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Original Research Article

Improving cancer patient emergency room utilization: A New Jersey state assessment

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ABSTRACT

Introduction: Due to its increasing incidence and its major contribution to healthcare costs, cancer is a major public health problem in the United States. The impact across different services is not well documented and utilization of emergency departments (ED) by cancer patients is not well characterized. The aim of our study was to identify factors that can be addressed to improve the appropriate delivery of quality cancer care thereby reducing ED utilization, decreasing hospitalizations and reducing the related healthcare costs.

Methods: The New Jersey State Inpatient and Emergency Department Databases were used to identify the primary outcome variables; patient disposition and readmission rates. The independent variables were demographics, payer and clinical characteristics. Multivariable unconditional logistic regression models using clinical and demographic data were used to predict hospital admission or emergency department return.

Results: A total of 37,080 emergency department visits were cancer related with the most common diagnosis attributed to lung cancer (30.0%) and the most common presentation was pain. The disposition of patients who visit the ED due to cancer related issues is significantly affected by the factors of race (African American OR = 0.6, p value = 0.02 and Hispanic OR = 0.5, p value = 0.02, respectively), age aged 65 to 75 years (SNF/ICF OR 2.35, p value = 0.00 and Home Healthcare Service OR 5.15, p value = 0.01, respectively), number of diagnoses (OR 1.26, p value = 0.00), insurance payer (SNF/ICF OR 2.2, p value = 0.02 and Home Healthcare Services OR 2.85, p value = 0.07, respectively) and type of cancer (breast OR 0.54, p value = 0.01, prostate OR 0.56, p value = 0.01, uterine OR 0.37, p value = 0.02, and other OR 0.62, p value = 0.05, respectively). In addition, comorbidities increased the likelihood of death, being transferred to SNF/ICF, or utilization of home healthcare services (OR 1.6, p value = 0.00, OR 1.18, p value = 0.00, and OR 1.16, p value = 0.04, respectively). Readmission is significantly affected by race (American Americans OR 0.41, standard error 0.08, p value = 0.001 and Hispanics OR 0.29, standard error 0.11, p value = 0.01, respectively), income (Quartile 2 OR 0.98, standard error 0.14, p value 0.01, Quartile 3 OR 1.07, standard error 0.13, p value 0.01, and Quartile 4 OR 0.88, standard error 0.12, p value 0.01, respectively), and type of cancer (prostate OR 0.25, standard error 0.09, p value = 0.001).

Conclusion: Web based symptom questionnaires, patient navigators, end of life nursing and clinical cancer pathways can identify, guide and prompt early initiation of treat before progression of symptoms in cancer patients most likely to visit the ED. Thus, improving cancer patient satisfaction, outcomes and reduce health care costs.

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1. Introduction

Cancer is a major public health problem in the United States and its increasing incidence is a major contribution to healthcare costs. Currently, cancer is the second leading cause of death in the United States, accounting for nearly 1 in every 4 deaths, and is expected to surpass heart disease as the leading cause of death in the near future [1]. About 1,688,780 new cancer cases are expected to be diagnosed in 2017 and about 600,920 Americans are expected to die of cancer in 2017 [2,3]. In New Jersey, 51, 680 new cases of cancer will be diagnosed leading to 15,880 deaths in 2017 [3–6].

The economic burden of cancer care for society and the patient is significant. In 2014, the direct medical cost for cancer care in the United States was estimated to be $87.8 billion [3–7]. Unfortunately, the cost of cancer care in the US is projected to increase to $157.8 billion dollars in 2020 [7]. It has been estimated that the highest costs are for breast ($16.5 billion), colorectal ($14.1 billion), lymphoma ($12.1 billion), lung ($12.1 billion) and prostate ($11.9 billion) cancers [8]. Cancer survival has been shown to be associated with substantial medical expenditure and lost productivity with an annual excess economic burden of $5420 per survivor [9]. In addition, only 33% of patients have medicare while 44% are privately insured, leaving 4.4% to pay from their own pocket [2–6,8].

Many cancer patients are utilizing the ED for their healthcare [10,11]. 27, 644 cancer survivors visited the ED 37,760 times (or 1.4 visits per person) in the State of North Carolina [12]. A visit to the ED by a cancer patient has been viewed as an indicator of poor quality of cancer care [13,14,10]. Lung cancer, breast cancer, GI, and colorectal cancers have been cited as the predominant malignancies associated with ED visits [11,12,15,16]. In addition, in 2011 EDs across the US diagnosed close to 284,000 new cases of cancer and 184,000 malignant neoplasms which required hospital admission [17].

