





Patient Views and Correlates of Radiotherapy Omission in a Population-Based Sample of Older Women With Favorable-Prognosis Breast Cancer

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BACKGROUND: The omission of radiotherapy (RT) after lumpectomy is a reasonable option for many older women with favorable-prognosis breast cancer. In the current study, we sought to evaluate patient perspectives regarding decision making about RT. **METHODS:** Women aged 65 to 79 years with AJCC 7th edition stage I and II breast cancer who were reported to the Georgia and Los Angeles County Surveillance, Epidemiology, and End Results registries were surveyed (response rate, 70%) regarding RT decisions, the rationale for omitting RT, decision-making values, and understanding of disease recurrence risk. We also surveyed their corresponding surgeons (response rate, 77%). Patient characteristics associated with the omission of RT were evaluated using multilevel, multivariable logistic regression, accounting for patient clustering within surgeons. **RESULTS:** Of 999 patients, 135 omitted RT (14%). Older age, lower tumor grade, and having estrogen receptor-positive disease each were found to be strongly associated with omission of RT in multivariable analyses, whereas the number of comorbidities was not. Non-English speakers were more likely to omit RT (adjusted odds ratio, 5.9; 95% confidence interval, 1.4-24.5). The most commonly reported reasons for RT omission were that a physician advised the patient that it was not needed (54% of patients who omitted RT) and patient choice (41%). Risk of local disease recurrence was overestimated by all patients: by approximately 2-fold among those who omitted RT and by approximately 8-fold among those who received RT. The risk of distant disease recurrence was overestimated by approximately 3-fold on average. **CONCLUSIONS:** To some extent, decisions regarding RT omission are appropriately influenced by patient age, tumor grade, and estrogen receptor status, but do not appear to be optimally tailored according to competing comorbidities. Many women who are candidates for RT omission overestimate their risk of disease recurrence. *Cancer* 2018;000:000-000. © 2018 American Cancer Society.

KEYWORDS: breast cancer, decision making, geriatric oncology, radiotherapy (RT) omission, risk perception.

INTRODUCTION

There is growing concern regarding the overtreatment of older women with early-stage breast cancer because they often are more likely to die of competing comorbidities than of breast cancer.¹ Two trials (Cancer and Leukemia Group B [CALGB] 9343 and PRIME II) have shown that among older women with AJCC 7th edition stage I, estrogen receptor (ER)-positive, invasive breast cancer who are treated with breast-conserving surgery (BCS) and endocrine therapy, adjuvant radiotherapy (RT) significantly reduces the incidence of local disease recurrence, but without an apparent influence on the rate of metastasis or breast cancer mortality.^{2,3} Guidelines now consider the omission of RT after BCS to be an acceptable treatment option for women aged ≥ 70 years with T1, clinically lymph node-negative, ER-positive breast cancer who receive endocrine therapy.⁴

Some have argued that all older women with characteristics similar to the eligibility requirements for the CALGB 9343 and PRIME II trials should not receive RT, regardless of whether they are infirm or fit.⁵ Others have advocated for a more individualized approach to decisions regarding RT that accounts for tumor characteristics, comorbidity, and patient preferences.³ The lack of consensus regarding the treatment approach in this scenario is evident in several studies of practice patterns that demonstrated only a modest decline in the use of RT after publication of the results of the

