

Brief Opinion

Overcoming Barriers to Radiation Oncology Access in Low-Resource Settings in the United States



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Abstract

Providing high-quality radiation therapy in medically underserved, low-resource environments can be challenging in the United States. During the American Society of Radiation Oncology 2020 Annual Meeting, the American Society for Radiation Oncology Committee on Health Equity, Diversity, and Inclusion hosted 4 radiation oncologists from both academic and community practices in an educational session. Speakers discussed creative ways to overcome barriers to equitable cancer care and outcomes for their vulnerable patient populations in both rural and urban settings. Successful tactics have included applying for state-sponsored grants, lobbying hospital leadership for equipment upgrades, implementing quality improvement programs specifically targeting the needs of the patient population, studying novel hypofractionation schedules, monitoring toxicities using wearable devices, and expanding transportation options.

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Introduction

Cancer health disparities exist in part due to differences or inequities in a variety of interrelated factors referred to as the social determinants of health.¹ Social determinants of health include conditions in the

environments in which people are born, live, learn, work, play, worship, and age that affect a wide range of health, functioning, and quality-of-life outcomes.² An important determinant is socioeconomic status (SES), as lower SES is associated with disproportionately higher cancer death rates.³ Patients of lower SES are more likely to have environmental or behavioral risk factors for cancer development, more aggressive tumor biology, a higher incidence of other comorbidities, and present with late-stage disease that is less amenable to curative treatment.^{4,5} Furthermore, patients of lower SES are less likely to have

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health insurance, to have adequate access to care, or to adhere to recommended treatment.⁶⁻⁸

Practicing in a low resource environment can also affect the quality of care delivered. For example, the ability of any radiation oncology (RO) practice to provide modern radiation therapy depends on having the finances to acquire updated technology and equipment, offer competitive salaries for recruitment of doctors and staff, and provide a comprehensive network of multidisciplinary services.

Vulnerable patients of lower SES are treated at a variety of institutions in the United States, ranging from larger safety-net hospitals in metropolitan areas, to smaller suburban or rural community practices.^{9,10} In each of these settings, systematic strategies are necessary to address health disparities, optimize cancer care, and improve outcomes. This article summarizes the discussion from an American Society of Radiation Oncology 2020 Annual Meeting educational session hosted by the American Society for Radiation Oncology Committee on Health Equity, Diversity, and Inclusion. During this panel session, radiation oncologists from 4 unique practice environments described practical approaches to providing a modern, high-quality radiation therapy in low-resource settings in the United States. Each of these discussion points, as well as other general approaches for radiation oncologists to help address cancer health disparities, can be found in [Table 1](#).

Overcoming Financial Challenges in Newark, NJ

Newark was one of the leading manufacturing cities in the country through the 1800s, and an important driver of the New Jersey economy. However, after World War II, as Black individuals moved from the South into cities like Newark, White flight was subsidized to the suburbs. Through the GI Bill, the federal government supported growth of the suburbs by providing low-cost mortgages and financial support for veterans.¹¹ However, these policies were discriminatory in that Black individuals were excluded from taking advantage of them. “Redlining” practices discouraged White individuals from moving into cities and kept Black individuals from moving out.¹² During the following decades, Newark became a struggling urban area with significant poverty.¹¹ Newark’s current population is 50% Black, 36% Hispanic or Latinx, 28% living below poverty, and 19% uninsured.¹³

One of the many challenges in any academic medical center serving a low SES patient population is that traditional business plans may not work well. Any RO practice has a mixture of Medicare, Medicaid, commercial health insurers, and self-pay or nonpaying patients. Although the contribution margin of all these payors varies significantly, the overall reimbursement for both

technical and professional services allow the traditional practice to cover its costs, including purchasing, maintaining, and updating its equipment, compensating its staff and physicians, and often providing additional contribution margins that support other parts of the hospital organization.

