

**EXPERT SYSTEM FOR PROVIDING
INTERACTIVE ASSISTANCE IN SOLVING
PROBLEMS SUCH AS HEALTH CARE
MANAGEMENT**

BACKGROUND OF THE INVENTION

The efficient management of health care has become both an economic and political issue. From time to time, a procedure recommended by a physician may not be the most prudent course to follow for a particular patient. Recently, health care insurers are becoming more involved in the decision as to what course of treatment to pursue for a particular medical condition. Such comprehensive case management can result in a more successful outcome for the patient at a lower cost.

In the past, the management of individual patient treatments has been provided on a transactional basis. In other words, each time a patient was diagnosed with a problem, a determination was made as to a recommended course of treatment for that diagnosis. After the treatment was undertaken, any further diagnoses and/or treatments were reviewed individually by the patient's insurer, without a comprehensive review of past diagnoses and treatments for the particular patient. Such a transactional review process can result in a patient undergoing a variety of treatments for the same condition, where an alternative treatment in the first place may have resulted in a better outcome for the patient at a lower cost for the insurer.

In order to provide a better level of health care management, the present invention provides a computer "expert system" for interactively assisting a user in solving problems, such as whether or not to certify a particular medical treatment for a diagnosed medical condition. The invention can be implemented using a relational database and graphical user interface for data capture and reporting. Dynamic decision support (e.g., as to whether or not to certify a medical procedure) provides information and recommendations to case managers, tailored to the experience level of the case manager, the level of the case manager's authority, and the relevant clinical situation. Policy and clinical guidelines can be authored centrally, distributed electronically and used locally by the case managers to ensure consistency in policy and decision making.

Significant productivity improvements and operational cost savings are provided by the invention. As reviewers (e.g., case managers) move through the workflow, they are supported by the system with information and guidelines tailored to their needs at that time. The information and guidelines are provided on a context-sensitive basis, based on a full awareness of the current medical situation.

Expert systems, per se, are well known. An example can be found in U.S. Pat. No. 4,648,044 issued on Mar. 3, 1987 for "Basic Expert System Tool." The '044 patent discloses a tool for building a knowledge system and running a consultation on a computer. As noted in the patent, knowledge systems are computer systems that emulate reasoning tasks by using an "inference engine" to interpret encoded knowledge of human experts stored in a "knowledge base." If the domain of the knowledge base, or scope of the problem is sufficiently narrow and a sufficiently large body of information is properly coded in the knowledge base, then performance that matches or exceeds the ability of a human expert can be achieved. In such a case, the knowledge system becomes an "expert system." The '044 patent is concerned with the building of an expert system, and not the implementation of such a system for a specific end use.

It would be advantageous to provide an expert system that interactively assists a user in solving problems such as the certification of a particular medical procedure for a given diagnosis. It would be further advantageous to provide such a system that provides a user with all of the information necessary to solve the problem. For example, in the medical context such information would include definitions of medical conditions and treatments, detailed articles from medical journals relating to the diagnosis and treatment, policy and clinical guidelines for use in assessing whether a proposed treatment is appropriate for the given diagnosis, and other relevant information such as basic definitions of the diagnosis and treatment.

It would be further advantageous to enable a user to selectively obtain full detailed information or a quick synopsis of the relevant information. This feature would allow more experienced users to quickly arrive at a decision without having to plod through a large amount of information that the user may already have knowledge of.

It would be still further advantageous to provide such an expert system that can be used by both experienced and inexperienced users. In order to enable inexperienced users to properly solve a problem, a highly structured approach should be provided to ensure that the user inputs all of the information necessary for the system to make a recommendation. An experienced user, on the other hand, should be able to properly solve problems with only minimal guidance from the system.

The present invention provides an expert problem solving computer system having the aforementioned advantages and useful for many different applications.

SUMMARY OF THE INVENTION

The invention provides a computer-based decision support tool for enabling users to decide whether to accept or reject a proposed solution to a problem. For example, in the health care field the decision tool can be used to recommend whether or not to accept a proposed treatment for a given medical condition. Four decision making models are provided for fostering appropriate decision making by users. In a specific embodiment, the decision making process will determine if proposed health care or care already delivered is the correct intervention and level of quality. It also allows a user to monitor the appropriateness of the amount of resources expended. Based upon the user, some of the decisions will cause cases to be referred to a higher level of authority, for example from a nurse to a physician, rather than allowing the ultimate decision to be made at the lower level. A decision maker at the highest level of review will have the flexibility of accessing the same tools utilized at all other user levels and be able to review an historical generation of information on the particular case or patient.

The tools provided by the present invention present criteria that help a decision maker screen a case for appropriateness or inappropriateness, decide if further review is needed by a higher level of authority, state policy, negotiate a compromise, and/or make an ultimate decision. The four different models provided are referred to as the "informational", "synopsis", "structured", and "guided" models. The informational model provides reference material, clinical guidelines and/or clinical policy presented in a manner that supports independent decision making. It is used to provide up-to-date support to a user, such as a nurse or physician, to assist the user in learning about and making an informed decision as to the problem at hand. The synopsis model is