of 2.176). Attitudes of nurses **towards** the elderly affected by their knowledge of the physical and behavioral aspects of aging ($P < 0.05$).
Schroyen (2015) [146]	Cross-sectional	Belgium	$n = 76$	Simulation	NR	n/a	1) To assess caring attitudes of nurses according to the patient's age. 2) To analyze whether support for treatments is statistically linked to ageism among nurses.	NR	Support for immunotherapy ($P < 0.001$), breast reconstruction ($P < 0.001$), and chemotherapy (< 0.001) is lower for older patients than for younger patients. Additionally, older nurses produce more positive words ($P = 0.01$).
Schroyen (2016) [153]	Cross-sectional	Belgium	$n = 40$	Survey	Convenience sampling	n/a	1) To **analyze** if healthcare professionals present more characteristics of elderspeak (positive as much as negative ones) when they explain a treatment to older patients, in comparison to younger ones. 2). To observe if characteristics of elderspeak (positive or negative) are more frequent in professionals who have a negative view of aging.	ANOVA with repeated measures.	Nurses' vision of aging (FSA-R and fluency task). Word-per-minute rate in relation to patients' age was associated with participants' view of aging (FSA-R test) ($P < 0.05$). There was significant difference in mean length of utterance for older patients and younger patients ($P = 0.003$). (i.e. speak slower and with shorter utterances)
Schroyen (2017)	Cross-sectional	Belgium	$n = 101$	Survey	NR	Breast, lung, gyne, hematological	To investigate the hypothesis that more negative self-perception of aging (SPA) and view of cancer could be linked to worse physical and mental health outcomes in cancer patients.	Descriptive measures Linear mixed models	Evolution of global health: more negative SPA and/or view of cancer associated with worse health outcomes ($P < 0.001$). When adjusted for evolution of SPA and cancer view, were taken into account, these two stigmas are still associated with evolution of mental health ($P < 0.001$); whereas only a negative evolution of SPA was linked to worse physical health outcomes ($P < 0.001$).

Table 2 (*continued*)

Author (year)	Study Design	Location	Sample & Population	Data source	Sampling Approach	Cancer Site	Purpose	Analysis	Findings
Scott (2019) [147]	Cross-sectional	USA	n = 170	Survey	Convenience	n/a	To examine difference in ageism beliefs (antilocution, discrimination, avoidance factors) of nursing students experiencing community service-learning activities with healthy older adults vs only ill or disabled older adults.	Descriptive statistics; t-test for comparisons	Higher level of ageism in the discrimination factor of the FSA was detected among students who participated in the game (i.e. interacting with active older adults) than students who only interacted with ill / disabled older adults (P = 0.03). No significant differences between community service groups were found for total FSA, antilocution, or avoidance.
Step (2009) [149]	Cross-sectional	USA	n = 180 pts.; 36 MDs	Audio-recordings from interviews	NR	Breast	To assess the contributions of clinician task and relational communication behaviors to cancer patients' decision outcomes (satisfaction with decision, decision conflict, decision regret), with an eye **towards** identifying age-related differences in clinical talk.	t-tests logistic regression linear regression	Results showed that oncologists were significantly more fluent (P < 0.01) and more direct (P < 0.01) with older than middle-aged patients and trended **towards** expressing their own treatment preferences more with older patients. Decision conflict was significantly associated with more discussion of oncologist treatment preferences (P < 0.01) and prognosis (P = 0.02), Decision regret was significantly associated with patient age (P < 0.01) and education (P < 0.01).
Vellanovich (2002) [139]	Cross-sectional	USA	n = 500	Cancer registry	Random sample	Breast	To determine the extent and causes of undertreatment in elderly breast cancer pts	Chi-square test; Mann-Whitney U test:	Standard treatment (<65y vs >65y): not received (6% vs 22,2%). Treatment omitted (<65y vs >65y): no tumor extirpation (16,7% vs 11,4%), no axillary dissection (38,9% vs 39,1%), no radiation therapy (33,3% vs 47,7%) and no chemo (33,3% vs 18,2%). Causes (<65y vs >65y): prohibitive associated medical conditions (27,8% vs 40,9%), favorable tumor pathology (16,7% vs 13,6%), patient treatment refusal (55,6% vs 31,8%), unexplainable (NA vs 13,6%).

CRC = colorectal cancer.
Pts = patients.
NR = Not reported.
EC = Esophageal cancer.
NSCLC=Non-small cell lung cancer.
* defined as care fully compliant with quality indicators (QI) defined by European Society of Breast Cancer Specialists (EUSOMA)
CA = cancer.

