



HEALTH INFORMATICS : THE VITAL WORK OF IMIA

(This report has been written for IFIP by Kenneth Owen,
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Of all the areas of computing practice, that of medicine and health care is arguably the most complex and wideranging. At one end of the spectrum are the expensive artefacts of advanced medical science; at the other the everyday techniques of hospital administration. The scale of systems can vary from a national or international network of mainframes to a single instrument in a laboratory or a micro in a doctor's surgery. The techniques of automation have to be applied not to a production line but to the human condition, with all its uncertainties and complexities. Attempting to devise systems which work individually and collectively in this environment, and to keep the many trades and professions involved informed of what is going on in their complex, sensitive world is a formidable task.

Nevertheless the attempt must be made or we shall have chaos. On the world stage the attempt is being led by the International Medical Informatics Association (IMIA), whose fourth triennial «Medinfo» Congress will take place later this year in Amsterdam, The Netherlands.

IMIA grew out of the former Technical Committee 4 (TC 4) of the International Federation for Information Processing (IFIP), whose membership consists of national professional societies concerned with information processing. IFIP's main aims are to promote information science and technology and to advance international cooperation in this field. IMIA now has the status of an IFIP Special Interest Group; it acts as a focus for the effective combination of medicine and informatics, drawing its membership from national professional societies in both fields.

Dr. David Shires, Professor of Family Medicine at Dalhousie University in Halifax, Nova Scotia, Canada, has been President of IMIA for the past three years. He sees IMIA's main role as that of coordinating national activities and distributing information as widely as possible. The people who are active within

IMIA, he points out, are not only computer scientists involved in medical applications; they include also doctors, nurses and members of the other health professions, all with an active interest and fair knowledge of computing and its allied technologies.

« The major world thrust in health care is now directed towards primary health care », Dr. Shires says. « World Health Organization programmes are aimed at access to health care for all by the year 2000. But many developing countries have no information structure and variable administrative structures. It is not known who is receiving health care, nor how cost-effective the programmes are.

« Relatively simple and relatively low-cost technology can provide those countries with enormous benefits. What is needed is *not* just the transfer of western developed-country technology; when that is attempted it usually doesn't work. What we in IMIA should be doing is providing training and help in the use of the technology in the expectation that the countries concerned will do it themselves. »

Putting these views into practice, IMIA was involved, together with the World Health Organization and the Intergovernmental Bureau for Informatics, in sponsoring a highly successful congress on medical informatics and developing countries which was held in Mexico City in 1982. Dr. Shires identifies three topics in particular that emerged from the congress : the application of microcomputers in developing countries, manpower training, and the development of infrastructures for informatics.

In each of these areas there is a need for expert guidance, and IMIA plans to hold a conference in Algiers next year at which the aim will be to produce specific guidelines on at least one of these topics. Thus the improvement of medical informatics in developing countries is a major thrust of IMIA activities at present, in parallel with a similar emphasis within IFIP as a whole.

Another strand of this concern is a proposal that an IMIA working group on medical informatics in developing countries should be set up. Working groups are the mechanism used by IFIP and IMIA to focus continuing expert attention on a range of specialist subjects; those of IMIA are listed below. This new one, it is proposed, would concentrate on three main subjects : curricula in medical informatics, planning aids, and primary care systems.

« One of the things I set out to do as President of IMIA », says Dr. Shires, « was to make the organization much more broadly represented in the world, particularly in the less-developed countries for which I could see these applications becoming vitally necessary. It was fortunate that at this time the personal computer arose, together with the idea of cheap and user-oriented software. So the process of being able to transfer appropriate technology from the developed to the developing nations has been accelerated. »

IMIA's overall programme of activity has two main streams. One is the sum of the working groups' own programmes of specialist conferences, tailored to their own members' interests and producing as output a series of conference proceedings. The second is directed towards the organization of the World Congress on Medical Informatics (Medinfo), a massive triennial event at which the entire medical informatics scene is reviewed in considerable detail.

Seven working groups have been formed to date, concerned respectively with :

- Information science and medical education.
- Application of new technology to health informatics.
- Electrocardiography (ECG) applications.
- Data security and confidentiality.
- Computers in the doctor's office.
- The role of informatics in the classification and coding of health data.
- Informatics and nursing.

