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The impact of self- and physician-administered cancer treatment on work productivity and healthcare utilization

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ABSTRACT

Background: Lost productivity in the workplace represents a significant portion of the economic burden of cancer in the United States. Cancer treatments have historically been physician-administered, while recent innovations have led to the development of self-administered, usually oral, agents. Self-administered treatments have the potential to reduce healthcare utilization and time away from work, but the magnitude of these effects is unknown.

Objective: To compare the effects of self- and physician-administered cancer treatment on work productivity and health care utilization.

Methods: Cancer subtypes with self- and physician-administered treatment options were selected. Patients with female breast, or lung or bronchus cancer diagnosed in 2004–2013 were identified in the Truven Health Analytics Commercial Claims and Encounters and Health and Productivity Management databases. Using multivariate regression models, work productivity and healthcare utilization were compared for patients receiving self- versus physician-administered treatment in the 12 months after initial diagnosis. Work productivity outcomes included the number of sick days and short-term disability claims.

Results: One month of self- versus physician-administered treatment significantly reduced cancer-related outpatient services, doctor visits, and infusions in the 12 months after initial diagnosis for both cancers of interest. In addition, breast and lung or bronchus cancer patients who received self-administered treatment were less likely to have short-term disability claims, and breast cancer patients with non-metastatic disease who received self-administered treatment had significantly fewer sick days.

Conclusions: Self-administered cancer treatment was associated with fewer cancer-related outpatient services and reduced time away from work compared to physician-administered cancer treatment.

1. Introduction

Cancer affects the lives of millions of Americans, imposing significant burden on patients and society. Direct medical costs for cancer were estimated to be $87.8 billion in the United States (U.S.) in 2014.[1] Lost productivity in the labor market is another component of economic burden experienced by patients and is often overlooked. The total cost of lost productivity in the U.S. due to cancer is estimated to be tens of billions of dollars annually,[2] but the costs attributed specifically to cancer treatment are unknown. Cancer patients who are employed may need to take time away from work for treatment and recovery,[3,4] with prior studies suggesting that cancer patients often spend hundreds of hours in physician office visits and hospitalizations in the initial phase of treatment.[5]

The pace of innovation in cancer treatment has accelerated in recent years, leading to targeted agents with novel mechanisms of action. This innovation has increased treatment options and improved patient outcomes.[6,7] Many of these newer agents are self-

Abbreviations: CCAE, Commercial Claims and Encounters; FDA, US Food and Drug Administration; HPM, Health and Productivity Management; NCI, National Cancer Institute; SD, Short-Term Disability Claims; US, United States.

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administered, often oral therapies, which potentially reduce the use of health care resources and the time patients need to take away from work to receive treatment and manage side effects. While the productivity costs attributed to a cancer diagnosis have been previously documented, the potential productivity effects of different modes of treatment administration are unknown. Thus, the objective of the current study was to explore the effect of modes of administration in treatment for breast, or lung or bronchus cancer on productivity measures and health care utilization and absenteeism using medical and pharmacy claims from a large national database.

2. Methods

To evaluate the productivity effects of cancer therapies, a retrospective analysis was conducted to compare productivity measures across patients with self- versus physician-administered treatment, both treatments, or no treatment. Additionally, the number of physician office visits were compared to identify the extent to which any observed productivity differences were due to differences in health care utilization.

2.1. Study population

The Truven Health Analytics Commercial Claims and Encounters (CCAE) and Health and Productivity Management (HPM) databases for the years 2004–2013 were used to obtain health and absenteeism data. The CCAE database provides information on inpatient, outpatient and prescription claims, diagnoses, hospital length of stay, and inpatient and outpatient costs (overall and out-of-pocket). The HPM database provides information on workplace absenteeism and short-term disability claims (SD) for a subset of enrollees in the CCAE database. A limitation of the productivity data is that not all employers reported SD claims, sick days, or both. Thus, the sample sizes across different outcomes changed according to the number of employers reporting. However, as long as employer reporting is unrelated to patient outcomes or treatment choices, this limitation should not bias the results.