Belgium (*n* = 3) [59,61,119], Italy (*n* = 2) [31,62], Canada (*n* = 1) [121], Switzerland (*n* = 1) [55], Poland (*n* = 1) [46], France (*n* = 1) [56], and Taiwan (*n* = 1) [49]. Most of these articles were written by a lead author identified as a medical doctor and for a medical audience (*n* = 26) [10,24,28,31,35,37–39,41,45,46,48,49,51,52,55,56,58–60,62, 64,65,118–120] or by a registered nurse for a nursing audience (*n* = 14) [29,30,36,40,42–44,47,50,53,54,121]. The remainder were written by a multidisciplinary team and made multidisciplinary recommendations (*n* = 4) [25,26,34,57].

Most opinions, editorials, and overviews we reviewed could be thematically grouped into four main themes: (1) heterogeneity of older adults and geriatric assessment, (2) lack of clinical trials participation, (3) bias in cancer screening, and (4) undertreatment. The heterogeneity of health and function **among** older adults and age-related bias against older adults was discussed in most papers (*n* = 15) [23,24,26,28,30–32,44,45,52,54,57,58,62,65]. These articles advocated for the routine use of Geriatric Assessment (GA) as a means of reducing physician bias. GA was also highlighted as a means of creating a data-rich environment for clinicians and older adults to make informed decisions about the risk of potential cancer-treatment toxicities and potential interventions that may support older adults' capacity to tolerate treatment. Many authors also noted that age alone is not a reliable or appropriate indicator to guide treatment decisions, and, without GA, treatment offerings may be biased.

Seven papers [10,29,31,41,46,48,51]emphasized the importance of older adults' inclusion in clinical trials. Several suggestions for expanding clinical trial inclusion to address ageism included: Balducci et al. 2014 [25] noting the value of a '*multipronged approach*' which included (among other things) stratification by life expectancy and predicted treatment tolerance, greater and more detailed assessment as suggested by Kazmierska [41], Lawlor's [46] suggestion of adopting a '*Geriacentric*' approach to increase clinical trials enrolment, and, finally, Muss [51] advocating for more social and financial support for older adults' participation. However, Kagan [39] notes that even expanding inclusion into clinical trials may not wholly address the pervasiveness of ageism in cancer care.

The remainder of papers addressed the themes of bias in cancer screening recommendations and undertreatment. Bouchardy and colleagues [29] note that undertreatment is well documented and the result of ageism is treatment offerings based on unclear standards that should instead be adapted to individual health status. Pritchard et al. [55] also argue that age-based limits for treatment may be anachronistic given the fitness of 70-year-olds in present day, and also notes a gendered element, with physicians tending to underestimate life expectancy in women.

One position statement and one position paper outline the role of ageism in the care of older adults with cancer; both were written by and targeted for a nursing audience [32,52]. The position paper on cancer and aging [32] from the Oncology Nursing Society in the USA advocates for nurses to first recognize their 'personal bias' towards aging and older adults before recommending engagement in advocacy, and integration of GA into practice among other positions. The 2004 position statement of the same organization [52] puts forth a position statement to shape practice which first introduces the distinct needs of older adults and the implications of an aging society. They argue that ageism in research, education, public policy, and practice "stands against core American values of autonomy and choice" [52].

6. Ageism in oncology: primary data

6.1. Quantitative studies

Thirty-two quantitative studies identified were published between 1987 and 2019 and sample sizes ranged from *n* = 49 [120] to *n* = 279,064 [122]. Nearly half were cross-sectional studies (*n* = 16). Of the 32 studies, 23 investigated treatment recommendation and/or treatment provision, of which nineteen studies reported patients less likely to

receive surgery or potentially curative treatment [122–126], less likely to receive chemotherapy [124,125,127,128], less likely to be offered breast conservation surgery and breast reconstruction [129,130], not given radiation therapy despite strong randomized evidence [131], received less rigorous treatment than younger patients of the same level of fitness [132], less likely to receive multimodality therapy than younger patients, and more likely to receive surgery only or non-surgical treatment [133]. They also reported oncologists' biases towards offering treatment options to younger and more socially active patients [134] and nurses showing less support for immunotherapy, breast reconstruction, and chemotherapy for older patients than for younger patients [135]. One study involving 247 oncology nurses across 39 states found that nurses have more positive attitudes than negative attitudes **towards** older adults [136]. Three (*n* = 3) studies investigated the causes of undertreatment for breast cancer, the impact of reduced mammogram cancer screening, and health outcomes specifically for older women [137–139].

Four studies found no evidence of differences by age. Audisio et al. [140] and Pasetto et al. [141] report that age discrimination was not evidenced in their respective studies (located in UK and Italy, respectively), despite the fact that GA was not commonly performed to guide treatment decision making [140]. Alternatively, Audisio reported that most breast surgeons were inclined to consult geriatricians regarding their older patients on a regular (32%) or occasional (42%) basis [140]. Additionally, Oszvald et al. [142] found that age did not play a role in the decision process for biopsy or tumor resection. Provencio et al. [143] reported no significant difference in treatment received between older and younger patients with glioblastoma.

