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Articles should be no longer than 3,000 words and should have no more than six illustrations, tables, diagrams or graphs. Articles must deal with issues related to the medical and allied medical field in its broad context.

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2. The author's name(s).
3. All degrees and diplomas, etc., held by the author(s).
4. The appointment of the author(s) including the full name of the Institution from which the work emanated.
5. Address of first author.
6. Telephone and/or telex and/or telefax number of the first author.
7. A statement, signed by all named authors, giving consent to publication.

2. Refer to articles in most recent issues for guidance on the presentation of papers. Pay special attention to capitalizations, punctuation, authors initials, authors title, wording and layout.

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The global purpose, HEALTH FOR ALL BY THE YEAR 2000, established unanimously by the nations of the world at Alma Ata in 1978, set the moral guidelines, stated the political urgency, and recognised the technology that would be required if the world were to overcome the worst aspects of poverty and deprivation (John H. Bryant).

Contrary to popular belief, the possibilities presented by the advent of computers in the fields of management, information access and data handling in health are not only directed towards tertiary care and privatised institutions. In fact, computerisation of health systems in the areas of management, education, diagnosis and information can only contribute towards coping with the vast population of the world more efficiently and cost-effectively.

At the same time, it should never be forgotten that computers are but a tool for improvement, never capable of replacing the human component of health, but enabling the health worker to dedicate his time to the administration of health care rather than to the management of such.

In this issue, The Leech has ventured into an inadequately considered topic in medicine - the use of computers in medicine. We have just touched briefly on different aspects of medical computerisation, and hope that this will stimulate your thought processes and encourage you to seek more information.

For the first time, The Leech is being distributed to all staff members of the Wits Medical Faculty - as well as all students. We continue to break new ground and hope to remain an information source for all that read the material.

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The Progress of Technology

How many of us have not at some time stopped to marvel at the speed with which technology is progressing? We have no sooner purchased that "all new product of the future" when we hear of another which does it bigger, better, faster and cheaper. It's now becoming a widely accepted fact that no matter how hard we try, technology will remain a few steps ahead of us. It is relieving to know that in most areas of our life this lag behind technology really doesn't matter. However in the field of computerized medical practice management this lag can be rather costly.

It is well known that the medical market is the target for every Tom, Dick and Harry with an idea for making a fast buck. Nowhere is this more evident than in the medical computer industry. So many companies appear and then in a matter of months are gone. The damage they do however, tends to hang around to remind the unsuspecting practitioner of his mistake for a lot longer.

In the early 1980's choosing which computer to purchase was easy. There was only one! IBM had, at that time, the only real "PC" on the market. Now today, as we move ever closer to the year 2000 the number of hardware producers and models seems to be limitless. It's no wonder practitioners on occasion get it wrong. Just think, they can choose from IBM, MBM, Olivetti, Acer, or Nixdorf to mention but a few and it doesn't stop there. They then have to decide on which model 8088 (XT), 80286 (AT), 80386SX, 80386, 80486 or the soon to be 80586. It's mind boggling and yet uncannily simple at the same time.

Let's begin with the first IBM PC or PC "XT" as it was known. The (8088) processor (or brain of the computer) used to drive this machine was an 8 bit processor. That is to say (in very simple terms), it could handle up to 8 pieces of data at one time. This processor was very slow and offered limited features when compared to the processors used now. However, it powered a generation of computers which are now considered to be archaic but are still being used and sold today.

The original (8088) PC was superseded by a computer called the "AT", a machine powered by an (80286) processor. This 16 bit machine offered a whole new world to both programmers and users alike. It opened the door to multi-tasking (simultaneously running two or more programs on one PC) and the development of new software packages and operating systems that could make use of the extended features of the processor.

By early 1989 a real computer for the "AT" was announced. It took the form of an (80386), a fast and powerful 32 bit machine. The "386" as it is now known came in two forms, a genuine "386" and a "386SX". The "386SX" is in real terms a hybrid machine, combining the genuine 32 bit (80386) processor with the basic system configuration and layout of the "AT". This machine has proved to be very popular because it offers the performance of an (80386) processor at the cost of an (80286) "AT".

The next generation of processing power is the (80486) which is the latest and by far the most powerful to date. It is, however, a very expensive option with the basic entry level machine costing around R30 000.00, almost five times the cost of a "386SX" and in real terms not only far too expensive for most medical practices, but also far more powerful than is necessary.

Hence, for various reasons, I would advise the purchase of an (80386)SX in today's market. It offers all the power that is necessary at a reasonable price. It also has the advantage of a 32 bit processor which allows it to run the new 32 bit software which is currently being developed all over the world and shipped at the present moment, a task which is beyond the reach of the "AT" or "XT".

There are many reasons why practitioners fall into this trap. I personally believe the main, if not only reason, is lack of knowledge. Therefore by educating the product purchaser we can reduce the number of practitioners who fall prey. Giving you hints and guidelines for the successful purchase and implementation of a functional computerized practice management system is a way of rectifying the situation. This comment looks at the progress of technology and its effect on purchasing a computer system today.

