The lack of radiotherapy services in Brazil

Accepted 21st December, 2017

ABSTRACT

Cancer is one of the leading global causes of death, accounting for approximately 7.6 million deaths per year. About a third of cancers are attributable to a small number of preventable risk factors, including smoking and harmful alcohol consumption, for which there are effective interventions at the population level. Despite this, progress in global cancer control has been slow and uneven, largely because of the weak and fragmented nature of both global and national responses. This has been exacerbated by the economic crisis and the trend towards other challenges involving food, energy security and climate change to obfuscate the cancer of the global political agenda. Thus, the general objective of this article is to analyze the deficit of radiotherapy services in Brazil. This is a descriptive study based on a theoretical framework and outlined based on current population estimates on databases, official information systems, professional sites and legislation and standards issued by the regulatory bodies in Brazil. The results indicate the lack of 445 equipment in the national territory. It is perceived that responding to the global cancer challenge requires a comprehensive and integrated approach that should include legislation and regulation. It is concluded that a reinvigorated approach to global cancer prevention, within the broader context of non-communicable disease prevention is an important pathway to health and development in general.

Keywords: Radiotherapy, cancer, treatment.

INTRODUCTION

According to the National Cancer Institute (Ministry of Health, 2017), cancer is the name given to a set of more than 100 diseases that have in common the disordered growth of cells that invade tissues and organs and can spread to other regions of the body. So there are several types of cancers and their causes can be varied.

Non-communicable chronic diseases (NCDs), mainly cardiovascular diseases, cancer, diabetes and chronic respiratory diseases are the leading causes of death, accounting for about 63% of global deaths (Teixeira and Fonseca, 2007). However, some factors can be considered as risk for the development of the disease such as environmental and hereditary factors. Cancer is believed to be one of the earliest known diseases, one of the earliest records of the disease dating back to 3,000 BC (Teixeira and Fonseca, 2007).

In the course of time science has evolved a great deal in regards to treatment and possible cures for cancer, but it was with the advent of the discovery of radiation by Roentgen in 1895 that the forms of treatment evolved...
considerably. In 1899, radiation was first used as a form of treatment for cancer, giving rise to what would later be known as radiation therapy. In Brazil, radiotherapy began in 1901 in the state of Rio Grande do Sul. Initially, it was performed through direct contact with radioactive materials and later with the appearance of linear accelerators, it began to be performed at a distance (Datta et al., 2014; Ferrigno, 2013). These two ways of using radiation in cancer treatments have come to be called brachytherapy (source in contact), and teletherapy (treatment at a distance).

In Brazil, services that offer radiotherapy treatment must follow specific legislation in order to offer the best treatment and ensure the radiological protection of patients. The calculation to plan the creation of new radiotherapy services considers the incidence of new cancer cases per year (National Cancer Institute, 2012).

The present study analyzes the deficit of radiotherapy services in Brazil, aiming to demonstrate the current conditions and indicate strategies that help to minimize new cases of cancer.

To reach its objective this article is structured in: introduction, which presents the context and the purpose of the study; theoretical framework, which addresses the theme under study; methodological procedures, with the description of the steps adopted to carry out the research; presentation and analysis of Global Cancer Data; Demand for radiotherapy services, Quantity of radiotherapy services / equipment available in Brazil X Recommended amount; final research considerations and the references used.

MATERIALS AND METHODS

This research is a descriptive study carried out based on theoretical reference of the legislation from the collection of public data, whose primary sources are the national information systems. The conditions for delimiting the data used and choosing the methodology considered the requirements of legal documents among them: (ordinances, norms, resolutions and regulations) pronounced by bodies that regulate the subject in Brazil, disclosed in preliminary documentary research. The research began with the identification of the databases that presented the necessary information to explain the aspects involved in the research.

Data analysis consisted of measuring the relationship between the number of radiotherapy services and the population of the states. A reflection was made between the data collected and allied to the knowledge about the aspects related to cancer. This knowledge is the result of the learning of the radiotherapy classes taught by CST Radiology at the Federal Institute of Santa Catarina and the researches and readings that guided the construction of this study.

It is relevant to clarify that this research is the result of a collaborative work between the students and the professor of the Radiotherapy discipline of the Federal Institute of Santa Catarina (IFSC), where the sharing of knowledge allowed the creation of new knowledge through searches in databases and reflections in the classroom. The practice of peer review was used as a way to refine the research results.

RESULTS AND DISCUSSION

Demand for radiotherapy services in Brazil

Radiation therapy is a medical specialty that employs ways to minimize and eliminate tumors by using ionizing radiation and destroying malignant cells. The main form of cancer treatment is surgery, and there may be other therapeutic methods such as radiotherapy and chemotherapy. About 60% of new cases of malignant neoplasms will require radiotherapy in at least one treatment phase, either alone or in combination with another treatment, such as surgery and / or chemotherapy, to ensure healing or a palliative effect (Zamboni, 2002).

