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Medical Intelligence Service Provider Based on Interconnected, Cooperating Medical Decision Support Systems

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Topic: Telehealth and medical practice using IP technologies

Track: Research

Type: Poster presentation

Full text: Not available

Slides: Not Available

Last modified: March 15, 2006

Abstract

Background: Knowledge-based medical decision support systems (MDSSs) were shown to be useful in patient care, especially when fully integrated into hospital or laboratory information systems, patient data management systems for intensive care, or medical practice software systems for the practitioner [1]. In order to remain medically up to date, the knowledge bases must be continually revised, extended, and made accessible to their sites of application. In addition, MDSSs are offered via the World Wide Web, to be accessed through a web browser or, browser-less, in order to receive queries and automatically return answers within a network-based communication protocol.

Objective: The general aim is to establish a web application that not only offers single, autonomous MDSSs but also provides an array of interconnected, mutually supportive MDSSs. By doing this, parts of, or the entire, medical decision making process in patient care is mimicked. For example, an MDSS that assists in the clinical differential diagnostic process in hepatology, a field of internal medicine, might generate - on the basis of jaundice, enlarged palpable liver, and increased bilirubin levels - the hypothetical diagnosis of hepatitis, among others. Hepatitis serology laboratory tests will now be required in order to confirm or exclude a viral cause for the inflamed liver. The one system (internal medicine) demands information from the other system (laboratory medicine) and, if available, incorporates these results in its own decision.

Methods: As shown previously [1], software-based medical knowledge modules are well suited to form the core of MDSSs. A next step is taken by providing a web interface that exhibits the different medical specialities as components that interact with each other, as (specialized) physicians do in actual medical situations. The components are backed by medical knowledge modules for the respective speciality. Calls for switching from one MDSS to the next and back, if appropriate, are triggered by the respective MDSS.

Results: Based on several autonomous MDSSs (Rheumexpert [2], Hepaxpert [3],

Thyrexpert [4], and Toxopert [5]) that have been routinely applied, a general web-based interface showing the specialities of internal and associated laboratory medicine is established. In this methodological and technical study, a blackboard system was used: it serves as a common communication platform between clinically oriented systems and systems for the analysis of laboratory test results.

Conclusion: We report the initial steps taken to establish a web-based medical intelligence service provider that includes MDSSs for the many large and small specialities of practical medicine, and also follows the information and decision flow in actual patient care by means of interconnected, mutually supportive MDSSs.

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