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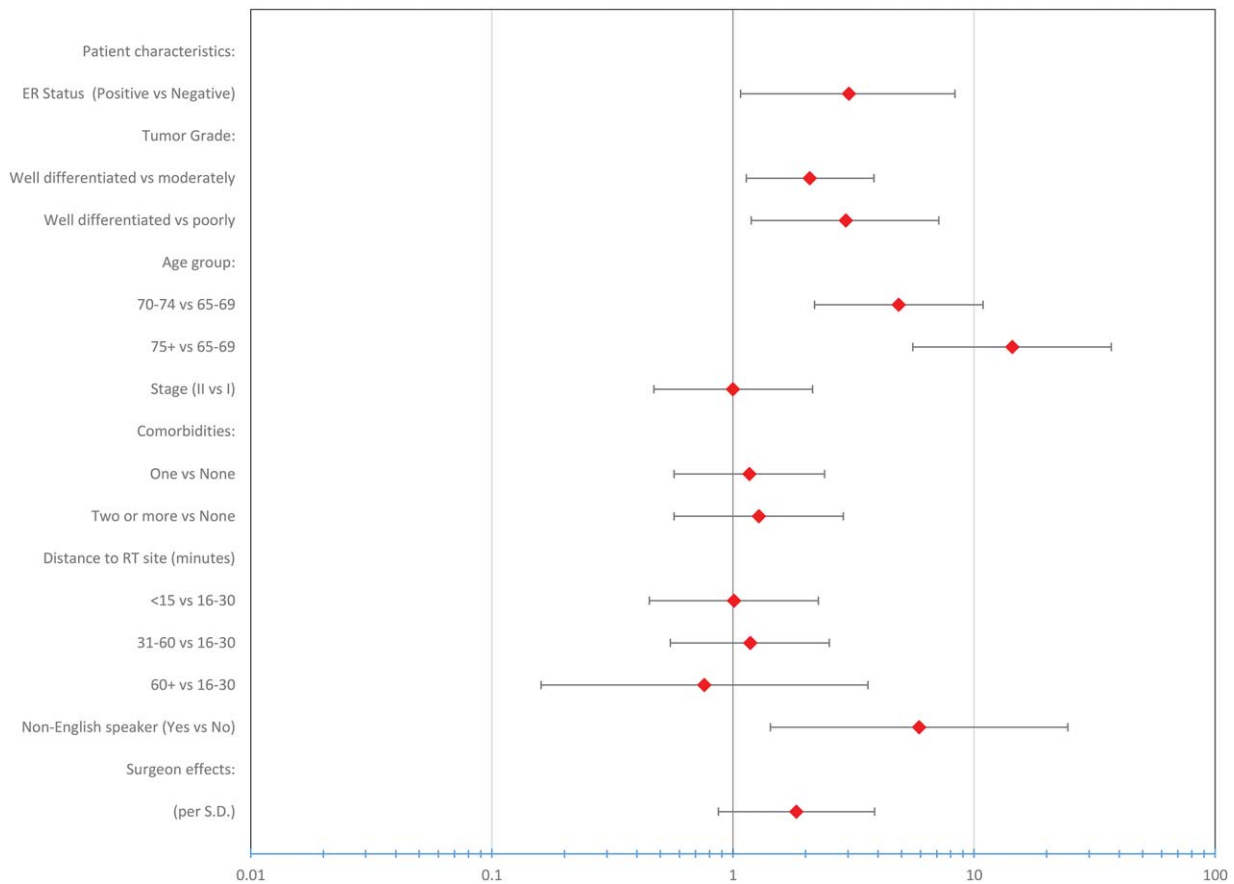


Figure 1. Odds ratios from a multilevel logistic regression model estimating radiotherapy (RT) omission. The model was adjusted for race; income; educational level; insurance; marital status; body mass index; and Surveillance, Epidemiology, and End Results site. The odds ratio for the surgeon effect represents the amount by which a patient’s odds of RT omission are multiplied if they see a surgeon associated with a rate of RT omission that is 1 standard deviation (SD) above that of the average surgeon. ER indicates estrogen receptor.

CALGB 9343 trial.⁶⁻¹⁰ Our previous work evaluating clinician views concerning the omission of RT in this context found that many clinicians overestimate the benefits associated with RT and continue to consider RT omission to be substandard therapy.¹¹ To the best of our knowledge, the frequency with which older patients are offered treatment without RT is uncertain, and little is known regarding their understanding of the risks and benefits of this treatment approach.

In this setting of evolving views concerning the treatment paradigm for older women with favorable-prognosis breast cancer, we sought to evaluate patients’ perspectives regarding the decision about RT omission as part of a survey that included a sizable sample of older women recently diagnosed with early-stage breast cancer, as identified by the population-based Georgia and Los Angeles Surveillance, Epidemiology, and End Results (SEER) registries. To our knowledge, the current study is the first to evaluate patient views regarding RT omission. Our objectives were: 1) to

evaluate patient characteristics associated with RT omission; 2) explore patients’ rationale for not receiving RT; and 3) assess patients’ understanding of the risk of disease recurrence.

MATERIALS AND METHODS

Patient Sample and Data Collection

The Individualized Cancer Care (iCanCare) Study is a large survey study of women aged 20 to 79 years with early-stage breast cancer who were reported to the population-based SEER registries of Los Angeles County in California and Georgia. Racial minorities were oversampled. Patients with tumors measuring >5 cm or stage III to stage IV disease were excluded. From the iCanCare study, we selected women aged ≥65 years for the current analysis.

