

Critical Review

Financial Toxicity in Radiation Oncology: Impact for Our Patients and for Practicing Radiation Oncologists



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Abstract

With rising costs of diagnosis, treatment, and survivorship, financial burdens on patients with cancer and negative effects from high costs, called financial toxicity (FT), are growing. Research suggests that FT may be experienced by more than half of working-age cancer survivors and a similar proportion may incur debt or avoid recommended prescription medications due to treatment costs. As FT can lead to worse physical, psychological, financial, and survival outcomes, there is a discrete need to identify research gaps around this issue that constrain the development and implementation of effective screening and innovative care delivery interventions. Prior research, including within a radiation oncology-specific context, has sought to identify the scope of FT among patients with cancer, develop assessment tools to evaluate patient risk, quantify financial sacrifices, and qualify care compromises that occur when cancer care is unaffordable. FT is a multifactorial problem and potential solutions should be pursued at all levels of the health care system (patient-provider, institutional, and systemic) with specific regard for patients' individual/local contexts. Solutions may include selecting alternative treatment schedules, discussing financial concerns with patients, providing financial navigation services, low-cost transportation options, and system-wide health policy shifts. This review summarizes existing FT research, describes tools developed to measure FT, and suggests areas for intervention and study to help improve FT and outcomes for radiation oncology patients.

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Introduction

Cancer is the second leading cause of death and one of the most expensive diseases to treat in the United States,^{1,2} and costs have risen dramatically in the 21st century.³ Out-of-pocket (OOP) costs for patients covered by

public or private health insurance have increased in lock-step,⁴ as has the share of bankruptcies attributable to medical causes.⁵ Currently, much research on FT for patients with cancer focuses on OOP medical expenses, as annual costs in the United States have been estimated to exceed \$5.6 billion.⁶ However, studying only OOP costs may fail to capture the full complement of financial burdens borne by patients with cancer, including employment disruption⁷ and long-term financial instability,⁸ which can persist for years after a cancer diagnosis.

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The cumulative psychological and behavioral tolls of these costs have been termed “financial toxicity” (FT), specifically referring to financial effects “akin to physical toxicity, which can diminish quality of life (QOL) and impede access to the highest quality care.”^{9,10} Similar to general trends within cancer care, an increasing number of radiation oncology (RO) patients face substantial FT. A variety of tools have been used to study FT across various cancer types (such as central nervous system, breast, and head and neck cancers¹¹⁻¹⁶) including in the RO context, specifically.

This review summarizes the scope of FT among patients with cancer (with an emphasis on patient experience in the United States), describes methods of quantifying FT, and discusses outstanding research gaps and potential interventions to mitigate FT and improve QOL and outcomes for RO patients.

Effects of financial toxicity on patients with cancer

Patients with cancer commonly report FT during and after treatment. Systematic reviews have suggested that FT is experienced by over half of working-age cancer survivors and that a similar proportion incur debt or avoid recommended prescription medications due to treatment costs.^{17,18}

Patients may experience FT based on a range of contributing factors. Direct costs of care include OOP payments for recommended surgical, medical, and radiation treatments as well as necessary supportive care such as medications, nutrition/dietician care, social work, home health aides, and palliative or end-of-life care. These costs may be paid entirely by the patient or may be reduced by health insurance (whether public or private), discount programs from hospitals or treatment manufacturers, or other forms of financial assistance. However, the availability of such aid may differ substantially based on a patient's place of residence, socioeconomic status (SES), or other factors. Indirect costs may include transportation, food/nutritional supplementation (eg, meal-replacement shakes for patients with dysphagia), or housing costs if traveling away from home for treatment. Finally, time away from work for treatment appointments or due to side effects may result in loss of income (or even loss of employment entirely) by the patient or their caregivers.¹⁹

