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## Original research article

# Investment in radiotherapy infrastructure positively affected the economic status of an oncology hospital

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## ABSTRACT

**Background:** Radiotherapy is among the most efficient treatment methods of cancer. However, a radiotherapy base needs a substantial financial investment, especially before the beginning of its operation, and in some cases, in developing countries such a huge investment may cause some financial disturbances for a hospital concerned.

**Aim:** To assess the influence of investments modernizing the radiotherapy base in the period between 2000 and 2007 on the financial condition of the oncology hospital in the region with population of about 3 million.

**Material and methods:** Financial reports and medical statistics for the period between 2000 and 2007 from the studied oncology hospital and a recognized staffing model, as well as data on epidemiological situation of the region have been used to calculate the economic effects of financial investment in the radiotherapy base.

**Results:** The growth of RT therapeutic potential has been driven by two cost-effective investment programmes. The total amount invested in both programmes was PLN 127,191,000.

The number of radiotherapy patients treated in the hospital increased from 2301 in 2000 to 4799 in 2007 with a the same number of five therapeutic machines, although all five of them were replaced over that period. Investments modernizing the radiotherapy base lead to a significant increase in depreciation and operating costs, which adversely affects financial results of the hospital.

**Conclusion:** Long term trends showed that investments had positive influence on hospital performance shown both in increased income and larger number of patients treated.

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## 1. Background

The health care sector can always consume more money than is available. It is mostly due to the development in science, clinical practices, and introduction of new technology.<sup>1</sup>

Improvement in technologically sophisticated radiotherapy allows to bring new treatment methods to patients. However, the process of preclinical research of new radiotherapy equipment and than its implementation into clinical practice is expensive and requires a very long evaluation, which increases economic cost for the health care system. On the

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**Table 1 – The number of radiotherapy treatments in relation to the number of therapeutic machines in the GPCC in 2000–2007.**

Year	Number of radiotherapy patients	Total number of therapeutic machines.	Number of purchased therapeutic machines
2000	2.111	5	0
2001	2.557	5	0
2002	3.353	5	0
2003	4.381	5	1
2004	4.794	5	1
2005	5.462	5	1
2006	5.348	5	1
2007	5.701	5	1

other hand, clinical evaluation of sophisticated radiotherapy equipment is problematic from the ethical point of view.<sup>2,3</sup> One of the issues is that, in practice, it is difficult to construct a clinical trial in which patients will be assigned to an old, i.e. probably less efficient therapeutic machine rather than to a new one. This is how new technologies, like three-dimensional conformal radiotherapy (3DCRT) and intensity modulated radiation therapy (IMRT), were introduced into clinical practice worldwide.<sup>4</sup> The cost-effectiveness of this new sophisticated radiotherapy machines and tools for one patient could be sometimes questioned, therefore, a careful analysis is required of how it affects a hospital budget. This issue is even more important when a hospital is a major radiotherapy provider in a region, thus being expected to provide a larger number of sophisticated and expensive procedures than smaller providers.

## 2. Aim

The aim of this study was to evaluate the influence of the investments modernizing the radiotherapy base in the period between 2000 and 2007 on the financial condition of the oncology hospital in the region with population of about 3 million.

## 3. Materials and methods

The description of radiotherapy service for the studied region was based on information received from the GPCC records, concerning the number of patients and type of radiotherapy treatment applied in the years 2000–2007. The population demand for radiotherapy treatment in the analyzed region was evaluated based on data from the Greater Poland Cancer Registry, which included cancer incidence recorded from 2000 to 2007. Data concerning the amounts of money paid to the hospital were taken from the hospital database and from the National Health Fund (the institution which contracts and reimburses medical procedures). The influence of the modernization of the radiotherapy base on the financial condition of the GPCC was assessed for the period of 2000–2007. These data were retrieved from financial reports – balance sheet, profit and loss statement and unit activity reports, taking into consideration medical statistics.

An inductive approach was used for which status at certain starting point was described and studied allowed for theoretical generalization.<sup>5</sup> These theories are derived from sociology<sup>6</sup> and also widely used in the organization and management

theory<sup>7</sup>. In addition, these allow to check whether specific modernization processes in specific conditions could have led to impairment of the financial condition of a health care unit.

## 4. Results

The growth of RT therapeutic potential was driven by two cost-effective investment programmes. The first of them was implemented in the period of 2000–2006 for a total amount of PLN 70,518,000 and was funded in a large part by the state budget. The other programme, carried out in 2004–2007, involved the investment of PLN 56,673,000, including PLN 30,908,000 coming from the Greater Poland Cancer Centre's own resources and PLN 25,765,000 from EU funds. The total amount invested in both programmes was PLN 127,191,000. Focusing investment activity on radiotherapy was dictated by both therapeutic needs and very high profitability of this particular type of medical service. The Greater Poland Cancer Centre maintained its financial liquidity throughout the period of 2000–2007. In each of these years, the Centre recorded positive balances, with the exception of 2007 when depreciation of newly activated tangible assets soared rapidly to almost PLN 16 million. But already in the following year of 2008, owing to a large extent to the increase in the material base of radiotherapy and income from radiotherapy services amounting to PLN 30 million, the accounts of the hospital were closed with a positive balance.

The Greater Poland province is a region of 70,000 km<sup>2</sup> situated in the western part of Poland with administrative capital in Poznan and inhabited by 3,200,000 people. Approximately 12,800 new cases of cancer are expected per year, which corresponds well with cancer registry data. More than 6400 patients may need radiotherapy treatment depending on the case mix, and this number was quite stable throughout the study period, considering size of the population studied. A potential change during the study period could be caused by the implementation of a screening program, but this effect had direct impact neither on the procedure cost nor on the reimbursement. In 2007, 5701 out of potential 6400 radiotherapy patients were treated in the GPCC (Table 1). The total number of patients recruited to radiotherapy in GPCC was constantly increasing from 2050 in 2000 to 4799 in 2007, and it affected the equipment and personnel workload. The number of patients treated on one accelerator increased from 410 in 2000 to 960 in 2007. The proportion of conformal radiotherapy which applied more sophisticated techniques (3DCRT, IMRT)

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