Between July 2013 and August 2015, we identified 7303 women who were confirmed to be eligible for the study. Surveys were completed at a median of 6.8 months (standard deviation [SD], 3.2 months) after diagnosis,

TABLE 1. Patient Characteristics

Characteristic	No. (N=999)	Weighted %	% Omitting RT ^a	P ^b
Age, y				
65-69	410	40.2	5.4	<.0001
70-74	337	34.1	16	
75-79	252	25.7	26	
SEER stage				.5404
I	749	73.5	14.3	
II	218	23.2	12.2	
Not reported	32	3.2	28.2	
ER status				.0164
Positive	857	85.5	15.3	
Negative	111	11.5	5.2	
Not reported	31	3.0	20.2	
SEER grade				.0029
1	346	34.8	18.1	
2	430	43.4	14.4	
3	187	18.2	6.1	
Not reported	36	3.7	17.8	
No. of comorbidities				.2995
0	482	49.5	13.6	
1	315	30.3	12.8	
≥2	190	18.9	17.8	
Not reported	12	1.3	21.8	
Receipt of endocrine therapy ^c				.2222
Yes	449	71.1	13.6	
No	170	26.8	17.7	
Not reported	15	2.1	18.5	
Site				.0113
Georgia	522	49.3	11.2	
Los Angeles County	477	50.7	17.2	
Primarily speak language other than English				.1279
Yes	896	90.9	13.5	
No	89	7.8	20.4	
Not reported	14	1.3	30.4	
Race				.3019
White	631	67.5	14.9	
Black	160	13.9	10.3	
Latina	136	11.3	14.9	
Asian	52	5.2	10.9	
Other, unknown, or missing	20	2.1	26.6	
Income				.0265
<\$20,000	163	15.3	15.3	
\$20,000 to <\$40,000	183	17.6	9.6	
\$40,000 to <\$60,000	136	13.4	15.5	
\$60,000 to <\$90,000	134	14.4	10.4	
≥\$90,000	147	16.8	11.4	
Do not know/not reported	236	22.6	21	
Educational level				.5094
At least some college	614	63.4	13.8	
No college	365	34.8	15.4	
Not reported	20	1.8	8.6	
Type of insurance				.1035
Medicaid	104	9.9	15.3	
Medicare	641	66.1	14.5	
Private	121	12.2	6	
Other	7	0.6	14.7	
Not reported	126	11.2	20.9	
Marital status				.5347
Married/partnered	523	53.3	13.5	
Not partnered	457	44.8	15	
Not reported	19	1.9	20.5	

TABLE 1. Continued

Characteristic	No. (N=999)	Weighted %	% Omitting RT ^a	P ^b
BMI				.1281
Underweight (<18.5 kg/m ²)	8	0.7	33.5	
Normal weight (18.5-25 kg/m ²)	262	27.8	17.4	
Overweight (>25-30 kg/m ²)	323	32.7	12.5	
Obese (>30 kg/m ²)	371	35.7	12.7	
Not reported	35	3.2	18.4	
Bra cup size				.5723
A/B	289	29.0	15.9	
C	322	32.1	14.7	
D	197	19.7	13.3	
≥DD	156	15.8	11	
Not reported	35	3.4	17.1	
Distance to nearest radiation oncology clinic ^c				.5430
≤30 min	350		11.3	
>30 min	126		11.3	
Not reported	34		54.8	

Abbreviations: BMI, body mass index; ER, estrogen receptor; RT, radiotherapy; SEER, Surveillance, Epidemiology, and End Results.

^aPercentage omitting RT calculated within the weighted sample.

^bP values for differences in the percentage of RT omission; the "not reported" category (if present) was excluded from the calculation.

^cNot all patients were asked to provide this information due to differences in survey versions.

with a response rate of 69.6% (5080 women). The analytic sample for the current study (999 women) consisted of patients aged 65 to 79 years with unilateral invasive breast cancer who were treated with BCS (see Supporting Fig. 1). Within this sample, 74% of patients had stage I disease and 23% had stage II disease (Table 1). Given that we observed a nonnegligible rate of RT omission in patients with stage II disease (12%), we also included patients with stage II disease in multivariable models of RT omission.

Surveys were mailed with a \$20 cash incentive; a modified Dillman method was used to improve the response rate.¹² Materials were mailed in English; materials translated into Spanish were added for women with surnames that suggested Hispanic ethnicity.¹³ Each SEER registry provided SEER data that were stripped of identifiers and merged to survey data. This study was approved by the University of Michigan institutional review board, the University of Southern California, Emory University, and the public health departments of Georgia and California.

