

RADIOTHERAPY IN GLOBAL CANCER CONTROL



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Cancer presents an increasing health problem in the world. Previously seen as a problem of the developed world, it is now recognized as a global issue. Currently, two thirds of all cancer deaths occur in low- and middle-income countries. The recently published World Cancer Report from the International Agency for Research on Cancer (IARC) confirms 14.1 million new cancer cases and 8.2 million deaths in 2012. This number represents less than 20% of all deaths in the world but the Global Burden of Disease study shows that the number of cancer deaths increased by 38% between 1990 and 2010. These data suggest that if no action is taken it will increase by 50% by 2030. Most of the increase in incidence will be due to population growth and ageing and most of the increase in cancer deaths will be due to the lack of access to care.¹ The United States cancer statistics have shown decreasing death rates from cancer in the last two decades. However, most low- and middle-income countries lack resources to establish effective cancer control strategies. With modern cancer care many deaths can be prevented.

The current focus on global health and specifically on non-communicable diseases (NCDs) offers a tremendous opportunity to reduce the burden of cancer in the world. Global efforts in cancer registration provide a huge amount of information on the cancer burden and allow us to track cancer incidence and mortality across the world.

Cancer is a complex group of diseases and although we now know a lot about what causes cancer, how to prevent it, how to treat it effectively, and how to support and palliate patients with cancer, in many parts of the world this knowledge has not been optimally applied. It is currently estimated that a third of all cancers can be prevented and a significant proportion of cancers can be cured or treated effectively. The most important factor for cancer prevention is tobacco control.³ Tobacco-related cancers account for 22% of all cancer deaths. Between 15–30% of cancers, more in low- and middle-income countries, are infection related and effective vaccines against HBV and HPV infections are expected to be effective tools for prevention of cervical and liver cancers. Cancer prevention is very important but many cancers are not preventable. In addition, it is well known that cancer prevention takes decades to show a benefit. Effective screening and early detection programmes combined with high quality diagnostic and treatment services have been shown to cure and prolong life in many cases.

Early detection and effective cancer treatment can save

lives. The access to affordable care represents a challenge in many countries. In some states, access is limited by the paucity of health care resources, in others by underinvestment in cancer. Other barriers to timely access to care include lack of insurance, lack of trained health professionals, lack of technologies for diagnosis and treatment, lack of affordable drugs, etc. Unfortunately, access to treatment is most limited in low- and middle income countries that face additional barriers to cancer care. Cancer is still considered as a relatively rare and mostly fatal disease not deserving investment. The stigma associated with cancer presents a huge barrier on all fronts from the individual to the decision-makers. Other health priorities, mostly communicable diseases, attract more attention. For many years now the World Health Organization recommended that each country develops a comprehensive cancer control plan adapted to local needs and resources. Many countries have done so, but many plans have not begun to be implemented.

The lack of equity in access to cancer care results in unnecessarily high death rates. In 2011 the International Atomic Energy Agency (IAEA) stated that low- and middle-income countries have less than 5% of the world's resources for cancer. Great disparities exist not only among countries but also within countries. One of the unaddressed issues in cancer control is the limited access to cancer care with massive shortages in diagnostic services, surgical services

and huge gaps in access to radiotherapy. The “Closing the Cancer Divide” report by the Global Task Force on Cancer Care and Control highlighted that between one third and a half of global cancer deaths are avoidable and 80% of these are in low- and middle-income countries.²

One of the largest gaps in access to cancer treatment is in radiotherapy. Radiation therapy is recognized as an essential tool in the cure and palliation of cancer, and is indicated in over half of new cancer patients.³⁻¹² The number of patients who would benefit from radiotherapy during the course of their disease has been reported to range between 40–62%. The number depends on the extent of disease at presentation and the profile of the cancers observed in the population. The profile of cancers seen in childhood and young adults with high numbers of haematologic malignancies and fewer solid tumours is associated with a lower demand in young patients, in those with haematologic malignancies, and a larger demand in older patients with solid tumours.

Access to radiotherapy

Radiotherapy plays an important and significant role in the management of some of the most common cancers in the world including breast, lung, prostate, cervix, rectal, and head and neck. In low- and middle-income countries, the need for radiation therapy may be higher because of the advanced stage of disease at presentation.

Unfortunately, the access to radiation therapy is inadequate in many countries. The access to radiotherapy is seriously limited in many low- and middle-income countries and non-existent in others. The lack of radiotherapy resources has been highlighted by the IAEA for several decades. Although the lack of radiotherapy resources is most acute in low-income countries, underinvestment in radiotherapy has been documented in all parts of the world.¹³ The delays in radiotherapy have been shown to be associated with poorer outcomes yet waiting lists are common and access to appropriate care is compromised.¹⁴

The IAEA is a United Nations agency that deals with the nuclear industry. A small part of its efforts are devoted to radiotherapy. IAEA maintains a voluntary database of global radiotherapy resources, known as DIRAC.¹⁵ Of the 190 countries that send reports for the IAEA directory, 40 have no radiotherapy at all. The 2010 IAEA publication estimated a need for an additional 7,000 radiotherapy machines in the world. Although the number of radiotherapy machines and centres is a good surrogate for access, the geographical distribution of equipment also matters. It has been shown that the utilization of radiotherapy drops sharply with

increasing distance to the radiotherapy treatment centre.