In the early 1980's choosing which computer to purchase was easy. There was only one!
Computers in Healthcare

Introduction

As background to the role of computers in healthcare facilities in South Africa, it is important to understand that only some twenty percent (20%) of all current healthcare-providing facilities have any computerisation at all.

Computerisation has largely been implemented in private hospitals and clinics, who charge for their services at medical aid rates and above, and whose performance is monitored by their managers who try and maintain their facilities as close to maximum efficiency and patient handling capacity as is possible.

Rapid urbanisation and modern medicine place an increasing responsibility upon healthcare administrators to provide adequate services, where the masses live, at the lowest possible cost to the patient and the state.

Hospital management and administrators are facing diminishing funds and resources from the near bankrupt state coffers. To date there has been little or no computerisation. Management do not have the tools or the know-how to tackle an already daunting task. Hospitals are being allocated meagre funding based upon their requirements. However, there are no accurate statistics on which to base their budgets or substantiate their claims and without computers, little or no chance of getting any adequate funding.

Outdated procedures, the lack of management skills and ability and qualified business personnel, as well as the total lack of meaningful management information, have been responsible for the escalating mess that exists in our state hospital today.

"Only 20% of all current healthcare-providing facilities have any computerisation at all."

Patient record keeping

When a patient arrives at a facility, their visit is recorded on the system. Firstly their demographic details are checked against the computer’s records to establish whether a record already exists for this patient. If a record does not exist then a new record is opened.

At this stage, the existing patient file is drawn from the Medical Records department and an admitting form may optionally be printed together with a set of patient identification labels. The labels are used to head up new medicolegal documents necessary for requesting and recording patient treatments, as well as labelling specimens taken from the patient to be sent for analysis. It is important to note that because the entire patient record is computerised, only the legally necessary documents are kept in the physical patient record.

An important aspect of the computer medical record system is its ability to track the medical record as it is handed from one clinician to another. The patient labels generated by the system should include a barcode of the patients file number (hospital number). As the patient file is accessed by another clinical department, the system will automatically know where the file is.

All prescribed treatment recommended by the attending clinician is entered on the system. The information is recorded as a result of a request being entered or as the treatment is carried out, e.g. in the case of medicines being dispensed, the computer will generate a prescription label with instructions directing how the medication should be administered and retain a record which is attached to the record of the patient. All treatments are thus entered into the system enabling a comprehensive record to be built up and retained. The system is controlled and driven by the ward staff.

Patients are booked for various

John Kemsley

CMC/Medis Computer Systems

Patient medical records and files have been kept according to very outdated and archaic methods, resulting in missing or lost documents.

The remedy

The only hope of sorting out this bad situation is to computerise, starting with financial systems and progressing to patient administration, clinical departments and their records, to get the hospital on to a sound business footing.

This however, has not been the case in the mining industry. Some of the more prominent groups, like Anglo American, have pioneered into computerisation. Hospitals such as the Ernest Oppenheimer Hospital in Welkom, the West Vaal Hospital near Orkney, the Western Deep levels Hospital outside Carltonville and most impressive of all, the Chamber of Mines - Rand Mutual Hospital in Johannesburg, have greatly benefited from computerisation.

"Red tape and the lack of funding have hindered progress in the state run institutions."

Computerisation

At the lower end of the scale, computers have become cheaper, more powerful and thus more available. The average person has a better knowledge and understanding of computers. Computers are being introduced into businesses everywhere, even into hospitals and clinics.
treatments like surgery, lab investigations, dispensed medicines, radiology investigations, special diets and other outpatient treatments like physiotherapy, dentistry, etc.

Nursing Care Plans are entered on the system and carried out by nursing personnel to meet the individual requirements of each unique patient case. Infection control information is monitored by senior nursing and clinical personnel to prevent further morbidity within the facility and to provide the department of Pharmacology with valuable information for infection containment and prevention.

Ward transfers are entered by the ward staff, usually the discharging ward. This enables the system to keep track of the patient so that any clinical results being processed for a patient will track the patient to the ward they are in.

Other services provided by the computer system cover such departments as Catering, CSSD for sterile packing, Cleaning, Laundry and Maintenance, whether these services be provided on site or brought in.

Modern computer systems have extensive financial control systems providing General Ledger, Patient Costing, Stock Control and Accounts Payable (Creditors), Invoicing and Debtors Control, Payroll and Asset Management.

Benefits from computerisation

Financial
Proper stock Control assisted by the computer system greatly reduces stock holding with the resultant saving in both cost and space. Some facilities have been able to reduce their stock holding to about a quarter of what they previously held.

All payments are controlled by the system and receipted in the case of cash received providing complete bank deposits as an automatic by-product of the run or shift.