Measures

We developed the questionnaire (provided in supplementary material) iteratively with input from survey design

experts and cognitive interviews with patients and clinicians to assess content validity, as described previously.¹⁴

The definitive surgical procedure was determined by asking patients to indicate the surgery that was performed after biopsy, and whether additional surgeries were performed. As the primary outcome measure, receipt of RT was determined by asking patients, “Did you or are you planning to have radiation therapy to treat your breast cancer?” as well as whether RT was completed, ongoing, or planned. Information regarding receipt of endocrine therapy was available for approximately 62% of the analytic sample (619 women) who completed the survey module concerning endocrine therapy.

Patient preferences and values were assessed by asking, “When decisions were being made about your treatments, how important was it to you that your treatments. . .” followed by several prompts such as “kept you from worrying about the cancer coming back,” each of which was rated on a 5-point Likert-type scale ranging from “not at all important” to “very important.” Women who omitted RT were asked to indicate the reasons for their decision in a “mark all that apply” format. Responses were aggregated into higher (ie, a lot, quite a bit, or somewhat) and lower (ie, not at all or a little bit) categories for analysis.

We evaluated patient perceptions of disease recurrence risk by asking, “After receiving all the planned treatments, what do you think is the chance that your cancer will come back in the breast or the area around it within 10 years?”, with instructions to write in a number from 0% to 100%. A similar question was asked regarding “the chance that your cancer will spread to other parts of your body within 10 years.” We asked patients how often they had worried about their cancer coming back within the past month, with responses rated on a 5-point scale ranging from “almost never” to “almost always,” dichotomizing those who reported “sometimes,” “often,” or “almost always” worrying from those reporting worrying “rarely” or “almost never.” We asked how much physicians discussed the chance of cancer recurrence, ranging from “not at all” to “a lot” on a 5-point scale. Patient preferences regarding decision control were evaluated by asking if they “preferred to make (their) own decisions,” with responses of “quite a bit of the time” or “all of the time” dichotomized from “some of the time,” “a little of the time,” and “none of the time.”

Additional covariates included patient-reported information regarding comorbidities, race/ethnicity (white, black, Asian, Latina, or other), educational level (no college vs at least some college), income (<\$20,000, \$20,000 to <\$40,000, \$40,000 to <\$60,000, \$60,000

to <\$90,000, and >\$90,000), insurance (private, Medicare, Medicaid, or other), marital status (married, divorced/separated, never married, or widowed), and travel time to the nearest radiation oncology facility (<15 minutes, 15-30 minutes, 31-60 minutes, and >60 minutes). We asked patients to indicate which language they primarily speak.

Surgeon Sample and Data Collection

Patients were asked to identify their surgeons. From the patient analytic sample, 960 women were linked to 311 treating surgeons, 240 of whom completed a surgeon-specific survey (77%). A mean of 3 patients (interquartile range, 1-4 patients) were linked with each surgeon. Surgeons were asked about their annual volume of patients with breast cancer, whether the practice included residents and fellows, and their number of years in practice. Surgeons also were asked, “How involved are you in the selection of adjuvant radiation therapy approach in your postlumpectomy patients?” with answers ranging from “not at all involved” to “very involved” rated on a 5-point scale.

Statistical Analysis

We first calculated the percentage of women omitting RT overall and by all demographic and treatment factors. Bivariate associations with RT omission were evaluated using the Rao-Scott chi-square test. Multivariable, multilevel logistic regression was used to explore the adjusted associations with RT omission, with patients as the primary units of observation and the surgeon identifiers as the secondary units (ie, patients clustered within surgeon).¹⁵ Models were constructed beginning with patient-level covariates, incorporating surgeon clustering, and finally adding surgeon-level covariates. The area under the receiver operating characteristic curve was reported to measure the model’s discriminatory ability. All statistical analyses incorporated weights to account for the differential probability of sample selection and survey nonresponse. In addition, although survey and SEER item nonresponse was low (<5%) for the majority of covariates, we multiply imputed missing items using sequential multiple imputation techniques^{14,16} to prevent potential bias when using complete-case methods in the presence of missing data. *P* values ≤.05 were considered to be statistically significant throughout. All analyses were conducted using SAS statistical software (version 9.4; SAS Institute Inc, Cary, North Carolina).

