Published in final edited form as:

Int J Radiat Oncol Biol Phys. 2017 July 15; 98(4): 748–757. doi:10.1016/j.ijrobp.2017.01.228.

The Influence of Age on Guideline-Concordant Cancer Care for Elderly Patients in the United States

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Abstract

Background—We examined frequency of guideline-concordant cancer care in elderly patients, including “older” elderly (age 80).

Methods—Using the Surveillance, Epidemiology and End Results-Medicare dataset in patients age 66 years, diagnosed with non-metastatic breast (n=55,094), non-small cell lung (NSCLC) (n=36,203), or prostate (n=86,544) cancer from 2006–2011, chemotherapy, surgery, and radiation (RT) treatments were identified using claims. Pearson chi-square tested associations between age and guideline concordance.

Results—Older patients were less likely to receive guideline-concordant curative treatment: in Stage III breast cancer, receipt of post-mastectomy RT (70%, 46% and 21% in patients age 66–79, 80–89 and 90 respectively; $P<0.0001$); in Stage I NSCLC, RT or surgery (89%, 80%, and 64% in age 66–79, 80–89 and 90; $P<0.0001$); in Stage III NSCLC, RT or surgery plus chemotherapy (79%, 58%, and 27% in age 66–79, 80–89 and 90; $P<0.0001$); and in intermediate/high risk prostate cancer, RT or prostatectomy (projected life expectancy >10 yrs—85% and 82% in age 66–69 and 70–75; and 10 years—70%, 42%, and 9% in age 76–79, 80–89, 90; $P<0.0001$). However, older patients were *more* likely to receive guideline-concordant de-intensified treatment: in Stage I–II node-negative breast cancer, hypofractionated post-lumpectomy RT (9%, 16% and 23% in age 66–79, 80–89 and 90; $P<0.0001$); in stage I ER+ breast cancer, observation after lumpectomy (12%, 42%, and 84% in age 66–79, 80–89 and 90; $P<0.0001$); in stage I NSCLC,

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Disclosure statement: Dr. B Smith receives research funding from Varian Medical Systems, but this was unrelated to the current research.

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stereotactic body RT instead of surgery (7%, 16%, and 25% in age 66–79, 80–89 and 90; $P<0.0001$); and in lower-risk prostate cancer, no active treatment (25%, 54%, and 68% in age 66–79, 80–89 and 90; $P<0.0001$).

Conclusion—Actual treatment of older elderly cancer patients frequently diverged from guidelines, especially in curative treatment of advanced disease. Results suggest a need for better metrics than existing guidelines alone to evaluate quality and appropriateness of care in this population.

INTRODUCTION

Practice guidelines are vital to radiation oncology practice, aiming to promote standardized, evidence-based approaches to care. Guidelines are fundamentally designed to optimize *clinical outcomes* metrics in cancer patients, by disseminating consensus-based “best” practice. However, guidelines are also increasingly regarded as a valuable source to assess *quality* metrics of care delivery (1–3), an important consideration, given that creation and reporting of quality metrics have risen as policy priorities in healthcare for the elderly. In particular, Medicare—the primary source of health insurance for elderly patients—has now directly coupled reimbursement to compliance with quality measures through the Medicare Access and CHIP Reauthorization Act (MACRA) (4–6).

With the expectation of quality reporting and MACRA’s future “pay for performance” impact on oncology practice, cancer care quality metrics are currently being formulated, selected, and refined (4,7). Therefore, a thorough understanding of baseline performance—by characterizing contemporary frequencies of concordance with benchmark oncology practice guidelines—is needed in elderly patients, to establish the “current state” of cancer care delivery in this population. The need to understand delivery and quality of cancer care in elderly patients is underscored by cancer’s rising incidence burden in US patients ages 65 and older (8,9).

Prior studies suggest that elderly patients receive less frequent cancer treatment, compared with younger patients (10–14). However, these studies were conducted in cohorts limited to specific disease sites and specific treatment comparisons. How patient age influences *overarching* patterns in guideline concordance of treatment decision-making is still not clear. We hypothesized that: 1) older age would predict lower rates of guideline-concordant decisions for *curative treatment*; 2) there is variation by age in guideline-concordant decisions for *de-intensified treatment*; and 3) there are common patterns of how age modifies treatment decision-making—across disease sites, stages, treatment modalities, and treatment paradigms.