Computerisation is a one time cost. It is taken into account as a true asset and depreciated with time. It does not ask for higher wages, go on strike if its demands are not met, or need to go on leave annually.

I would go so far as to say that without a computer system it would not be possible to effectively run a modern medical facility - even in a third world country like South Africa. There are just too many facets that management needs to control to attempt to run either profitably or within budget. Most times with manual methods, by the time problems are discovered it is too late to do anything about it and the culprit is long gone.

Administrative
One of the greatest nightmares of any hospital administrator is stock shrinkage. Computerisation provides management with the tools to determine departmental usage, especially of those items not allocated to a patient. In this way one department or ward may be compared with a similar one as well as comparing this week or period with the last.

In certain areas such as patient registration and reception as well as certain administrative sections such as Accounting and Statistics, less staff are required to perform the same tasks and in the case of statistics, this becomes a by-product of processing and can be accessed as and when required.

In searching for a patient record, the computer system greatly reduces the risk of duplication by different methods. One of these is the soundex search facility. Here in South Africa we have developed hybrid versions of the soundex to cater for ethnic names prevalent here.

With all of the patients details on the computer system we strive to achieve a paperless electronic record as far as is legally possible. As a result less space is occupied by hospital files, which may now be housed in modern facilities, keyed or referenced by the computer system.

Management
Accurate patient statistics are a by-product of processing. They form part of a wealth of management information available at the touch of a button. Some reports may be printed automatically by the system to enable management to act timeously on the matters that count.

Patient costing is a special tool for clinic and hospital management, enabling them to make time critical decisions regarding the mix of products offered by their facilities. Each patient is costed individually and grouped by diagnosis. The average here gives us a cost per diagnosis code. Diagnosis codes may then be further grouped by Diagnosis Related Groups (DRG's). Taking this one step further, we can then group them by Clinical department, which will show us the profitability of each department. These figures can then be compared with other facilities within an organisation. From this we will get an indication of whether it is profitable to offer certain services or buy them in from other organisations - a true management tool.

Clinical
With the implementation of a computer system many tedious tasks are reduced or eliminated that had previously taken up precious time of clinical staff. Now professional staff are able to perform the tasks they are employed to do - improving the level of healthcare for that facility.

Accuracy and greater control and reduced repeat-requesting lead to greater efficiency and profitability. The computer system provides many facets of quality control, reporting on an out-of-the-ordinary occurrences for management to act upon.

Summary
Where computers have already been installed in private hospitals and clinics are well as in various academic institutions, they can be run and controlled on a business basis and the level of healthcare will continue. Where there is little or no computerisation, senior administrators will soon have to fit themselves with the tools to maintain an acceptably high level of health care.

Now professional staff are able to perform the tasks they are employed to do - improving the level of healthcare for that facility.
Electronic Data Interchange in Healthcare

Electronic Data Interchange (EDI) is the electronic transfer of data in standard format between computers in two different organizations. Standardization of the format is critical since the receiving computer must be able to accept the data without human intervention; however translation software can resolve problems of different computer hardware being used by the sender and receiver.

EDI is being rapidly accepted as a cost saving and strategic imperative in the transport and distribution industries, but there are relatively few healthcare applications that are beyond the pilot stage.

There are three major areas of application in the South African Healthcare Industry:

- Medical Aid Industry: claims and membership files;
- Pharmaceutical and Surgical Supplies: Order/Invoicing;
- Transfer of health data: pathology results.

Of these, the first is of immediate and strategic importance, and is in the process of being developed. The second falls more into the tactical category, and the third application will probably emerge as a by-product of networks set up to carry claims traffic.

**Medical Aid Claim and Response**

The scenario towards which the industry is moving would ideally develop like this: The patient visits his doctor and provides his medical aid details (or swipes his medical aid card through an optical/magnetic reader). The doctor enters the details of the visit, diagnosis, tariff code, prescription and fee on to his PC. His software translates the data into the standard format and transmits it to the medical aid who process the claim within 24 hours, and notify the doctor that the fee will be electronically transferred to his bank account.

Dr Sally Velzeboer

MBBS, BSc (Med), FFARCS, FFA (SA)
Currently completing MBA (Wits)

It is obvious that there are significant cost savings to be had if this technology is implemented effectively. If doctors had access to medical aid membership files, they would be able to virtually eliminate their bad debts. The doctors would also save on the costs of stationery and the now very significant costs of posting three or four statements, not to mention the benefits of faster payment.

Advantages from the medical aid administrator's point of view are also appreciable. Data capture is now down for them, duplication of claims is eliminated, standardized data will be easier to analyze, and administration of increasingly complex packages of medical benefits will become possible.

**Pharmaceutical Industry**

The logistical problems of supplying thousands of pharmacies and hospitals with pharmaceutical and surgical supplies make this an ideal application for EDI. Pharmacies would be able to order electronically from their wholesaler, and receive on line, or relatively fast order confirmation. In some organizations, the order can be automatically processed as well. By accessing manufacturer's stock files, the wholesaler can manage his own ordering better and reduce stock holdings significantly, with corresponding reduction in requirements for working capital.

