Chapter 12
Application of Data Mining Techniques in Clinical Decision Making:
A Literature Review and Classification

Hakimeh Ameri
K. N. Toosi University of Technology, Iran

Somayeh Alizadeh
K. N. Toosi University of Technology, Iran

Elham Akhond Zadeh Noughabi
University of Calgary, Canada

ABSTRACT

Data mining techniques are increasingly used in clinical decision making and help the physicians to make more accurate and effective decisions. In this chapter, a classification of data mining applications in clinical decision making is presented through a systematic review. The applications of data mining techniques in clinical decision making are divided into two main categories: diagnosis and treatment. Early prediction of medical conditions, detecting multi-morbidity and complications of diseases, identifying and predicting the chronic diseases and medical imaging are the subcategories which are defined in the diagnosis part. The Treatment category is composed of treatment effectiveness and predicting the average length of stay in hospital. The majority of the reviewed articles are related to diagnosis and there is only one article which discusses the determination of drug dosage in successful treatment. The classification model is the most commonly practical model in the clinical decision making.

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INTRODUCTION

Healthcare and medical researchers and practitioners have used different quantitative techniques in various areas of healthcare and medical decision-making. Among these techniques, statistical and artificial intelligence techniques methods have received considerable attention during the last few decades. Among these tools, data mining is becoming increasingly popular, if not increasingly essential. Different techniques of data mining are becoming of great interest and importance for healthcare practice and research. Data mining applications can greatly benefit all areas involved in the healthcare industry. For example, data mining can help healthcare insurers detect fraud, healthcare organizations make customer relationship management decisions, physicians identify effective treatments and best practices, and patients receive better and more affordable healthcare services (Koh & Tan, 2011; Berka, Rauch, & Zighed, 2009).

Based on the existing literature, we can categorize data mining applications in healthcare into three main categories: "clinical decision making", "public health" and "administration and policies". This chapter discusses data mining application in the first area. As the best of our knowledge, this is the first research which studies the applications of data mining in clinical decision making through a systematic literature review and presents a classification and framework for it. Actually, this study tries to do a systematic literature review on the application of data mining techniques in clinical decision making and presents a framework accordingly. In this regard, the exciting literature was studied. Accordingly, the applications of data mining in clinical decision making are categorized into two main categories: treatment and diagnosis. Each category has some sub-categories which are discussed in this chapter.

The organization of this chapter is as below:

At first the research methodology is explained. Next, the classification method is presented and then a classification and framework for applications of data mining in healthcare is discussed. Finally, the distribution of papers in this area is provided and the limitations and future works are discussed.

RESEARCH METHODOLOGY

The following online journal databases were searched to provide a bibliography of the clinical decision making and data mining.

- Science direct
- IEEE Transaction
- Hindawi Publishing
- Pub med
- Springer
- Weily online library
- Google scholar
- Online international conferences

Approximately 600 articles were read and reviewed. Those articles were not completely related to the subjects of applied data mining in clinical decision making were eliminated at the first step. Some conference papers with a low citations, text- books, masters and doctoral dissertations, and unpublished working papers were eliminated.