Disease and treatment factors that may influence costs include type and stage of cancer, recommended treatment, symptom burden from cancer and treatment, as well as patient-specific factors including age, racial/ethnic identification, gender, SES, availability of paid medical leave, insurance coverage, comorbidities or functional limitations that lead to employment disruption, and cost-sharing requirements.²⁰⁻²² These factors can all influence the likelihood of experiencing cancer-related FT, leading

to material consequences such as reduced income or savings, debt, or even bankruptcy; and psychological consequences such as reduced QOL, depression, and anxiety. FT can further lead to coping strategies such as reducing spending on noncancer costs (either medical or nonmedical), leading to additional consequences and causing a downward spiral that can be difficult to break.²³

Cancer patients' QOL is strongly influenced by FT. One study has even suggested that FT is the single most influential factor affecting QOL for patients with cancer, with patients experiencing FT having a 4-fold decrease in the likelihood of reporting a high QOL.¹³ Another study of patients with stage II-IV lung cancer demonstrated a correlation ($r = 0.41$; $P < .001$) between FT and QOL and found that 3 simple risk factors (inability to afford necessities, possessing <1 month's worth of expenses in savings, and being employed but on sick leave) strongly correlated with increased FT.²⁴ A secondary analysis of a cluster randomized trial of 536 patients over 70 years old with stage III or IV cancer found that FT is significantly associated with not only QOL but also with negative psychological traits such as depression, anxiety, and emotional distress.²⁵ Additional research suggests that FT may correlate with worse clinical outcomes, including a prospective analysis of patients with locally advanced non-small cell lung cancer that suggested that patient-reported FT may be a significant predictor of reduced progression-free survival.²⁶

Patients from underserved populations (such as members of linguistic, racial or ethnic minority groups) may be specifically and disproportionately vulnerable to FT. One analysis of 2502 patients with early-stage breast cancer using Surveillance, Epidemiology, and End Results program data found that 42% of patients reported that their financial status was “worse off at least partly due to breast cancer.” Approximately 37% of white patients and 35% of Asian patients reported financial hardship, compared with 49% of Latina patients and 55% of Black patients. Although fewer than a third of white patients (27%) took on new debt as a result of cancer treatment, Black patients were twice as likely to have done so with more than half (59%) reporting debt. Twice as many Black patients (32%) than white patients (12%) reported inability to pay bills and needed to cut food spending due to treatment costs (45% vs 22%, respectively).²⁷ Three percent of all patients in this study even reported losing their home due to treatment, reaching 5% to 6% among Black and Latina patients.

Patients with cancer are more likely to declare bankruptcy than individuals without a cancer history. One study from Washington State found that cancer patients are more than 2.5 times more likely to declare bankruptcy than control patients without cancer, with younger patients having higher relative risks than older patients.²⁸ Additional analysis concluded that patients with cancer who declared bankruptcy have a hazard ratio for death of 1.79 ($P < .001$)

compared with a propensity-matched sample of patients with cancer who did not declare bankruptcy. Statistically significant mortality risks were found for subgroups of patients with breast (HR = 1.48), lung (HR = 1.55), prostate (HR = 2.07), and colorectal (HR = 1.49) cancers.²⁹ Although health insurance has been shown in a meta-analysis to reduce the risk of bankruptcy among patients with cancer,³⁰ a study of all bankruptcy petitions (n = 118,308) in the United States between January and April 2007 found that 62% of all bankruptcies had a medical cause and that in three-quarters of medical bankruptcies, the debtor was covered by health insurance.⁵

Even among those who do not declare bankruptcy, many patients with cancer still face significant financial burden from OOP costs. Using data from 1409 community-dwelling Medicare recipients with newly diagnosed cancer, Narang et al found that without supplemental insurance coverage on top of standard Medicare benefits, patients' median annual OOP expenditure was \$3743, with a mean annual OOP cost of \$8115. Patients at the 90th-percentile of spending had OOP costs of more than \$17,000.³¹ When the authors calculated "financial burden" as the ratio of OOP/household income, patients without supplemental insurance experienced an average burden of 23.7%, indicating that nearly a quarter of their total household income was going to medical costs. At the 90th percentile, patients without supplemental insurance spent 63.1% of their total household income on medical costs. Patients with private supplemental insurance (either "Medigap," employer-sponsored, or Medicare HMO) reported higher OOP costs and financial burden ratios than patients with supplemental Medicaid or Veteran's Administration coverage, although OOP expenditures for patients with Medicaid or Veteran's Administration supplemental coverage still reached around one-quarter of income at the 90th percentile, suggesting potentially substantial financial burdens for many patients regardless of insurance coverage.³¹