Several studies have been conducted to understand the reasons cancer patients visit the ED however ED utilization by cancer patients and subsequent healthcare costs in the United States is not well characterized [11,12,15,16]. Mayer et al. were among the first to provide a population-based snapshot of ED visits by cancer patients in North Carolina [12]. A statewide population-based data set and descriptive statistics were used to characterize patient demographics, cancer type, reasons for ED presentation and payer information. Their results showed comorbidities and treatment play a significant role in cancer patient visits to the ED. Another study conducted by Sikka et al. analyzed colorectal and lung cancers diagnosed in Michigan EDs between 1996 and 2000 [11] and found patients who were diagnosed with colorectal cancer were more likely to visit the ED if they had comorbidities and were insured by Medicaid. The aim of our study was to identify factors that can be addressed to improve the appropriate delivery of quality cancer care thereby reducing ED utilization, decreasing hospitalizations and reducing the related healthcare costs.

2. Methods

The State Inpatient Database and State Emergency Department Database were used to determine emergency department usage by cancer patients in the state of New Jersey in the year 2013.

The Healthcare Cost and Utilization Project (HCUP) administrative longitudinal databases contains encounter-level information on inpatient stays, emergency department visits, and ambulatory surgery in U.S. hospitals. These databases are created by AHRQ through a Federal-State-Industry partnership. The State Emergency Department Databases (SEDD) are a set of longitudinal State-specific emergency department (ED) databases included in the HCUP family. The SEDD capture discharge information on all emergency department visits that do not result in an admission. Information on patients seen in the emergency room and then admitted to the hospital is included in the State Inpatient Databases (SID). Our analysis focuses on encounter-level information on Emergency Department visits. We can not identify the patient because the database does not capture any unique patient identifier to follow a specific patient over the year.

The SID incorporates almost 90% of all discharges in the US and comprises a set of clinical and nonclinical information on all patients, regardless of payer, including those covered by Medicare, Medicaid, private insurance, and the uninsured. The SEDD, on the other hand, captures discharge information on all emergency department visits that do not result in an admission to the same facility (i.e., patients in the SEDD were treated and released). Similar to the SID, SEDD contains a set of clinical and nonclinical information on all patients. Records for inpatient stays that began in the ED are found in the SID. Both the SEDD and the SID are required to analyze all ED encounters in a given state.

Following approval of the Biomedical and Health Sciences Institutional Review Board and the completion of a data user agreement, the datasets were obtained from the Agency for Healthcare Research and Quality (AHRQ). According to the data user agreement, individual cell counts of 10 could not be reported, in order to preserve patient confidentiality. In accordance with this agreement, such low individual cell counts were not reported.

Our dataset comprised 37,080 ED discharge records of patients 18 years and older diagnosed with cancer in the state of New Jersey in the year 2013. Consistent with the methods of Mayer et al. [12], we included only those patients who had ED visits with the cancer-related ICD-9-CM codes of Neoplasm (140–208.91), Malignant Carcinoid Tumor (209.0-209.3), Secondary Neuroendocrine Tumor (209.7-209.74, 209.79), Merkel Cell Carcinoma (209.31-209.36, 209.75) and Carcinoma In Situ (230–234.9).

The primary outcome variables of interest were patient disposition and readmission to the hospital/ED facility within 7 days of the prior visit. The independent variables were demographic characteristics, payer and clinical characteristics.

Based on previous studies [12,18], we constructed multivariable unconditional logistic regression models using clinical and demographic data to predict hospital admission or return to ED visits. Unconditional logistic regression models predicted which patients were more likely to be readmitted (those who visited ED or other acute care facilities within 7 days of prior visit). Given this high rate of admission, a logistic regression analysis was performed to identify the patients who were likely to be hospitalized (i.e. disposition of the patient). Descriptive statistics were used to summarize the incidence of various types of cancers and identify the most associated complaints for ED visits. Chief complaints (CC) varied considerably and were grouped under the major categories of Pain, GI, Neurologic, Malaise, Injury, Fever, Allergic Reaction, Bleeding, Syncope, Respiratory Abnormalities, Psychiatric, and Cancer Related Complications. Our approach can be summarized as follows.

2.1. Handling missing values

To replace missing values, we applied multiple imputations using fully conditional specifications implemented by the MICE algorithm [19]. Each variable has its own imputation model. Built-in imputation models were provided for continuous data (predictive mean matching), binary data (logistic regression), unordered categorical data (polytomous logistic regression) and ordered categorical data (proportional odds).

2.2. Identification of predictive variables

To identify statistically significant predictive variables, we performed unconditional logistic regression analysis for each outcome variable. Through an iterative process, independent variables found to be statistically insignificant (by applying likelihood ratio test – chi-square test) were removed until a final model was achieved.