Over the years, the numbers of new cases of cancer increased and consequently more treatments of radiotherapy became necessary to serve the entire population (IBGE, 2017). The demand for radiotherapy services is increasing because the lifestyle currently adopted is not the same as before, and there are several factors that may be environmental or hereditary factors that influence the likelihood of developing cancer. Risk factors can be found in the physical environment, inherited or result of habits or customs specific to a particular social and cultural environment (Ministry of Health, 2017).

Hereditary factors are associated with genetics. Environmental factors, such as lung cancer are associated with smoking, "the higher the smoking burden, the greater the likelihood of cancer onset" (National Cancer Institute, 2015). The National Cancer Institute characterizes environmental factors as smoking, eating habits, alcoholism, sexual habits, medications, occupational factors and solar radiation (Ministry of Health, 2017).

It should be noted that the current Brazilian population according to the Brazilian Institute of Geography and Statistics is approximately 208 million people (Good GOV, 2007) and the estimated new cases of cancer for 2016 to 2017, according to the National Cancer Institute is 600...
Radiotherapy is an efficient treatment in the fight against cancer that uses ionizing radiation to destroy cells and can be used both internally and externally (Jamison and Murray, 2006). Internal radiation therapy, also known as brachytherapy, is when the radioactive element is introduced close to the tumor and consists of a shorter treatment time compared to external radiation therapy. Already external radiotherapy or teletherapy, a beam of ionizing radiation or electrons that interact with the tumor at a distance is used (Arthur, 2014). Both are produced on a linear accelerator and a computer system along with a team of professionals calculates the doses that will go to the tumor without letting the healthy organs receive a larger dose than allowed. This treatment usually happens 5 days a week, on average 1 month and a half (World Health Organization, 2007).

The choice of which type of treatment to adopt is the responsibility of the radiotherapist and the planning is adopted by a multidisciplinary team of nurses, technicians and / or technologists in radiology, physicians, physicists, dosimetrists, among others, who together are responsible to guarantee the reproducibility of the treatment, that is, that the tumor receives the prescribed dose eliminating the smaller number of neighboring healthy cells (Ferrigno, 2013).

Global cancer facts

There were two main sources for estimates of the global burden of cancer: The World Health Organization (WHO) and the International Agency for Research on Cancer (IARC) study (Kamangar et al., 2006). Unfortunately, these estimates are not congruent. The Institute of Metrics and Health Assessment in Seattle, funded by the Bill and Melinda Gates Foundation, provides an additional source of estimates (Facina, 2014).

The WHO Global Burden of Disease study provides the most comprehensive estimate of global disability and mortality data. This study uses a wide range of data sources, including death record data, disease registry data, health facility data and research and study data (Ministry of Health, 2012). Possible problems with this type of data include incomplete verification, non-representativeness, instrument bias, misclassification and distortion. Adjusted health statistics correct known biases in order to increase the likelihood of generating valid, reliable and comparable health statistics. However, there is still a need to extrapolate data to uninformed populations and to make extensive use of the cause of death and epidemiological models to arrive at estimates for those countries with no usable data like Brazil.

The IARC estimates are based on cancer registries that provide the data for cancer surveillance. In 2006, there were 449 cancer registries in the world producing cancer incidence data covering approximately 22% of the world population (De Araújo et al., 2016). Although only half of those records (in number and coverage) produce sufficiently high quality data for inclusion in the periodic volume of standard comparative statistics (cancer incidence on five continents), the remaining records, especially in low- and middle-income municipalities, provide data valuable for the purpose of making estimates (Alvares et al., 2017).

In several low- and middle-income countries, cancer registration faces significant challenges, including low priority given to cancer control, lack of trained staffs, lack of data processing experience, lack of personal identifiers, unstable populations, lack of census data and lack of access to data due to concerns about confidentiality. Alternatives to population records, such as hospital records, pathology records and hospital episode statistics are the best solutions. Hospital cancer records are common but suffer from the inability to estimate the denominator in any analysis, which leads to many prejudices. For example, in low resource settings, many people with high mortality cancers, such as liver and pancreatic cancer, do not go to the hospital and therefore are not counted.

Quantity of radiotherapy services available in Brazil X amount recommended by law

In Brazil, it is estimated that 600 thousand new cases of cancer arise every year. Currently in the country there are about 283 radiotherapy devices, of these 248 are in the public network distributed in 154 services. Only in the first seven months of 2017, more than 8.15 million procedures were performed involving radiotherapy (De Arruda and Viani, 2017). In order to try to alleviate the problem of long queues for cancer treatment, the Federal Government approved Law 12.732 / 2012, known as the "60-day law" in 2015.