We surmised if deviations from guidelines were detected more frequently with older age in cancer patients, such a finding could help signal barriers to disseminating “best” practices in the elderly (15–18). Alternatively, frequent deviations in older patients might also signal that current guidelines themselves are inherently insufficient for shaping quality and healthcare delivery metrics for the elderly. Such a finding would thereby help establish baseline gaps in cancer guideline and quality metric development for this population. Accordingly, in a nationally representative cohort of elderly cancer patients diagnosed with incident breast,

lung, or prostate cancer, we sought to determine the relationship between age and concordance with select cancer care guidelines, with a focus on radiation treatment.

STUDY METHODS

Patient cohort

We used the Surveillance, Epidemiology and End Results (SEER)-Medicare dataset to examine treatment utilization (chemotherapy, surgery, radiation, and hormone therapy), in patients age 66 with incident breast (AJCC stage I–III), non-small cell lung (NSCLC) (stage I–III), or prostate (clinical stage T1–3, N0M0) cancer from 2006–2011. We excluded patients with prior diagnosis of another malignancy within first year of diagnosis; unknown histology; no pathologic confirmation; and cancer diagnosis at autopsy/by death certificate. Medicare Part A and B coverage and no HMO enrollment 12 months prior to and 12 months after diagnosis was required. Patient and disease factors at diagnosis extracted from SEER included age, diagnosis year, disease stage, tumor grade, and estrogen receptor status (for breast cancer patients). Final samples included 55,094 breast, 36,203 NSCLC, and 86,544 prostate cancer patients. (eTables 1–3)

Age

Age was initially categorized as 66–79, 80–89 and 90, especially to highlight patterns of treatment in older elderly-- octogenarians (age 80–89) and nonagenarians (age 90). Analyses of patients age 90 are presented as a unique age category. In certain analyses, when results included n 11, results are suppressed to prevent compromise of patient identities. Where this was applicable, we state “the number of patients age 90 was too low to report”.

Where guidelines specifically reflected age, additional age categories were analyzed (with inflection points at age 70 for early breast cancer patients and age 75 for prostate cancer patients based on use of the National Social Security Index actuarial estimate of life expectancy of at least 10 additional years for US men age 75) (19,20).

Other covariates

Modified Charlson comorbidity index was derived (21–23) from claims for comorbid diseases occurring between 12 months prior and 1 month after cancer diagnosis. As previously established, to enhance specificity, diagnosis codes identified in Part B files must have occurred in 2 separate claims over >30 days or also in Part A claims (24,25). Performance status score was derived from the Medicare Durable Medical Equipment file, indicating use of home oxygen, cane, commode, wheelchair, or hospital bed (26,27), categorized as 0= none, 1= 1 item, 2= 2 or more items.(26) (eTables 4a–b)

Cancer treatment and outcomes

Treatment through one year from diagnosis was defined by *International Classification of Diseases* (ICD)-9 procedure and Healthcare Common Procedure Coding System (HCPCS)/Current Procedural (CPT) claims codes for chemotherapy, site-specific surgery (e.g. lumpectomy, mastectomy, radical prostatectomy, sublobar resection, lobar resection,

lobectomy, etc.), and radiation treatment (RT). Stereotactic body radiation therapy (SBRT) was based on procedure claims (regardless of number of radiation fractions). Number of radiation fractions was based on radiation delivery claims with unique dates of service, or weekly treatment management codes (representing 5 fractions delivered) when claim dates were unavailable. Chemotherapy codes identified cytotoxic and targeted systemic therapies and androgen deprivation therapy (ADT). (eTables 4a–b) Oral endocrine therapy claims in breast cancer patients were available in patients with Medicare Part D coverage and coded for this subset (28). Overall survival and cause-specific survival were based on Medicare death date and SEER cause of death. Time to event was calculated from diagnosis.

Practice guidelines

Frequency of concordance of treatment with the following select practice guidelines, based upon National Comprehensive Cancer Network (NCCN) guidelines (20) for each disease site was assessed:

Breast

- In select early stage breast cancer patients (stage I–II, node negative), treated with lumpectomy plus post-lumpectomy RT: use of *hypofractionation*, defined as 15–23 RT fractions. This proxy definition of hypofractionation, based on number of fractions, was selected as details of actual radiation dose delivered per fraction are not available in SEER-Medicare (29).
- In select early stage breast cancer patients (stage I, ER positive, treated with lumpectomy): use of *observation* instead of post-lumpectomy RT.
- In select advanced stage breast cancer patients (Stage III, treated with mastectomy): use of *post-mastectomy RT*.