**Healthcare Information Transfer**

Pathology laboratories already use electronic transfer of data to pass results back to doctors in larger centres such as private clinics. This, however, is via a dedicated terminal, rather than by EDI and is restricted to areas where there is heavy traffic of results. Availability of a network which could be accessed by all doctors, would enable all to participate in this benefit. The network could also be used to disseminate public health data on infectious diseases, and to automatically update tariff codes held in the practice software package.

**Making it happen**

This Utopian situation however, calls for a great deal of co-operation between the healthcare industry players. The hostility which has developed between the providers of healthcare and the funders of this care will need to be sublimated and a new attitude of partnership in healthcare fostered, to turn the implementation of EDI into a win-win situation.

One of the issues that needs to be resolved is the adoption of standardized codes throughout the industry. Codes are needed for pharmaceutical and surgical supplies, diagnoses and procedures, as well as for doctors, medical aids and tariffs.

The message and communication formats and protocols also need to be agreed upon at an early stage and adopted by the whole industry, to avoid costly paths such as that taken by the banks when automatic terminals were first introduced, and rival organizations adopted different standards, which were later scrapped and uniform standards introduced.

The prohibition by the post office until last year of private commercial networks or VANS, has delayed the introduction of EDI, but licences have now been granted to several organizations, and the industry now has the choice of setting up its own VANS, using one of the commercials VANS now available, or linking through Beltel to the Telkom X.400 data communication network.
Spiralling costs of healthcare, falling traditional medical aid membership base, and possible changes to the regulatory legislation are all factors which are threatening the survival of private medical care and insurance as we now know it. The seriousness of this threat may be the impetus which drives the industry to more conciliatory partnerships which will introduce electronic data interchange to the benefit of all.

The standardized format of the claims data will make healthcare statistics easily available, and this may be seen as an opportunity or threat. Cost containment has become a critical issue in health insurance, with accusations of overservicing generating a great deal of bitterness. The doctor has been placed in an unenviable position as Scale of Benefits fees have fallen far below MASA tariffs, and shorter repeat visits and dispensing are seen as the only alternatives to supplement falling real income. The combination of deregulation and EDI will be a powerful stimulus for the provider and funder to study better ways of providing affordable quality care while retaining the services of dedicated professionals, and EDI data will facilitate this study.

The new government will expect the private healthcare industry to demonstrate that it can provide care for more than the few top income earners. There are enormous opportunities here for the private sector to provide cost effective health services for millions of middle and lower income groups. Traditional health insurance is unsuitable but EDI facilitates a range of options from administration of national health insurance, through a variety of managed health care options.

Cost containment has become a critical issue in health insurance.

Conferences

SAPS 26th AGM & Congress

Seven International Speakers
Theme: Clinical Trials & Methodology
Venue: Holiday Inn, Bloemfontein
Date: 13-15 September 1992

This theme will examine issues such as:

- Good clinical practice
- Quality assurance, and
- Regulatory requirements

The speakers will address various topics which will be subjected to intense and comprehensive discussions throughout the three day programme. In addition, poster presentation and discussion sessions will enable researchers to communicate their findings.

The 1992 speakers are an experienced group of professionals who will impart extremely useful and important information to delegates. The list of confirmed speakers includes:

Dr Horst Plettenberg, Director of Quality Management, LAB, Neu-Ulm, Germany.

Dr Howard Lassman, Director of Clinical Pharmacology, Hoechst-Roussel Pharmaceuticals Inc., New Jersey, USA.

Professor Peter Folb, Head, Department of Pharmacology, UCT, and Chairman of the SA Medicines Control Council.

The Society is also awaiting confirmation from Dr Sheila Linder and Dr Peter Maurice, both from Switzerland.

Additionally, a workshop encompassing “Design, Evaluation and Reporting of Clinical Trials” has been scheduled to take place on Wednesday 16 September at the same venue.

For further information and application forms please contact:

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Expert Systems in Clinical Medicine

Introduction

An expert system is a computer program that contains and embodies in its operation, the knowledge and experience of an expert or experts. These programs are more than the clever use of text and images presented on a computer screen. They serve a different educational purpose than that of electronic textbook, since they try to reflect (clinical) logic and thinking rather than (physiological/pathological) facts. A good expert system will display on request, the logic used to arrive at a given conclusion.

Background

Internationally, many hundreds of medical expert systems have been built, sometimes addressing rather limited clinical areas, chosen for their easy of representation on computer. However, several very comprehensive systems have been developed but as a rule of thumb these take about five man years and approximately five million US dollars to bring to fruition. A large component of the costs is the considerable amount of time which the "Domain Expert" and the "Knowledge Engineer" have to spend together in order for complete and correct transfer of knowledge to occur. Very specialised software technology has also been a factor. Overall, very few medical expert systems pass laboratory and field testing, and only a handful have reached implementation and commercial viability.