Financial toxicity in radiation oncology practice

Additional research has evaluated FT specifically among patients receiving radiation therapy (RT). In one study from the University of Kansas, RO patients who live in rural regions experienced significantly worse FT than urban residents.¹¹ Hypofractionated treatments, such as stereotactic body radiation therapy (SBRT), may help mitigate FT for patients undergoing RT, although one study of prostate patients treated at Memorial Sloan Kettering Cancer Center failed to show that SBRT significantly improved FT.³²

Studies from other countries, even those that provide universal health insurance to citizens, have also found

that RO patients experience FT. A cross-sectional study in Germany reported that 68% of patients receiving RT said that direct costs were a source of FT and 25% experienced loss of income. Nearly one-third of patients reported experiencing subjective financial distress, which was associated with lower household income.³³ Such studies emphasize that even if costs of care are not borne by patients, FT can arise from other sources such as lost income from employment disruption.

Radiation Oncologists are increasingly aware of FT among their patients. A survey of 210 American Society for Radiation Oncology (ASTRO) members found that 53% of respondents were "very concerned" about patient FT and that 52% would consider FT when recommending treatment if equipoise existed between multiple options. Eighty percent said they would support adopting an FT screening tool in their practice. However, despite this awareness among ROs, 75% also reported that they neither routinely screen patients for FT nor discuss costs with patients.¹⁹ Patients also report desires to discuss costs with their medical team but that these desires are unmet. Among nearly 1000 patients with early breast cancer who said they "at least somewhat" worried about FT, 73% stated that their cancer team (oncologists or their staff) did little to help them.²⁷ Among more than 500 patients who expressed a desire to discuss financial or employment effects from their breast cancer, more than half (55%) reported never having a relevant discussion with any professional (physician, staff, social worker, or other professionals).²⁷

However, by the time many patients are referred to RO, they have often undergone a significant number of clinical visits, diagnostic tests, or treatment modalities with other specialties (eg, radiology tests, surgery, chemotherapy/immunotherapy, etc) with attendant costs. Jiang et al reported that patients undergoing curative-intent concurrent chemoradiotherapy attended an average of 9 clinical appointments and 4 diagnostic tests before RO consultation. Most patients in that study reported FT before the start of their therapy, suggesting that even pre-treatment workup contributes significantly to FT even before encountering the significant costs of treatments like surgery, chemotherapy, immunotherapy, RT, etc.³⁴

Measurements of financial toxicity

Methods to quantify and accurately describe FT are essential to facilitate screening and interventions to mitigate the effects of FT. Historically, some instruments have focused on objective measurements of FT (eg, OOP expenses) and others describe subjective parameters (eg, patient-reported distress). Because FT reflects cumulative effects of OOP costs, lost income and job opportunities, medical debt, personal bankruptcy, and other costs,³⁵ FT

tools should be comprehensive, inclusive of these factors, and be validated for many cancer types.

One survey used for characterizing FT is the Medical Expenditure Panel Survey (MEPS), which draws its sample from the National Health Interview Survey, an ongoing survey about the general health conditions of adults in the United States.³⁶ MEPS collects extensive data on medical expenditures and their consequences, including insurance information, cost of care, OOP costs, employment changes, medical debt, financial distress, and behavioral coping strategies such as delaying or foregoing care in order to save money. Recently, supplemental survivorship questions have been added inquiring about financial burdens, access to medical care, employment patterns, health care utilization and expenditures, and use of prescription drugs among cancer survivors. Although comprehensive, this questionnaire is more suitable for surveillance and research, rather than routine clinical practice.