Non-small cell lung cancer (NSCLC)

- In stage I NSCLC patients: use of potentially *curative treatments* including: SBRT, other external beam RT, any surgery (including sublobar resection, lobectomy, and pneumonectomy) vs. no treatment.
- In Stage III NSCLC patients; use of potentially *curative treatments* including: any RT or any surgery (with or without chemotherapy) vs. no treatment

Prostate

- In intermediate or high risk prostate cancer patients (Gleason 7–10 or at least clinical T2b stage), use of potentially *curative treatments* including: RT (external beam RT and/or brachytherapy) or prostatectomy; further stratified by projected life expectancy >10 years (age ≥ 75) (19).
- In lower risk prostate cancer patients (both clinical stage T1 and Gleason 6), use of *no active treatment*. Prostate-specific antigen (PSA) is not available for patient risk-stratification in SEER-Medicare.

Guidelines were classified into two treatment paradigm groupings for analysis: “Do more”, or *curative* treatment, including PMRT for stage III breast cancer, surgery or RT for stage I and stage III NSCLC, and definitive RT or surgery for intermediate/high risk prostate cancer; vs. “Do less”, or *de-intensified* treatment. De-intensification indicated treatments with less invasiveness, time burden, or toxicity compared with other standard treatment options, and in this analysis included hypofractionated RT for early stage breast cancer, observation after lumpectomy for stage I ER+ breast cancer, SBRT for stage I NSCLC, and no active treatment for lower risk prostate cancer.

Statistical analyses

Associations between age and guideline-concordant treatment were tested using the Pearson Chi-square test. Multivariate logistic models examined associations between age and use of guideline-concordant treatments, adjusted for comorbidity and performance status. Because these two covariates demonstrated collinearity, separate models were fitted for each. In multivariate models, age was initially tested as a continuous variable. Because the linearity assumption did not universally show goodness-of-fit in all models by Hosmer and Lemeshow criteria, age was also tested categorically. Final models are presented using the categorical variable, with significance tested using the Wald Chi-square test. Time-to-event analyses evaluated associations between guideline-concordance and OS and CSS using the Kaplan-Meier log-rank test. Analyses were conducted using SAS (Cary, NC). Statistical tests were two-sided. P-value<0.05 was considered statistically significant. This study was exempted by the Institutional Review Board.

RESULTS

Median age was 74 years (interquartile range (IQR) 70–79); for breast patients 75 years (IQR 70, 81), NSCLC 75 years (IQR 71–81), and prostate 73 years (IQR 69–77). A total of 22% of patients were age 80 and 2% age 90 years. (eTable 5)

General Treatment Patterns by Age

Older patients were *less* likely to receive guideline-concordant curative treatment, but *more* likely to receive guideline-concordant de-intensified treatment. (Figure 1a–b) Specific frequencies of treatment use by cancer site are delineated below.

Specific Treatment Use by Cancer Site

Breast Cancer

Benchmark #1: Use of hypofractionation (15–23 fractions) in stage I–II, node-negative breast cancer patients receiving post-lumpectomy RT: Only 10% (of n=20,631) were treated with hypofractionated RT. Use of hypofractionated RT increased with older age: Utilization was 9% in patients aged 66–79 (of n=16,473), compared with 16% age 80 (of n=4,021), and 23% age 90 (of n=137); p<0.0001.

Benchmark #2: Use of observation in stage I, ER positive breast cancer patients receiving lumpectomy: A total of 21% (of 18,940) were observed after lumpectomy.

Among patients who underwent observation after lumpectomy (with available drug prescription data), 59% (of n=1,688) filled a prescription for endocrine therapy.

Observation increased with older age: 12% in patients aged 66–69 (of 673), compared with 42% age 80 (of n=867), and 84% age 90 (of n=148); $p<0.0001$. Because NCCN guidelines specify observation as appropriate in patients age 70, frequencies of observation (versus RT use) were further delineated using the additional cutpoint of age 70, demonstrating the most dramatic increase in observation after age 75: 6% age 66–67, 8% age 68–69, 10% age 70–74, and 19% age 75–79. Endocrine therapy use in these ER+ patients decreased with older age: 65% aged 66–79 (of n=673), compared with 57% age 80 (of n=867), and 41% age 90 (of n=148, $p<0.0001$)

Benchmark #3: Use of post-mastectomy RT in stage III breast cancer patients: Only 60% of this patient group (of n=3,996) underwent RT. Use of post-mastectomy RT decreased with older age: Utilization was 70% in patients aged 66–79 (of n=2,607), compared with 46% age 80 (of n=1,196), and 21% age 90 (of n=193); $p<0.0001$. In this group, chemotherapy use was 60% (of n=3,996) and also negatively associated with age: 76% in patients aged 66–79 (of n=2,607), compared with 32% age 80 (of n=1,196), and 9% age 90 (of n=193); $p<0.0001$.

