A Palliative Radiation Oncology Consult Service's Impact on Care of Advanced Cancer Patients

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Abstract

Introduction: Palliative radiation therapy (PRT) is a commonly utilized intervention for symptom palliation among patients with metastatic cancer, yet it is under-recognized as a distinct area of subspecialty within radiation oncology.

Objective: We developed a multidisciplinary service model within radiation oncology called the Palliative Radiation Oncology Consult (PROC) service to improve the quality of cancer care for advanced cancer patients. We assessed the service's impact on patient-related and healthcare utilization outcomes.

Design: Patients were included in this observational cohort study if they received PRT at a single tertiary care hospital between 2009 and 2017. We compared outcomes of patients treated after (post-intervention group) to those treated before (control group) PROC's establishment using unadjusted and propensity score adjusted analyses.

Results: Of the 450 patients in the cohort, 154 receive PRT pre- and 296 after PROC's establishment. In comparison to patients treated pre-PROC, post-PROC patients were more likely to undergo single-fraction radiation (RR: 7.74, 95% CI: 3.84–15.57) and hypofraction (2–5 fraction) radiation (RR: 10.74, 95% CI: 5.82–19.83), require shorter hospital stays (21 vs. 26.5 median days, $p=0.01$), and receive more timely specialty-level palliative care (OR: 2.65, 95% CI: 1.56–4.49). Despite shortened treatments, symptom relief was similar (OR: 1.35, 95% CI: 0.80–2.28).

Conclusion: The PROC service was associated with more efficient radiation courses, substantially reduced hospital length of stays, and more timely palliative care consultation, without compromising symptom improvements. These results suggest that a multidisciplinary care delivery model can lead to enhanced quality of care for advanced cancer patients.

Keywords: bone metastases; consult service; length of stay; palliative radiation therapy; radiotherapy planning; symptom improvement

Introduction

Background

PATIENTS WITH METASTATIC CANCER often experience symptoms of pain and discomfort. Palliation of bone metastases is the most common reason for requesting involvement of a radiation oncologist in the setting of advanced malignancy, often when medical management is no longer adequate.^{1–3} Palliative radiation therapy (PRT), or radiation therapy focused on symptomatic treatment rather than cure, is highly effective in achieving relief of symptoms arising from bone metastases.^{1–4} Evidence suggests up to 50% to 90% symptom and pain relief response rates in cancer patients with painful bone metastases.^{2–4}

Despite its high efficacy, PRT may place an increased burden of care and responsibility on patients and their families. Treatments can involve lengthy durations, including prolonged hospitalizations, and acute treatment-related side effects may sometimes outweigh treatment benefits in patients with shorter life expectancies.³ Evidence supports that shorter treatments like single-fraction or hypofractionated (2–5 fractions) radiation courses provide similar efficacy and pain relief rates as longer treatments without compromising patient functional status.^{3,5} Despite consensus guidelines recommending the use of shorter radiation courses for palliation of bone metastases, PRT patterns in the United States have typically involved more protracted treatment courses, posing challenges for advanced cancer patients in terms of

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financial costs, travel time, and temporary detriments in quality of life.^{6–10}

The point at which patients are experiencing burdensome, debilitating pain symptoms from advanced cancer may be an opportunity for the evaluation of the “whole person,” which invites the involvement of cancer supportive services, including specialty-level palliative care. To facilitate this multidisciplinary work flow, a Palliative Radiation Oncology Consult (PROC) service was established at Mount Sinai Hospital in October 2013. PROC is a radiation oncology clinical service that operates closely with the inpatient and outpatient palliative care service. It is staffed by a radiation oncologist, nurse, administrative assistant, and rotating residents and fellows. The service cares for advanced cancer patients with any type of palliative radiation need. Individual cases are discussed on a regular basis during an associated specialty tumor board attended by PROC representatives. PROC members routinely participate in family meetings where goals of care (GOC) are discussed in a multidisciplinary manner. In this way, radiation oncology and other care teams are directly involved in face-to-face shared decision making, often before the start of radiotherapy.

Objective

Our primary objective was to assess the impact of PROC, a newly designed care delivery model, on clinical and health-care utilization outcomes among advanced cancer patients. While the service cared for patients with metastases involving any anatomic site, we focused our investigation on those who underwent PRT for symptomatic bone metastases.