Another commonly used instrument comes from the European Organization for Research and Treatment of Cancer (EORTC) Core Quality of Life questionnaire (EORTC QLQ-C30), a well-validated 30-question questionnaire for the QOL of patients with cancer, including physical, psychological, and social effects of cancer.³⁷ One question evaluates the financial effects of cancer on patients by asking “Has your physical condition or medical treatment caused you financial difficulties?” Patients respond via a Likert scale: Not at all, A little, Quite a bit, or Very Much.³⁸ This single question provides a quick description of patients’ financial burdens, but it does not address the full spectrum of FT effects. Additionally, it has never been validated for use as a single question to assess FT.

The concepts of financial stress and financial strain have also been used to evaluate FT. Francoeur defined objective financial stress as stressors for the household and subjective financial strain as an individual’s perception of that financial stress.³⁹ Sharp et al used Francoeur’s definitions to develop two 7-level Likert questions⁴⁰ and found that 49% of patients with cancer experienced financial stress and 32% experienced increased financial strain. Although financial stress and strain offer more insight into a patient’s FT, the measures have not been validated to date.

The InCharge Financial Distress/Well-Being Scale is a validated instrument to measure financial distress using 8 short questions which address both a person’s objective financial well-being (eg, “How confident are you that you could find the money to pay for a financial emergency that costs about \$1000?”) and their reaction to their financial status (eg, “What do you feel is the level of your financial stress today?”) The instrument has been validated within a general population and was not designed specifically for patients with cancer, although it has been used in cancer FT studies.^{41,42}

The Comprehensive Score for Financial Toxicity (COST) questionnaire has been developed to specifically

measure FT among patients with cancer. The COST score was developed in an advanced cancer population based on literature review and interviews with patients and oncology experts addressing themes including distress, coping, family, financials, and available resources. The most recent version (version 2) contains 11 Likert-scale questions, each scored from 1 to 4 points, yielding a total score from 0 to 44, with higher scores suggesting less FT. A 12th question (“My illness has been a financial hardship to my family and me”) is not scored but is meant to serve as a summary item. As the only widely available, validated measure of FT for patients with cancer, COST is commonly used both to screen for FT and to evaluate the effectiveness of FT interventions.⁴³ It has been used to correlate FT with QOL, delays in care, treatment discontinuation, follow-up care, and to measure the effects of financial navigation programs.^{44,45} Sadigh et al used the COST score in a pilot study of their remote cost communication and financial navigation program, which decreased patient worries about financial hardships.⁴⁵ The COST measure has been validated in many languages for use around the world, such as in Japan, China, Korea, Brazil, and Turkey.⁴⁶⁻⁵⁰ It is available without cost from the Functional Assessment of Chronic Illness Therapy (FACIT) group. The COST questionnaire is easy to use in a clinical setting as the answers to the questionnaires can be collected during a routine follow-up and trends can be followed over time. Increased use of COST may allow for routine clinical implementation of future FT interventions, such as financial navigation programs or FT screening programs.

Reliable and validated measures of subjective FT should be collected in research and routine practice. To obtain a nuanced picture of FT, subjective measures of FT can be supplemented with objective FT metrics, including bills sent to collections, percentage of income spent on OOP costs, debt levels, credit scores, and medical bankruptcy have also been examined.^{22,51} As the field of FT evolves, new instruments should be developed and validated for different sociodemographic (including non-English speaking) and clinical populations.⁵²

Interventions to address financial toxicity

Available evidence suggests that FT is common among patients with cancer generally, and RO patients specifically. It is widely recognized as a problem by patients and physicians but remains uncommonly discussed and poorly addressed. Reliable methods to identify FT and interventions to mitigate its effects are needed to move from awareness of the problem toward potential solutions. To succeed, methods depend heavily on an individual patients’ context, including understanding a patient’s prognosis, functional status/deficits, goals of care, family situation, cultural background, SES, availability of

financial and health insurance resources in the local area/state, and many others. Given that FT may manifest very early in a patient's cancer journey (often well before RO referral is made), all physicians and care providers must be aware of FT. Although ROs can play an important role in helping to address FT, all participants in the health care system can identify FT and help those patients who are experiencing it at the earliest possible stage.