Non-Small Cell Lung Cancer

Benchmark #1: Use of curative treatment in Stage I NSCLC patients: A total of 86% of this patient group received any treatment, while 14% received no active treatment (of n=15,777). Use of any treatment decreased with older age: 89% in patients aged 66–79 (of n=11,272), compared with 80% age 80 (of n=4,253), and 64% age 90 (of n=252); $p<0.0001$.

Of patients undergoing treatment, 9% received SBRT and 16% received other EBRT, while 72% received surgical resection (lobectomy, sublobar resection, or pneumonectomy) (of n=13,577). SBRT use was associated with older age: 7% in patients aged 66–79 (of n=9,998), compared with 16% age 80 (of n=3,416), and 25% age 90 (of n=163); $p<0.0001$.

Benchmark #2: Use of curative treatment in Stage III NSCLC patients: A total of 71% received any treatment, while 29% received no active treatment (of n=17,142). Use of any treatment decreased with older age: 79% in patients aged 66–79 (of n=11,693), compared with 58% age 80 (of n=4,958), and 27% age 90 (of n=491); $p<0.0001$.

Specific use of standard curative multi-modality therapy included: chemoradiation in 37% of patients aged 66–79 (of n=11,693), compared with 20% age 80 (of n=4,958), and 3% age 90 (of n=491); $p<0.0001$. Use of surgery plus chemotherapy was 12% in patients aged 66–79 (of n=11,693), compared with 3% age 80 (of n=4,958); $P<0.0001$. The number of patients age 90 was too low to report.

Prostate cancer

Benchmark #1: Use of curative treatment (definitive RT or prostatectomy) in intermediate or high risk stage and/or grade prostate cancer patients, based on projected life expectancy >10 years (age 75) and 10 years (age >75): A total of 84% (of n=31,168) of patients age 75 received either up front definitive RT alone (54%, of n=31,168) or prostatectomy (33%, of n=31,168)—both considered curative treatment, and 72% of all patients received curative treatment. Use of curative treatment decreased with older age: Among patients with projected life expectancy >10 years, curative treatment utilization was 85% in patients aged 66–69 (of n=13,397), compared with 82% in age 70–75 (of n=17,771); $p<0.0001$. Among patients with projected life expectancy 10 years, curative treatment utilization was 70% in patients age 76–79 (of n=8,561); 42% age 80–89 (of n=8,914); and 9% age 90+ (of n=617); $p<0.0001$.

Benchmark #2: Use of no active treatment in lower risk stage and grade prostate cancer patients (cT1 and Gleason 6): A total of 22% (of 84,272) of these patients received no active treatment. No treatment was used in 18% in patients aged 66–69 (of n=24,262), 20% age 70–75 (of n=31,658), 25% age 76–79 (of n=14,355), 31% age 80 (of n=13,198), and 39% age 90 (of n=799); $p<0.0001$.

Almost all remaining patients received definitive treatment (RT or prostatectomy), though a small portion received ADT alone: 4% in patients aged 66–69 (of n=24,262), 6% age 70–75 (of n=31,658), 12% age 76–79 (of n=14,355), 32% age 80 (of n=13,198), and 53% age 90 (of n=799); $p<0.0001$.

Comorbidities, performance status, and outcomes

Worse comorbidity and decreased performance status showed similar patterns of association with guideline concordance, demonstrating lower concordance with curative treatments and higher concordance with de-intensified treatment. (Figure 2a–b, Figure 3a–b, eTable 6). However, in multivariable analyses, for every guideline, age remained an independent predictor of guideline concordance ($P<0.0001$) even after accounting for confounding by comorbidity and performance status. (Table 1) Regarding outcomes, use of curative therapies was associated with increased overall and cause-specific survival. (eTable 7)

DISCUSSION

In elderly patients with breast, lung, or prostate cancer, guideline concordant care was significantly associated with age. There were similar patterns of the impact of age on treatment decisions across disease sites, stages, and treatment modalities, though patterns were opposite depending on treatment paradigm. Consistent with our hypothesis, decisions for *curative treatment* were less frequent as age increased, especially for the older elderly, who comprised almost 20% of this cohort. Concordance with curative therapies were 70% to over 80% in patients age<80 years, compared to approximately 30% to 50% in patients age 80 years. In contrast, the frequency of decisions for *de-intensified treatment* increased with age. The relationships between age and guideline concordance could not be fully explained by differences in comorbidity or performance status. This age-associated variation

in frequency of guideline-concordant care suggests that current guidelines may insufficiently inform clinical decisions for care, particularly in older elderly patients, and especially in the settings of curative treatment, advanced cancer, and multi-modality therapy (4–6).

