Chapter 5

The Application of Data Mining to Evaluate the Cost-Effectiveness of Alternative Treatment Modalities in a National Medicare Database

Phoebe D. Sharkey  
Loyola University Maryland, USA

Wesley Hsu  
Wake Forest Baptist Medical Center, USA

Sachin Batra  
Johns Hopkins Hospital, USA

Daniele Rigamonti  
Johns Hopkins Hospital, USA

ABSTRACT

This paper reports on a case study applying data mining techniques to large Medicare claims databases to discover insights related to the comparative cost effectiveness of two alternative treatment modalities for treating brain tumors in the elderly. The authors evaluate the cost effectiveness of open surgery, radiosurgery, or a combination of the two. The study applies data mining algorithms including data preparation, classification, association, and predictive modeling techniques to reveal insights into the costs of alternative health care practice patterns. The results suggest radiosurgery appears to be less costly compared to surgical resection in the Medicare-eligible population. The authors also identified the fact that African Americans comprised a smaller percentage of patients receiving radiosurgery. The study demonstrates that data mining methods can be applied to large complex Medicare claims files to identify and extract undiscovered knowledge to guide medical decision making and public policy.

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The Medicare population represents a major user of healthcare services in the United States and the claims database represents the utilization and demographic information of the healthcare services provided to these beneficiaries. Standard Analytical Files (SAFs) are available for inpatient, outpatient, skilled nursing facilities and home health agencies as well as for ambulatory and physician/supplier claim types (Centers for Medicare and Medicaid Services, 2010). Variables included in these files capture patient level encounter data related to diagnoses, procedures, Diagnosis Related Group (DRGs), dates and location of service, and related costs, as well as beneficiary demographic information and physician/supplier information. The unit of observation is an individual claim and multiple claims are possible for each episode of care. These files provide a powerful resource for the application of data mining techniques to compare the cost and utilization of various clinical services as well as assess the characteristics and management of specific patient populations.

Meningiomas are common intracranial tumors, and autopsy studies suggest that approximately 3% of people over 60 years of age may have an asymptomatic meningioma (Nakasu, Hirano, Shimura, & Llena, 1987). The management of these tumors continues to be debated by medical providers, and factors such as the presence of neurologic deficit, location of tumor, and tumor size/growth rate are important considerations when deciding the optimal treatment paradigm.

Traditionally, surgical resection of meningiomas has been the gold standard for tumors causing neurological deficit or exhibiting progressive growth on serial radiographic imaging. However, a younger technology, radiosurgery has played an increasing role in the management of meningiomas, particularly those that reside in areas that are of difficult surgical access. Radiosurgery may also be of benefit in patients with significant comorbidities who may not tolerate surgical resection.