Potential

Computerised Chess games have reached such a level of sophistication that only chess Masters and Grand Masters can consistently beat them. So too have certain medical expert systems consistently outperformed average practitioners in specific clinical areas. Computerised logic has the advantage of consistency under all conditions and perfect memory of the facts at hand. It is unwise to reject expert systems in medicine and many people believe that they will inevitably become more important, both in medical education and the everyday clinical practice of medical and paramedical people.

Problems

What has been missing in the past is a cheap, PC based development tool, simple enough for the medical expert himself to use, without the need to involve a Knowledge Engineer. Also, ethical questions about how and when computer programs can be used in the treatment of patients are still affecting progress to some extent and must be resolved as soon as possible. Users of an expert system must make final decisions themselves and must at all times remain personally responsible for the welfare of the patient. Lastly, very simple and effective user interfaces to the program are needed if clinicians are to use a computer while treating patients.

Developments

A good shell program has become available locally for the development of medical expert systems. This program assumes that clinicians think in "checklists" of options that are applicable in a particular situation. All signs, symptoms, test results, diagnoses and treatment options are broken down into "building blocks" each of which has its own identifying code deep in the computer program. The program displays a menu or checklist of the recommended options in a specific situation. The user then designates the choice or choices that apply to the patient being examined. For each choice, the program advances to the next checklist which provides more detail about the option(s) previously chosen. The program remembers each choice that was made. In this way, it builds up a case record as a string of clinical attributes chosen from predefined lists. This methods seems to be useful in describing case and other material from any of the clinical disciplines. Full and complete detail is achieved. Each clinical attribute has its own identifying code. This means that the program can sift and compare thousands of cases recorded in this way, thereby automating the process of clinical research. Very important from the point of view of building an expert system, this means that "rules" can be defined as combinations of attributes. For example, in WINTER (01) an otherwise healthy patient complains of a COUGH (02), HEADACHE (03), RUNNY NOSE (04) and GENERAL MUSCLE PAIN (05). There is a SORE THROAT (06) but no evidence of TONSILLITIS (07) or OTHER UPPER RESPIRATORY TRACT INFECTION (08). The chances are good (shall we say 95%) that the patient has INFLUENZA. The system can be programmed as follows: IF any case record includes the codes (01), (02), (03), (04), (05) and (06) but not the codes (07) and (08), THEN display following line of text. "The diagnosis with 95% certainty is Influenza". This apparently simple method can be used to give warnings, direct further investigation or give surpri-singly accurate and sophisticated diagnostic or therapeutic recomme-dations. As an added bonus, all the information...
recorded is placed into an integrated word processor and can be manipulated into various formats such as Case Summaries or Referral notes and printed out immediately.

Summary

Thus there is practical evidence to suggest that medical expert systems can be developed with a very high level of clinical accuracy and with great potential for medical education. Many of the problems that have surfaced are computer technical, financial but temporary or philosophical. The advent of low cost development tools should stimulate interested parties to develop medical programs of particular benefit in a country with burgeoning Healthcare requirements and rather constrained resources. Providing the correct technical choices are made at the outset to ensure flexibility and cost effectiveness, there is no reason why we should not begin to see medical expert systems and knowledge based programs performing useful work in the hospitals, clinics and medical schools of South Africa.

Breast Cancer in on the Increase, yet too Many Women Choose to Avoid the Issue

Breast cancer is being labelled as one of the health scandals of the decade. It is predicted that one in 10 South African women will need treatment for the disease - widely regarded as a primary killer of women.

But while medical specialists say that breast cancer is curable, they believe it is often fear that's the killer.

Says Dr Anne Hacking, one of the consultants who heads up the Breast Cancer Clinic at Groote Schuur Hospital: "Our major problem here is South Africa ... is that by the time most women come to us, they have advanced breast cancer and we can do little to help them".

Statistics show that if breast cancers are caught "very" early, the 10-year survival rate is 99 percent and minimal disfigurement of the breast can be expected.

Where cancers are localised to just the affected duct, the survival rate is 80 percent and a lumpectomy with radiation can still be a good option.

And for cancers that have only spread to surrounding tissue, the rate is a hopeful 68 percent.

Yet despite the high success rate in curing cancer of the breast specialists are distressed that many women choose to simply "avoid the issue" when preventative action can be taken.

They claim women do little about educating themselves on self-examination or health screening, which could detect a malignancy that might not have been seen or felt.

In addition few women did anything about learning what options were available if they did have breast cancer.

Other reasons given for the apparent increase in breast cancer are firstly that research into the disease is inadequately funded, and secondly that many of the drugs are too expensive to be widely available outside the private sector.