Methods

Setting and study design

We performed an observational cohort study on the effects of our consult service on PRT planning characteristics, healthcare utilization, and patient treatment outcomes at Mount Sinai Hospital. Mount Sinai Hospital is a high-volume tertiary care center with a patient population spanning diverse socioeconomic backgrounds. We set our period of analysis between December 2009 and February 2017, as this period ensured that all our subjects had electronic medical records at Mount Sinai Hospital. Our study was approved by the institutional review board.

Participants

In this observational cohort study, we focused our investigation on patients who underwent treatment at Mount Sinai Hospital for symptomatic bone metastases since pain improvement, one of our primary outcomes, was more consistently documented in this group. Advanced cancer patients who received PRT for symptomatic bone metastases between December 2009 and February 2017 were thereby eligible. Patients were identified through electronic medical records and presence of an International Disease Classification code denoting secondary malignant neoplasm of bone (ICD-9 code 198.5 and ICD-10 code C79.51). Patients were excluded if they had incomplete medical records or were lost to follow-up.

We defined a radiation treatment course as a group of radiation treatments recommended and prescribed by the radiation oncologist in one consult encounter. These treatments

were typically given within a few (<5) days of each other and may have targeted different anatomic sites, bone and non-bone (but included at least one bone site). We included the last treatment course given to a patient that composed of radiation to a bone site (spine, pelvis, extremities, ribcage, or skull) and confirmed it by checking the anatomic site documented on the radiation treatment prescription. To prevent effects from other conflicting radiation treatment courses, patients were excluded if they received a course of nonbone targeted radiation treatment within 30 days after completing a bone PRT course.

The control and post-intervention cohorts were defined according to two time periods: before the establishment of PROC (December 2009 to October 2013) and after establishment of PROC (October 2013 to February 2017).

Variables

Outcomes of interest. Our outcomes of interest were changes in PRT course planning and completion, pain improvement, hospital length of stay (LOS), and utilization of palliative care services. Details of PRT delivery were reviewed for each record and included the target anatomic site, number of elapsed days of the PRT course, and radiation prescription. Dose fractionation was categorized into single fraction, hypofractionation (2–5 fractions), 6–10 fractions, and >10 fractions. For patients who were unable to complete their entire course of PRT, the reasons for discontinuation were documented.

In accordance with international consensus on palliative radiotherapy endpoints, patients were defined to have experienced pain improvement if provider follow-up notes at one month after PRT included the words, “slight improvement,” “improvement,” or “resolution” in relation to pain at their treated site.¹¹ Patients who experienced worsening or similar pain after PRT were considered to have no pain improvement. Hospital LOS was calculated from admission date to discharge date for any patients who started PRT during a hospitalization. Stays in the emergency department that did not result in an eventual admission to the hospital were excluded. Patients were counted as having utilized palliative care services if their chart documented a consult with a palliative care provider within one month of PRT.

Other predictors. Comparisons were balanced on 13 covariates covering demographic and clinical factors. We used categorical variables for gender, race, primary cancer type, and inpatient status at time of PRT. We used continuous variables for age, Charlson Comorbidity Index (CCI),¹² number of previous PRT courses for bone metastases over the patient’s lifetime, and baseline Eastern Cooperative Oncology Group (ECOG) scores.¹³

Addressing potential imbalances in treated patients

Selection bias was not hypothesized to be a problem in our study since exposure variable designation was decided by time period before or after the PROC was implemented and not according to patient-level factors. However, baseline characteristics may be correlated with outcomes of interest and where distribution of these characteristics differs between cohorts this may lead to bias in analysis. Moreover,

smaller sample size increases the likelihood of imbalance through natural variation across cohorts. To minimize the effects of such confounding, propensity score kernel weights were calculated to balance observed confounders between cohorts.¹⁴ Balance across groups was evaluated with standardized differences both before and after weighting the samples. Samples differ across analyses due to missing data on relevant outcomes, for example, outpatients do not have a hospital LOS. Where samples were altered due to missing outcome data, a new sample-specific propensity score was created each time.¹⁵

Statistical analyses

An unweighted comparison for PRT course characteristics and patient outcomes was performed with χ^2 test for categorical variables (treatment site, fractional groups, discontinuation of PRT, palliative care consultation, and pain improvement) and Mann-Whitney U tests for continuous variables (PRT course total dose and duration and hospital LOS). Weighted comparisons for binary outcome variables were performed with a binary logistic regression using weighted predictor variables (age, CCI, baseline ECOG, gender, race, primary cancer, inpatient status, and number of previous bony PRT courses). A multinomial logistic regression was conducted for cohort effects on the distribution of fractional groups, using the 6–10 fraction group as the reference group. We estimated generalized linear models (GLM) with a γ distribution and a log link for continuous outcome variables.