Examples of recent specialist conference subjects addressed by IMIA include hospital statistics for population-based health care in epidemiology; impact of computer technology on drug information; use of computers in aiding the disabled; communications networks in health care; nursing informatics; data protection and health information systems; and education in medical informatics. Conferences planned for 1984 will focus on health informatics and coding/classification systems and assessment of technology.

MEDINFO

The fourth World Congress on Medical Informatics (Medinfo 83) is being held in Amsterdam during August 21-26, 1983. Earlier Congresses were held in Stockholm (1974), Toronto (1977) and Tokyo (1980). « Medinfo », says Dr. Shires, « is our main event, held every three years. The general pattern is that we try to give a state-of-the-art review of the whole field. We expect about 2,000 people to attend Medinfo 83, which will make it the biggest yet. » Medinfo's wide scope is indicated by the wide range

of people it is designed to attract: health information scientists and medical computing specialists as well as public health planners, doctors (both specialists and generalists), nurses, health administrative staff, hospital managers, paramedical staff, representatives of the information technology industries and health care consultants.

« This year's Congress has several innovations ». Dr. Shires points out. « As well as the main scientific sessions and the associated exhibition, we have added a series of user-oriented seminars. These will give practical information on planning and management, hospital information systems, pharmacy automation, computers in the physician's office, computing in clinical laboratories, and nursing systems.

« Poster sessions will report the very latest developments in research. On-line access to relevant data banks will be demonstrated. Films and video tapes will be shown throughout the Congress. Technical excursions to nearby universities, laboratories and hospitals are being arranged, and a « Medimicro » show will enable practitioners of medical informatics to bring along and demonstrate their own micro-computer-based solutions. »

The main scientific programme is another powerful indicator of the diversity of topics embraced by IMIA. Main session topics include health and hospital information systems, clinical laboratory and departmental systems, imaging, general practice and ambulatory care, nursing applications, drug information systems, administration and finance, patient monitoring and intensive care, support of clinical decision-making, evaluation of health care, medical research support systems, epidemiology and statistics, education and training, data protection for health information systems, community health care and national health care systems, preventive and occupational care, the impact of microcomputers and other new technology, networks and distributed systems, software systems, free text processing, and modelling and simulation.

Each of these main topics in turn embraces a variety of concepts and applications. Aspects of artificial intelligence in general and knowledge-based expert systems in particular are featured heavily within the decision-making theme. « Imaging » includes ultrasound, nuclear magnetic resonance, computer-assisted tomography and the digital display of radiographic images. Clinical systems cover microbiology, cardiology, radiology and the many other « ologies » of the medical vocabulary. New technology ranges from word processing to voice recognition and two-way television-based medical consultation.

(Information technology has also proved essential in processing the candidate papers for the Medinfo 83 scientific sessions. Dr. Gwilym Lodwick of the University of Missouri, U.S.A., chairman of the Scientific Programme Committee, first entered the salient facts of all submitted papers into his own computer system. With appropriate software, his committee's arduous task of assessing papers and fitting approximately 300 of them into appropriate sessions then proved not quite so arduous.)

Through its working groups and through its conferences, IMIA clearly casts its net very wide indeed. Rather than recite a long list, Dr. Shires quotes just two examples — one esoteric, one very much in the public arena. Coding and classification may sound mundane, but an informatics input to international discussions on this subject is highly significant. « A new version of the International Classification of Disease is expected to come out in 1995 », the IMIA President notes. « The existing system is basically a statistical system and is very limited in the context of computing. We have the opportunity in the forthcoming version to retain the statistical benefits while enhancing greatly the usefulness of the classifications for computer applications. »

Dr. Shires' second example concerns the implications of the developing computer networks. « In the co-ordination of networks and health care, it would be very useful for IMIA to serve some sort of monitoring role, so that these things don't get out of hand. The particular problem in health-care networks is basically that of data security, but problems of compatibility, structures, and the international exchange of information are also relevant. These are the kinds of thing I have in mind when I talk about a monitoring role for IMIA — or for a body in which IMIA can participate. »

Mr. William Abbott of the North East Thames Regional Health Authority in the United Kingdom, secretary to IMIA, stresses the complexity of medical informatics. « In health care, you're talking about a multiplicity of disciplines being concentrated on a moving set of problems. » The range of problems is wide, and the number of people involved in the « industry » is great.