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Introduction

Computers have been surrounded by an undeserved mystique in the past and there is a temptation to treat them as a panacea or blanket problem-solver for gross structural inadequacies in data collection and processing systems. Computers produce results that reflect the quality of the data entered into them and when raw data is flawed, the aggregated results, though very attractively presented, are also flawed. Many developing countries rely on micro-computers for processing health data and there is certainly a role for this kind of technology when it is used appropriately and in conjunction with an accurate and efficient data collection system. However, in developing countries undergoing a national emergency, normal communications and conditions of work may be experiencing a process of desegregation which will impact not only on data collection but also on the appropriate use of the computer in processing this data.

One such country is Mozambique which, for the last twelve years, has been gripped by a bloody and protracted civil war, the effects of which have now been compounded by the worst drought in living memory. With up to a million refugees in neighbouring countries and as many as three million internally displaced, the country is among the poorest in the world and claims the dubious distinction of having one of the highest infant mortality rates (IMR).

Both the country's health infrastructure and the health of the Mozambican population have been particularly affected by the civil war and its attendant problems. Health posts have been destroyed, supplies stolen or ruined. Health personnel have been attacked and sometimes killed or kidnapped and the population has been without adequate medical support in some areas for years. Because of a highly centralised bureaucracy and the difficulties of road transport, supplies are slow to reach outlying districts or even provincial capitals. The black market has thrived on stolen medical supplies and equipment. Nurses function in the most adverse conditions and often do not even have a pencil with which to record data.

While the Ministry of Health (MOH) based in Maputo received a substantial amount of aid each year, there are numerous obstacles to its equitable distribution around the country. The result is that competent medical services are concentrated in large urban centres (mainly Maputo and the larger provincial capitals). In one respect, however, the MOH is well ahead of any other part of the country and that is in the acquisition and use of information technology (IT). Somewhat incongruously, the MOH began to receive donated micro-computers from early 1988 and by the end of 1990 well over sixty had been installed. While rural health posts and even provincial hospitals were struggling for blankets and medicines, the MOH had embarked on an entirely new generation of technology.

The impact of computers has been significant in several sectors of the health management and delivery system. However, perhaps their most important contribution (at least up to the end of 1991) has been to cause a re-evaluation (and subsequently, a re-organisation) of manual systems of data collection, information processing and health management.

As a result of the rapid influx of micro-computers and in the context of the growing national emergency that was increasingly isolating Maputo from the rest of the country, the MOH initiated a rationalisation programme in January 1990 aimed at optimizing the use of this expensive asset. The programme had two phases:

1. The rationalisation of computer use and acquisition through an analysis of the current situation and the development and implementation of a set of recommendations.

2. Development of appropriate software applications in order to expand the use of computers beyond word-processing and simple spreadsheets.

Because of space constraints, and because the second phase of the project is on-going, the rest of this article will evaluate briefly the first phase.
of the programme and examine how the process of rationalising computer use impacted on the role of computers in relation to manual data collection systems both in the MOH and throughout the health delivery system.

Problems and obstacles in IT use

In early 1990, an evaluation was conducted of each department in the MOH that used computers. While there had been a substantial amount of progress made by some departments who were resourceful in their acquisition of skills, the majority of departments were experiencing difficulty in putting their computer to good use. Many of these obstacles were similar to those of other developing countries:

- Problems with heat, humidity and dust;
- Frequent power cuts and unstable power supplies;
- A low level of understanding with regard to what tasks computers were capable of performing.

Other problems were specific to the conditions in Maputo at this time and were beyond the control of the individual or department. The three most important of these are discussed.

1. Maputo had very little computer expertise as a whole, either in the form of technicians who could execute repairs or experts in software training and development. The large foreign aid agencies were able to hire much of the local expertise because of their ability to pay foreign currency salaries while local personnel were not able to hire a technician and the result, in terms of the MOH, was a waiting period of up to six or eight months for repairs.

2. Until recently, computers and spare parts could only be purchased in foreign currency (because of government import and commercial laws) and consequently, were difficult to arrange without donor assistance. While donors were all too happy to provide the capital equipment, they were very reluctant to make any provision for recurrent costs associated with computer use. Thus, while the number of computers within the MOH almost doubled in 1990 alone, there were no funds available for their maintenance and repair. However, an additional problem seemed to be an attitude to donated equipment that has developed within the MOH and, to a great extent, has been fostered by the aid agencies themselves, the result of which is that little value is placed on this kind of resource. In one case, when approached for funds to fix a relatively minor problem, the MOH department concerned was told (unofficially) to throw the computer away and request a new one from that agency because it involved less paperwork for the agency itself, although the department in question would have had to wait twelve to sixteen months for a replacement. This kind of attitude has a highly negative impact. Not only does it create a "throw-away" mentality in one of the world’s poorest countries, but it degrades a relationship that should be based on mutual respect between donor and recipient.

