Designing an expert system for diagnosis of TB

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Letter to Editor

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Today, "Computer Decision Support Systems" are designed and used in various fields of science. In this new atmosphere, "Expert Systems", as a sub-branch of Artificial Intelligence, play a central role. In Expert Systems, decisions are made by the computer [1]. Expert Systems are knowledge-based systems that initially acquire knowledge from an expert person, and then transfer it to the computer, so that by making decisions based on the data collected, they can be of help to humans. So far, many Expert Systems have been presented in various fields like industry, control, space, financial decisions, etc [2].

Expert Systems have also found their way into medicine. For example; Dendralsoftware program (1965) to describe and express molecular structure [3], MYCIN software (1976) for diagnosis of coronary heart diseases [4], VM for monitoring Intensive Care patients [1], CADCUCEUS for diagnosing internal medicine related diseases [1], BLUEBOX for diagnosis and treatment of depression [1], as well as systems that detect acidic electrolytes, andmanagement of anesthesia education [1].

Our aim is to present an Expert System for diagnosing TB.A medical Expert System is a computer program that helps with decision making for diagnosis of diseases and suggests treatment methods. Once patient's data are entered, the system performs diagnosis of disease, predicts potential complications, and suggests treatment method. These systems are distinct from other medical software, since, to arrive at a medical result, they imitate the rationale of an expert physician. Expert systems require many rules and facts of medical science about diseases and condition of the disease to be able to make decisions and present accurate results. Tuberculosis is a chronic bacterial infection that primarily affects lungs, but may also spread to other organs.In early stages of development, it is so latent that can only be detected by X-rays [5]. With progress of pulmonary TB, symptoms of coughing, fever, and bloody sputum are seen. Other symptoms include weight loss, night sweats, and chest pain. Physician or the expert person suspects tuberculosis through taking medical history, physical examination, laboratory tests, radiography, and in some cases tuberculin test. One of the most common methods of designing Expert Systems is prototype method. In this method, systems that are not yet fully ready for delivery are presented to operators to receive necessary feedbacks, and then the system is modified [4]. This method consists of three phases of analysis, design, and implementation, which are at once, repeated together [5]. We used prototype method, as well. An Expert System uses knowledge and inference procedures to solve problems that are sufficiently difficult. Most Expert Systems are made with Expert System Shell products. Shell is part of the software that includes a user interface, a descriptor, and an inference engine. A data engineer uses the shell to construct an expert system to solve a problem with a specific domain. This means that an expert system shell can be used with all databases that have data representation compatible with the problem domain. For this, we used vp-expert shell. There are 4 target roles in the expert system we wrote for diagnosis of TB. The decision making table

contains a column for decision making factors. In fact, these factors are prerequisites of achieving results. Ultimately, the columns of the table indicate the relationship between prerequisites and the results. There are 4 rows in the table in our system that contain appearance,testing, radiography, and tuberculin testing, and the table columns contain prerequisites of fever, shortness of breath, coughing, bloody sputum, chest pain, etc. Expert systems should be written with possibility of expansion and development. There are many different ways to develop expert systems. One way is in-depth method and another is superficial expansion. To refine expert system, roles should be examined. If there are numbers in the roles, it would be better to define these numbers as constants at the beginning of the program. In this way, whenever we want to change a numerical value, the problem is solved just by changing value of the constant at the beginning of program. One way to refine the system is "Mile Stone", in which the user is kept informed of every stage that the system arrives at an important result (a Mile Stone). Ultimately, the system must be evaluated. At this stage, we evaluate and test the system to find and resolve any potential problems. The Expert System has now been designed for diagnosis of tuberculosis, and just like any other expert system, it includes sub-systems of data-base management, user interface management, and inference (search) engine [1,5]. What we have presented is an expert system for diagnosis of TB using vp-expert shell.The results of the designed system show that the expert system collects data through the user's questions and answers, and ultimately informs the user of the decision it has arrived at. In the system presented, the expert person's behavior is simulated. The system is not flawless; in that, it cannot recognize wrong answers given by the user, and does not recommend a treatment method. Therefore, presenting a system that can propose treatment method in addition to diagnosing the disease could be recommended as a subject for future research.

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