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Synopsis

Health and Clinical Management

The four research projects presented in this section are grouped into two categories discussing mainly information-management issues in patient-care and those related to information retrieval. In the first category Eccles et al. [1] evaluate the use of a computerized support system for decision-making for implementing evidence based clinical guidelines for the management of asthma and angina in adults in primary care. The second paper in this category presented by Oniki and co-authors [2] examines the effect of computer-generated reminders on nurse charting deficiencies in two intensive care units. In the second category Hahn et al. [3] and Zeng et al. [4] provide health researchers and caregivers with valuable tools that are useful for supporting clinical information retrieval by selecting relevant information and reducing information overload.

During the last two decades numerous computer-based decision support systems have been developed and implemented in routine clinical practice to facilitate health and clinical management. The effectiveness of such systems has been assessed in various evaluation studies and the use of those systems has been shown to be beneficial. Eccles et al. [1] conducted a pragmatic cluster randomized controlled trial of a computerized decision support system to implement clinical guidelines for the management of asthma and angina in adults in primary care. The computerized decision support system was based on pre-existing software that was currently available to support prescribing for acute conditions. The system anticipated clinicians' requirements by using information contained within a patient's computerized record to trigger the guideline and present patient scenarios. The authors found no effect of a computerized support system as a vehicle for implementing evidence based guidelines for the management of two chronic diseases in primary care. They addressed the complexities of such management where clinicians provide ongoing care for patients with complex conditions and for extended periods. For most general practitioners in the study the computerized system functioned in the context of routine surgeries. Under the assumption that the technical challenges of producing a system that truly supports the management of complex disease can be overcome there remains the problem of how such systems function within clinical encounters where patients with complex conditions are managed. The conclusion states that although an increasing number of studies show that computerized decision support systems can function in a variety of circumstances, the challenge still remains to show how far this is possible, desirable, and efficient.

Oniki and co-workers [2] report on a trial implementation of computerized reminders directed toward the intensive care unit (ICU) nurses and an evaluation of the reminders' effect on ICU charting deficiencies at LDS Hospital in Salt Lake City, Utah, intensive care unit. For the purpose of the study, four routine nursing tasks, considered as ICU standards, were charted in the computer at least once per shift. An absence of documentation indicating that any of the four nursing standards had been met was deemed an "end-of-shift deficiency". For each of the four possible end-of-shift deficiencies, a mid-day condition was identified that might predict occurrence of the end-of-shift deficiency, barring subsequent action. The mid-day conditions and the end-of-shift deficiencies were translated into new rules in the Table-driven Clinical Rules (TCR) system at LDS Hospital. A program that formed printable reminders from the results of executing the mid-day condition rules was developed. It was hypothesized that delivering these patient-specific reminders to the nurses at mid-day would result in a reduction of end-of-shift deficiencies. An enrolling comput-

er program ran automatically each day at 13:00 and assigned any new patients to the study or control group according to the study's assignation scheme. At the end of each shift, the TCR system executed the rules representing the end-of-shift deficiencies on the study and control patients. Nurses caring for a group of 60 study patients received patient-specific paper reminder reports when charting deficiencies were found at mid-day. Nurses caring for a group of 60 control patients received no reminders. The end-of-shift deficiency rules and the mid-day reminder rules were also executed on the data of 60 retrospective group patients. Two orthogonal contrasts were used to compare the average numbers of charting deficiencies at the end of the shift in each of the three groups. The mid-day reminders appeared to reduce deficiencies in the nurses' charting, as evidenced by the statistically significant difference between the average number of deficiencies in the control and study groups. Apparently, because of the nurses' many responsibilities, reminders are helpful in focusing the nurses' attention on specific duties. The authors recommended that the implementation of reminders should be reserved for situations in which the clinical or financial consequences merit it, because reminders represent both an implementation expense and a possible imposition on caregivers. The concluding fact could be that the results suggest that the implementation of computerized, patient-specific reminders is a viable means of affecting positive change in the behaviors in ICU nurses.