Of note, in a retrospective cohort study by Peake et al. [144] on adults with lung cancer, increasing age was associated with decrease in histological diagnosis, receiving active treatment, and survival – even after adjusting for case-mix factors and non-cancer causes of death. Other forms of ageism reported included oncology healthcare professionals' negative attitudes **towards** older patients [135,145–148] and nurses' and oncologists' age-related stereotypes in communication with older patients [135,149], including the tendency to express their own treatment preferences more with older patients [149]. Age-based exclusion from clinical trials was also reported. A systematic review by Hamaker et al. reported that almost 70% of trials excluded older adults with a hematological malignancy explicitly or implicitly and 27% excluded patients based on age, while another study reported that no patients aged >80 entered trials despite eligibility [150,151].

6.2. Qualitative studies

The three qualitative studies of ageism in oncology were published between 2013 and 2020. In a study by Hasak et al. [152], patients perceived racial or age bias in clinicians' information sharing, and reported clinicians' words as being paternalistic, condescending, and dismissive. Using linguistic analysis, Schroyen et al. [153] found potentially age stereotype-related communication style in a study with medical students and physicians as well as fewer discussions regarding side effects of treatment (in particular, those related to sexual issues). One study [154] specifically focused on the subject of cancer screening, and found clinicians perceived over-screening of older adults as problematic, and were concerned that the use of life-expectancy to define over-screening may lead to bias and harm (see Table 3).

7. Ageism interventions

We identified a total of 52 interventions addressing ageism in healthcare settings. These include pre-licensure (*n* = 48) [66–112,155] and post-licensure interventions (*n* = 5) [113–117] targeting pre-licensure students of healthcare and/or allied health disciplines, or unitary and multidisciplinary post-registration healthcare professionals, respectively. None of the identified interventions were focused

Table 3
Overview of qualitative studies.

Author (year)	Study design	Location	Sample & Population	Sampling Approach	Cancer Site	Profession of Focus	Purpose	Analysis	Findings
Hasak (2017) [152]	Implementation research framework	USA	n = 40 20 pts.; 10 MDs; 10 RNs	Purposive	Breast	RNs (peri-operative); MDs (plastic surg)	Explore stakeholders' perspectives (patients, surgeons, nurses) on ways to support postmastectomy breast reconstruction decision-making to improve patient-centred care for women with breast cancer and to support women with PMBR.	NVivo software coding of transcripts.	Many patients felt pressured by clinicians to make decisions about breast reconstruction. Many patients expressed regret in when they were not engaged in PMBR Patients often perceived a race-or age-bias in clinician information sharing. Patients recalled words as being paternalistic, condescending and dismissive. Patient stakeholders were reluctant and attributed this to fear that disagreement would not be acceptable.
Schoenborn (2020) [154]	Content analysis	USA	n = 30 24 MDs; 1 Phys asst. 5 RN(NPs)	f snowball sampling and maximum variation sampling	Screening for breast, colorectal, and prostate	RN(NP)s; MDs (Geri, internal, fam med); Phys Assts	To better understand primary care clinicians' views regarding over-screening and specifically around the current approach of using limited life expectancy of <10 years to guide screening cessation for breast, colorectal, and prostate to critically inform efforts aimed to reduce overscreening.	Transcripts analyzed using Atlas.ti textual data analysis software.	Content analysis revealed three major themes and subthemes: (1) Many, but not all, clinicians perceived overscreening in older adults as a problem; (2) Controversy around using limited life expectancy to define overscreening; (3) Concern that life expectancy to define overscreening may introduce bias and unintended harms. Several clinicians disagreed with guideline frameworks of using limited life expectancy to guide cancer screening cessation. Some disagreement stems from inadequate knowledge about the benefits and harms of cancer screening
Schroyen (2016) [153]	Linguistic analysis	Belgium	n = 40	Purposive	Breast	Medical students; MDs (Fam Med)	1. To analyze if healthcare professionals present more characteristics of elderspeak (positive as much as negative ones) when they explain a treatment to older patients, in comparison to younger ones. Moreover, we will analyze if the content of the speech is	Linguistic analysis with Web-based L2 software; Semantic content analyzed with Calculus software; Vocal characteristics extracted with PRAAT software; Statistical	When participants explained the treatment to the older patient, they used shorter utterances and made more repetitions. They also evoked fewer side effects, especially those related to sexual issues, and evoked fewer solutions to side effects.

Table 3 (*continued*)

Author (year)	Study design	Location	Sample & Population	Sampling Approach	Cancer Site	Profession of Focus	Purpose	Analysis	Findings
							different for a 70- or a 40-year-old patient. 2. To observe if characteristics of elderspeak (positive or negative) are more frequent in professionals who have a negative view of aging.	analysis using paired *t*-tests.	Moreover, reduction in length of utterances and of word-per- minute rate was observed for older patient when participants have a positive view of aging but for both patients when they have a negative view of aging.

specifically on cancer care settings (See Tables 4 and 5).