Medical informatics has developed over the years from two separate streams — devoted to medical and administrative tasks respectively — into a more integrated activity, Mr. Abbott says. Large-scale information processing systems now handle both organizational procedures and the record-keeping elements of the medical applications.

As the technology has advanced, so has our understanding of how a hospital actually works, with all its complex inter-relationships. Hence better systems can be designed. This improves the cost-effectiveness of medical informatics systems — which is particularly important in a time of recession when money for health care is short — but, in a more basic sense, today's target levels of health care simply cannot be achieved without information technology.

In parallel with the greater understanding of hospital mechanisms by the system designer has come an enormous growth of informatics awareness on the part of the user, i.e. the doctor, nurse or other medical or paramedical professional. Today the users can specify their information requirements more precisely, and the technology is such that they can insert, manipulate and extract the information they need much more easily.

This user-friendliness of systems, and the other general advances in computer technology that have

emerged in recent years, are having a tremendous effect on hospital and other health-care organizations. « Compared with other sectors of computer usage », says Mr. Abbott, « the extra ingredient lies in fitting all these developments into the extra complexity of health-care delivery. At the end of the day, health care is still delivered by one person to another, whether it be a physiotherapist, a pharmacist, a doctor or a nurse. There are many different professionals, and many different supporting personnel behind each professional. New technologies are bringing new professionals, new supporting technicians and new ratios between the two. These are the complexities. »

NURSING

While the roots of medical informatics are to be found in medical science and hospital administration, recent growth has included a substantial interest in the potential impact of computers on nursing. A new working group has been set up within IMIA to address this topic, with Miss Maureen Scholes, Director of Nursing Service at The London Hospital, London, England, as chairman.

Introducing the published proceedings of the 1982 Harrogate conference on nursing informatics, Miss Scholes commented: «Nurses are the specialised group caring for the sick and promoting health. There are greatly increased populations, diseases are better understood and there are known methods of prevention and treatment for many of them. Surgical techniques and drug therapy have advanced rapidly. In response, nursing has become more complex, with specialised sub-groups: at one extreme the health visitor acting as counsellor and adviser about health; at the other extreme the intensive therapy nurse needing highly technical skills to care for critically ill people. »

Nurses had been slow to grasp the potential of computers for nursing. Leaders of the nursing profession were confronted by recruits who knew nothing about nursing but who knew about computers. This had produced a sense of unease and an urgent desire for computing knowledge, and some interesting research had begun. Three major streams of activity were those of patient care, nurse education, and nursing management.

« Nurses involved in *direct care* see the computer as a possible solution to some of their problems of nursing records. In order for a frequently changing team of nurses to give planned, systematic and consistently good care to an individual patient, whether in hospital or the community, there is a plethora of paperwork. The time taken up by this constantly makes inroads into the time needed to give the planned care. Will the computer tip the scales in the patients' favour ?

« Nurses involved in *administration* see the computer as a highly useful management tool. Too often they are required to provide a nursing service for a workload over which they have little control. Medical

staff appointments are made without proper estimation of the nursing workload which will accrue to them. Alternatively the workload may have been predicted, but the money needed for resources not agreed.

If nurses can combine the logic and precision of the computer with their own intuition and generosity, and if they have a sound knowledge base, Miss Scholes concludes, then the quality of nursing care can be improved.

DATA PROTECTION

Within computing generally the subject of data protection is a highly emotive issue, and in medical informatics in particular it raises a host of difficult questions. IMIA's Working Group 4 (WG 4) was set up in 1977 to address this subject, and since then the Group has organised three working conferences on data protection in health information systems and has published a book on the subject.

Mr. David Kenny, Regional Administrator of the North West Thames Regional Health Authority in the United Kingdom and chairman of WG 4, has pointed out that the many facets of the subject include doctor/patient relationships, privacy rights, computing technology, health care structures, social forces, legal issues, developments in medical care and resource requirements. Each one of these topics is changing, and each can be controversial in its own right.

Those involved face four categories of problem. There are *technical and operational* problems arising from new developments in microcomputing, database management systems and encryption; and from the need to integrate organizational, hardware and software strategies.

There are *legislative* problems, as the wait-and-see attitudes of governments result in fragmented systems both nationally and internationally. Confusion about patients' rights will increase.

There are *ethical* problems - - in particular, a real danger that the patient's right to control the circulation of personal information is being eroded, because clinicians are increasingly being put in a position where they are giving consent on the patient's behalf.