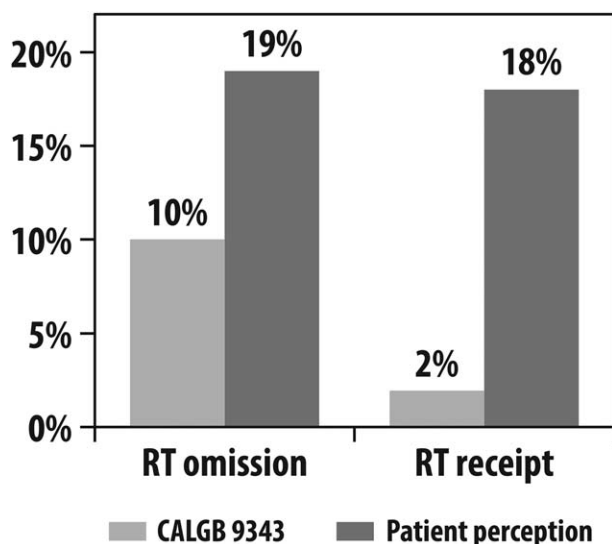


Figure 2. Patient-reported estimates of 10-year risk of local disease recurrence in patients aged 65 to 79 years with stage I, estrogen receptor-positive, invasive breast cancer compared with results of the Cancer and Leukemia Group B (CALGB) 9343 trial. RT, radiotherapy.

RESULTS

Radiotherapy Receipt

Table 1 and Supporting Table 1 show the distribution of patient and surgeon characteristics. Overall, approximately 14.4% of women in this sample of older women omitted RT after BCS, with a 15.7% omission rate in the subset of patients with ER-positive, stage I disease. Among those who received RT, approximately 48.1% received conventionally fractionated whole-breast RT, 26.6% received hypofractionated whole-breast RT, 11% received accelerated partial breast RT, 2.2% reported “other” or the duration was not specified, and 12.1% were scheduled to receive RT but had not yet received it at the time of the survey. On bivariate analysis, age, tumor grade, ER status, SEER region, and income were associated with omission of RT. Figure 1 shows the results of a multilevel logistic regression model that included patient-level variables, SEER site, and surgeon identity. Older patient age, lower tumor grade, and ER-positive disease each were found to be strongly correlated with RT omission. Patient age of 75 to 79 years had a dominant effect, with an odds ratio (OR) of 14.4 (95% confidence interval [95% CI], 5.6-37.1) when compared with an age of 65 to 69 years. The odds of non-English speakers omitting RT were greater when compared with English speakers (OR, 5.9; 95% CI, 1.4-24.5). It is interesting to note that patient comorbidities were not found to be associated with RT omission on either bivariable or multivariable

analysis (OR, 1.3 for ≥ 2 vs 0 comorbidities; 95% CI, 0.6-2.9). Surgeon variables were not found to be significantly associated with omission of RT and therefore were not retained in the final model.

The multilevel model predicted RT omission well, with an area under the receiver operating characteristic curve of 0.83 (95% CI, 0.79-0.87). When analyzing clustering according to the surgeon identifier, the odds of a patient omitting RT would be predicted to increase approximately 2-fold (OR, 1.83; 95% CI, 0.87-3.87) if she were to see a surgeon with a practice approach that was 1 SD above the RT omission rate of an average surgeon (while adjusting for other model covariates). However, this trend for surgeon influence was not found to be statistically significant. In a model restricted to the subgroup of patients with information regarding hormonal therapy, the use of endocrine therapy was not found to be significantly associated with omission of RT, although there appeared to be a trend for women who omit RT to also omit endocrine therapy (OR, 2.22; 95% CI, 0.87-5.65) (data not shown). In a model limited to patients with ER-positive, stage I disease, we again observed that age, tumor grade, and non-English language were significantly correlated with RT omission, without a significant association with comorbidities, similar to the model derived from the larger analytic sample.

Risk Perception and Communication

In the subset of patients with ER-positive, stage I disease, approximately 33.1% of women overestimated their risk of local disease recurrence after all treatments were received as being $>10\%$ at 10 years. Among those who omitted RT, when asked to approximate their risk of local disease recurrence at 10 years, the mean estimate was 19% at 10 years (compared with the CALGB 9343 trial finding of 10%), and among women who received RT, the mean estimate was 17% (in contrast to 2% as reported in the CALGB 9343 trial) (Fig. 2).² The risk of distant disease recurrence was similarly overestimated, with 46% of women approximating their risk of distant disease recurrence as $>5\%$ at 10 years. The mean estimate of 10-year risk of distant disease recurrence was 16.0% (compared with the CALGB 9343 trial finding of 5% both among those who received and those who omitted RT).² In this group of older women with a favorable prognosis, approximately one-quarter (26.9%) reported that within the last month, they had “sometimes,” “often,” or “almost always” worried about their cancer coming back, without significant differences noted for women who received or omitted RT.