In elderly patients, it remains unclear whether lack of guideline-concordant care may reflect appropriate clinical decision-making vs. inappropriate care, undertreatment or overtreatment—the typical quality metrics guideline concordance is thought to reflect. Our results suggested a potential inflection point for age-dependent variations in guideline-concordance, occurring at the age 80 years and older. Under age 80, frequencies of guideline-concordant practice across disease, sites, stages, and treatment modalities was surprisingly consistent, with little “spread” in absolute frequencies of guideline concordance: about 80% for “do more” treatments and about 20% for “do less” treatments. In contrast, variation in frequency of guideline-concordant practices widened for patients age 80 years and older, suggesting that current guidelines may be insufficient for informing quality metrics of cancer care delivery, particularly in older elderly. This insufficiency is notable since older elderly are one of the fastest growing cancer populations (9).

Barriers to guideline-concordant care and quality measures in older elderly cancer patients may be multi-factorial. Particularly for curative treatment, older patients are often underrepresented in randomized trials informing guidelines. For example, only 2% of patients enrolled on CALGB protocols for node-positive breast cancer were >70 years (30), though elder risk stratification has recently been included in select prospective studies, for example in NSCLC treatment trials (31–33).

Where clinical outcomes evidence exists, there remain mixed results for disease benefits vs. toxicity risks for cancer treatments in the elderly. Select prior studies demonstrate undertreatment of elderly patients leading to worse cancer outcomes, and appropriate treatment improving overall survival and quality of life even in patients with comorbidity and poor performance status (10,34–37). Yet other studies demonstrate older patients facing measurably increased toxicity (and mortality) risks associated with a variety of cancer treatment modalities (33,38–40). Still other evidence demonstrates potential benefits of shorter or less intensive regimens (e.g. hypofractionation) as well-tolerated and potentially of special benefit to frail elderly patients (41–44). The need to obtain more age-adapted morbidity and mortality risks associated with interventions (33)—remain key needs for developing age-adapted practice guidelines and quality measures.

Finally, decision-making in elderly patients are driven by additional considerations such as life expectancy, comorbidities (45,46), functional status, biologic aggressiveness of disease (47–48), benefits of palliation, availability of alternatives, and access to treatments are all important considerations in treatment choice (12,49,50), as well as patient preference, including decisions favoring less than curative treatment.

Implications of our results in context are twofold: oversimplified guideline-based quality benchmarking (for example, defining best quality as “100% guideline concordance”) is inadequate. This approach can lead to undiscerning measures of quality cancer care, especially for the older elderly. Optimal quality benchmarking of guideline-based practice

may involve, first, stratifying by treatment paradigm and, second, calibrating with age-adapted and case-mix factors, allowing for broader and more nimble definitions of quality benchmarks.

Limitations included proxy variable definitions from claims. Breast hypofractionation was based on number of radiation fractions, as details of radiation dose/fields are unavailable in SEER-Medicare. Endocrine therapy in breast cancer patients may have been underreported, as this variable was derived only from Medicare Part D coverage and not prescriptions filled under secondary insurance. PSA levels are unavailable for risk group-stratification in prostate cancer patients, and our “lower” risk prostate cancer group may have included patients with PSA>10. Validation of age trends may be needed to further understand treatment use for these patient subsets.

CONCLUSION

Actual care for older elderly cancer patients frequently diverges from guidelines, and this divergence was especially marked for curative treatment for advanced disease. Results suggest a need for better metrics than existing guidelines alone to evaluate quality and appropriateness of care in this population.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

This study was supported in part by the Cancer Prevention & Research Institute of Texas (CPRIT RP140020) (GLS, SHG), the Duncan Family Institute (WGH, GLS, BDS, SHG), NIH K07 CA211804-01 (GLS), NIH R01 CA207216 (BDS), the Andrew Sabin Family Fellowship (BDS), the Cancer Prevention & Research Institute of Texas (RP140020 and RP160674) (BDS), the Department of Health and Human Services National Cancer Institute (P30CA016672) (BDS), the Center for Radiation Oncology Research (BDS), and grants from the MD Anderson Cancer Center (BDS).

