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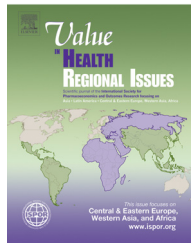

Prognosis, Cost, and Occurrence of Colorectal, Lung, Breast, and Prostate Cancer in Hungary

András Inotai, PharmD, PhD[1,*], *Zsolt Abonyi-Tóth, MSc*[2,3], *György Rokszin, MD*[2], *Zoltán Vokó, MD, MSc, PhD*[1,4]

[1]*Syreon Research Institute, Budapest, Hungary;* [2]*RxTarget Statistical Agency, Szolnok, Hungary;* [3]*Department of Biomathematics and Informatics, Szent István University, Budapest, Hungary;* [4]*Faculty of Social Sciences, Department of Health Policy and Health Economics, Institute of Economics, Eötvös Loránd University (ELTE), Budapest, Hungary*

ABSTRACT

Background: There is an increasing social debate on expenditures on the care of patients with malignant diseases, especially in Central Eastern European countries with limited health resources. **Objectives:** The aim of this research was to estimate the epidemiological and quality measures and resource use indicators in Hungary in four malignant conditions (breast, colorectal, lung, and prostate cancer) from the National Health Insurance Fund (NHIF) database. **Methods:** Survival and cost analyses were performed on the NHIF database. Patient records containing the *International Classification of Diseases* (*ICD*) codes C50 (breast cancer), C18–C20 (colorectal cancer), C33–C34 (lung cancer), and C61 (prostate cancer) were considered eligible. Inclusion criteria were at least two consecutive *ICD* codes between 2000 and 2012, with a minimum of 30-day difference, or one *ICD* code, followed by patient death within 60 days. A total of 428,860 social insurance numbers met inclusion criteria. **Results:** The number of new cases was 6381 for breast cancer, 8457 for colorectal cancer, 8902 for lung cancer, and 3419 for prostate cancer. The probability of 5-year overall survival from the first diagnosis was 75.2%, 41.3%, 17.1%, and 62.1%, respectively. Median time from first diagnosis to treatment initiation was less than 1 month in all conditions except for lung cancer. The annual cost of treatment was €2585, €3165, €4157, and €2834, respectively. Cost figures were compared with hemophilia as benchmark (€8284). **Conclusions:** The results indicated that the database of the Hungarian NHIF is suitable for real-world data analysis in the field of oncology and can support long-term evidence-based policymaking.

Keywords: breast cancer, colorectal cancer, cost, evidence-based policymaking, hemophilia, lung cancer, mortality, new cases, payer's database, prostate cancer, survival, time to treatment.

Introduction

Malignant diseases represent considerable clinical, economical, and humanistic burden in middle- and higher-income countries [1–3]. There is an increasing social debate on the money spent on the care of patients with malignant diseases [4], especially considering some high-priced treatments with marginal health gain [5]. This is especially true for Central Eastern Europe, with even more limited health care resources compared with Western countries [6]. Countries of the region, though, are generally associated with poorer health status than are countries of Western Europe and North America [7,8], indicating a higher need for appropriate decisions in prioritizing among interventions and disease areas [9]. Estimating the clinical burden via epidemiologic indicators, evaluation of quality indicators of treatment, and monitoring effectiveness and cost of care are therefore becoming increasingly important in the region. Burden of disease studies are suitable to support evidence-based decision making by identifying unmet need and disease areas for public health care investment [10–12]. In Hungary, data to estimate these indicators are routinely collected in the database of the National Health Insurance Fund (NHIF) [13].

The aim of this research was to estimate the epidemiological (occurrence and mortality) and quality (survival and time from diagnosis to treatment) measures and resource use (annual health care cost of patient) indicators in Hungary in four malignant conditions (colorectal cancer, lung cancer, breast cancer, and prostate cancer) from the payer's database.

Methods

The analyses were performed on the NHIF database. Inpatient or outpatient care patient records containing the following *International Classification of Diseases* (*ICD*) [14] codes (main or supplementary diagnosis) were considered eligible for the study: C18–C20 (colorectal cancer), C33–C34 (lung cancer), C50 (breast cancer), and C61 (prostate cancer). Patient records were included

Conflict of interest: The authors have indicated that they have no conflicts of interest with regard to the content of this article.

* *Address correspondence to*: András Inotai, Syreon Research Institute, Thököly út 119, H-Budapest 1146, Hungary.
E-mail: andras.inotai@syreon.eu.

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in the study from January 1, 2000, to December 31, 2012, in which there were

1. at least two consecutive *ICD* codes from those listed above, with a minimum of 30-day difference between their establishment, or
2. one of these *ICD* codes, and the patient died within 60 days.

Multiple different cancer codes (except for colon + rectum) were excluded from the study.