Comprehensive data on cancer-related costs, improvements in communicating cost data to patients, and establishing system-level infrastructure to support price transparency and financial navigation are keys to developing strategies to address FT.⁷ However, when thinking about FT, patients, providers, and policymakers may tend to focus on only one component of FT as the solution to the entire problem (eg, availability of public/universal health insurance, high sticker-price of drugs/treatments, work disruption from appointments, etc). A multifactorial approach to understanding and addressing FT within a patient's individual or local context is preferred to a one-size-fits-all model.

It is also critical to realize that prior research in FT has mostly focused on convenience samples of English-speaking patients in predominately white, non-Hispanic cohorts. As FT may disproportionately affect communities affected by social determinants of health and structural racism,⁶ a specific research focus on historically (and currently) marginalized communities is essential. Specific research into effective interventions targeted at these marginalized communities (including racial/ethnic, religious, or linguistic minority groups and patients with low SES) should be pursued to provide extra benefit to those patients and communities most affected by FT.

Potential solutions to FT that provide real benefits to patients can be pursued within patient-provider, institutional, and systemic frameworks.⁵³ Table 1 summarizes potential sources of FT and possible interventional solutions. At the interpersonal level, screening patients for FT with validated instruments could allow physicians and the care team to address FT with patients during routine care appointments. Providers can initiate conversations with patients to encourage optimized, value-based care, and ongoing cost discussions may help identify potential costs incurred throughout the treatment course and beyond. A majority of patients with cancer (50%-80%) report a desire to engage in cost conversations with their oncologists.^{54,55} However, only 19% of patients report actually having these conversations with their physician, and only 28% talked to any health care professional about their financial burdens, suggesting that many patients may be suffering silently from FT.^{54,55} In another review of cost communication in oncology, this time from the providers' perspectives, around half (47%) of physicians reported talking to their patients about cost⁵⁶ potentially highlighting the disconnect between what patients and providers feel constitutes an effective cost conversation.

Financial discussions should include not only the costs of medical treatments, but also effects on employment and financial stability. Based on a national survey, 37% of working-age cancer survivors reported never discussing the effects of their cancer on employment, precluding opportunities to tailor treatment scheduling around work or preparing patients to negotiate accommodations with their employer.⁵⁷ Another survey at NCI Designated Cancer Centers found that 70% of centers either "strongly agreed" or "agreed" that oncologists were reluctant to discuss financial issues with patients with cancer.⁵⁸ More than half of centers also "strongly agreed" or "agreed" that patients with cancer may be reluctant to ask for help when they need it, underscoring the importance of proactive cost conversations and creating social norms around addressing cost concerns.⁵⁸

Cost conversations may be further stymied by lack of price transparency, which provides an institutional-level opportunity for addressing FT. Among NCI-Designated Cancer Centers, 72% of centers "strongly agreed" or "agreed" that it was difficult to determine how much a patient's treatment would cost.⁵⁸ This finding reflects the complicated landscape of health insurance, benefits, manufacturers, coupons, patient assistance programs, and other factors that interact to determine OOP costs for patients in the United States.^{59,60} Price transparency has been shown to reduce costs, with one study reporting that a majority of patients who discussed costs of treatment were able to reduce expenditures. Such cost conversations helped 6% of patients coordinate care and decrease the frequency of clinic visits, 19% switch to less expensive medication, 25% of patients had their physicians appeal to their insurance, and 53% of patients were referred to appropriate financial assistance.⁵⁴ Future research should address meaningful and actionable cost communication, including methods for tailoring communication to diverse clinical and cultural contexts and within distinct periods in a cancer treatment trajectory.