3. Access to computers, scarce computer training and resource materials were disproportionately geared in favour of expatriate aid workers. Because of a lack of time or motivation and the shortage of skilled local staff, expatriates often used computers for their own work without transferring the knowledge to their local counterparts. Mozambican personnel were sent on software training courses before they had access to a computer at the MOH and the absence of on- or off-site support resulted in a gradual erosion of knowledge. Finally, all of the software and most of the manuals were in English and were thus largely inaccessible to the Portuguese speaking population so that even those with motivation were unable to develop their skills without the help of a foreigner or some kind of formal assistance.

In addition to these largely external problems was the complex issue of data and its relationship to the computer. Attempts to use computers for data processing in order to facilitate decision-making highlighted two very serious obstacles. Firstly, the system of collecting data was problematic and secondly, the role of computers in data and information processing was not clearly understood. While these difficulties were observed in several departments of the MOH including supplies and shipping, personnel, finance and administration as well as the directorate for health delivery programmes, one area - that of health information - will be used as an example of a widespread national problem.

Data collection in itself is not a new activity in Mozambique. Indeed, one of the main problems with the process has been a proliferation of data collection forms emanating out of the MOH without much coherence and which duplicate data requests. The pressure on rural health workers to provide this data has been tremendous and they may have to devote a full day a week to meeting the demands of the MOH, which, given the conditions of their work and the fact that they may be the only health worker on duty, is unrealistic. Both because of their lack of training and general education and because the collection process provides no follow-up or report back, transcribing of statistics and information is done without any real understanding of what it could be used for, or indeed, what the data actually means. In the eyes of the health worker, it is only another one of their many duties and this isolation from the process leads to data that is incomplete, inconsistent or simply incorrect. The demands of the MOH, distant and isolated from the rest of the country, were the crux of the problem.

The use of a computer at the MOH level to present the data compounded the problem in two ways. Firstly, the data was not processed initially on the computer. It was
aggregated by hand and then transferred to the computer for presentation purposes. Secondly, the smart, high-tech appearance of the graphs produced gave the statistic an authority that was deeply misleading.

A new attitude to the function and purpose of data was required, particularly since it was not used for any management or planning purpose at the time. There were several component parts of re-organising the manual system of data collection:

1. To develop an education programme for health workers that aimed to improve their understanding of data collection and to teach some skill for data analysis that they might use for their own purposes and which would encourage accurate transcription.

2. To develop a coherent set of data forms at MOH level that asked a limited number of relevant questions and which could be completed on a monthly basis in a timely manner.

3. To develop a flexible and uncomplicated software application where the data aggregated by each provincial directorate could be entered into and processed by a computer at MOH level.

4. To build skills within the MOH for data analysis and its use for planning and management purposes.

The programme was conducted over several years and indeed, is ongoing. Communications are poor and the education of health workers - the crux of the project - is a very slow process. However, without accurate and timely data from ground level, the planning work of the MOH will always amount to stabs in the dark. The computer does have a future in Mozambique and will be of enormous benefit to the health services in the country. However, it is essential to identify the gaps in manual systems at all levels of the health sector and to cause a lengthy but critical re-organisation of these.

The Availability and Use of Carbohydrates in Sports Performance

The availability and use of carbohydrates in the body during exercise to a large degree determines an athlete’s performance, was the message delivered at the yearly Nutrition Society/Vitamin Information Centre seminar held in Johannesburg in October.

According to Kevin Stevenson, consultant sports physiologist, maintaining muscle and liver glycogen levels during training by eating a high carbohydrate diet is of primary concern for endurance athletes. However, if an athlete exercises for one hour a day it is not necessary to make major nutritional changes.

Athletes are able to maintain a high carbohydrate intake by consuming mainly complex carbohydrates at meal times and then using high carbohydrate (glucose) drinks before, during and after training.

Liquid food is also easier to digest and absorb and after four hours most of the absorption will have taken place. A drink consisting of two bananas mixed with low fat yoghurt and honey will be classified as liquid food.

Andrew Bosch from the Sports Science Department, UCT pointed out that researchers have shown that as long as high blood glucose concentrations are maintained during prolonged exercise by ingesting carbohydrate, the muscle will continue oxidising carbohydrate as a fuel at a high rate. It appears that maintaining a high rate of carbohydrate oxidation enables exercise to be continued for a longer time before exhaustion occurs. However, studies have shown that muscle glycogen levels are not critical for exercise to continue, provided that blood glucose remains high. Bosch questions the above by stating there may be some "protective" effect from high muscle glycogen levels, independent of blood glucose concentration, that enables exercise to continue for longer before exhaustion occurs, he says.

Carbohydrate loading should take place for 6-7 days prior to an endurance event.

Live glycogen is depleted after four hours of exercise and muscle glycogen after five and half to six hours.

Ingesting carbohydrates during exercise has no effect on muscle glycogen. By using carbohydrate supplements less glycogen is used in the liver. This means that glucose ingestion during exercise saves liver glycogen stores.

