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Information system for pharmacotherapy method selection

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Abstract

Currently, when health care is provided for the population using methods of pharmacotherapy, the accessibility and range of it are defined by the country's level of health care. Moreover, a doctor, who prescribes a medication, has to determine how it interacts with other prescription medicines and patient's already existing diseases. The choice of such medication is extremely difficult if a patient has a large number of illnesses and has already been prescribed medication. This article considers the solution to that issue through the application of the information system based on the expert knowledge, which suggests a reasonable method of pharmacotherapy to a doctor.

1. Introduction

The process of health care providing is worldwide determined by economically viable evidence-based decisions and is becoming increasingly controlled by the government. The choice and acceptability of the methods of pharmacotherapy and chemotherapy used in medical aid depend on the level of the health care in each country. Effectiveness of the methods of pharmacotherapy is assessed comprehensively and is based on the preliminary and further estimation of the risks, management of these risks, treatment plans adjustment, and application of proven methods of pharmacotherapy. The efficiency of doctors' decision-making may be significantly increased by the creation of the knowledge system with mechanisms for searching and using this knowledge and knowledge representation in open format meant to be used in large information systems.

2. Rationale

Pharmacotherapy method (further, PM) refers to the medication based on the set of medical interventions with the use of medication. The treatment is prescribed by the doctor and its goal is elimination or alleviation of a

symptom (symptoms), or patient state, restoration or improvement of the patient's health, their employability and life quality.

The standardization of the collection, storage, processing, and analysis of the PM information and the production of materials for managerial decision-making in healthcare is a key element in PM development. The establishment of the European network for Health Technology Assessment (EUnetHTA) in 2005 that nowadays include 73 organizations from 29 European countries highly contributes to the international standardization of PM.

At the same time, evidence-based medicine and clinical and economic analysis allow to choose the most optimal and suitable PMs for their application. This ensures optimal standards implementation, in case of medical care (the aid is provided only to those patients who actually need it) and expenses (cost savings by rational selection of medical technologies).

It is impossible to solve this problem without the use of information technology that includes methods of collection, storage and processing of the information and translation it into knowledge[1,2,3,4]. Knowledge in that context should be interpreted as the data after the analytical transformation that is presented in the structured way, for instance, in the form of ontology changing under the influence of the analysis.

The authors define the following main directions of information technology development:

- The development of the knowledge management system that allows to collect, store, analyze and transform information about PM into knowledge. This includes experts' influence analysis system. Algorithmic principles of knowledge management are the mathematical models, namely the mathematical and informational representation of knowledge and influence. Heuristic and statistically reliable approaches are planned to be used to meet the challenges.
- Providing knowledge in the transparent form to use it in PM applied information systems. The development of the applied information system prototype for doctor decision-making and automated selection of PM after the prescription of drug treatment is essential only to check the knowledge transparency and negotiability.

3. PM assessment information system

The prototype of the PM assessment information system[9,10] is developed for the verification of technology, structure, storage format and transfer of knowledge that is provided by the pharmacotherapy knowledge management system (further PKMS), depending on the way of using it. The information services will be developed to address these issues. In order to do this, firstly, the primary data of evidence-based medicine in accordance with the modern principles of clinical epidemiology and the objective information on the impact of PM, including the percentage of the medical results achievement with further formalization are gathered. Secondly, the methodology to assess the effectiveness of applied PM will be developed. The efficiency of PMs will be calculated, considering medical, social and economic components, using formalized data on health consultations.

The application of the PM assessment information system is to use the expert evaluation, based on any available knowledge, at the same time taking into account its reliability. For instance, if a doctor decides which medicine to prescribe or which technology to apply, or if a specialist purchases means of medical use. For that purpose, a distributed information resource that consists of two main subsystems will be developed (Fig. 1).

First subsystem, PKMS, is intended for the PMs assessment and will provide experts the service for the formalization of their knowledge about considered PM[7,8]. PKMS will consist of two main parts: semantic network with related concepts from the area of PMs application that will be formed first and foremost on the basis of clinical recommendations, standards of medical care and delivery of health services (PMs classifiers, the State Register of Medicinal Products, medical care standards, correspondence tables between medicine and diagnosis, correspondence tables between medicine and age, tables on the drugs interactions inside the body, drugs interactions outside the body, interactions of drugs and anthropometric human parameters, etc.).