Dedicated financial navigation staff at treating institutions may help bridge this gap between awareness of FT and meaningful solutions. Nearly all NCI-Designated Cancer Centers state that they offer their patients assistance with understanding medical bills and OOP costs and with applications for applying for health insurance, pharmaceutical assistance programs, and medical discounts.⁵⁸ Despite these services and resources, 40% of centers indicated that there was a lack of staff awareness about financial services for patients with cancer and that staff did not have enough time or capacity to coordinate financial services for patients.⁵⁸ These results underscore the need to improve awareness of financial assistance services among both patients and staff, and to enhance care coordination and delivery to connect patients who are concerned about or experiencing financial hardship with available services. For RO, building additional capacity to deliver comprehensive financial navigation and

Table 1 Contributing factors for financial toxicity and opportunities for intervention

Contributing factor	Opportunity for intervention
Lack of early identification of financial toxicity	Screening programs Cost awareness training for all staff members Health insurance literacy training for patients
Cost of surgical, medical, radiation oncology treatments	Price transparency Cost discussions with providers or dedicated staff Training for staff along the care continuum Financial toxicity tumor boards Financial navigation apps Choosing Wisely/value-based care models Assistance to patients in applying for health insurance coverage
Transportation costs	Parking cost assistance/discounts Transit passes Ride share programs Facilitate national not-for-profit assistance through Lazarex or through organ site specific (eg, Leukemia & Lymphoma Society Pay-It-Forward Patient Travel Assistance, Sarcoma Alliance Hand in Hand)
Medication assistance	Facilitated application to pharmaceutical assistance programs Shared decision making regarding low-cost alternatives Knowledge sharing of low-cost pharmacy alternatives (eg, GoodRx, Cost Plus Drugs)
Employment disruption	Minimize appointment times Offer extended treatment hours Schedule appointment times during off-hours or around work hours for those currently employed Advocate for federal and state paid medical leave and caregiver leave both as individuals and within professional societies such as ASCO, ASTRO, AACR Telehealth appointment options Counseling patients about relevant legal protections Proactive discussions about employment disruption
Other costs of living	Provide food in waiting room Facilitate financial assistance through nonprofits Public assistance program navigation

Abbreviations: AACR = American Association for Cancer Research; ASCO American Society of Clinical Oncology; ASTRO = American Society for Radiation Oncology.

evaluate whether patients are referred to and helped by different financial services is critical to delivering high-quality care and improving patient outcomes.⁷

Health care technology is another potential tool to help reduce unexpected costs and improve affordability for patients. Researchers at Duke University developed a mobile financial navigation app aimed at helping patients identify eligible financial assistance programs and initiate contact with financial counselors.⁶¹ In a randomized trial, 30% of patients who used the app received financial assistance while only 9% who did not use the app received assistance, underscoring the effectiveness of the app in helping connect patients to eligible financial assistance programs. Financial navigation “bootcamps” have also been developed that help train health care providers and staff to help navigate patients through the circuitous system of health insurance, fees, and co-pays, such as one offered by the Association of Community Cancer Centers (ACCC).⁶²

In addition to addressing direct costs of cancer treatment, strategies should also aim to reduce indirect cancer care expenses. For example, more than 40% of cancer survivors report employment disturbances,⁶³ and additional travel costs per cycle of outpatient treatment is between \$40 to \$100.⁶⁴ When patients are asked which practical efforts could help improve affordability, 27% of patients said access to free food during or around appointments, 41% cited access to a public transit pass or free rides to and from appointments, and 35% said minimizing wait time associated with appointments “that keeps me away from work”⁶⁵; these represent simple targets for interventions that can improve affordability and diminish FT for patients. Another addressable source of FT are parking prices that hospitals charge to patients when receiving treatment and during survivorship visits. One study found that hourly rates for parking can range up to \$19, with daily rates up to \$40. They also found that one-third of NCI Designated Cancer Centers charge patients for

parking while they are receiving radiation therapy, which is typically administered daily for several weeks.⁶⁶ These recurring costs may add up to a frustrating financial burden; practical solutions like subsidized parking or parking vouchers may improve access and affordability, especially for the most vulnerable patients.