"Art. 2º the patient with malignant neoplasm has the right to undergo the first treatment in the Unified Health System (SUS), within a period of up to 60 (sixty) days from the day on which the diagnosis is established in a pathological report or in a shorter period according to the therapeutic need of the case recorded in a single medical record" (IBGE, 2017).
However, this measure is not enough to solve the long queues due to poor distribution of services and equipment. This is a great problem for patients who depend on the treatment of radiotherapy, since there are states that do not yet have services and equipment, making it difficult for patients who need this treatment (Table 1). The World Health Organization (WHO) recommends radiotherapy equipment for every 300,000 inhabitants. In this way, the column referring to the equipment deficit was based on this resolution. However, it was not possible to obtain the number of equipment, so, for the study, it was stipulated that each radiotherapy service in Brazil had at its disposal, equipment. It can be observed that states such as Amapá and Roraima, located in the northern region of the country, do not have radiotherapy services to attend the population, forcing these patients to go to other states to receive treatment. Situations like these go against what is recommended by (WHO).

According to the Brazilian Institute of Geography and Statistics (2017), the Brazilian population in 2017 is 207.7 million inhabitants, setting a population growth rate of 0.77% between 2016 and 2017, slightly lower than the 2015 rate / 2016 (0.80%). If they are divided into regions, the situation is even more critical, since the highest concentrations of radiotherapy services are located in the south and southeast regions of the country. Figure 1 shows the distribution of radiotherapy services by regions.

Brazil has 143 hospitals equipped with radiotherapy service and 11 isolated radiotherapy services, comprising 154 radiotherapy services and 247 equipment, either a cobalt unit or a linear accelerator (Zubizarreta et al., 2015). This survey of equipment makes possible the visualization of the Brazilian deficit of this type of treatment, since it shows the lack of 445 equipment in the national territory.

In terms of human resources, there are 431 radiotherapists, 272 physicians and 393 supervisors of

<table>
<thead>
<tr>
<th>State</th>
<th>Radiotherapy services</th>
<th>Population</th>
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<tbody>
<tr>
<td>Acre</td>
<td>1</td>
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<tr>
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<tr>
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<td>3</td>
<td>363,140</td>
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<tr>
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<td>590,118</td>
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<tr>
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<tr>
<td>Rio de Janeiro</td>
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<tr>
<td>Rio Grande do Sul</td>
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<tr>
<td>Sergipe</td>
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<tr>
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</tr>
<tr>
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<td>0</td>
<td>474,706</td>
</tr>
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</table>

It can be observed that states such as Amapá and Roraima, located in the northern region of the country, do not have radiotherapy services to attend the population, forcing these patients to go to other states to receive treatment. Situations like these go against what is recommended by (WHO).
radio protection and from the intersection of information between physicist and supervisor of radioprotection, there are 245 professionals who have, cumulatively, the physicist-medical and supervisor of radioprotection (Zubizarreta et al., 2015). According to the number of inhabitants, it is notorious that it is not possible to meet the demand established in the norms. It highlighted the difficulty in finding information about radiotherapy services and population needs. Most of the time, the data appear in different and unrelated places of consultation, making it difficult to evaluate the population’s needs. According to the Brazilian Court of Audit (TCU), the state and municipal health secretariats do not keep SUS information system data updated (Oliveira et al., 2014).

Also, the Federal Government announced the construction of the first linear accelerator plant in Brazil, scheduled to start operating in 2018. According to the Ministry of Health, the factory will promote greater access to linear accelerators by increasing the quality of treatment cancer and radiotherapy in Brazil. However, the present research evidenced that the actions of the Federal Government are not sufficient to the demand of the cancer cases, confirming a deficit of radiotherapy services in Brazil. Other authors Teixeira and Fonseca (2007) and Zubizarreta et al. (2015) similarly pointed out the lack of radiotherapy services, as well as the need for professional training.

**Conclusions**

Most of the global deaths from cancer occur in low- and middle-income countries. Up to one-third of these deaths could be prevented through a comprehensive and integrated approach to cancer prevention that includes legislation and regulation targeting key risk factors. The expected increase in cancer deaths represents a failure in developmental response, as there are cost-effective interventions, but they have not been widely implemented to date. If implemented effectively, cancer prevention strategies have not only reduced cancer mortality rates, but also reduced deaths from cardiovascular disease that share common risk factors. A reinvigorated approach to global cancer prevention therefore has the potential to
substantially strengthen global health and development.

Addressing the underlying causes of cancer will require new approaches, including legislation, that are based on longer horizons and also address how the social pattern of cancer risks creates health inequities and strengthens poverty. Concerted efforts to combat cancer must recognize the synergies between chronic disease prevention, health equity and development at both national and international levels. The health impacts of cancer are broad enough, as it is hard to imagine the substantial progress that can be made for the future of global health until governments, bilateral and multilateral development agencies, civil society organizations, and health stakeholders development come together to make prevention a priority for action.

ACKNOWLEDGMENT

The authors wish to appreciate the effort of the professors of the Superior Course of Technology in Radiology for assistance in the course of this research.

REFERENCES


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