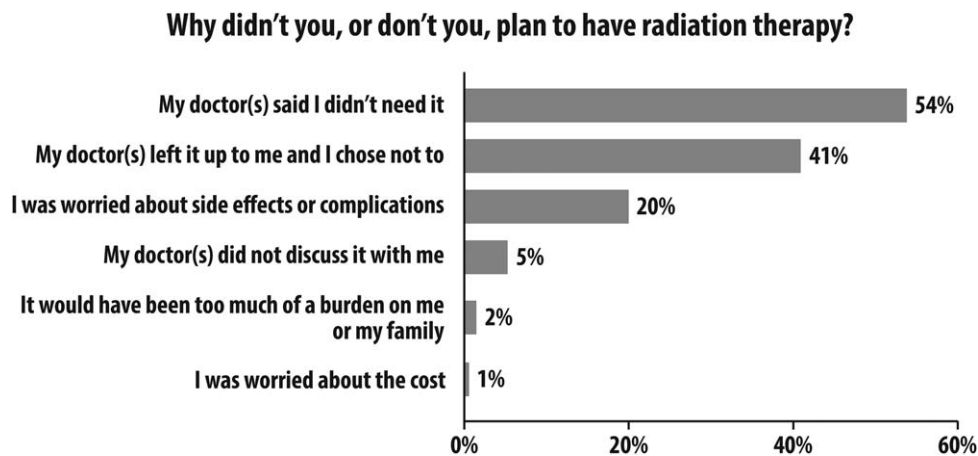


Figure 3. Patient-reported reasons for the omission of radiotherapy. Responses were not mutually exclusive.

With regard to communication with providers, approximately 46.2% of patients in the overall sample reported that their physicians used numeric estimates to describe their risk of the cancer coming back. Approximately one-third of patients (37.9%) reported that their physicians discussed the chance of the cancer coming back “not at all” or “a little bit.” Although the majority of women (70.0%) reported that they preferred that their physicians tell them what to do for breast cancer treatment, women who omitted RT were more likely to report that they preferred to make their own decisions regarding breast cancer treatments compared with women who received RT (45.8% vs 35.7%; $P = .03$).

Patient Preferences and Values

Among women who omitted RT, the most commonly reported reasons were that a physician told the patient it was not needed (53.8% of patients who omitted RT) and that the decision was left to the patient and she chose to omit RT (40.9%) (Fig. 3). Concerns about placing an excessive burden on the family and the absence of discussion with a physician regarding RT were uncommon reasons for omitting RT ($\leq 5\%$). Although approximately 11.8% of patients reported “quite a bit” or “a lot” of worry regarding current or future financial problems as a result of breast cancer and treatments, $<1\%$ of women who omitted RT reported that cost motivated their treatment decision.

When asked about considerations that were important in their decision making, the most commonly reported priorities were that the treatment kept them from worrying about the cancer coming back (74.0%), had a low possibility of complications (73.9%), and allowed them to continue caring for their home and

family (73.6%) (Fig. 4). Women who omitted RT more often endorsed the importance of avoiding exposure to radiation (69% vs 37%; $P < .001$) and the need for fewer trips for treatment visits (49.2% vs 37.2%; $P = .008$).

DISCUSSION

In this large, contemporary survey of older women with early-stage breast cancer, we observed that to a substantial extent, decisions regarding RT omission appear to be appropriately tailored based on older age, ER-positive disease, and lower tumor grade. However, the higher rate of RT omission in non-English speakers and the lack of an association with comorbidity observed herein are concerning. Incorporation of age and pathology findings into the decision to omit RT may be viewed as a starting point, but there remains a great need to further consider comorbidity status and remaining life expectancy to ensure that decisions regarding RT are appropriately individualized.¹⁷

We found that despite having an excellent prognosis, a sizeable percentage of older women with stage I, ER-positive breast cancer overestimate their risk of local disease recurrence, with an average 2-fold overestimation in women who omitted RT and an 8-fold overestimation in women who received RT. Nearly one-half of women perceived that their risk of distant disease recurrence was higher than has been reported in clinical trials, with an average 3-fold overestimation. This unrealistically pessimistic view of disease recurrence risk is reflected in the report from approximately 25% of women that they frequently had worried about cancer recurrence within the preceding month.

The observations in the current study are consistent with prior reports that, notwithstanding a favorable

When decisions were being made about your treatments, how important was it to you that your treatments...