And there are problems of *organization*. More active involvement by top management is required to ensure effective integration of strategies, to improve user behaviour and to provide an environment for clear procedures.

On the occasion of the third working conference, held in Kiel, West Germany, in September 1982, Mr. Kenny noted : « We have reached a new stage in the development of the subject. So far, choice of data protection measures has been subjective, and has been made on the basis of the immediate local circumstances. It has not always been possible to draw upon specific or general experience elsewhere, and solutions have therefore had to be ad hoc.

« Expansion of computing has now extended the corpus of knowledge and experience so that problem-solving must be based on wider and more informed considerations.

« The whole emphasis is shifting from quick ad hoc responses to more comprehensive and systematic risk analysis planning, the social engineering problems of user behaviour, and the need to improve the education and level of awareness of legislators, the public and the users. To that extent we are beginning a new game. »

At Medinfo 83 in August, issues such as these will be exposed to a wider scrutiny. One international point of discussion will be the inherent contradiction between the wait-and-see attitudes of governments on the subject of trans-border transmission of data, and the actual increase in the volume of that traffic.

KEY QUESTIONS

To keep abreast of all facets medical informatics is an impossible task (although the published proceedings of Medinfo 83 will give a comprehensive guide). Dr. Donald Lindberg of the University of Missouri School of Medicine, who is the United States Trustee on the IMIA Board, highlights three topics as having particular importance at the present time.

First, the emergence of the technologies of artificial intelligence (AI). « Certainly AI is a very promising area at the moment, for what is probably a good reason. It offers the opportunity to make knowledge-based systems which are capable of reasoning on a symbolic basis rather than a numerical basis. It therefore opens up many areas of medical expertise, which formerly were very difficult to approach using only numerical methods. To use symbolic reasoning makes it more natural in medicine, and perhaps matches the medical empiricism. »

Second, the process of educating medical people in medical informatics. « We recently completed a very useful international working conference in Chamonix, France, on the subject of education in medical informatics. I found that Europe, especially Germany and the Netherlands, is definitely ahead of the United States in implementing formal educational programmes for medical students rather than for physicians. »

Dr. Lindberg's third topic, reflecting Dr. Shires' remarks above, is that of medical informatics in developing countries. There appears to be a genuine feeling within IMIA that this problem merits urgent attention. But, Dr. Lindberg points out, « that topic gathers quite a lot of enthusiasm, and quite a lot of willingness on the part of knowledgeable informaticians to contribute help towards spreading this sort of technology to developing countries -- but also a considerable confusion as to how best to proceed. »

Other areas within medical informatics blow hot and cold over the years, Dr. Lindberg comments :

clinical laboratories were once the focus of intense activity but are rather less exciting now, while decision-making functions have grown in interest. Administration remains a big problem, particularly on national and regional levels, but steady progress has been made.

Perhaps the trickiest problem of all concerns the comparative evaluation of medical technologies. «This is really a conceptually difficult area, which perhaps hasn't had enough attention devoted to it », says Dr. Lindberg. « We're not even sure of the criteria that should be applied. » The problem is to judge proposed systems in terms of cost-effectiveness, in a medical sense. «It's quite easy to develop cost-effectiveness measures with respect to the application of technology systems, but often very difficult to assess the benefits — to know the alternative courses of action and to put some sort of unitary cost figure on benefits which are non-financial. »

Very often, the problem is highly controversial — whether to buy a very expensive piece of equipment that can keep a small number of people alive, for example, or to spend the money on more mundane health care that will benefit many more people. « Very

often that is exactly the question », says Dr. Lindberg, « and I think the medical informatics people are quite convinced that that is a value decision which should not be left to the technologists. That is a matter of public policy.

« There are good, clean, formal mechanisms for evaluating Technology A versus Technology B to do a given job. The problem is how should you prioritise that job against the other possible jobs that can be done in medicine and welfare and public concerns. That's a question of value judgements, and we don't know how formally to make those. These issues are often better resolved on a national level; I don't think IMIA ought to enter into these sorts of societal value judgements.

« The same question arises and makes difficult this developing countries issue. If there remains a problem in a hypothetical country X in obtaining a clean water supply and a proper sewerage system, and there is no transportation and no communication, should one be implementing an automated hospital information system ? That has to be the judgement of the people who know and love the country best. »

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