At University Hospital in Newark, as at many academic centers in cities that provide care to a low SES population, there is a high percentage of underinsured or uninsured patients for whom the services rendered are not adequately compensated. It is often difficult to cover the costs of upgrading and maintaining equipment and retaining well-trained professional staff members in a competitive environment. Partnership with Rutgers Cancer Institute of New Jersey (CINJ) facilitates recruitment of academic faculty members at competitive salaries, but like the other neighboring inner city hospitals in the area, equipment upgrades are more challenging. Many of the other high-technology services in the hospital, including surgery, radiology, and cardiology are in the same situation, competing annually for the limited available budget for capital purchases. Services typically only received what they requested on an “as-needed” basis, often translating to purchasing new equipment only when the current equipment was at or near its end of life. For instance, our aging technology was not adequate for stereotactic body radiation therapy, brain stereotactic radiosurgery, or respiratory gating, and although these treatments could be offered by the same Rutgers CINJ physicians at our other academic medical center in New Brunswick, NJ, transportation and other logistical issues remain a challenge for patients as the other academic facility is 1 hour away. Furthermore, without a financial agreement between institutions, there is also some degree of detriment to the revenue earned at University Hospital when patients undergo more technologically advanced treatments elsewhere.

One mechanism in New Jersey that helps to offset the costs of the patients who are unable to pay is “charity care.” These are state-allocated funds that are distributed to the hospital depending on the volume of patients who the hospital provides care for who apply for and are eligible for “charity care.” Although these funds help to provide resources for the continued delivery of care to these patients in need, the hospital funds dedicated to capital improvements, new equipment, and upgrades remain limited. This is challenging for an academic RO department that wants to consistently and equitably provide cutting-edge technology.

Fortunately, University Hospital was recently able to secure a \$10 million state-supported grant to upgrade the department, which is currently being used to install 2 new linear accelerators with the latest capabilities, a new computed tomography simulator, and a new RO electronic medical record and planning system. Overall,

Table 1 Approaches to reducing cancer health disparities in low-resource environments

Patient- and facility-directed interventions

- Obtain financial support for modern radiation technology (eg, by applying for state-sponsored grants, lobbying hospital leadership, or seeking charitable donations)
- Develop community partnerships to help understand and build trust with patient population
- Expand transportation options (eg, by lobbying for free parking and funding for ride-share programs)
- Reduce financial toxicity (eg, through use of hypofractionated radiation therapy, telemedicine, or incorporating inexpensive wearable devices into toxicity monitoring)
- Implement a quality improvement program specifically targeting the needs of underserved patients
- Offer culturally competent patient forms and education materials
- Promote cancer screening among racial and ethnic minorities
- Address preventable risk factors of cancer development (eg, through partnerships with public health and population scientists)

Faculty- and staff-directed interventions

- Promote diversity in cancer training and hiring (eg, through development of a holistic review process or initiation of a pipeline program or diversity elective)
- Teach principles of diversity, equity and inclusion to faculty, staff, and trainees
- Address barriers to clinical trial design and enrollment of racial and ethnic minorities
- Offer funding for research to address disparities and promote health equity

while the technology University Hospital has been using clearly needed to be upgraded, the dedicated academic physicians and professional staff continue to provide a high level of care, clinical trials, and essential training for our residents in caring for an underserved patient population.

In summary, the financial challenges at University Hospital have been addressed by taking advantage of state run programs to compensate for uninsured patients, applying for state grants for capital improvements, and partnering with an academic institution to support competitive salaries for radiation oncologists. Additional approaches to address cancer health disparities in the future can be found in [Table 1](#).

Clinical and Technological Development in Miami, FL

During the past 60 years, the Hispanic or Latinx population of Miami has grown from 5% to 70%.¹³ This has been driven largely by migration of individuals fleeing economic hardships brought on by destabilized governments and damaging US policies in Latin American countries, and more recently the effects of climate change.¹⁴ Miami currently has the highest proportion of foreign-born residents of any major city worldwide.¹³ Although it has attracted a high concentration of billionaire residents, its shrinking middle class and large workforce that depends on poorly paid service jobs has led to some of the greatest income inequality in the United States, with a 16% poverty rate and 19% of residents lacking health insurance.¹⁵

Jackson Memorial Hospital (JMH) is a public safety-net teaching hospital affiliated with University of Miami Miller School of Medicine. JMH provides care for a majority-minority patient population, including 65% Hispanic, 17% non-Hispanic Black, and 15% non-Hispanic White. University of Miami RO physicians and trainees practice at both JMH and the private Sylvester Comprehensive Cancer Center facility. Despite the challenges encountered in practicing in lower-resource environments, there are many opportunities for a partnership between an academic institution and a safety-net hospital. Vulnerable patients benefit from high-quality care from academic physicians who have access to clinical trials and work as part of a multidisciplinary team. Trainees are exposed to treatment of more diverse conditions not seen as often at private institutions, such as locally advanced head/neck and gynecologic cancers. Faculty physicians and trainees engage in quality improvement projects to identify cancer care disparities and implement system changes that could result in improvement of cancer outcomes for these vulnerable populations.^{16,17}

