Chapter VII

The Application of Data Mining Techniques in Health Plan Population Management:
Disease Management Approach

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Introduction

Healthcare has become a data-intensive business. Over the last 30 years, we have seen significant advancements in the areas of health information technology and health informatics as well as healthcare modeling and artificial intelligence techniques. Health informatics, which is the science of health information,[1] has made great progress during this period (American Medical Informatics

Association). Likewise, data mining, which has been generally defined as the application of technology and statistical/mathematical methods to uncover relationships and patterns between variables in data sets, has experienced noteworthy improvements in computer technology (e.g., hardware and software) in addition to applications and methodologies (e.g., statistical and biostatistical techniques such as neural networks, regression analysis, and classification/segmentation methods) (Kudyba & Hoptroff, 2001). Though health informatics is a relatively young science, the impact of this area on the health system and health information technology industry has already been seen, evidenced by improvements in healthcare delivery models, information systems, and assessment/ diagnostic tools.

Data mining techniques in the healthcare industry have evolved from the assimilation of artificial intelligence (AI) with large databases (Borok, 1997). Historically, the first AI techniques to become generally accepted in medical informatics were *expert systems*, developed in the late 1970s and early 1980s. Expert systems are algorithms designed to follow the same problem-solving steps that "real" experts might go through to derive a solution. For example, individuals recognized as being authorities in certain areas or domains (e.g., cardiology) are interviewed on their problem-solving methods. This information is programmed into a computer file called a rule base. Additionally, another file called a knowledge base is created containing the data needed to reveal the facts behind the rules. Usually prompted by a series of questions, an expert system is able to take answers from each question, search the rule and knowledge bases, and produce a result. Expert systems are currently in place to assist physicians with the identification of various medical events, such as myocar-

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