7.1. Pre-licensure

Of the 47 pre-licensure interventions we identified, the majority targeted medical (*n* = 15) [66,70–72,83,86,90,92,93,95,97,100,101, 104,112] and nursing students (*n* = 16) [67,73,76–81, 85,88,91,96,98,99,105,109]followed by social work (n = 5) [82,84,103,108,111] and physical therapy (*n* = 2) [69,102], with the remainder targeting nursing aides, physician assistants, **counseling** students, paramedics, and speech language pathologists (Table 4 for study details). Most studies took place in the USA (*n* = 41) [66–79,82–84,86–98,101–109,111,112], followed by Taiwan [80], Spain [81], Australia [85], China [99], Singapore [100], and New Zealand [110]. Sample sizes ranged from four [72] to 448 [86] and they were published between 1979 [72] and 2020 [89].

The nature of interventions varied and included educational sessions, intergenerational activities, and mentorship opportunities. Most interventions (*n* = 37) were educational in nature or included a knowledge-based, didactic, or experiential learning component [68–71,73,75,77–81,83–85,87–89,91–95,97–100,104–114]. These interventions included lectures, simulation exercises, games, courses 'infused' with gerontology or geriatrics content, and/or specific geriatric training courses. The main outcomes of interest included attitudes towards older adults (*n* = 39) and knowledge about older adults (*n* = 23). Other outcomes of interest included satisfaction (*n* = 10), change in practice (n = 1), change in patient outcomes (n = 2), and community impact (n = 1). The majority (*n* = 42) of these pre-licensure interventions reported positive findings on at least one of the study outcomes. A minority of studies (*n* = 5) had no impact on their outcomes of interest; these were all educational interventions targeting attitudes [68,74,102,106] and knowledge [76].

7.2. Post-licensure

There were five post-licensure ageism interventions [113–117] ranging in sample size from six [113] to 476 [116] (Table 5). Three were multidisciplinary and included nurses, social workers, physicians, dentists, physician assistants, and non-clinical staff [114,116,117]. Two interventions focused solely on occupational therapists [113] and emergency medical technicians (EMTs) [115], respectively. All interventions were educational in nature, but their content and delivery varied. Delivery modalities included simulation and a hybrid simulation gamification intervention [116] (both coupled with debriefing), while the remainder focused on more traditional didactic training sessions with diverse modalities. All interventions had a positive impact on outcomes, which included knowledge, attitudes, and satisfaction.

8. Discussion

We reviewed and extracted data on 133 papers and studies to understand the nature and extent of the literature related to ageism against older adults in cancer care. To our knowledge, this is the first comprehensive review of the literature on this topic. Based on our review of the literature, we note that experts in the field consistently raise ageism as a concern in cancer care. Although there is evidence for ageism in some specific domains or aspects of cancer care, the relationships between ageism in treatment offerings or type and treatment recommendations remains tenuous. This abundance of literature related to both treatment recommendation and treatment provision for older adults with cancer emphasizes that equitable care is an ongoing issue for this population despite being highlighted for over two decades [63]. Notably, we also found that there were no interventions focused on addressing ageism in cancer care.

Clinical research to improve the care of older adults may be more challenging than for younger patients due to heterogeneity related to age-related physiological changes, multimorbidity, and functional impairments [156]. Together with the European **Organization** for Research and Treatment of Cancer (EORTC) and the America Study Alliance, the International Society of Geriatric Oncology (SIOG) has previously proposed strategies to address the deficiencies of clinical research for older adults with cancer [157], for instance: removal of upper age limits to enable entry of older adults in clinical trials, use of large observational studies and registries within community settings (ideally parallel to randomized trials) for questions that cannot be answered in randomized trials, specific trials for older patients integrating meaningful outcome measures, mandatory incorporation of comparable forms of GA in studies, and regulatory organizations mandating adequate data collection regarding efficacy and toxicity of new drugs in fit and frail older adults [157].

In our review, we found that exclusion from clinical trials was a dominant aspect of the literature attributed to ageism in cancer care. Research suggests older adults and their caregivers view exclusion from trials based on age alone as one form of age discrimination [158,159]. GA is one useful tool for guiding treatment decision making for older adults by providing insights into the their health, functional status, and psychosocial status, which should be carried out to optimize treatment strategies for older patients to improve treatment efficacy and mininize treatment-related toxicity [160]. Prior studies demonstrate that older adults with a good performance status who were treated aggressively survived significantly longer than those who did not receive a more radical treatment [161].

Our review also documents the presence of common misconceptions and stereotypes about older adults, including that they are hard of hearing and have reduced cognition, and the assumption that sexual concerns are not important to older adults [113,135]. Stereotypical perceptions of older adults and their level of functioning may influence communication [162]. Although tailoring aspects of verbal

Table 4
Pre-licensure interventions targeting ageism.