For LOS, due to a reduced number of samples with these data, primary cancer covariates were condensed to 4 strata: hematologic, breast, lung, and other cancers, yielding a total of 10 covariates used for propensity score matching. Odds ratios were calculated for binary logistic regressions, relative risk ratios for the multinomial logistic regression, and estimated average treatment effects for linear regressions. A Somers' D measurement was used for hospital LOS to determine nonparametric associations not accounted for in our linear regression model. p -values <0.05 were considered statistically significant in all analyses. Propensity score matching was conducted by the Covariate Balancing Propensity Score (CBPS) package in R (version 3.4.0; The R Foundation for Statistical Computing, Vienna, Austria). All statistical analyses were conducted using STATA (version 14.2; StataCorp, College Station, TX).

Results

Patient demographic and clinical information

We identified 450 patients that met inclusion criteria for our analysis, with 154 control patients receiving PRT before the establishment of PROC and 296 post-intervention patients receiving PRT after the establishment of PROC. Demographic and clinical information for these patients are summarized in Table 1. Eight patients were excluded for having incomplete medical records. Nine patients were excluded for receiving an unrelated radiation treatment course within 30 days after finishing their last bone PRT course.

Before matching, there were notable differences ($\geq 10\%$ absolute standardized difference) on baseline covariates between cohorts: age, female gender, white race, prostate cancer,

and inpatient status. The majority of the primary cancers were hematologic malignancies (31.6%), which could be further broken down to multiple myeloma ($n=140$, 98.6%), lymphoma ($n=1$, 0.7%), and leukemia ($n=1$, 0.7%). After matching, baseline imbalances were small with a mean absolute standardized difference of 1% and no absolute standardized difference greater than 3% (Table 1).

PRT utilization and symptom improvement

PRT course characteristics are summarized in Table 2. In total, 1391 palliative radiotherapy courses were prescribed pre-PROC and 1693 courses prescribed post-PROC. The most commonly treated body site for both cohorts was the spine. Patients treated in the post-PROC period received 7 days (median) shorter courses of PRT ($p<0.001$). Compared against pre-PROC patients, the relative risk of post-PROC patients receiving single-fraction and hypofractionated treatments compared to 6–10 fractions increased by a factor of 7.7 and 10.7, respectively, ($p<0.001$).

Symptom improvement and palliative care utilization

Symptom improvement and palliative care utilization are summarized in Table 3. The rate of treatment completion was higher in the post-PROC cohort (92% vs. 86%, $p=0.047$). In total, 44 out of 450 patients (10%) were unable to complete their PRT course due to disease progression ($n=25$, 6%), death ($n=11$, 2%), treatment-related toxicities ($n=4$, 1%), and personal preference ($n=4$, 1%). The majority of patients in both cohorts experienced an improvement in pain at one month follow-up after PRT (73.2% pre-PROC vs. 79.2% post-PROC, $p=0.189$). Difference on pain improvement rates between cohorts was not significant in our logistic regression model ($p=0.263$). Post-PROC patients had 2.7 higher odds of receiving palliative care consults within one month of PRT compared to pre-PROC patients ($p<0.001$).

Hospital LOS

Hospital LOS is summarized in Table 4. Median hospital LOS significantly decreased by around 5 days for post-PROC patients compared to pre-PROC patients (21 days vs. 26.5 days, $p=0.013$). Our Somers' D test yielded a coefficient of -0.2 , indicating that there was a greater likelihood for post-PROC patients to have a shorter LOS compared to pre-PROC patients ($p=0.024$); however, the magnitude of reduction was unclear given the inherent limitations of this statistical test. Our GLM, which analyzed LOS in terms of means rather than medians, yielded an estimated mean treatment effect of -2.8 days for post-PROC patients compared to pre-PROC patients, although the difference was not significant ($p=0.290$).

