A Prospective Evaluation of the
Medical Consultation System CADIAG-II/RHEUMA
in a Rheumatological Outpatient Clinic

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Background

Ill-defined medical areas such as internal medicine have traditionally been a primary focus for the development of medical expert systems designed to support health professionals in clinical decision making.

Objective

The aim of this study was to evaluate the performance of the medical consultation system CADIAG-II/RHEUMA [1-6] as consultant in the evaluation of patients visiting a rheumatological outpatient clinic. The specific tasks of CADIAG-II/RHEUMA in the consultation process were to offer both a complete and correctly ranked list of diagnostic hypotheses.

Material and Methods

From 54 patients visiting the rheumatological outpatient clinic, patient history information and all results of the physical examination and other tests including laboratory and X-ray findings of the first and the follow-up visits were collected and entered into a patient data base. After completing data collection, the clinical discharge diagnoses of all patients were matched to the list of available CADIAG-II/RHEUMA diagnoses. The list comprised 170 documented diagnoses out of a total of 403 known rheumatological diseases according to a classification scheme which is currently used. We then started the CADIAG-II/RHEUMA consultation for each patient and compared the list of generated diagnostic hypotheses to each clinical discharge diagnosis.

Results

More than 70% of suspected diagnoses, which led to the referral of patients to the rheumatological outpatient clinic, were inflammatory joint diseases. After the clinical evaluation, the 54 study patients were discharged with a total of 126 rheumatological diagnoses, 26 of which could not be matched to any CADIAG-II/RHEUMA diagnosis. Of the remaining 100 discharge diagnoses, 55% were degenerative rheumatic diseases, 18% inflammatory joint diseases, 18% soft tissue diseases, and 9% other rheumatic conditions. As a result of the CADIAG-II/RHEUMA consultation, a median of 134 diagnostic hypotheses was generated for each patient. 94% of all discharge diagnoses occurred in the list of CADIAG-II/RHEUMA hypotheses, but only 82% among the first third of the list of hypotheses and 48% among the first five hypotheses. Results were also compared between different rheumatological diagnoses, with the use of different ranking procedures and with the use of hypothesis thresholds. We identified the following factors limiting CADIAG-

II/RHEUMA's ability to generate both a complete and correctly ranked list of diagnostic hypotheses: (1) a large percentage of study patients with early stages of unclear rheumatological conditions; (2) the limited number of CADIAG-II/RHEUMA diagnoses compared to the large number of different known rheumatological conditions; (3) the fact that rheumatological diseases are rarely characterized by a single pathognomonic feature but are diagnosed by combinations of rather unspecific findings.

Technical Specification

CADIAG-II/RHEUMA was programmed both as a PL/I-batch version which was used in this study and as an online system. The online system was written in CICS/VSE command level language and in PL/I. It is embedded in the Vienna General Information System WAMIS [7], which runs on an IBM 2003 under VSE/ESA. VSAM index-sequential files are used to store patient data and CADIAG-II/RHEUMA's knowledge base. Patient data were collected through WAMIS and—after data-to-symbol conversion—were accessed by CADIAG-II/RHEUMA.

Conclusion

CADIAG-II/RHEUMA's performance as a consultant in the evaluation of rheumatological outpatients was limited by the same problems that also occur when a correct clinical diagnosis has to be found. Accepting these limitations, a CADIAG-II/RHEUMA consultation is still a valuable support in clinical diagnosis by pointing to rare rheumatological conditions and to diagnoses which are most closely related to the patient's condition and thus require primary attention—both from a practical and from a financial point of view.

References

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