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Decision Support System for Medical Care Quality Assessment Based on Health Records Analysis in Russia

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Abstract

The paper presents developed decision system, oriented for healthcare providers. The system allows healthcare providers to detect and decrease nonconformities in health records and forecast the sum of insurance payments taking into account nonconformities. The components are ISO13606, fuzzy logic and case-based reasoning concept. The result of system implementation allowed to 10% increase insurance payments for healthcare provider.

Keywords:

Standards, Case Based Reasoning, Quality Assurance

Introduction

Medical care process in Russia was unified [1] and medical standards were implemented. Standard describes the necessary medical services and drug prescriptions for groups of diagnoses. Medical services contain coefficients, which determine the probability of application. This fact identifies medical standard as reference document with uncertainty and makes fuzzy logic [2] as a relevant tool to work with them. Medical organizations (MO) have to provide their activity with standards. Insurance companies (IC) makes evaluation for MO's medical care by inspecting health records. On the result of evaluation, IC makes an invoice document that contains data of insurance payment for a medical service. However, this evaluation can be based not only on standards, but also on medical expert's personal experience. Expert produces a document, which presents all nonconformities. This document evaluates the quality of medical care specifies the sum of insurance payments for the analyzed treatment case. Medical care quality assessment based on health records evaluation by expert. Expert can evaluate using medical standards (explicit knowledge) and personal experience (implicit knowledge). In the Russian practice, the use of implicit knowledge is more common. We propose a concept of a decision support system for medical aid quality management, which allows healthcare providers to detect and reduce medical nonconformities in health records taking into account uncertainty and forecast the sum of insurance payments.

Methods

The object of the research is planned surgical treatment in the Institute of Microsurgery (Tomsk, Russia). We acquired a set of health records of 2015 inspected by medical experts and the results and conclusions of their evaluation. Combinations of treatment cases of 2015 and results of expert evaluation determined a training set. Linking the medical conclusions to the results of the expert evaluation allowed us to formulate the logical inference rules. We used the Euclidean metric to limit the set of cases and Mamdani algorithm to determine the probability coefficients. Using developed models, we determined how many

medical documents are required at each step of the medical care process. Mamdani algorithm was used to evaluate the quality of treatment case and to forecast insurance payments based on the detected nonconformities.

Results

The system implementation in Institute of Microsurgery's treatment process in the beginning of 2016 would allow to significant decrease the total sum of deduction from insurance payments (table 1) by detecting nonconformities in health records and insurance payments forecasting.

Table 1 -Results	hefore	and after	system	imnlen	nentation
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Month	Fine sum before	Fine sum after
January	26359.853	10016.74
February	10772.973	7002.43
March	15904.979	8111.54
April	24854.181	10190.21
Mai	8906.788	1068.81
June	18725.46	0.00
July	2990.136	508.32
August	7305.686	3068.39
September	14187.242	7093.62
October	9818.673	0.00
November	13678.28	6018.44
December	23486.35	6106.45

The key results of intellectual system implementation:

- The possibility of the insurance payments forecasting;
- The insurance payments for medical care were increased by correction of health records;

Conclusion

The methods presented this research has demonstrated an effectiveness on insurance payments forecasting. Presented concept can be also applied to others solution in public health, hybrid inference method based on fuzzy logic and CBR can be used for different relevant problems, which require decision-making process.

References

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