

H. Takeda

Department of Medical  
Information Science,  
Osaka University Medical Hospital,  
Osaka, Japan

## Synopsis

### *Health and Clinical Management*

As the medical infrastructure for computing and communication develops and as computers play a more important role than ever before, data acquisition, storage, retrieval and processing are about to improve health and clinical management. The integration of health data and decision support has become much easier and much research has been carried out in this area. In this section of selected articles, major scientific projects in building and evaluating useful and acceptable health and clinical management systems are introduced and discussed.

In the first paper, "PC-based system for an objective quantification of manual movement disability for clinical and scientific purposes" [1], Machetanz and co-authors introduce new aspects of the use of a computer-based data entry system as a quantitative measurement tool in a clinical consultation setting. Using standard hardware with a Microsoft-compatible mouse, the strategy of the research project was to evaluate manual movement disability. Data such as reaction/movement time, pursuit tracking, sequential movements and tapping were acquired in a homogenous form using a mouse. Parameters to elucidate manual movement disability were obtained in the form of general measures of error, cross-correlation, overshoot quotient and reaction/move-

ment time ratio. The PC-based system seems to be clinically useful and cost-effective. Clinical data collection and its assessment will be helpful in promoting this kind of research for clinical consultation.

The second paper deals with the classification of diseases by means of neural networks. In "Application of neural networks to the classification of giant cell arthritis" [2], Astion and co-authors applied a backpropagation network to classify certain types of arthritis. Their method was applied to the analysis of a vasculitis database containing 807 cases in which 214 cases were diagnosed as giant cell arthritis (GCA) and 593 cases as other forms of vasculitis. The system correctly classified 202 (94.4%) out of the 214 GCA cases, and 545 (91.9%) of the 593 other forms of vasculitis. Neural nets and classification trees were compared by ROC analysis. The ROC curves indicated which of the two methods gave a better classification. Although many researchers dealing with neural networks have been partially successful in developing diagnostic classification rules, clinicians are not completely satisfied with the level that was accomplished. We should keep in mind that classifying diseases and making a primary diagnosis is sometimes only a working hypothesis for further examinations to diagnose a disease. In order to facili-

tate neural network related research, another clinical management model, which links the diagnosis to the therapeutic process may be required.

In Linnarsson's "Drug interactions in primary health care" [3], an analysis is reported of drug prescriptions, and the use of databases for supporting decisions in routine clinical practice is described. The objective of this study was to investigate potential drug interactions in primary health care by means of computerized medical record systems. After each drug prescription was entered into a computer-based medical record, the potential interactions of the drugs were analyzed over a four-year period (including 55,000 prescriptions). Results indicated that potential drug interactions were found in 1.9% of all prescriptions, that 22% of elderly patients were at risk (those receiving more than two drugs), and that in many cases prescribing physicians did not take appropriate actions, despite these potential interactions. What this study shows is a new promising method for analyzing retrospective clinical data from computer-based patient record systems with the help of a query language, in order to support decision making in routine clinical practice, such as drug prescribing. These results were used to provide a basis for awareness on the side of primary health care concerning potential drug interactions.

"Clinical databases and critical care research" by Kahn et al. [4] reported on electronic databases for clinical research in critical care. The issues discussed in this paper help to increase the awareness of clinical investigators concerning the strengths and weaknesses of the electronic storage of data in generic databases, clinical databases, and electronic medical record systems. Although the advantage of a database management system is well understood, the author stressed the problems faced by most hospitals. Because the original intentions of the databases were department oriented, most clinical database systems were limited in satisfying investigative needs, such as sharing data among various specialized systems. The key to successfully integrating a widespread patient care-oriented database system is described requiring the use of standards, validated data definitions, and an adequate hardware and software environment. If the authors had had more illustrative examples concerning the handling of electronic data storage in promoting clinical research, the article would have revealed a better understanding of this topic.

The next two papers focus specifically on the use of computer-based literature searches and their impact on patient care. The objective of Gorman and co-authors' study in "Can primary care physicians' questions be answered using the medical journal literature?" [5], was to determine the proportion of medical questions generated in primary care and answerable through information obtained by literature search. A second goal was to compare time and cost of such information gathering with the current methods of information retrieval employed

by general practitioners. The study was done in the form of office interviews, on-line searches by librarians, and feedback by clinicians. Results showed that the search process took 43 min. and cost \$27 on average, and that clinicians found 46% "clear answers" to their questions, and rated the impact of such literature searches as 40% related to their patients and 51% to their practice. The study gave an evaluation of on-line medical journal literature search. If persons carrying out literature searches have the necessary expertise, and the required hardware and software, and if the time and cost of searching can be reduced, primary-care physicians are interested in accessing information via on-line medical literature databases.

In "Effect of on-line literature searching on length-of-stay and patient care costs" [6], Klein and co-workers studied the effect of literature searches using MEDLINE upon the length-of-stay and the cost of hospitalization. An outcome-based and prospective study of 192 test cases and 10,409 control cases, was conducted. The results indicated that inpatients for whom searches were conducted beforehand had significantly lower costs and length-of-stay than those for whom searches were conducted later on. Thus, the study demonstrated that an extensive "intervention" of a librarian-mediated MEDLINE search would help hospitals in optimizing the use of its resources.

The last two papers clearly demonstrate that librarians offer an original contribution to medical informatics through database searching for health and medical management.

The needs for health and medical care are increasing in quantity, but

diversifying in quality. With this background, health and clinical management are becoming increasingly dependent on the effective use of data communication and information technology. Researchers in the medical informatics community need to be aware of this rapidly changing situation and they need to construct models that effectively fulfil the needs of clinicians while properly using the new technology. Not only do they have to develop such systems, they also have to assess their impact. The articles in this section all deal with one or more of these important issues.

## References

1. Manchetanz J, Foster J, Bischoff C, Meyer BU, Isenberg C, Conrad B. PC-based system for an objective quantification of manual movement disability for clinical and scientific purposes. *J Biomed Eng* 1993; 15: 363-70.
2. Aston ML, Wener MH, Thomas RG, Hunder GG, Bloch DA. Application of neural networks to the classification of giant cell arthritis. *Arthritis & Rheumatism* 1994; 37: 760-70.
3. Linnarsson R. Drug interactions in primary health care. *Scand J Prim Health Care* 1993; 11: 181-6.
4. Kahn MG. Clinical databases and critical care research. *Critical Care Clinics* 1994; 10: 37-51.
5. Gorman PN, Ash J, Wykoff L. Can primary care physicians' questions be answered using the medical journal literature? *Bull Med Libr Assoc* 1994; 82: 140-6.
6. Klein MS, Ross FV, Adams DL, Gilbert CM. Effect of online literature searching on length of stay and patient care costs. *Acad Med* 1994; 69: 489-95.

Address of the author:  
Hiroshi Takeda, M.D.,  
Department of Medical Information Science  
Osaka University Medical School,  
2-15, Yamada-oka, Suita,  
Osaka 565, Japan