System-level research is also needed to identify the complex factors that facilitate and constrain cost communication and financial service delivery.⁷ From such a system-wide perspective, as a national organization, ASTRO has also strived to improve care for patients with the Choosing Wisely Guidelines.⁶⁷ These guidelines aim to improve the value of cancer care by promoting conversations between radiation oncologists and patients to choose the best care supported by evidence, eliminate tests or procedures that may be costly but offer little or no potential benefit, and minimize disruption in a patient's life. For example, one suggested guideline is "Don't initiate whole breast radiotherapy as a part of breast conservation therapy in women with early-stage invasive breast cancer without considering shorter treatment schedules."⁶⁷ This recommendation could potentially reduce the financial burdens on women with low-risk breast cancer who have evidence-based treatment options spanning from moderate hypofractionation, partial breast, or radiation omission. Furthermore, value-based care models are also being examined, such as bundled payments schemes attempting to incentivize physicians to provide better coordinated and efficient care to improve quality and outcomes of care at lower costs.⁶⁸ Examples include the Radiation Oncology Alternative Payment Model (RO-APM), which, although currently on "indefinite hold," was conceptualized to reward ROs for participation and performance in quality initiatives, while ensuring fair, predictable payments for radiation oncologists, and incentivizing treatments that result in the highest quality of care.⁶⁹ More recently, ASTRO has proposed the Radiation Oncology Case Rate (ROCR) model as an alternative program with similar goals. Input from ROs, patients, institutions, payers, and other stakeholders will be needed to ensure that new models are implemented in an equitable manner and can further the goal of improving care while minimizing FT burdens on patients.

Radiation oncologists can play an important role in reducing FT experienced by patients with cancer. Research supports ROs ability to implement screening interventions in their clinics. A single-institution pilot FT screening study has helped identify patient-reported early FT after radiation therapy.⁷⁰ A second RO-specific pilot tested the effectiveness of an educational intervention⁷¹ and is pending longitudinal data. Further validation and broader implementation of these piloted interventions is necessary in RO clinics across diverse centers.

One seemingly simple but actionable solution for ROs is to support patients to continue working during treatment, if medically possible, so that patients do not need to take

unpaid leave. To support this, ROs can aim to schedule working patients in the early morning, lunchtime, or evening (based on patients' schedules) to help ensure that appropriate patients are able to work with fewer interruptions. Expanded hours during the week may also help patients who need to work throughout treatment. Evidence-based altered-fractionation or hypofractionated treatment regimens may also decrease travel or time-off-work burdens. Another possible solution is linking patients with financial counseling to decrease the risk of unexpected medical bills. Financial counselors can help navigate patients through the expected financial course of their treatments by estimating the patient's OOP, providing details on specific insurance benefits, and addressing questions about different patient services and insurance/billing options that may be available. One study found that 88% of participating patients said talking with a financial counselor helped them better understand their OOP costs and prevent unexpected costs.⁷² However, the availability of financial counselors, especially for patients treated outside of academic or large hospital centers, would need to be addressed to ensure all patients can access these services to try to decrease costs and improve FT.

Conclusion

The burden of FT in the United States is growing, especially for patients with cancer. Various methods have been developed for evaluating FT and studies have demonstrated the deleterious effects of FT on patient QOL and other outcomes, including survival. However, significant gaps remain in our understanding of specific causes and effects of FT and the development and testing of effective solutions. Future research should focus on moving beyond simple awareness of FT as a problem faced by cancer patients to developing and evaluating structured interventions to identify patients at risk of FT and to help mitigate its effects. Such research should include patients from potentially marginalized groups, who have been generally underrepresented in FT research to date, to ensure that interventions are effective across a range of geographic, socioeconomic, and cultural contexts.

Practical solutions exist that can be implemented by ROs and their institutions now, requiring only the willingness to do so. Examples include providing food for patients at appointments, considering alternative/shorter treatment courses, providing scheduling flexibility to minimize work disruption for patients or their caregivers, subsidizing parking or transit passes for patients who must undergo prolonged RT courses, providing financial navigation services to assist with applying for eligible assistance programs, considering financial costs during tumor boards, and simply discussing financial issues with patients.

Although FT often manifests early in a patient's cancer journey (often before RO referral is made), ROs can and

should play a leading role in advocacy, research, and improving awareness of FT at all levels of the health care system (patient-provider, institutional, and system-wide). Fully addressing FT requires a multifaceted and coordinated approach at all levels of the health care system (patient-provider, institutional, and system-wide). All health care providers, including ROs, have a responsibility to be aware of FT in their patients and to actively work to mitigate this toxicity.

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