We examined frequency of guideline-concordant cancer care in elderly patients, including “older” elderly (age 80) using the Surveillance, Epidemiology and End Results-Medicare dataset. Actual treatment of older elderly patients with breast, lung, and prostate cancer frequently diverged from guidelines, especially in curative treatment of advanced disease. Results suggest a need for better metrics than existing guidelines alone to evaluate quality and appropriateness of care in this population.

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Figure 1.

A. “Do More”: Age and concordance with curative treatment guidelines; B. “Do Less”: Age and concordance with de-intensified treatment guidelines

Figure 2.

A. “Do More”: Comorbidity and concordance with curative treatment guidelines; B. “Do Less”: Comorbidity and concordance with de-intensified treatment guidelines

Figure 3.

A. "Do More": Performance status and concordance with curative treatment guidelines; B. "Do Less": Performance status and concordance with de-intensified treatment guidelines

Table 1

A. Adjusted odds of achieving guideline-concordance with older age for curative and de-intensified treatment guideline accounting for comorbidity; **B.** Adjusted odds accounting for performance status

A. Do More: Adjusted for comorbidity			
Characteristic	OR	95% CI	P
Breast-PMRT			<0.001
Age 80–89 vs. 66–79	0.37	0.33, 0.43	
Age 90 vs. 66–79	0.11	0.08, 0.16	
NSCLC-St I			<0.001
Age 80–89 vs. 66–79	0.57	0.51, 0.62	
Age 90 vs. 66–79	0.27	0.20, 0.35	
NSCLC-St III			<0.001
Age 80–89 vs. 66–79	0.40	0.38, 0.43	
Age 90 vs. 66–79	0.11	0.09, 0.13	
Prostate-Treat			<0.001
Age 80–89 vs. 66–79	0.18	0.17, 0.18	
Age 90 vs. 66–79	0.02	0.02, 0.03	
Do Less-Adjusted for comorbidity			
Characteristic	OR	95% CI	P
Breast-Hypofx			<0.001
Age 80–89 vs. 66–79	2.04	1.85, 2.26	
Age 90 vs. 66–79	3.48	2.34, 5.17	
Breast-Obs			<0.001
Age 80–89 vs. 66–79	5.39	4.98, 5.83	
Age 90 vs. 66–79	37.68	28.88, 49.16	
NSCLC-SBRT			<0.001
Age 80–89 vs. 66–79	2.53	2.24, 2.86	
Age 90 vs. 66–79	4.50	3.12, 6.49	
Prostate-Obs			<0.001
Age 80–89 vs. 66–79	2.81	2.59, 3.06	
Age 90 vs. 66–79	4.96	3.33, 7.37	

B. Do More: Adjusted for performance status

Characteristic	OR	95% CI	P
Breast-PMRT			<0.001
Age 80–89 vs. 66–79	0.37	0.32, 0.42	
Age 90 vs. 66–79	0.11	0.08, 0.16	
NSCLC-St I			<0.001
Age 80–89 vs. 66–79	0.52	0.47, 0.57	
Age 90 vs. 66–79	0.24	0.18, 0.31	
NSCLC-St III			<0.001
Age 80–89 vs. 66–79	0.38	0.36, 0.41	
Age 90 vs. 66–79	0.10	0.08, 0.13	
Prostate-Treat			<0.001
Age 80–89 vs. 66–79	0.18	0.17, 0.18	
Age 90 vs. 66–79	0.02	0.02, 0.03	
Do Less: Adjusted for performance status			
Characteristic	OR	95% CI	P
Breast-Hypofx			<0.001
Age 80–89 vs. 66–79	2.04	1.84, 2.25	
Age 90 vs. 66–79	3.46	2.33, 5.14	
Breast-Obs			<0.001
Age 80–89 vs. 66–79	5.49	5.08, 5.94	
Age 90 vs. 66–79	38.27	29.34, 49.91	
NSCLC-SBRT			<0.001
Age 80–89 vs. 66–79	2.59	2.29, 2.93	
Age 90 vs. 66–79	4.74	3.26, 6.89	
Prostate-Obs			<0.001
Age 80–89 vs. 66–79	2.83	2.60, 3.07	
Age 90 vs. 66–79	5.03	3.38, 7.47	

Abbreviations: OR Odds ratio, CI confidence interval, PMRT post-mastectomy radiation treatment (Stage III), NSCLC non-small cell lung cancer, St stage, Hypofx hypofractionation, Obs observation