Author (year)	Sample size	Location	Profession of focus	Intervention description	Outcomes of interest	Intervention freely available Y/N
Adelman (1988) [66]	48	USA	Fourth Year medical students	EDU- 1) lectures to the medical students, 2) health seminars by medical students (with faculty) IGA- Medical students and elder participants Other- Health consultations	Satisfaction ✓ Attitudes ✓	NO
Aud (2006) [67]	325	USA	Nursing students	EDU- gerontological nursing care course	Knowledge outcomes ✓ Attitudes✓	Was revised
Baliey (2018) [68]	58	USA	First year Master of Education students (Counseling and Higher Education)	OTHER- Board game using Intervention mapping Model (Bartholomew, Parcel, & Kok, 1998,2011)	Attitudes ✗	NO
Beling (2003) [69]	40	USA	Physical therapy students	IGC/EDU –Geriatric rehab course with community service (1 semester)	Knowledge outcomes ✓	NO
Bernard (2003) [70]	IG = 108; CG =117	USA	Year 1 and 2 of medical school	IGA- Students did structured interviews with a 'senior mentor' (a volunteer 65 or older living in the area)	Knowledge outcomes✓	NO
Besdine (2011) [71]	30	USA	Undergraduate medical students	EDU - Comprehensive redesign of the medical school curriculum–enriched to 80 h	Changes in patient outcomes ✓	NO
Birenbaum (1979) [72]	4	USA	Medical students (first year)	Field project including several components: EDU- 1) Students conducted residents' needs assessment and seminars with practitioners IGA- Geriatric community mental health centre with a multidisciplinary team OTHER- Weekly meetings with field coordinator; 50 visits to health care facilities	Knowledge outcomes ✓ Attitudes✓	NO
Blais (2006) [73]	41	USA	Nursing students	EDU- 1) Strategies to incorporate gerontological content into BSN curricula 2) Developed gerontology courses 3) Developed faculty expertise in elder care OTHER- Established new and/or enhanced existing community partnerships	Attitudes✓	NO
Bloom (1994) [74]	30	USA	Nursing aides	EDU OTHER (role play, exercises)	Attitudes✗	BLANK
Boswell (2012) [75]	43	USA	Pre-nursing and psychology undergraduate students	EDU - No details of the semester long adult development and aging course	Knowledge outcomes ✓ Attitudes ✓ Changes in practice ✓	NO
Briscoe (2004) [76]	56	USA	Nursing students	EDU – nursing course with no aging content (1 semester)	Knowledge outcomes ✗	NO
Brown (2017) [77]	45	USA	Nursing students	EDU- Course on health care delivery system and demonstrating effective communication techniques (two semesters).	Satisfaction outcomes ✓ Attitudes ✓	N/A
Burbank (2006) [78]	124	USA	Nursing students	EDU	Attitude ✓ Knowledge outcomes ✓ Satisfaction outcomes ✓	N/A
Buttner (2009) [79]	121	USA	Nursing students	EDU- Gerontological nursing course for third year students in nursing as part of a four-year BSN program	Attitudes✓	N/A
Chen (2009) [80]	194	Taiwan	Nursing Students	IGC – shared creative activities (8 weeks)	Attitude ✓	NO
Cobo (2015) [81]	76	Spain	Nursing students	EDU - Does not specify the nature of the Nursing and Aging Course implemented.	Attitudes✓	UNKNOWN
Cohen (2004) [82]	105	USA	Undergraduate social work students	EDU OTHER (focus group)	Attitudes✓	UNKNOWN
Corwin (2006) [83]	78	USA	Year 1 to 4 medical students	IGA- Senior Mentor Program. Pairing of a medical student with a senior mentor/senior mentor couple (four years). EDU- Structured assignments completed by	Satisfaction outcomes✓ Attitudes✓	NO- Appears be available to medical students at The University for South Carolina Med School

Table 4 (*continued*)