Hahn and co-authors [3] present in their paper *"MEDSYNDIKATE – a natural language system for the extraction of medical information from findings reports"* an appropriate tool to serve as a natural language processor, which automatically acquires medical information from finding reports. In the past few years, research

efforts have also been targeted at the automatic extraction of relevant information directly from document sources. Ideally, this approach should remove the user from the burden to read and understand documents, since all relevant information is already harvested from them and accessible by querying a data or knowledge base. Several information extraction (IE) systems that have been developed in the medical domain showed various weaknesses. SYNDIKATE system family has improved those shortcomings and has developed a more sophisticated level of information extraction from real-word texts. The source documents dealt with here are currently taken from two domains, viz. test reports from the information technology (IT) domain (ITSYNDIKATE) and pathology findings reports (MEDSYNDIKATE). MEDSYNDIKATE is designed to acquire from each input text a maximum number of descriptive factoid propositions, as well as subjective evaluative assertions, the latter based on a model of dimensional and comparative reasoning. The goal of this system is to extract conceptually deeper and inferentially richer forms of relational information by presenting open system architecture for information extraction where the depth of text understanding is constrained only by the accidental limits of available knowledge sources, the domain ontology, in particular. To achieve this goal, several requirements with respect to language processing proper have to be fulfilled. The general task of any SYNDIKATE system consists of mapping each incoming text into a corresponding text knowledge base, which contains a formal representation of text content. Then each knowledge base can be accessed for various purposes such as inferentially supported question – answering, and other information services such as text summarization. Hence, a second major issue

has been focused on and concerns alternative ways to support knowledge acquisition in order to foster the scalability of the system. Finally, empirical data were discussed characterizing the information extraction performance of MEDSYNDIKATE in terms of the semantic interpretation of three major syntactic structures, viz. genitives, modals and auxiliaries, and prepositional phrases. These reflect, at the linguistic level, fundamental categories of biomedical ontologies: states, processes and actions.

In the last paper *"Providing Concept-oriented Views for Clinical Data Using a Knowledge-based System"* Zeng et al. [4] evaluated the functionality of a knowledge-based system that generates concept-oriented views of clinical data. By using a knowledge base system of interrelationships between medical concepts, the authors have shown the relationships between data in electronic medical records. They have also evaluated the ability of the system to select relevant information, reduce information overload, and support physician information retrieval. According to the analyses provided, the authors maintain that computer-generated, concept-oriented views can be used to reduce clinician information overload and improve the accuracy of clinical data retrieval. The foregoing statements stem from the fact that overload of information is a common problem for clinicians confronted with large amounts of patient data in charts or electronic medical records. Moreover, it is maintained that during the information retrieval and decision-making processes, owing to the limited time allotted to the activity by clinicians, information overload may result in errors. To test several hypotheses related to computer generated concept-oriented views, they developed a general-purpose, concept- oriented view-generation system, referred to as the Query Clinical Information

System (QCIS). An evaluation of the QCIS ability to identify relevant information for concept-oriented view generation, to reduce information overload, and to benefit clinical practice is provided. The generation of concept-oriented views in the QCIS follows four steps: concept selection, concept expansion, data retrieval, and display generation. The source of the clinical data for the QCIS is the central clinical data repository at New York Presbyterian Hospital (NYPH). The evaluation was carried out following the three points tested in the hypotheses. That is the quality of relevant information identification; the reduction of information overload and the effect on information retrieval. The results showed that automated selection on relevant clinical information is a very promising technique; concept-oriented views containing much less information than whole records could be used to reduce amount of information presented to users interested in particular topics; simulation studies showed that a fixed, specially designed, flow sheet or spreadsheet type of clinical data display improved the speed and accuracy of information retrieval. Finally, an effort to evaluate the functionality and the utility of a concept-oriented view generation system has been made. Their belief is that different types of views meet the needs of various clinical tasks and users.

The above papers show clearly that computerized health information systems are valuable, but critical tools contributing to the improvement of the quality of health and clinical management. It is, therefore, believed that these computerized support systems must be integrated into the clinical workflow to be widely accepted by practicing health workers. The right information must be delivered to the right place and presented in the right format, at the right time, without requiring special effort.

References

1. Eccles M, McColl E, Steen N, Rousseau N, Grimshaw J, Parkin D, Purves I. Effect of computerised evidence based guidelines on management of asthma and angina in adults in primary care: cluster randomised controlled trial. BMJ 2002;325:941-6.

2. Oniki TA, Clemmer TP, Pryor TA. The Effect of Computer-generated Reminders on Charting Deficiencies in the ICU. J Am Med Inform Assoc 2003;10:177-87.

3. Hahn U, Romacker M, Schulz S. MEDSYNDIKATE - a natural language system for the extraction of medical information from findings reports. Int J Med Inform 2002;67:63-74.

4. Zeng Q, Cimino JJ, Zou KH. Providing Concept-oriented Views for Clinical Data Using a Knowledge-based System: An Evaluation. J Am Med Inform Assoc 2002;9: 294-305.

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