The period 2000 to 2003 was considered as a run-in period in the estimation of the number of new cases. Because in this period patients who had their diagnosis established before 2000 might have received care, their inclusion into this period might have resulted in an overestimation of the number of new cases. Therefore, we estimated it only between 2004 and 2011 annually. The reason for omitting 2012 from the calculation was that because two occasions of care with the same *ICD* code were required over a 30-day interval for inclusion in the study, and patients receiving care first at the end of 2012 and then at the beginning of 2013 would not have been included in the calculation of the number of new cases for 2012, it would have resulted in an underestimation.

Two separate survival analyses were performed by applying the Kaplan-Meier method in newly diagnosed patients. In the first analysis, death from any cause was considered as an outcome, whereas in the second analysis, time to the occurrence of the combined outcome of being either treated or dead was considered. To estimate the time from diagnosis to treatment, patients were considered as treated patients who had radiotherapy/chemotherapy (L01 and partially L02 ATC)/surgery with the same *ICD* code as the diagnosis. Epidemiological and quality measures were compared with the data of the Hungarian Central Statistical Office, the National Cancer Registry, and international references from the medical literature.

In cost analyses, the following categories were considered: outpatient cost (including some forms of radiotherapy), inpatient cost (surgery, chemotherapies from the NHIF manual, other high-price drugs, radiotherapy, "hotel costs"), sick allowance, cost of reimbursed drugs, drug co-payment, cost of computed tomography (CT)/magnetic resonance imaging (MRI), cost of high-price medical devices, diagnostics, and interventions (e.g., positron emission tomography [PET]/CT), and cost of high-price drugs. High-price drugs were considered at 80% price to compensate for the effects of the expected rebate from manufacturers toward the NHIF.

Costs were segmented into disease- and non–disease-associated costs. Disease-associated costs included drug cost (with the same *ICD* code on the prescription as in the patient's diagnosis—available from 2007), inpatient cost (coded with the same *ICD* code as the diagnosis), outpatient cost (coded with the same *ICD* code as the diagnosis), CT/MRI, and high-price medical devices (e.g., PET CT) and interventions (coded with the same *ICD* code as the diagnosis). However, non–disease-associated cost reflected similar categories, but coded with *ICD* codes other than those for the diagnosed condition. Sick allowance was also calculated. In Hungary, inpatient services are financed by the diagnosis related group (DRG) system and outpatient services are financed via German points. Unit costs of DRG (150,000 HUF in 2011) and German point (1.5 HUF in 2011) were multiplied by the actual values of each service utilization documented in the NHIF database and aggregated in this analysis. Cost figures of the study are presented at constant 279.21 HUF/1 euro (€) (2011 average exchange rate); longitudinal cost figures did not consider inflation (nominal values).

To compare the cost figures of this study, hemophilia, another serious condition with high impact on patient's quality of life and payer's health care budget, was selected. Patient records containing D66–D68 *ICD* codes from January 1, 2008, to December 31, 2012, were considered eligible. At least two occurrences of these *ICD* codes with a minimum of 30-day gap were required for inclusion in the study. In addition, the screening syntax involved those patients who were prescribed factor products for hemophilia. The following cost categories were considered for patients with hemophilia: outpatient cost, inpatient cost, drug cost, CT/MRI, high-price medical devices, diagnostics, and interventions (e.g., PET CT), and cost of high-price drugs (at 80%).

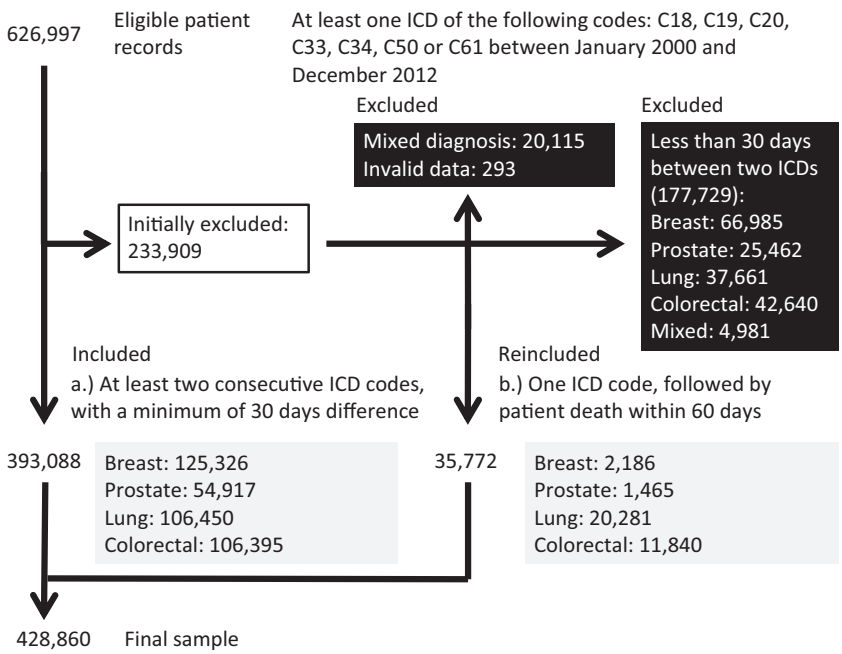

Fig. 1 – Patient flow. ICD, International Classification of Diseases.