Hypofractionation: A Practical Strategy to Expand Cancer Care in Resource-Limited Settings

Cancer care is entering a crucial period in global health. The global number of cancer cases is increasing, but this rise is not the same in all regions of the world. A large and increasing share of new cancer cases and cancer deaths now occurs in low- and middle-income countries (LMICs), where access to diagnosis, treatment facilities, and healthcare resources is often limited[1,2,3]. Radiotherapy services are still very limited in many low- and middle-income countries due to few machines, shortage of trained staff, long waiting lists, and financial barriers, which delay timely cancer treatment[4,5]. In this situation, hypofractionation is often seen as a patient-friendly or time-saving treatment. However, it is more than convenience; it is an important strategy to make cancer care more accessible, efficient, and sustainable.

For many years, most solid tumors were treated with conventional radiotherapy schedules, typically 1.8–2 Gy per fraction over five to seven weeks. Over time, growing clinical evidence has questioned this traditional approach and led to important changes in practice[6].
In breast cancer, large clinical trials have shown that shorter radiotherapy schedules, such as 40 Gy in 15 fractions or 42.5 Gy in 16 fractions, work just as well as the longer traditional treatments. More recently, even shorter regimens like 26 Gy in five fractions over one week have shown similar results in selected early-stage patients[7,8].

In prostate cancer, studies have shown that shorter radiotherapy schedules, such as 60 Gy in 20 fractions or 70 Gy in 28 fractions, give results similar to conventional treatment with acceptable side effects[9]. More recently, even shorter treatments like SBRT have shown good outcomes in selected patients[10]. This works well because prostate cancer has a low alpha/beta ratio, meaning it responds well to larger doses per fraction[11].
In rectal cancer, short-course radiotherapy (25 Gy in five fractions) is now a well-accepted option, especially within total neoadjuvant treatment protocol[12]. In lung cancer, SBRT has improved outcomes for patients with early-stage disease who cannot undergo surgery by any means[13]. In palliative setting, single or shorter course of radiotherapy schedules are commonly used to relieve symptoms quickly with less treatment burden[14].
Hypofractionation is not a compromise. It is based on basic science of radiobiology. The linear–quadratic model shows how tumors and normal tissues respond to different fraction sizes, and cancers like prostate with a low alpha/beta ratio respond well to larger doses per fraction. With modern imaging, good immobilization, image guidance, and advanced planning systems, these higher doses can now be delivered safely while protecting normal tissues[11,15].

In many countries, the demand for radiotherapy is much higher than the available machines, and issues like breakdowns and maintenance reduce capacity even more. With conventional treatment, one patient may need 25–35 sessions, which leads to long waiting lists. Hypofractionation shortens treatment time, allowing more patients to be treated with the same resources without building new facilities.
Long waiting times for radiotherapy can harm outcomes, increase patient stress, and widen the gap between urban and rural patients. Shorter treatment schedules help start treatment earlier and reduce waiting lists. They also cut travel costs and time away from work and family, making treatment more manageable, especially in LMICs where patients most often pay out of pocket.

Radiotherapy is often cheaper than many systemic treatments, but building and maintaining radiotherapy machines and facilities needs a large investment. Hypofractionation shortens treatment time, so more patients can be treated with the same machines while reducing costs and improving efficiency.

Some clinicians worry that hypofractionation may increase side effects because each fraction delivers a higher dose. This is why accurate contouring, good immobilization, image guidance, and strong quality assurance are essential. With proper training and modern techniques like IMRT, VMAT, and IGRT, hypofractionation can be delivered safely and effectively.

During the COVID-19 pandemic, many radiotherapy centers started using shorter treatment schedules to reduce hospital visits and lower infection risk. This experience showed that hypofractionation can be safe and practical for several cancers, encouraging its continued use after the pandemic[16,17].
Even with strong evidence, hypofractionation is not widely used everywhere. Many doctors were trained with conventional schedules, so changing old habits takes time. In some systems, payment models that favor more fractions can also discourage shorter treatments.

In low- and middle-income countries, building new radiotherapy machines alone is expensive and slow. A more practical approach is to optimize treatment schedules, and hypofractionation offers a faster way to increase capacity and improve access to care. Shorter regimens reduce treatment costs for patients, improve machine efficiency, and help health systems treat more people with existing resources.
For LMICs facing rising cancer burden and limited resources, hypofractionation provides a realistic path to expand treatment access. The goal of modern radiation oncology should not be the number of fractions delivered, but better outcomes, wider access, and higher value care. In that vision, hypofractionation is not simply a convenient option, but an important strategic direction for the future of cancer treatment.

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