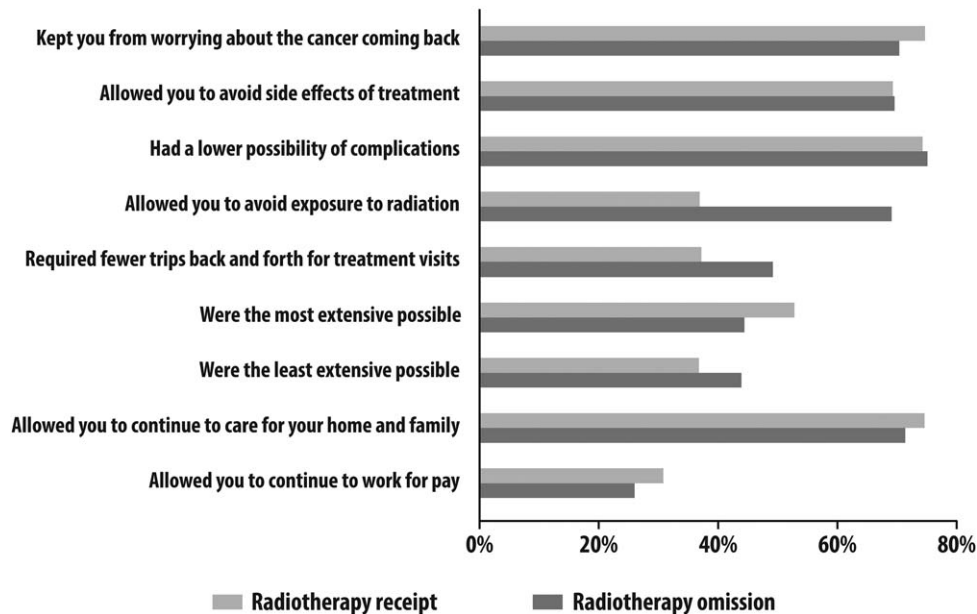


Figure 4. Patient-reported considerations that influenced decisions regarding breast cancer treatment.

prognosis, a large percentage of the most favorable subgroup in the current study sample of older women believed they were likely to develop a local or distant disease recurrence and die of breast cancer, resulting in psychological distress, frequent worry, and a lower quality of life.^{18,19} Overestimation of the risk of disease recurrence may lead to a multiplicative overestimation of risk reduction from interventions,²⁰ resulting in an overly generous attribution of benefits obtained from treatment. This might underlie the correlation that has been observed in prior research between worry about disease recurrence and receipt of RT.^{21,22} It is interesting to note that one of the highest priorities that influenced decision making for women in the current study was that the treatment minimize the worry about cancer recurrence. Although RT undoubtedly does reduce the risk of local disease recurrence,^{2,3} the current study results indicate a need to more clearly communicate the favorable prognosis in this group, and to more directly address worry about disease recurrence and ensure that decisions are optimally informed.

The effects of patient overestimation of risk of disease recurrence may well relate to physician overestimation as has been demonstrated in other work. In a nationwide survey, approximately 19% of radiation oncologists and 32% of surgeons overestimated the 10-year risk of local disease recurrence.¹¹ The reluctance of many surgeons and

radiation oncologists to consider the omission of RT to be a reasonable option in select older women is particularly problematic given the findings of the current study demonstrating that the most common reason given by women to omit RT was advice from a physician that RT was not needed. Furthermore, the majority of women (70%) preferred that their physicians tell them what to do regarding their breast cancer treatment. Therefore, physicians' attitudes and approaches to communication may be particularly important to ensure that patients do indeed consider all options and their risks and benefits. Many potential mechanisms have been considered as possible drivers of physicians' poor communication practices in this setting, including a lack of up-to-date knowledge of clinical trial results,¹¹ heuristics such as risk aversion and anticipatory regret that may motivate physicians and patients alike to embrace overly aggressive treatments,²³ a lack of training in effective risk communication skills,²⁴ and financial incentives that reimburse the delivery of care rather than its omission.⁷ The data from the current study suggest a compelling need to evaluate the relative roles of these underlying drivers further to develop appropriately targeted interventions that encourage clinicians to improve communication in this regard. We find it striking that approximately one-third of women reported minimal discussions with their providers regarding the risk of disease recurrence,

which is absolutely essential for a patient to understand the relative impact of interventions such as RT.