Physicians' desire to deliver equal quality cancer care in both the private and safety-net settings can also result in improvements in technology. As in the vignette above, many hospital services compete annually for a limited available budget for capital purchases, and typically new equipment is only procured when the current equipment nears its end of life or contributes to inefficient or ineffective patient care. For instance, in early 2008 JMH had an outdated fluoroscopic simulator, and Computed Tomography (CT) simulations had to be performed at the radiology department, causing significant treatment delay. The JMH administration was eventually persuaded that having a CT simulator at the RO facility would improve

efficiency, shortening the time for initiation of therapy, therefore increasing the number of patients under treatment. If utilization of CT simulator were not maximized, diagnostic CTs could be performed in the RO Department after hours.

JMH had 2 linear accelerators that were more than 10 years old, limiting the treatments to 3-Dimensional Conformal Radiation Therapy or Intensity Modulated Radiation Therapy step-and-shoot. The hospital leadership was shown that the radiation therapy delivery time would decrease by half if treated with volumetric-modulated arc therapy with a new linear accelerator. The benefits in outcomes for patients with brain metastases receiving stereotactic radiosurgery and stereotactic body radiation therapy for oligometastatic disease that would be available with a new machine were also outlined. The hospital finally acquired a new linear accelerator in 2018.

Acquiring an High Dose Rate brachytherapy unit to replace the use of low dose rate “hot sources” for gynecologic implants was also challenging. However, replacement of the low dose rate sources was felt to be a safety issue for our residents, hospital, and staff, and ultimately the combined efforts from our graduate medical education office and department leadership made the change possible. Finally, a program for breast intraoperative radiation therapy was established at JMH. It provided an option for patients with early-stage breast cancer who could not come for external beam radiation therapy due to their work schedule or transportation issues, and would have chosen mastectomy otherwise. Philanthropic donations have also helped support the opening of the JMH Breast Center, which includes a multidisciplinary clinic.

In summary, capital improvements at JMH have been facilitated through a combination of lobbying hospital leadership for funding on the premise of improved efficiency and safety, as well as seeking charitable donations. Higher quality care has been delivered through quality improvement initiatives targeting health disparities, and by partnering with an academic institution for staffing. Additional approaches to address cancer health disparities in the future can be found in [Table 1](#).

Addressing Needs of Patients at a Community Hospital in Lowell, MA

Lowell was once known as the cradle of the US industrial revolution, due to its many textile mills and factories.¹⁸ Although standards of living were initially high, rising competition led that standard of living to decline. Successive immigrant groups filled low-paying jobs in the mid-19th century, often serving as strikebreakers for the group preceding them. With declines in manufacturing jobs, and later movement of businesses to suburban areas, the population of Lowell declined and poverty

rose.¹⁸ During the Cambodian genocide, the city also took in an influx of refugees, leading to the second-largest Cambodian American population in the United States.

Unlike the patients who traveled for treatment from suburbs or other countries to academic medical centers in large cities, patients living in regions like Lowell often have multiple challenges without good solutions. Although serving a very diverse practice, Lowell General Hospital routinely employs interpreters for Khmer, Portuguese, and Spanish because English is not the primary language in the majority of Lowell households. Many patients do not have the insurance coverage or the desire, ability, or means to travel to academic centers, and they often present with more advanced disease with a limited or absent support network. The peer-reviewed medical literature provides some guidance to community physicians on innovative solutions to help support patient care and address cancer health disparities, but published medical literature predominantly reports the experiences of academic institutions, given that community practice physicians generally have less time, resources, and incentive to publish as their academic counterparts. Sharing of information in less formal online forums helps with this issue, but ultimately community clinicians must often overcome this knowledge gap about how challenges and solutions may differ in nonacademic community cancer care, and develop their own innovative solutions that are adapted to their own institution and community's needs.

