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Synopsis

Health and Clinical Management

The importance of information and information technology in relation to health and clinical management cannot be over-emphasized. The World Health Organisation reminds us that "the road leading to Health for All by the year 2000 passes through information" (Weiss, 1992, p. 152 [1]). A number of papers selected for the 1993 Yearbook of Medical Informatics focus attention on this central and recurring theme. Both the development and use of informatics are increasingly, intrinsically linked to successful management of medical care and, ultimately, health itself.

Nine articles have been selected to represent the scope and range of developments and applications of information technology in health and clinical management. They can be broadly categorized into three areas:
- Informatics and health education,
- Informatics and health communication,
- Informatics and health care planning and evaluation.

The studies are summarized for readers in order to encourage further and fuller reading of the selected articles. Taken together, they raise a range of questions, challenges and opportunities for the use of informatics in the clinical management of health.

Informatics and Health Education

Three articles focus on the use of information and computing for educational purposes. The articles by Bridges et al. [2] and Schwid and O'Donnell [3] both address applications for clinical teaching and assessment. The article by Turnin et al. [4] describes a computerized tool for self-monitoring and learning by patients.

Bridges et al. [2] report that "the computer is an instrument that can be used efficiently to educate large numbers of users. The computer and instructional system not only presents facts to the user, it can help the user learn visual concepts and discriminations by presenting examples and nonexamples of concepts" (p. 3). With this in mind, Bridges and his colleagues developed an application, AI/LEARN/ RHEUMATOLOGY, which is a learning theory-directed educational system that uses a computer-assisted interactive videodisc system for teaching the rheumatic diseases. "While interacting with the user, it conveys knowledge using visual and problem-solving techniques" (p. 3). The system, which uses a graphic assisted-learning environment (GALE), contains a videodisc with approximately 50,000 frames including, for example, physical findings, radiographs and histological findings related to rheumatic diseases. As the user progresses through the material, the learning becomes more detailed and challenging. Features, such as "more information" screens and "compare and contrast" options allow gradual and integrated learning. Early feedback from students using the tool is positive, they find it beneficial and enjoyable. Formal testing of the system is underway and should indicate its wider effectiveness with medical students and postgraduate trainees.

Schwid and O'Donnell's study [3] evaluated the effectiveness of anesthesiologists' handling of critical incidents via the use of an anesthesia simulator in order "to identify specific patterns of error in diagnosis and treatment" (p. 495). While the simulator was used in this study for evaluation, the results suggest that it could be a useful tool in anesthesia education regarding critical incidents which seldom occur in practice and require careful and appropriate response. The limitations of simulations are known from use in other fields; however, they also have been found to be highly effective training devices in some areas. Schwid and O'Donnell confirm earlier studies identifying the serious need for regular updating of anesthesia training. "Further studies will examine the role of graphic and full-scale simulators in training and re-training for critical incidents in anaesthesia" (p. 500). The use of simulation for both evaluating and for learning about clinical training requirements is already a major development area for medical informatics.

The use of computer-assisted self-monitoring for care and education is the subject of the study of Turnin et al. [4] study which evaluated a computer-assisted diet education system for diabetics. Two six-month studies, of two

groups of both insulin dependent and non-insulin dependent diabetics, indicate that 'Diabeto' which is an on-line expert system (provided directly to patients' homes, with free access) helps diabetic patients self-monitor their diets and balance their meals with personalized counselling. "Diabeto led to significant improvement of dietetic knowledge and also to improved dietary habits" (p. 204), and demonstrated a number of other benefits to both groups studied. While the importance of traditional dietetic knowledge alongside the use of this tool is emphasized, the authors conclude, "diabeto appears to be an effective therapeutic tool in the control of metabolic diseases" (p. 204). Its use was perceived as highly satisfactory by users; the challenge for the future expansion of access to this type of on-line tool will be the availability and cost of networks, hardware and software, as well as appropriate clinical and technical support of the system.

Informatics and Health Communication

Two articles discuss the application of computing to the improvement of health-related communications. Locke et al. [5] test the suitability of computer-based interviewing, and Branger et al. [6] demonstrate the effectiveness of electronic communication.

Locke et al. [5] set out to test the ability of a computer-based interview to detect factors related to the risk of HIV among potential blood donors. The results showed that "computer-based screening elicits more HIV-related factors in the histories of blood donors than do the standard questionnaire and interviewing methods currently in use" (p. 1301). In addition the subjects "enjoyed the computer interview and judged it to be more private than the standard donor assessment method" (p. 1301). While no one identified via this process actually tested positive for HIV, the study indicates the need to consider this alternative approach in order to improve the identification of risk factors and to improve the acceptability of the information gathering process. These results may apply well to a number of client groups whose views and health status require sensitive and confidential investigation.

