



Current Perspective

Radiotherapy infrastructure and human resources in Europe – Present status and its implications for 2020



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Abstract Radiotherapy (RT) is required for nearly half of the newly diagnosed cancer patients. To optimise the quality and availability of RT, guidelines have been proposed by European Society for Radiotherapy and Oncology-QUAntification of Radiation Therapy Infrastructure And Staffing Needs (ESTRO-QUARTS) and the International Atomic Energy Agency (IAEA). This study evaluates the present status of RT capacity in Europe and the projected needs by 2020 as per these recommendations. Thirty-nine of the 53 countries, listed in Europe by the UN Statistical Division, whose cancer incidences, teletherapy and human resources were available in the Global Cancer Incidence, Mortality and Prevalence (GLOBOCAN), International Agency for Research on Cancer (IARC) and DIrectory of RAdiotherapy Centres (DIRAC) (IAEA) databases were evaluated. A total of 3550 teletherapy units (TRT), 7017 radiation oncologists (RO), 3685 medical physicists (MP) and 12,788 radiotherapy technologists (RTT) are presently available for the 3.44 million new cancer cases reported annually in these countries. The present infrastructure and human resources in RT are estimated to provide RT access to 74.3% of the patients requiring RT. The current capacity in TRT, RO, MP and RTT when compared with recommended guidelines has a deficit of 25.6%, 18.3%, 22.7% and 10.6%, respectively. Thus, to respond to requirements by 2020, the existing capacity needs to be augmented by an additional 1698 TRTs, 2429 ROs, 1563 MPs and 2956 RTTs. With an imminent rise in cancer incidence, multifaceted strategic planning at national and international levels within a coordinated comprehensive cancer control programme is highly desirable to give adequate access to all patients who require radiotherapy across Europe. Specific steps to address this issue at national and continental levels involving all major stakeholders are proposed.

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1. Introduction

The European Health Report 2012 indicates that 20% of all deaths in the region are due to cancer [1], making it the second commonest cause of death. Radiotherapy (RT) is required in at least 45–55% of newly diagnosed cancer cases [2]. Of all cancer patients cured, 40% are by RT alone or in combination with other modalities [3]. RT is a capital-intensive treatment modality requiring specialised and trained personnel including radiation oncologists (RO), medical physicists (MP) and radiation therapy technologists (RTT). Adequate RT capacity, which includes both infrastructure and human resources, and equitable and timely access to it, is a matter of concern due to the impending rise in cancer incidence in the coming decades.

In 2005, the European Society for Radiotherapy and Oncology (ESTRO) proposed guidelines for RT capacity through its QUAntification of Radiation Therapy Infrastructure And Staffing Needs (QUARTS) project [2]. Most of these guidelines have also been recommended by the International Atomic Energy Agency (IAEA) and are currently accepted as a universal standard [3].

In a recent overview, Rosenblatt et al. analysed the availability of RT equipment, primarily teletherapy units in 33 European countries based on the Directory of Radiotherapy Centres (DIRAC) IAEA database [4]. They observed that, of the 3898 teletherapy (TRT) units required, only 3157 TRT units were available at the time of review. As a comprehensive RT service also depends on the availability of trained professionals and sustainability for the future, the present analysis has been performed to review the total RT capacity in Europe and also the projected needs for 2020.

2. Materials and methods

2.1. Databases

Fifty-three countries included in Europe by the UN Statistical Division were considered for this study [5]. The cancer incidence for ‘all cancers excluding non-melanoma skin cancers’ for each of the 53 countries was compiled using Global Cancer Incidence, Mortality and Prevalence (GLOBOCAN) [6]. The present incidence refers to 2012 and no attempt was made to interpolate the cancer incidence of 2014 from 2010 to 2015. However, predicted cancer incidences in 2020 were taken to compute the requirements for 2020. For RT infrastructure and human resources, the present availability of TRT units and the personnel were taken from the DIRAC database [7] (Supplementary Table 1). All calculations are based on information posted at GLOBOCAN and IAEA-DIRAC as of 27th April 2014.

2.2. Guidelines used for estimation of present requirements and projected needs for 2020

The guidelines recommended by European Society for Radiotherapy and Oncology-QUAntification of Radiation Therapy Infrastructure And Staffing Needs (ESTRO-QUARTS) and the IAEA have been used for calculation purposes [2,3]. Where the guidelines provided a range, a specific value was chosen (Table 1). In accordance with the ESTRO-QUARTS and the IAEA guidelines, it was assumed that 62.5% of all cancer patients would require RT (50% of new cancer patients plus 25% of these for re-irradiation) [4,8]. Estimations for brachytherapy have not been undertaken as specific guidelines were not available.

Using the above benchmarks and the databases, the present requirements for TRT along with the staffing needs were estimated. These were compared with the existing numbers recorded in DIRAC and the present deficit and additional requirements for 2020 were computed as detailed in an earlier publication [9]. The predicted cancer incidences for 2020 for each of the countries have been taken from GLOBOCAN [6]. The methodology used to forecast 2020 cancers is well explained under GLOBOCAN web access.

Based on these data, the key parameters computed are:

- (i) TRT per million = Present number of TRT units/population in millions
- (ii) % patients with access to radiotherapy = (Nos. of patient with radiotherapy access/Nos. of patients estimated to need radiotherapy) × 100
- (iii) % Present deficit = {(Number presently required as per guidelines – Number presently available)/Number presently required as per guidelines} × 100.
- (iv) % Additional required = {(Number required in 2020 as per guidelines – Number presently available)/Number presently available} × 100.

For items (iii) and (iv), computations have been done for each of the components of radiotherapy capacity, i.e. TRT units, ROs, MPs and RTTs for each country.

3. Results

Cancer incidence, RT infrastructure and staffing data were not available for 13 of the 53 countries (countries listed in Supplementary Table 1). The RT infrastructure of Monaco is listed in DIRAC but their cancer incidence is not listed in GLOBOCAN. Thus, a total of 14 countries were excluded from further analysis. These are – Aland Island, Andorra, Channel Island, Faeroe Island, Gibraltar, Guernsey, Holy See, Isle of Man, Jersey, Liechtenstein, Monaco, San Marino, Sark and Svalbard

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