The current study data suggest that surgeons, who are the first breast cancer clinicians to outline a plan of care, may play an important role in decisions regarding the omission of RT. Although we did not detect a statistically significant impact of the surgeon on the likelihood of RT omission, this may be due to the sample size and distribution of patients across surgeons within the current study sample. However, we did observe a notable trend, and others have shown that among women with a short life expectancy, the probability of receiving RT varies substantially across primary surgeons.²⁵

We also found that non-English speakers were significantly more likely to omit RT, even after adjustments for race, income, employment, and educational level. This finding may reflect barriers to high-quality decision making in a vulnerable population. Numerous reports have described non-English speakers as a vulnerable population, particularly Latinas with low acculturation.²⁶⁻²⁹ Latina women who are less acculturated previously have been found to have a greater desire for information, lower satisfaction with breast cancer decision making,²⁹ and perceived powerlessness in medical encounters,³⁰ thereby highlighting a need for greater attention to support these patients and identify potential barriers.³¹ Although disparities often are viewed within the context of undertreatment of an aggressive cancer, with vulnerability related to known risk factors such as lower educational level or minority race, it is interesting to note that vulnerability to overtreatment may be an entirely distinct concept that primarily affects classically privileged populations, as has been observed with trends in contralateral prophylactic mastectomy.^{32,33} The association between language barrier and RT omission is worthy of further exploration in future studies.

We observed a trend for patients who omit RT to also omit endocrine therapy. This is a particularly concerning finding that merits further evaluation because receipt of endocrine therapy is known to have a substantial impact on reducing local disease recurrence³⁴ and is believed to be a key factor leading to the acceptable rates of local failure observed in trials such as CALGB 9343 compared with historical studies in which endocrine therapy was not required.^{35,36} Endocrine therapy nonadherence and discontinuation are known to be an issue for nearly one-half of women with breast cancer in general,³⁷ and if women who omit RT are even more likely to omit endocrine therapy, rates of disease recurrence may be higher than expected.

There are aspects of the current study that merit comment. Its strengths include a contemporary, diverse, population-based sample with a high response rate and specific measures of patients' clinical decision making. Multiple imputation and weighting were used to account for potential bias related to missing data, and to ensure that the results were representative of the overall population. Limitations include data obtained from 2 large SEER regions (Georgia and Los Angeles County), which might not reflect the entire US population. The number of patients who omitted RT was small. Patient responses were necessarily retrospective and may have been subject to recall bias. Finally, the current study evaluated patients' views of RT omission, but did not explore views concerning omitting endocrine therapy rather than RT.³⁸ Nonetheless, we believe the current study offers a novel and clinically relevant view of decision making in older women with favorable-prognosis breast cancer.

The findings of the current study indicate several targets for interventions to improve the quality of older women's decision making regarding RT after lumpectomy. First, although decisions concerning the omission of RT are influenced by some clinical factors, interventions are necessary to ensure that decisions reflect not only considerations of age and tumor characteristics but also patients' health status and remaining life expectancy. Second, communication must improve, as patients cannot share in the making of preference-concordant decisions when they are not optimally informed about key facts such as risk of disease recurrence risk and report that their providers had little discussion with them regarding this issue. Ultimately, we believe that a combination of physician-facing and patient-facing interventions are necessary, as it appears that both patients and physicians play important roles in the predominant intervention bias that has resulted in the overtreatment of many older women with early-stage breast cancer.⁷ The current study results demonstrate that the majority of older women with breast cancer care about avoiding complications as well as reducing worry regarding disease recurrence. Therefore, decision aids that present risk information in understandable formats, such as pictographs,³⁹ constitute particularly promising avenues for the improvement of decision quality in practice. Clear information and communication are critical, both for the subset of older patients with favorable-risk disease in whom RT omission is a reasonable and guideline-concordant option if it accords with individual preferences, and for the subset of individuals with more aggressive or advanced tumors for whom RT remains a fundamental component of cure.

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CONFLICT OF INTEREST DISCLOSURES

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AUTHOR CONTRIBUTIONS

Dean A. Shumway: Conceptualization, methodology, investigation, visualization, writing-original draft, and writing-review and editing. **Kent A. Griffith:** Methodology, data curation, formal analysis, software, writing-original draft, writing-review and editing, and visualization. **Sarah T. Hawley:** Conceptualization, methodology, investigation, writing-original draft, writing-review and editing, project administration, and funding acquisition. **Lauren P. Wallner:** Conceptualization, methodology, investigation, writing-original draft, and writing-review and editing. **Kevin C. Ward:** Conceptualization, methodology, investigation, writing-original draft, writing-review and editing, and project administration. **Ann S. Hamilton:** Conceptualization, methodology, investigation, writing-original draft, writing-review and editing, and project administration. **Monica Morrow:** Conceptualization, methodology, investigation, writing-original draft, and writing-review and editing. **Steven J. Katz:** Conceptualization, methodology, investigation, writing-original draft, writing-review and editing, project administration, and funding acquisition. **Reshma Jagsi:** Conceptualization, methodology, investigation, visualization, writing-original draft, writing-review and editing, and funding acquisition.

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