Discussion

Establishment of a clinical PROC service focused on the radiotherapeutic management of advanced cancer patients was associated with substantial improvements in patient outcomes related to both clinical and healthcare utilization parameters. Patients treated within this specialty service were more likely to receive abbreviated courses of radiation without compromising their symptom improvement, thereby

TABLE 1. PATIENT DEMOGRAPHICS AND CLINICAL CHARACTERISTICS

	<i>Unadjusted samples</i>				<i>Propensity score adjusted samples</i>		
	<i>Pre-PROC</i> (n = 154)	<i>Post-PROC</i> (n = 296)	<i>Absolute</i> <i>SD (%)</i>	<i>p-value</i>	<i>Pre-PROC</i> (n = 154)	<i>Post-PROC</i> (n = 296)	<i>Absolute</i> <i>SD (%)</i>
Age							
Years (Mean)	62.6 ± 13.3	63.9 ± 12.5	10%	0.315	63.7 ± 12.7	63.9 ± 12.5	2%
Range	23–95	25–93					
CCI							
Score (Mean)	5.8 ± 2.6	5.7 ± 2.6	5%	0.620	5.8 ± 2.5	5.7 ± 2.6	2%
Range	1–15	1–15					
Gender							
Female (%)	38.3	43.2	10%	0.314	41.9	43.2	3%
Race							
Black (%)	24.7	27.4	6%	0.539	27.0	27.4	1%
White (%)	46.1	40.5	11%	0.257	41.9	40.5	3%
Other (%)	29.2	32.1	6%	0.532	31.1	32.1	2%
Primary cancer							
Hematologic (%) ^a	31.2	31.8	1%	0.899	31.1	31.8	1%
Breast (%)	12.3	11.5	3%	0.790	11.5	11.5	0%
Lung (%)	16.2	17.2	3%	0.789	17.3	17.2	0%
Prostate (%)	6.5	9.1	10%	0.336	9.0	9.1	1%
Liver (%)	11.7	9.1	8%	0.389	9.5	9.1	1%
Other (%)	22.1	21.3	2%	0.846	21.5	21.3	1%
Status							
Inpatient (%)	44.2	34.1	21%	0.037	35.6	34.1	3%
Number of lifetime bone PRT courses							
Mean	1.1 ± 0.3	1.1 ± 0.3	5%	0.607	1.1 ± 0.3	1.1 ± 0.3	0%
Range	1–3	1–3					
Baseline ECOG							
Mean	1.7 ± 0.9	1.7 ± 1.0	7%	0.519	1.7 ± 0.9	1.7 ± 1.0	0%
Range	0–4	0–4					

^aHematologic cancers include multiple myeloma, lymphoma, and leukemia.

SD, Standardized Difference; ECOG, Eastern Cooperative Oncology Group; PROC, Palliative Radiation Oncology Consult; PRT, palliative radiation therapy.

reducing some burdens associated with time spent undergoing radiation. Patients were also more prone to finish their prescribed radiation course and undergo palliative care consultations within a month of PRT. Those who started PRT as inpatients stayed for a shorter duration in the hospital. Overall, our service allowed for a near doubling of referrals for patients who may benefit from more appropriate PRT (154 vs. 296 patients).

In general, roughly 40%–50% of patients referred for radiotherapy are treated with palliative intent.^{16–18} Despite this large scope of practice, our clinical service model represents one of only a handful of similar service models in current existence that combines radiation oncology with supportive services such as specialty palliative cancer care. Published data from the Rapid Access Palliative Radiotherapy model in Edmonton, Canada demonstrate similar improvements in terms of use of shorter treatment courses, as well as faster access to PRT for patients with urgent need.^{19,20} The Supportive and Palliative Radiation Oncology (SPRO) service at the Brigham and Women's Hospital/Dana-Farber Cancer Institute similarly devised a team of radiation oncology and palliative care providers with the goal of integrating palliative care principles into radiation therapy.^{21,22} Surveyed clinicians under SPRO saw an enhancement in the quality of

palliative cancer care by virtue of improved treatment plans that were appropriate to patients, communication with patients and their families, time dedicated to palliative care services, and patient follow-up.²¹

Our study adds to the existing literature by demonstrating the direct impact of a care delivery model on patient-related and healthcare utilization measures beyond shortened treatments. Notably, there was a significant reduction in median hospital LOS for patients treated within PROC during a hospitalization. Our unadjusted analysis demonstrated a 5.5 day (median) reduction in hospital LOS. We used GLM in our adjusted analysis of this parameter, which tracked LOS in terms of means rather than medians. This limitation in our analytic method may explain why the adjusted *p*-value was not significant, yet the magnitude of the treatment effect remained substantial. Upon closer evaluation of several patients in the pre-PROC cohort, patients with poor functional status or otherwise unable to travel to radiation were more inclined to remain hospitalized for the duration of their radiation course.²³ To our knowledge, the association between a palliative radiation oncology clinical service model and reduction of hospital LOS has not been established previously. No other study has found a similar magnitude of reduction in LOS as a result of any palliative intervention. Our