The recent publication from IAEA stated that 80% of Africans do not have access to radiotherapy.¹⁶ As a sobering example, 29 of 52 African nations have no radiotherapy facilities at all, and these 29 countries comprise an estimated 198 million people. The availability of radiotherapy equipment varied from 8.6 machines per million people in high-income countries (per World Bank definition), to 1.6 per million in high-middle income, 0.71 in low-middle income and 0.21 per million in low-income countries.

A recent review on planning cancer control activities in Latin America and the Caribbean identified huge disparities in the availability of radiotherapy with 6 radiotherapy units per 10 million people reported in Bolivia and 18 machines for 3.3 million people in Uruguay.¹⁷ Although the IAEA DIRAC database constitutes a useful resource, its validity has been questioned and the information has not been independently validated.

Several national and international efforts to improve radiotherapy planning and to evaluate its cost-effectiveness have been undertaken. The largest have been the QUARTS and the HERO project by ESTRO.^{18,19}

Barriers to the implementation of radiotherapy

There are numerous barriers to the effective implementation of radiotherapy services. In addition to the fundamental shortage of radiation equipment, the shortages of qualified personnel including radiation oncologists, medical physicists and radiation therapists also represents a barrier. It is difficult to ascertain which comes first, the lack of investment in equipment leading to shortages of trained personnel, as there is little incentive to train if radiotherapy facilities and therefore jobs are not available, or the lack of trained personnel which limits the decision to invest in the construction of and the equipment for a new radiotherapy department. The concept of the “brain drain” is often given as the cause of personnel shortages but a lack of investment in jobs may indeed be a stronger driver of shortages. Although human resources pose a problem, novel ideas on how to enhance health professionals’ education are emerging.²⁰

Geography presents another barrier to accessing radiotherapy. A need for a sound geographic distribution of equipment is highlighted as distance to the cancer facility is a barrier. In most countries, even high-income countries, radiotherapy is available in densely populated areas or urban centres with limited access in rural or sparsely populated areas.

A number of perceptions limit the investment in

radiotherapy. Among them the view that radiotherapy is too expensive, too complicated, requires specially trained and hard to find personnel, that other priorities in cancer care are more important, and that in the longer term newer treatments will replace radiotherapy and therefore the investment is not required. These perceptions have limited the implementation of appropriate radiotherapy resources in many countries, even in well-resourced ones. There is also a long-standing perception that cancer is a systemic illness and the investment in local treatment modalities will not reduce death rates. The hope for a better systemic therapy, initially with systemic chemotherapy and now with molecular targeted agents may detract policy-makers from investing in radiotherapy. In the meantime, while the improved systemic therapy is awaited, cancer patients are dying from the lack of access to proven therapies.

Radiation therapy is also perceived as an expensive treatment modality. The facts speak otherwise. One radiation machine can treat thousands of cancer patients over many years. Even when priced in high-income countries, radiotherapy is one of the more cost-effective interventions in cancer.

Another factor is the relatively small manufacturing sector engaged in producing radiotherapy equipment. Since industry is fuelled by demand, the lack of investment by governments in radiotherapy keeps the supply small and the costs high. This is in contrast to the pharmaceutical industry where high demand and a large industry have driven the costs of drugs down in lower income countries. A small industry does not have the same lobbying power further limiting the solution to the problem.

Radiotherapy is cost-effective

There is an urgent need to recognize that radiotherapy is one of more cost-effective treatments for cancer. Planning, construction and deployment of radiotherapy facilities takes a long time. Failure to deploy radiation therapy resources will only exacerbate the burden of cancer and will reinforce this continuing cancer disparity in the world.

Significant effort has been made to address this deficiency by the IAEA and the Program of Action for Cancer Therapy (PACT).²¹ However, the speed of progress is far too slow. The scale of the problem calls for a more urgent response. The resources of the IAEA, whose mandate does not include cancer care, are insufficient to solve the problem. In fact, the mistaken idea that there is a United Nations agency that is responsible for radiotherapy gives a false sense of security and comfort. With a lack of investment by governments in radiotherapy, private facilities offering expensive and mostly

unaffordable radiotherapy have emerged in many countries. Cancer care is mostly delivered in publically funded systems and is largely unappealing to private investors. Therefore, an investment in publically-funded radiotherapy facilities integrated into comprehensive cancer facilities is long overdue.

Key messages

- ▶ Treatment is an important element of cancer control (prevention and treatment are complementary).
- ▶ Radiotherapy (RT) is an indispensable element of a comprehensive cancer control programme.
- ▶ The societal benefits of RT depend on its accessibility (and its quality).
- ▶ Access to RT is less than optimal in many parts of the world, both rich and poor.
- ▶ Making good quality RT more accessible in lower income countries has the potential to reduce the burden of cancer dramatically.
- ▶ Increasing the use of RT in lower income countries presents unique challenges, but none should be regarded as insurmountable.
- ▶ The core elements of a radiation facility are well understood.
- ▶ Investments in human resources and education are required for safety and stability.
- ▶ A systems-thinking approach is required to address the challenges of global RT deployment.
- ▶ Radiotherapy systems are complex and require a high level of programmatic sophistication for safe operation.
- ▶ There is a need and opportunity for international collaboration and harmonization of national guidance and standards documents. ●

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