In one example, the opioid epidemic had a disproportionate effect on this community. In response, a quality improvement program was implemented to transition to the use of gabapentin to decrease pain with head and neck cancer radiation therapy. Although the article describing this approach did not provide guidance on implementation,¹⁹ the nursing team at the hospital publishing the data was able to provide this information to the pharmacists at Lowell General. Between 2016 and implementing changes in 2017, narcotic use decreased from 90% to 56% and gastrostomy tube use from 42% to 20%. These results were published in the hospital's annual report, and since then these findings have been confirmed in randomized trials.^{20,21}

A second example is in the context of the coronavirus disease 2019 pandemic, as low-resource environments may be less likely to have access to the cutting-edge pharmaceutical trials available at university-based academic centers. Therefore, low-dose radiation therapy to the lungs was worth exploring for hospitalized coronavirus disease 2019 patients in this community, despite the controversies regarding its effectiveness and toxicities.²² Participating in a phase 2 randomized trial testing low-dose radiation therapy gave Lowell General's patient population access to a potentially effective and relatively inexpensive treatment, when they may not otherwise have had access to other novel therapies. Any treatment-related charges for inpatient evaluation, simulation, and

treatment would be bundled with the hospitalization and not billed to patients separately.

In summary, health disparities at Lowell General Hospital have been addressed through quality improvement initiatives to better manage symptoms during treatment, and offering clinical research opportunities to patients so that they have access to novel therapies even in a community setting. Additional approaches to address cancer health disparities in the future can be found in [Table 1](#).

Facilitating Treatment Completion in the Bronx, NY

The Bronx was also heavily shaped by redlining, as suburban neighborhoods to the north were marked for investment, and most of the southern and central neighborhoods were not.¹² The Bronx is New York City's poorest borough and contains some of the poorest districts in the nation.¹³ The Bronx population is 44% Black and 56% Hispanic or Latinx.¹³ Poor health outcomes have been a problem in the Bronx dating back to the early 20th century. Expressways were designed to run through low-income and minority neighborhoods, with industries considered too undesirable for Manhattan moved to the Bronx, leading to significant pollution.²³

The Montefiore/Einstein Center for Cancer Care is an academic institution that serves a diverse and largely underserved urban population, for whom missed radiation therapy appointments is a prevalent issue. A study of more than 2000 patients treated with curative-intent radiation therapy identified several risk factors for missed treatment: low SES, undergoing a long course radiation therapy, and diagnosis of head/neck or gynecologic cancer.²⁴ Missing radiation therapy treatments was also identified as an independent risk factor for both disease recurrence and death.²⁵ Causes for missed appointments are now monitored during patients' radiation therapy courses, and transportation issues, work and family responsibilities, and treatment toxicities have been identified as common issues.²⁶ Using departmental funds and support from private and government-sponsored agencies, the Montefiore Department of Radiation Oncology has activated a series of investigator-initiated prospective trials to better characterize and address barriers to receipt of effective cancer therapy in our patient population. These include a study evaluating financial distress in patients receiving curative-intent radiation therapy, trials testing novel hypofractionated radiation therapy schedules for breast, lung, and prostate cancers, and a series of studies using wearable devices to monitor patients receiving radiation therapy or systemic therapy.²⁷⁻²⁹

In summary, health disparities at Montefiore/Einstein Center for Cancer Care have been addressed through research aimed at better identifying and addressing

barriers to compliance with treatment, including through more patient-friendly fractionation schemes and novel technologies. These experiences may serve as an example for implementing cancer care delivery research to address the specific needs of a local patient population. These challenges are also relevant to other practice settings. Multi-institutional cancer care delivery studies related to radiation therapy are critical for eliminating disparities in our field.³⁰

Conclusions

There are many challenges inherent to treating cancer patients in low-resource environments. With those challenges comes the opportunity to overcome long-standing structural and systemic inequities in health care delivery and improve the lives of patients who may not receive high-quality, cutting-edge cancer care otherwise. [Table 1](#), and the clinical vignettes herein, highlight practical approaches for radiation oncologists to help mitigate cancer health disparities in underserved communities, such as applying for state-sponsored grants, lobbying hospital leadership for equipment upgrades, implementing quality improvement programs specifically targeting the needs of the patient population, studying novel hypofractionation schedules, monitoring toxicities using wearable devices, and expanding transportation options, that radiation oncologists working in a variety of health care settings may consider for the benefit of their patients.

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