

# Chapter 7

## Outcomes Research in Physical Therapy

**Jennifer Ferrell Pleiman**  
University of Louisville, USA

### ABSTRACT

*This research investigates the outcomes of physical therapy by using data fusion methodology to develop a process for sequential episode grouping data in medicine. By using data fusion, data from different sources will be combined to review the use of physical therapy in orthopedic surgical procedures. The data that were used to develop sequential episode grouping consisted of insurance claims data from the Thomson Medstat MarketScan database. The data will be reviewed as a continuous time lapse for surgery date; that is, the utilization of physical therapy for a defined time period both before and after surgery will be used and studied. The methodology of this research will follow a series of preprocessing cleaning and sequential episode grouping, culminating in text mining and clustering the results to review. Through this research, it was found that the use of physical therapy for orthopedic issues is not common and was utilized in under 1% of the data sampled. Text mining was further utilized to examine the outcomes of physical rehabilitation in cardiopulmonary research. The functional independence measures score at discharge can be predicted to identify the potential benefits of physical rehabilitation on a patient by patient basis. By text mining and clustering comorbidity codes, the severity of those clusters were used in a prediction model to determine rehabilitation benefits. Other information such as preliminary functional independence scores and age (in relation to independence scores) were used in the prediction model to provide the prescribing physician a way to determine if a patient will benefit from rehabilitation after a cardiopulmonary event.*

### INTRODUCTION

The purpose of this study is to use claims data to investigate the use of physical therapy as a way to

avoid surgery in the treatment of orthopedic problems. In order to investigate this problem, the period from the start of treatment through surgery (if surgery happens) needs to be defined and identified.

Currently, episode groupers are used in medicine to examine specific conditions that occur within a

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set time period. Therefore, any medical condition, usually gathered from insurance claims data, that occurs outside of that time period is not defined in that episode, regardless of its pertinence to the prior conditions. Hence, the time limits place unnecessary restrictions on prior events. This can cause concern when trying to make medical decisions based on defined episodes. A data mining process that is similar in nature to episode groupers is data fusion. Data fusion is defined as gathering data from different sources and combining them in a way that gives a different view of the situation. Data fusion is used in image processing to combine images taken at different times and overlapped to increase relevant information. This method requires taking parts from different sources and making them whole. Once the data are gathered from the different sources, data mining techniques can then be used to determine outcomes such as classification or predictions.

This research will use data fusion methodology to develop processes for sequential episode grouping data in medicine. By using data fusion methodology, data from different sources can then be combined to give more information about the totality of patient treatment. The combination of these two ideas will be used to develop processes for sequential episode grouping. This technique will be used to identify the outcomes of certain conditions and include a more complete review of the patient's experience from beginning to end. This technique will allow a review of the data that occurs both before and after the outcome in question takes place. Additionally, these processes will assist researchers with the preprocessing of multidimensional data from different sources.

Specifically, this study will be focused on patients with orthopedic conditions. It is expected that doctors advise patients with orthopedic problems, such as knee injuries, to participate in months of physical therapy, only to have surgery as the outcome. By using the developed process for episode grouping, the data will be reviewed to define episodes for patients with orthopedic

conditions. By defining these episodes, classification and prediction models will be developed to determine outcomes based on these episodes.

Developing this process will be no easy task. A common issue in data fusion is weeding out the data that are not pertinent to the needed information. With medical claims data, this will undoubtedly occur. Therefore, the process must take into account that not every medical claim will define an episode.

The benefits of the newfound processes will be to allow researchers to combine multiple datasets into one. Applications in the healthcare field would be greatly enhanced by allowing doctors to make more informed decisions based on previous outcomes of patients with similar conditions. Also, insurance companies will be able to anticipate more accurately the next steps in patient care and can be prepared for future claims. Other fields, such as finance, will be able to apply this process to more accurately value organizational worth and to predict future cash flows and investment opportunities by looking at multiple datasets. The development of this process can provide multiple benefits in different areas of study.

## **BACKGROUND**

### **Preprocessing**

When working with real world data, certain revisions will need to be made to the raw data to turn the information into usable inputs for processing within a statistical software system. Unless working with a manufactured data set, it will be necessary to review the data for data integrity as well. Preprocessing is the series of steps to clean and refine the data into a useful set. Not only will preprocessing put the data into a usable format, it assists the researcher to become more familiar with the complete data. In preprocessing, familiarization with how the data appear in a raw state will allow the researcher to make early con-

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