TABLE 2. CHANGES IN PALLIATIVE RADIATION THERAPY COURSE CHARACTERISTICS BEFORE AND AFTER ESTABLISHMENT OF PROC

<i>Treatment site (%)</i>	<i>Unadjusted outcomes</i>			<i>Propensity score adjusted outcomes</i>		
	<i>Pre-PROC (n = 154)</i>	<i>Post-PROC (n = 296)</i>	<i>p-value</i>	<i>OR</i>	<i>95% CI</i>	<i>p-value</i>
Spine	65.6	59.5	0.205	0.92	0.60–1.42	0.715
Pelvis	15.6	23.7	0.046	1.68	0.99–2.86	0.056
Extremity site	18.8	19.6	0.846	0.88	0.52–1.50	0.634
Ribcage site	6.5	7.1	0.811	1.06	0.44–2.56	0.894
Skull site	7.1	5.7	0.560	0.79	0.35–1.79	0.569
Nonbone	7.8	7.4	0.891	0.94	0.41–2.14	0.876
<i>Fractional group (%)^a</i>				<i>Relative RR</i>	<i>95% CI</i>	<i>p-value</i>
Single fraction	9.7	24.0	<0.001	7.74	3.84–15.57	<0.001
Hypofractionated (2–5 Fractions)	14.3	44.9		10.74	5.82–19.83	<0.001
6–10 fractions	59.1	27.0		Reference		
>10 Fractions	16.9	4.1		0.54	0.23–1.23	0.141
<i>Prescription dose (cGy)</i>				<i>ATE (cGy)</i>	<i>95% CI</i>	<i>p-value</i>
Median	3000	2000	<0.001	–528.8	–667.0 to –390.6	<0.001
Range	800–4000	800–4500				
<i>PRT course duration (Days)</i>				<i>ATE (Days)</i>	<i>95% CI</i>	<i>p-value</i>
Median	13	6	<0.001	–5.3	–6.7 to –3.8	<0.001
Range	0–45	0–44				

^aReference group for multinomial logistic regression was set at 6–10 fractions.

OR, odds ratio; CI, confidence interval; RR, risk ratio; ATE, average treatment effect; cGy, centiGray.

observation can be attributed to a combination of factors: our service model's facilitation of earlier-onset palliative care consultations, increased use of single-fraction and hypofractionated radiation treatments in patients with limited prognoses, and upfront shared decision making about goals and expectations of PRT before its start.

Establishment of PROC was associated with earlier receipt of specialty palliative care services, as seen by the significant increase in the number of palliative care consultations obtained within one month of PRT. This observation can be credited to the routine initiation of referrals to palliative care services by the PROC team. In the same year that PROC was established, a pilot palliative care consultation program was initiated in the same hospital to promote palliative care consultation among inpatients with solid tumors. A recently published study from this program found an increase in palliative care consultations for hospitalized patients with advanced solid cancers. However, hospital LOS was not affected.²⁴ The observed decrease in radiation fractionation and shorter LOS in our study are thus likely better accounted

for by changes implemented by our consult service than by this or any other concomitant hospital-wide systemic change.

An important dimension of the PROC model was the routine engagement of PROC team members in goals of care (GOC) conversations with patients and their families. The timing of PRT for many of the patients in the post-PROC cohort coincided with transitioning GOC, heightening the importance of discussions regarding functional status, disease progression, and appropriateness of radiotherapy. The leading PROC radiation oncologist and majority of PROC team members had undergone communication skill training which facilitated challenging conversations regarding prognosis and GOC. Given the nature of these discussions, a radiation oncologist trained in principles of primary palliative care could satisfy both the radiotherapy and primary palliative care needs of patients. At present, primary palliative care training is not widely provided in radiation oncology residency programs, although it is increasingly being recognized as an important yet currently inadequate part of radiation oncology training.²⁶ Until the time when radiation oncologists