Author (year)	Sample size	Location	Profession of focus	Intervention description	Outcomes of interest	Intervention freely available Y/N
				paired student and senior mentor/ senior mentor couple under SMP (met 4–6 times per year for four years).		
Cummings (2006) [84]	271	USA	Social work students	EDU – "Geri-Infused" content added	Knowledge✓ Anxiety✓	NO
Edwards (2008) [85]	42	Australia	Nurses	EDU (virtual learning) 3 modules: active aging & health promotion, older people in the acute care setting, community and residential care setting.	Satisfaction ✓ Knowledge outcomes✓ Attitudes?	YES (universally accessible)
Gonzales (2010) [86]	328 medical students 120 older adults	USA	First and second year medical students	OTHER- Meeting sessions between medical students and older adults at a local museum 92 h sessions).	Satisfaction ✓ Knowledge outcomes✓ Attitudes✓	UNKNOWN
Halpin (2017) [87]	230	USA	First year physician assistants	IGA-First year healthcare professional students paired with seniors.	Satisfaction✓ Changes in patient outcomes✗	NO- Senior Mentor Program in medical and nursing school curricula
Harper (2007) [88]	42	USA	Nursing Students	EDU – online gerontology nursing course (12 weeks)	Knowledge outcomes✓ Attitudes✓	NO
Heuer (2020) [89]	145	USA	Undergraduate students majoring in communication sciences and disorder speech and language and audiology undergraduate students	EDU- Lecture delivery in long-term care facilities	Knowledge outcomes✓ Attitudes✓	NO- For Undergraduates majoring in communications science and disorders (speech-language)
Intrieri et al. (1993) [90]	96	USA	Medical Students	EDU – Geriatric training course (6 h)	Knowledge outcomes✓ Attitudes✓	
Jansen (2004) [91]	107	USA	Nurses	EDU - change in curriculum from a designated aging course to integrated aging content in multiple courses.	Attitudes✓	UNKNOWN
Jarvik (1981) [92]	144	USA	Medical students	EDU- Delivery of three educational contents via use of examples, practicing interviews, inhouse interview experience, complemented by field trips. OTHER- Voluntary tutorial dinner following field trips with eight students and two physicians.	Satisfaction✓	NO- For UCLA medical students only
Jeste (2018) [93]	178	USA	Medical students	EDU- Participation by students in an aging-focused summer research training program (8–12 weeks full time)	Attitudes ✓	NO- Medical students at 7 National Training Centres in the USA
Kaf (2004) [94]	75	USA	Speech language pathology	IGC – service learning with OA with dementia (1 semester)	Attitudes ✓	NO
Kantor (2006) [95]	823	USA	Medical students	EDU + IGA- Senior Partners Program (SPP) - the senior partnership, an online curriculum, and didactic and group sessions (4 years).	Knowledge outcomes ✓ Attitudes✓ Changes in practice✓	NO
King (1983) [96]	49	USA	Nursing students	IGA- 1) 11-week rotation involving a 6-week placement with well older adults in the community, 2) 2-week in-house placement with elderly less independent than the first placement and 3) 2-week clinical placement with dependent older adults. EDU- lectures, seminars and laboratory session learning clinical skills.	Satisfaction✓ Knowledge outcomes✓ Attitudes✓	UNKNOWN
Laks (2016) [97]	74	USA	First and second year medical students	EDU- 1) Preclinical elective course- students conducted needs assessment, created health education projects, reflection through written assignments and presentations. 2) Lectures by course instructor on special topics in Geriatrics	Satisfaction✓ Knowledge outcomes✓ Attitude Mixed findings Changes in practice? Community impact✓	NO
Leblanc (1995) [98]	98	USA	Nursing Students	EDU – lecture on aging with aging simulation (3 h)	Attitudes ✓	NO

Table 4 (*continued*)

Author (year)	Sample size	Location	Profession of focus	Intervention description	Outcomes of interest	Intervention freely available Y/N
Leung (2012) [99]	103	China	Medical and Nursing students	IGC –student/OA pairs discuss illness and age-related changes (10 weeks)	Attitudes ✓	NO
Leung (2016) [100]	45	Singapore	Nurses, medical students, pharmacy and social work undergraduates	OTHER- Training on misconceptions towards older persons and how to care for them, followed by home visits to at risk older people over 6 months (groups of 2–3 students).	Knowledge outcomes✓ Attitudes x	UNKNOWN
Lu (2010) [101]	137	USA	Medical students	IGC/EDU – Student/OA pairs attend education sessions with social visits (40 weeks)	Knowledge outcomes✓ Attitudes✓	NO
Mount (1993) [102]	97	USA	Physical therapy	IGC/EDU –Aging content and practicum with students providing health services to OA (12 weeks)	Attitudes✗	NO
Olson (2002) [103]	94	USA	Social work	EDU – curriculum on social work practice with OA (3 weeks)	Knowledge outcomes✓ Attitudes✓	NO
Pacala (1995) [104]	55	USA	Medical Students	EDU –Aging Game workshop with role play activities (3 h)	Knowledge outcomes✗ Attitudes✓	NO
Parchment (2002) [105]	52	USA	Nursing students	EDU- Teaching by class instructor about aging. Simulation presented by students about sensory deficits caused by aging. IGA- Interaction of students with older adults.	Knowledge outcomes✓ Attitudes✗	NO
Pilkington (1993) [106]	75	USA	Nurses, LPNs, care aides (nursing home staff)	EDU – OA communication training program (12 weeks)	Attitudes✗	NO
Puentes (1995) [107]	98	USA	Registered nurses	EDU- Continuing education program about the incorporation of reminiscence techniques into interactions with clients in the acute care setting	Attitudes✓ Changes in practice✓	NR
Radu (2007) [108]	243	USA	Social workers	EDU- "A GeroRich program intentionally integrated aging content through the curriculum and the field practicum through a variety of methods."	Satisfaction outcomes✗ Knowledge outcomes✓ Attitudes - mixed	Hartford foundation
Rankin (1986)	16	USA	Nursing baccalaureate students	EDU- 1) Educational class gero nursing (2 h); 2) An elective course on "Gerontological Nursing" developed and taught the summer after the students' sophomore year (eight-week); 3) Use of innovative educational strategies	Satisfaction outcomes✓ Knowledge outcomes✓ Attitudes✓ Changes in practice✓	N/A
Rose (1984) [109]	46	USA	Nursing Students	EDU – gerontological nursing course (1 semester)	Knowledge outcomes✓	NO
Ross (2015) [110]	11	Australia/ New Zealand	Paramedic students	IGA- Interaction and engagement activities between the students and 11 independently living elderly residents.	Attitudes✓	BLANK
Schuldberg (2005) [111]	99	USA	Social workers	OTHER- 15 Secure Project Older Adult Sensitivity Kits. (Copyright 2000 by Lee Memorial Health Systems, Older Adult Services, Fort Myers, FL.	Attitudes ✓	YES
Varkey (2006) [112]	84	USA	Medical students	EDU- Aging Game simulation with a group of 10–12 students and 5–6 facilitators (three hours). Three phases- 1.Student as an independent senior. 2.As a semi-independent living condition 3.In a long-term care facility. Simulation followed by further discussion among faculty member and students.	Attitudes✓	UNKNOWN

