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The Cost of Melanoma and Kidney, Prostate, and Ovarian Cancers in Russia

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ABSTRACT

Objective: The objective of this study was to assess the total annual economic burden of melanoma and kidney, prostate, and ovarian cancers in Russia using the unified methods. **Methods:** The general prevalence-based cost-of-illness model was developed to evaluate the annual health and social care costs and value of lost productivity attributable to the following cancers: melanoma and kidney, prostate, and ovarian cancers from the perspective of the overall governmental budget. All costs were calculated using the "bottom-up" costing technique for the total population of patients with studied cancer, including both newly diagnosed patients stratified by cancer stage and patients diagnosed in previous years who were still alive in the study year. **Results:** The lowest aggregate annual cost was found for melanoma—€17.48 million (52.4% health care costs, 34.9% social care costs, 12.7% attributed to productivity loss) and the highest—€84.52 million—for prostate cancer (72.0%, 19.0%, and 9.0%, respectively). Estimations for kidney and ovarian cancers were €45.33 and €45.56 million, respectively, with a similar distribution (42.5%–45.2% health care costs, 39.0%–40.3% social care costs, 14.5%–18.5% lost productivity). Cost for a newly diagnosed patient was several times higher than for a patient diagnosed in previous years (€1144– €1947 vs. €145–€417, respectively). For patients in the first year after diagnosis, the major part of economic burden was attributed to health care costs, whereas for those diagnosed before the study year, costs not related to health were more prominent, except for prostate cancer. **Conclusions:** The economic impact of cancers is more prominent during the first year after diagnosis. A considerable part of the economic burden of cancer lies outside the health sector.

Keywords: cancer, cost-of-illness, economic burden, health care costs

Introduction

According to federal statistics, by the end of 2012 there were almost 3 million cancer patients registered in Russia, approximately 2% of the total population. Cancer is the second leading cause of disability and mortality. More than 280,000 people die because of cancer every year in Russia, almost one third of them being younger than 60 years [1].

Despite the growing understanding of the magnitude of economic burden caused by cancer, data on its actual size in Russia are sparse and there is no unified methodology for accurate estimation. Few cost studies of specific types of cancer in Russia have been conducted; all of them used inconsistent methods and sources of information, especially for the assignment of unit costs or prices for the identified resource consumption [2–4]. This could be explained by difficulties in data collection resulting from the specifics of the federal surveillance system and health care financing in Russia [5,6]. Such discrepancies in research methods and data make comparison or combination of research findings almost impossible. Consequently, it hinders the process of health technology assessment, vitally important for rational decision making under the conditions of limited resources.

The objective of this study was to estimate the economic burden of melanoma and kidney, prostate, and ovarian cancers from the perspective of the government's overall budget using the developed standard methodology. These cancers were chosen to test the developed cost-of-illness model for several reasons. First, we were looking for diseases considered to be a public health problem with different epidemiologic and clinical characteristics to observe their effect on the results. Second, we expected our findings to be of use for health technology assessment; therefore, we selected cancers for which there were new treatments to enter the Russian market and no previous research on their costs has been done.

Thus, we selected melanoma as one of the cancers with the most rapidly growing incidence and with a similar impressive increase in mortality—36.39% and 39.75%, respectively, during 10 years (from 1999 to 2009). Prostate cancer is one of the most prevalent cancers among men (68.1 cases per 100,000) and is also

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characterized by the growing mortality rate—41.39% in 10 years. Ovarian cancer is one of the leading cancers killing women of working age. In 2009, almost 70% of ovarian cancers were diagnosed at advanced stages; hence, more than one quarter of the patients died during the first year after diagnosis. Kidney cancer was chosen as an example of cancer for which only incidence data are collected on the federal level.

Methods

Model Overview and Structure

We have developed a general prevalence-based cost-of-illness model to evaluate the annual health care and social care costs and value of lost productivity attributable to the following cancers: melanoma (*International Statistical Classification of Diseases, 10th Revision* [*ICD-10*] code C43), kidney cancer (*ICD-10* code C64), prostate cancer (*ICD-10* code C56), and ovarian cancer (*ICD-10* code C53). All costs were calculated using the "bottom-up" costing technique for the total population of patients with studied cancer, including both newly diagnosed patients stratified by cancer stage (i.e., localized, regional, distant, unstaged) and patients diagnosed in previous years who were still alive in 2009 (the study year). The model was built using Microsoft Excel 2010 software.