TABLE 3. SYMPTOM IMPROVEMENT AND PALLIATIVE CARE UTILIZATION BEFORE AND AFTER ESTABLISHMENT OF PROC

	<i>Number of subjects</i>		<i>Unadjusted outcomes (%)</i>			<i>Logistic regression</i>		
	<i>Pre-PROC</i>	<i>Post-PROC</i>	<i>Pre-PROC</i>	<i>Post-PROC</i>	<i>p-value</i>	<i>OR</i>	<i>95% CI</i>	<i>p-value</i>
Symptom improvement	127	255	73.2	79.2	0.189	1.35	0.80–2.28	0.263
Palliative care consults	154	296	35.1	44.9	0.044	2.65	1.56–4.49	<0.001

TABLE 4. HOSPITAL LENGTH OF STAY BEFORE AND AFTER ESTABLISHMENT OF PROC

	<i>Unadjusted outcomes (Days)</i>			<i>Somers' D</i>			<i>Generalized linear regression model</i>		
	<i>Pre-PROC</i> (n=68)	<i>Post-PROC</i> (n=101)	p-value	<i>Coefficient</i>	<i>95% CI</i>	p-value	<i>ATE</i> (Days)	<i>95% CI</i>	p-value
Hospital LOS									
Days (Median)	26.5	21	0.013	-0.2	-0.39 to -0.03	0.024	-2.8	-7.84 to 2.34	0.290
Range	2-105	2-139							

LOS, length of stay.

are consistently trained to provide primary palliative care, most radiotherapy patients would benefit from specialty palliative care consultation at the time of PRT evaluation.

In our study, unfinished treatments were another manifestation of overwhelming treatment burden. More patients completed the prescribed radiation in the post-PROC period, which was found to be significant according to the unadjusted analysis. This finding was also likely the result of shared and multidisciplinary decision making regarding the expectations and details of radiation treatment before start of radiation. Moreover, supportive services at the start of PRT ensured that acute treatment-related toxicities were aggressively managed before they became unbearable for patients and were thus obviated as a potential reason for premature termination. Our finding lost statistical significance after adjusted analyses, likely due to a low number of events.

There are certain limitations regarding our study. First, our study is an observational cohort analysis, which controls only for observed confounding. Our results are not necessarily generalizable, given that our patient database is from a single institution. Since Mount Sinai Hospital is a tertiary care center, there may be a predilection for a population of patients with more advanced and complex diseases, which may not be reflected in community settings. In addition, our cohort included a large number of patients with multiple myeloma. This observation reflects the fact that our institution is a major referral center for treatment of multiple myeloma. Although our service is not standard of care for other hospitals, we would consider expanding PROC on a more general level so that it could be applicable to other institutions.

We did not take into account potential interactions with other therapies like surgical procedures, chemotherapies, or target-based immunotherapies. Given how our study was divided temporally, patients in the post-PROC period may have undergone newly advanced cancer treatments, which could have impacted outcomes. In addition, total oral morphine equivalent opioid usage, a more specific assessment of pain response to PRT, was not consistently available in our observational cohort study. We anticipate that collecting these data systematically in prospective studies will enhance our assessment of pain response. Another limitation in our study is that radiotherapy-related toxicities were excluded from our analysis due to their varying consistency of documentation in radiation treatment summaries. Treatment-related side effects could have impacted healthcare utilization and quality of care for patients. However, multiple randomized trials have found a lower incidence of acute toxicities (e.g., nausea and vomiting, diarrhea, fatigue) among single-fraction courses compared to multiple fraction (>1 fraction) courses, although these differ-

ences were not statistically significant.²⁵ No other trials have established a significant difference of short- or long-term side effects between these two fractionation schemes. Finally, our GLM yielded a wide confidence interval for average treatment effect on hospital LOS. A larger sample size of hospitalized patients receiving PRT will be needed to derive a more precise treatment effect estimate. Regardless of these limitations, clear changes in patient outcomes were observed that should provide insight on how to best manage advanced cancer patients with symptomatic bone metastases.

Conclusion

Our analysis demonstrates the feasibility and efficacy of a management approach incorporating both radiation therapy and palliative care for advanced cancer patients with bone metastases. Our PROC service allowed for the use of shorter, more efficient radiation treatment regimens in line with ASTRO's guidelines. As a result, patients were more likely to complete their prescribed radiation treatment courses, obtain earlier palliative care services, and spend fewer days in the hospital. Symptom improvement was not compromised despite the use of shorter treatment courses. Consequently, our service reduced treatment burdens related to palliative radiotherapy and enhanced the overall quality of care for advanced cancer patients and their families. Expanding this care model to other institutions may improve symptom and utilization outcomes for advanced cancer patients on a broader scale.

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