✓ = Achieved outcome.

✗ = Did not achieve outcome.

EDU = Education.

IGA = Intergenerational Activity.

Mentorship.

OTHER.

Table 5
Post-licensure interventions addressing ageism.

Author (year)	Sample size	Location	Profession of focus	Intervention description	Outcomes of interest	Intervention freely available Y/N
Alden (2015) [113]	6	USA	Occupational therapists	EDU- 1) Educational module designed as a 90-min, in-person module followed by three 30-min, online modules completed over four weeks. 2) Teaching strategies included videos, PowerPoint lectures, informational handouts, discussion board, and interactive assessments	Knowledge outcomes✓ Attitudes-Mixed	No link given, described in article
Alexander (2019) [114]	97	USA	Nurses, social workers, physicians, and other healthcare professionals	EDU- CST program for HCPs that offered three modules (1-day): (1) Geriatrics 101;(2) Cognitive Syndromes; and (3) Shared Decision Making.	Attitudes✓	BLANK
Fleisher (1996) [115]	27	USA	Emergency medical technicians (EMTs)	EDU + OTHER- Training session involving 6 individual training scenarios, designed for simulation (2 h), followed by discussion. (Training scenarios in which participants role play geriatric patients, sensitivity training - "The Geriatric Obstacle Course")	Satisfaction outcomes✓	The scenarios are included as an appendix in the article.
Halpin (2015) [116]	476	USA-	Nurses, social workers, physicians, psychologists, medical support assistants, nurse assistants, dentists, physician assistants, and non-clinical staff	EDU- Aging simulation workshop utilizing the Lee Memorial Health System's SECURE Project [Lee Memorial Health Systems, 2014]. (45-min).	Attitudes✓	UNSURE- link leads to the main lee memorial page.
Karner (1998) [117]	95	USA	Nurses, social workers, physical therapists, hospital employees	EDU- "The Aging Game" program consisted of playing the Into Aging simulation game, followed by a debriefing period and clarification of some common misconceptions about aging (2 h). The second part of the session consisted of viewing selected segments of the film Images of Aging (Terra Nova Films, Inc., 1991), followed by discussion.	Knowledge outcomes✓	YES (2nd edition of "Into aging" available online).

EDU = Education.
IGA = Intergenerational Activity.
CST = Clinical Skills Training.

communication such as volume and cadence reduces processing demands [163] (especially for those who have hearing/cognitive impairment), not all older adults have hearing difficulties or trouble comprehending information; this may be perceived as discriminatory behaviour and precipitate communication breakdown [164,165]. Our findings highlight the need for and importance of training and education on aging and gerontology in the cancer space to understand when and how to tailor communication to the preferences and needs of older adults. A systematic review on healthcare professionals' attitudes towards older adults [166] found attitudes varied from neutral to positive. We note mixed findings related to oncology healthcare professionals' attitudes **towards** older adults with cancer, with a caveat that this was only from three studies. More research is needed to continue to investigate the prevalence of ageism among healthcare professionals and how to address ageism using educational approaches.

The poor perception of geriatrics in general (regardless of practice area or setting) is also known in practice and research [167], and may in part contribute to healthcare professionals' attitudes towards older patients. Moreover, research shows that degree of preference to work with older adults, level of knowledge related to aging, and level of anxiety about one's own aging, are consistent predictors of nurses' attitudes **towards** older patients [168,169].

