On Supporting Medical Quality with Intelligent Data Mining

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Abstract

The healthcare sector is currently facing both the economic necessity and the technical opportunity of a data based approach to quality management. Against this background, we introduce a process model for a data based medical quality management and apply intelligent data mining methods to patient data. Intelligent data mining incorporates advantages of both knowledge acquisition from data and from experts. We present the Knowledge Discovery Question Language (KDQL), a controlled language for business questions which abstracts from database and data mining terminology to allow high-level interaction. We use a knowledge-based measurement of relevant subjective interestingness facets like novelty, usefulness, and understandability which enables flexible ways to access the results of data mining. Questions asked in this project were targeted on diagnostic and therapeutic measures as well as the quality of documentation. For these issues in the field of medical quality management interesting results were found.

1. Introduction

Reforms in the healthcare sector have caused a continuously rising cost pressure during the last years. At the same time quality demands on hospitals and other suppliers of medical services are increasing. Along with an aggravating competitive situation the demand for enforced cost and quality management in all fields of the healthcare sector, in diagnostics as well as in therapeutics and administration [22], is growing, aiming at the exploitation of efficiency potentials. On the other hand, the introduction of integrated hospital information systems (HIS) and the step-by-step conversion to electronic patient data files enable the capture of large amounts of data and thus a comprehensive documentation of historical diagnostic and therapeutic information on cases. Electronic documentation goes along with standardization efforts, e.g., the definition of diagnostic keys ICD-9 and ICD-10 [5] [16]. Henceforth, distributed, heterogeneous, operative databases can be integrated, consolidated in a data warehouse or hospital information system, and made available within clinics or beyond. Rising costs and quality pressure on the one hand and new technologies of data processing on the other hand create both the necessity and the opportunity of a data based quality management in the health care sector.

Approaches to assessment of quality of care can be divided into three main areas: structure, process, and outcome. Structure is comprised of material resources, facilities, equipment, finances, and human resources. Process is comprised of the treatments, the patient’s role in seeking healthcare, and the practitioner’s role in diagnosing and prescribing. Finally, the outcome describes the effects of care on health status as well as patient satisfaction [8]. Figure 1 illustrates this taxonomy of issues in the field of medical quality management.

![Figure 1. Taxonomy of issues in the field of medical quality management](image-url)