Breast and lung or bronchus cancer (referred to herein as lung cancer) were selected since these are among the most common cancer types in the US and therefore provide adequate sample sizes for the analysis.[8] The Surveillance, Epidemiology, and End Results Program estimates that 15.0% of all new cancer cases in 2017 were female breast cancer,[9] and 13.2% were lung cancer.[10] In addition, breast and lung cancer were selected since self-administered treatments for these cancer types have been approved in the last 10 years. Self-administered therapies for breast cancer include treatments targeting the human epidermal growth factor receptor 2 gene, treatments that block angiogenesis, treatments that block specific molecular pathways, and treatments that improve the efficacy of hormonal therapy.[6] For lung cancer, recently approved oral treatments include those targeting the epidermal growth factor receptor and the B-Raf V600E.[7]

Individuals with any inpatient- or outpatient medical claims with a primary or secondary diagnosis code indicating breast (female only) (ICD-9-CM codes: 174.x) and lung cancer (ICD-9-CM codes: 162.2–162.9) were identified in the database. To eliminate "rule-out" diagnoses, i.e., where the patient did not actually have cancer, only individuals with at least one inpatient claim or two outpatient claims with a primary diagnosis matching one of the codes listed were included. An index date was identified for each patient based on the date of the first medical claim with a diagnosis for breast or lung cancer. Individuals were followed for the 12 calendar months following the month of diagnosis (13 months total).

Individuals were required to be 18 years of age or older at the time of their first observation in the data and have at least 6 months of continuous enrollment at the start of plan coverage. To link health care utilization to productivity measures, individuals were only included if they had overlap between Truven HPM enrollment and plan enrollment for the 13 month analytic period (index month is the month of cancer diagnosis and 12 months post cancer diagnosis). There did not have to be an overlap between the 6 months of continuous enrollment at the start of plan coverage and the 13 months of continuous enrollment at the start of the cancer diagnosis. The latter inclusion criterion excludes patients who passed away in the 12 months post the month of cancer diagnosis, resulting in a healthier sample population. Only health plan beneficiaries who were employees of the firm providing coverage were included in the analysis; excluding any dependents or secondary beneficiaries, as these individuals typically did not have associated productivity data. The primary beneficiaries had to be fully, partly, or seasonably employed at the start of the health plan coverage. The attrition of the study population given the inclusion criteria is described in Appendix Table 1.

2.2. Explanatory variable for mode of treatment

Data from several sources were compiled to categorize treatments as self- or physician-administered. First, a list was used from a prior study on pharmaceutical cancer treatments for breast and lung cancer.[11] Second, a list of targeted therapies from the National Cancer Institute (NCI) was obtained that included any therapy approved in or after 1997 (the year when the first monoclonal antibody was approved).[12] Approval dates were retrieved from the U.S. Food and Drug Administration (FDA) drug labeling database.[13] Third, a list of targeted therapies, immunotherapies and chemotherapies was obtained from the Cancer Therapy Look-up Tables published by the NCI.[14] For validation purposes, this list was compared to the list of drugs approved for the specific cancers of interest by the NCI, so as to exclude drugs only approved to treat side effects.[15,16] Finally, the list was compared with, and supplemented by targeted therapies, immunotherapies and chemotherapies listed on the National Drug Code Directory published by the FDA.[17]

The key explanatory variable was treatment type in each of the 12 months following the month of diagnosis, which was categorized as: (1) self-administered treatment (usually oral medications), (2) physician-administered treatment (intravenous therapies or therapies administered in the outpatient setting), (3) self- and physician-administered treatment contemporaneously (which likely represents treatment switching), and (4) non-pharmacological cancer-related treatment (which includes no treatment as well as surgical treatment, radiation, etc.).

As individuals may change treatment type in the 12 months of follow-up, treatment was measured as the number of months during the course of follow-up. The number of months across treatment types summed to 13, i.e., the month of diagnosis (month of the index date) plus the 12 months follow-up. Consequently, an additional month of self-administered treatment is one fewer month of physician-administered treatment, as well as one fewer month receiving both or neither types of treatment.

2.3. Productivity and health care utilization outcomes

The analysis had two sets of outcomes: (1) work productivity, and (2) health care utilization. Three productivity outcome measures were used for the 12 months following the month of diagnosis: (1) an indicator for whether or not workers had SD claims in the follow-up period, (2) the total length of all SD claims measured in months, and (3) the total number of sick days.

Several outcomes to measure health care utilization were obtained from the medical claims data in the CCAE: (1) the number of outpatient services, (2) the number of outpatient services with a

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