Of the 53 interventions we reviewed that targeted ageism, none were developed or implemented in cancer care. These interventions predominantly focused on pre-licensure settings, included educational components, and focused on increasing knowledge and changing negative attitudes towards older adults. Although none of these interventions were specific to cancer settings, many of these strategies could be adapted to either pre-licensure or post-licensure professionals in cancer care. Thus, there is a critical need for research specific to oncology to identify strategies that can best address negative or ageist attitudes in caring for older adults with cancer.

We identified abundant opinion and editorial papers from leaders in the field describing the negative implications of ageism towards older adults, which speaks to awareness of this issue among experts in the field. These expert opinions noted that ageism is underpinned by the continued exclusion of older adults from clinical trials of cancer treatment and the absence of age-friendly approaches to cancer, specifically the absence of universal use of GA in oncology practice. These expert opinions and reviews, alongside the research data and the absence of interventions in cancer care indicate that more must be done to elucidate ageism in the cancer space.

Our work echoes recent discussion within SIOG, which published a post [170] highlighting the importance of both implicit and explicit bias towards older adults. Trevino argues that for professionals spending much of their time treating and caring for older adults, implicit ageist stereotypes outside one's consciousness and contradictory to personal beliefs are still possible based on the overwhelmingly negative view of older adults in society more generally [170]. The author references the Reframing Aging initiative, which is based on values of justice, ingenuity, and building momentum [171]. The Initiative states that articulating unequal treatment (and perceptions) of older adults can lead to transformative changes in our healthcare system. We feel that the present review takes a step towards articulating the nature and extent of research and literature on ageism in cancer care. Finally, we agree with Trevino, who argues that: "The value of justice challenges views of older adults as 'other' and directs the conversation toward building systems and processes that enhance equity across age".

9. Limitations and strengths

To be comprehensive, we included the broader scope of the literature

including expert opinions and review papers, as well as empirical studies mentioning ageism in cancer or interventions to address ageism. While this diversity of methods of the included studies precluded our ability to analyze the effects of ageism on patient outcomes and draw concrete or directional conclusions, it did allow us to meet our objective to understand the *scope of the literature*, consistent with scoping review methodology [17]. This study presents many strengths, including the breadth of information synthesized, that each title/abstract and full text was screened by at least two reviewers, and inclusion of studies published in multiple languages.

10. Conclusions and recommendations

Our findings highlight that ageism is a frequently raised as a concern in cancer care. However, there is a paucity of rigorous studies investigating ageism or the impacts of clinician and system age-related bias on patient outcomes. Given that cancer is most common in older adults and global growth in the number of older adults with cancer is projected, interventions to address ageism in oncology may address the concerns frequently reported in the literature. Given the team nature of oncology [172,173] and the diverse needs of older adults, approaches to addressing ageism in oncology should take a multidisciplinary and interprofessional approach.

This study has several implications for both research and practice; as such, we offer the following recommendations. From the practice perspective, developing interventions to address ageism and creating a workforce prepared to address the needs of older adults while encouraging dialogues and reflections regarding ageist beliefs are imperative. Also, given that the majority of people treated for cancer are older adults, efforts to increase awareness about ageism among oncology care providers and incorporating geriatric training into curricula as standard components is essential. Specific strategies suggested by Trevino include starting with small changes to language around aging and removing terms like 'tidal wave' and 'tsunami' which have negative connotations [170]. Broader suggestions include adopting a health-equity approach to advocate for institutional change to promote fair and just treatment of older adults [171].

For research, future practice-oriented studies should explore tailoring pre/post-licensure interventions to the cancer care setting to address implicit and explicit ageist attitudes and biases. Research is also warranted to identify ways to minimize age-stereotypes and ageism from the perspectives of older adults and care providers in this setting. From a methodological point of view, clinical trials have been a main focus. Parks et al. [174] reiterate solutions to older adults involvement in clinical trials, including alternative study designs (e.g., prospective cohort studies, pragmatic trials, and utilization of population-based datasets), flexible study inclusion criteria, and integration of GA to inform randomization and patient treatment according to their individual needs. As has been stated before [175], researchers and clinicians can advocate for governing health bodies and trial sponsors to standardize enrolment of older adults into clinical trials. Such actions will begin to address the limited nature of evidence related to treating older adults with cancer.

Author contributions

Study concepts: KH, SS, MP; Study Design: KH, SS, MP; Data Acquisition: KH, SS, MP, KR; KH, SS, MP; Data Analysis and interpretation: All authors; Manuscript preparation: KH, SS, MP; Manuscript editing: All authors; Manuscript review: All authors;

Declaration of Competing Interest

Pergolotti is employed by Select Medical.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jgo.2022.09.014.

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