Our cost-of-illness calculations were performed using different data sources because detailed data sets containing all the necessary information are rarely available to researchers in Russia. When the parameters needed for calculations were not found in the data collected and published by the federal statistical services, we applied to regional registries, extrapolating the derived evidence to the whole country. Data unavailable both from federal and regional surveillance systems were extracted from published studies. Finally, to derive details not found in published sources, we held an expert survey of 21 participants from eight Russian regions.

All statistical information and prices were taken for the year 2009 (study year), the latest available year for all statistical data at the time the research was started. The national currency rubles was converted into euros by using the mean nominal exchange rate in 2009 [7].

Main rates and values used for cost calculations and their sources are listed in Appendix 1 in Supplemental Materials found at http://dx.doi.org/10.1016/j.vhri.2014.07.002.

Cancer Patient Populations

Incidence and prevalence data of studied cancers and distribution data of newly diagnosed cases by cancer stage were acquired from federal health statistics collected for the whole country [8,9]. Age and sex distribution data of patients and stratum-specific rates of cancer treatments were derived from six regional cancer registries, in total covering 8.3% of the Russian population.

For kidney cancer, the federal surveillance system collects only incidence data; therefore, we have estimated the total number of patients in Russia on the basis of the number of newly diagnosed patients from the federal data and the ratio of the total number of patients to newly diagnosed patients from regional cancer registries.

Estimates of the total annual social care cost and lost productivity were based on the number of individuals employed and permanently disabled because of cancer among the studied patient populations. We have assumed that the age-specific rate of employment for cancer patients at the time of diagnosis did not differ from that for the general population; therefore, we have used data from federal statistics [10–12]. Our estimation of the number of "potentially" employed persons included people of postretirement age because the rate of employment among them reaches 34.4% according to federal statistic surveillance.

The number of individuals permanently disabled because of cancer was calculated as the product of the total number of registered cases of disability due to cancer from federal statistics and rates attributable to specific types of cancer from Russian published research [13–16]. For persons newly registered as permanently disabled in 2009, all related costs were calculated for 6 months only.

Health Care Costs

Health care costs were estimated as the sum of payments made to health care providers for inpatient (hospital stay) and outpatient care (polyclinic/outpatient center visits and bed-days at outpatient day-care centers) for different types of cancer treatment and budget spending on the provision of medications to cancer patients in outpatient care.

The general modeling approach to calculate the cost of inpatient and outpatient care is presented in Table 1. Stratum-specific estimation of health care resource utilization expressed as the number of outpatient visits and inpatient days was obtained through combining data from different sources—number of patients from federal statistics, rates of different types of cancer treatments from regional cancer registries, and average number of inpatient days and visits for each type of cancer treatment studied through the expert survey. Average costs per hospital and outpatient day care center bed-day and outpatient visit costs were taken from the annual report of the Ministry of Health on the provision of medical care to citizens in 2009 [17]. In this report, all annual expenditures on medical care borne by governmental and public medical insurance budgets are attributed to the total number of hospital and outpatient days and outpatient visits provided by all medical institutions in the Russian Federation, despite their specialization or affiliation. Therefore, the average cost of amount of care derived from this source represents all costs related to diagnostics and treatment including laboratory testing, all types of manipulations, medications, and so forth.

According to federal and regional regulations, cancer patients have a right for the provision of all medications in outpatient care free of charge. The government covers all expenses. In our model, we assessed these budget spendings on medications for the whole country on the basis of data from four regional registries.

Social Care Costs

Social care costs were assessed as the budget spending on sick-leave payments and disability pensions attributable to cancer.

Because there were no statistical data available on the number of working days missed by cancer patients and experts were unable to provide this information, we assumed the number of working days missed because of temporary disability caused by cancer to be equal to the number of inpatient days for employed individuals. This restrictive approach was chosen to avoid the overestimation of social costs. The average social payment for one missed working day because of illness was defined on the basis of statistical data on the total expenses and the number of sick-leave days paid in 2009 from the Social Insurance Fund [18].

The size of the average disability pension was derived from the Report of the Pension Fund for the year 2009 [17].

Value of Productivity Losses

Value of productivity losses was calculated as the amount of gross domestic product (GDP) unproduced by the employed