The study by Branger et al. [6] demonstrates that "electronic communication between primary and secondary care providers is a feasible (and beneficial) option for improving communication" (p. 1068). More specifically, the study was designed to assess the impact of the establishment of electronic data transfer between general practitioners and hospitals. Of particular interest were the speed and efficiency of handling information, and improvement in the continuity of patient care between sectors of the health system. As the authors report, "the first attempt to introduce electronic data exchange in Dutch health care was successful. Electronic communication...led to shorter delays in transmission of admission-discharge and laboratory reports to the general practitioners" (p. 1070). It also led to more complete and more accurate patient records. Perhaps the biggest indication of the application's success is the fact that the costs are shared by the users themselves, and the network has remained in operation after the completion of the study period. The opportunities for expanding and extending the benefits demonstrated may seem obvious; however, the challenge for more widespread use of electronic communication "is an issue to be negotiated by hospitals, care providers, and health insurance companies" (p. 1070). As always, financial feasibility remains an issue to be clarified.

Informatics and Health Care Planning and Evaluation

In one sense, all of the articles are about planning and evaluation. They plan the application of information technology for a certain intervention; they evaluate the effectiveness of the application. However, there are four studies which use computerized tools and techniques that link integrally into planning and evaluation procedures for the improvement and analysis of clinical services. Two articles, Lepage et al. [7], and Iezzoni et al. [8], explore the use of data from hospital information systems to either predict or improve health or health care outcomes. The remaining two articles explore the use of particular analytical tools for planning and quality assurance purposes.

The Lepage et al. study [7] reviews the role of a computerized hospital information system in improving blood transfusion practice. The system was developed to "optimize blood ordering practice and to increase physician awareness by feeding back accurate information to physicians" (p. 253). Results from the 12-month study "strongly suggest that an on-line computerized order-critique system is effective in a routine clinical environment" (p. 258). The success of such a system is dependent on a number of factors, including the active involvement of medical staff and feedback to individual physicians. These factors highlight the importance of the human aspects of advances in medical informatics.

The Iezzoni study [8] indicates some interesting "counter-intuitive" results of the investigation of coding data concerning comorbidities and complications captured by hospital information systems and their ability to predict mortality. The results demonstrate an inverse relationship to mor-

tality and numbers of coded secondary diagnoses. The authors suggest that this indicates an incomplete and/or inadequate use of diagnostic coding. There could of course be other factors confounding these results and the subsequent hypotheses made. None-the-less, the results suggest the need to further examine the effectiveness of current coding practice, which (in the U.S.) may be driven more by coding to maximize billing, than coding to match diagnoses in relation to patient morbidity or mortality.

Carter et al. [9] studied the use of decision-analysis as a quality assurance screening tool. The accuracy of a computerized decision analysis tool developed for the selection of initial drug therapy for hypertension is assessed in comparison to decisions made by faculty reviewers and decisions of residents in training. "The results suggest that computerized decision analysis techniques may be a useful adjunct to other clinical quality assurance procedures in residency training programs" (p. 362). The results of this investigation require further testing, particularly given the small number of faculty reviewers and the particular inter-rater agreement rule adopted. However, even with these provisos, the prospects for using computerized analysis tools in conjunction with other clinical information for training and evaluation purposes seem hopeful.

The final article by Bolger and Davies [10] in this health and clinical management section investigates "the use of a computer simulation model in planning and budgeting for renal replacement services" (p. 605). The investigation undertaken reveals that the simulation program performed well and "could be used by individual renal units to evaluate different treatment policies and to budget for resource use" (p. 605). The authors were par-

ticularly interested in the model's ability to accurately predict different needs under different possible futures. The validation simulation undertaken showed the model-predicted results in good agreement with actual data. The uses and range of application of analytical planning tools which allow the simulation of different scenarios over time can prove to be invaluable in an era of rapid change. This is especially true when the change is attended by serious attempts at cost containment.

The nine articles selected for the Health and Clinical Management stream of the 1993 Yearbook of Medical Informatics, address far more than the issue of containing health care costs; they review the relevance of various components of information technology to health and clinical management. They make significant contributions to the further testing and development of informatics in support of clinical services and health improvement.

The synopsis for this stream of the 1993 Yearbook ends with three quotations (in Lea, 1992, pp. 25-27 [11]); the first two emphasize the impact and import of medical informatics; the third reminds us where the ultimate responsibility lies:

"The impact of technology on medicine is rather phenomenal" (Steven Huesing, Executive Director - Canada's Health Informatics Association).

"Traditionally, medical skills were memorizing and reciting data. Now, with new ways of organizing and storing data, doctors (and other health care providers) can retain their skills and focus on clinical reasoning rather than memorizing" (Dr. Robert Hayward, Professor of Medicine - McMaster University).

"The computer is a decision support tool. It's just another test. The final responsibility lies with the doc-

tor, or primary care giver [or, indeed, the patient or client]" (Francis Lau, Department of Applied Sciences - University of Alberta).

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[3] Schwid HA and O'Donnell D. Anesthesiologists' management of simulated critical incidents. Anesthesiology 1992;76:495-501.

[4] Turnin MCG, Beddok RH, Clottes JP, Martini PF, Abadie RG, Buisson JC, Soulé-Dupuy C, Bonneu M, Camaré R, Anton JP, Chrisment CY, Farreny H, Bayard F and Tauber JPJ. Telematic expert system Diabeto. New tool for diet self-monitoring for diabetic patients. Diabetes Care 1992;15:204-12.

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[10] Bolger PG and Davies R. Simulation model for planning renal services in a district health authority. BMJ 1992;305:605-8.

[11] Lea N. Information overload. Physician's Management Manuals 1992 December;16 (12): 23-27.