Ingested carbohydrates during exercise is available in the muscle and save existing muscle glycogen. The muscle and liver glycogen work independently from each other.

It is therefore important to carbohydrate load and to ingest carbohydrates during exercise.

Vicki Lambert from the Department of Physiology, UCT says despite adequate fuel reserves, glycogen-depletion appears to be the limiting factor in the performance of prolonged heavy muscular work.

The most interesting aspect of the regulation of carbohydrate and fat metabolism during exercise is the recent evidence which suggests that moderate to high-intensity exercise work output may be maintained once an individual has adapted to a high-fat diet.

However, carbohydrate yields more energy per unit oxygen consumed and the pathway of carbohydrate oxidation is more direct.

If athletes are glycogen replete, no effect from caffeine can be expected.
The Advent of the Microsoft Operating System

First we must ask "what is an operating system"? The answer is simple. An operating system is a very specialized piece of software which is designed to run on a computer to allow it to communicate in an easily understandable way with the outside world. It also creates a set of conditions to which every programme must adhere, thereby forcing programme developers to standardize. Every computer uses an operating system and just like the computers themselves there are various types of operating systems.

In the early 1980's a new operating system called "DOS" (Disk Operating System) was launched to coincide and indeed compliment the launch of the first IBM PC. This operating system produced by a company called Microsoft Fast became the world standard PC operating system and at that time was considered to be very powerful and flexible.

DOS was a single task operating system, that is to say that it was limited to doing one job at a time. It also had a restriction on how much memory it could manage. At first, these limitations did not affect the programmers or users but as time passed and technology progressed, they became more and more annoying. Users wanted more flexibility and programmers were being forced to work within these limitations and so could not develop the software the users were demanding. DOS versions were announced year after year. Each offering something better than the one before but not removing the limitations.

The market place continued to accept the limitations of DOS up until a few years ago when Microsoft announced the solution. It was not a new DOS version. Instead it was a new operating system altogether. They announced the birth of "OS/2" (operating system 2).

OS/2 opened a whole new world and offered the solution to all of the limitations imposed by DOS. It also made programme developers re-think their whole approach to writing software. It gave the computer industry a boost into a new generation of power. DOS had been a text based system, that is to say, all communication between user and computer depended on the written word or text. OS/2 was a text/graphically based system. It used pictures and symbols to replace much of the tedious typing and by doing this, it made itself much easier to use than DOS, opening the door to the uneducated user to learn and move around with much more ease and confidence.

OS/2 also demolished the barriers of memory size and single task computing. It offered massive memory increases and allowed the power of the new generation of computers which had been under-utilized by DOS to be used. It also allowed true "multi-tasking", that is, the ability for one PC to manage and run multiple programs simultaneously. Hence it freed the programme developers to design and produce the software that the users had been requesting for many years.

It is plain to see the advantages of OS/2 but what about the future? I see OS/2 totally replacing DOS in the marketplace (an idea which is backed by IBM itself). I also see the users becoming more involved in their systems as OS/2 has much more user appeal than DOS because of its graphical interface and power. As for the medical environment, I would anticipate that it would follow the rest of the computerized world in the switch to the latest and most stable technology.

Gerry Duffy
MBM Computers (Pty) Ltd

"Good work ... but I think we might need just a little more detail right here."
The use of computers in medicine is as common as its application in every walk of life. Computers play a role in the lives of patients and in health care organisation ranging from simple demographic data storage and retrieval systems to the control of medical instrumentation, as well as in the recognised field of research.

In this article, the emphasis will be on the use of computers in medical imaging. In particular the important role of computers in x-ray imaging, gamma ray imaging (Nuclear Medicine Imaging) and in Magnetic Resonance Imaging will be addressed.

The goal of all these imaging procedures is to enhance information acquired from non-invasive methods to understand and interpret the physiological processes and anatomy within the body. All these modalities make use of energy beams within the electro-magnetic energy range. The spectrum varies from the long ultrasound wave through the short x-ray to the gamma ray which are all penetrating waves used for diagnosis. The information acquired this way necessitates the use of complex analytical functions of computer technology. The clinical application of computers in the imaging field is thus to reconstruct interpretable images which can differentiate the subtle changes in patho-physiological and disease states.

With the development of integrated circuit technology on an economical basis the hardware required for computers began to be cost-effectively applied in medicine.

How does it happen?

When the analogue information (raw data) that is obtained through imaging modalities is transformed to digital data, complex processing becomes feasible.

The image (analogue data) is obtained through:

- X-rays (based on the principle of differential attenuation of the rays through the body);
- Emission of gamma rays (from inserting small doses of radioactivity into the body);
- The rebound of ultrasound waves;
- Radio frequency waves such as used in magnetic resonance imaging;
- Digital subtraction angiography (contrast enhanced x-ray imaging).

The data from all these electromagnetic energy waves is converted to electronic impulses through the detector devices and then converted to digital data which is then computer compatible.

Every aspect of data acquisition, the storage of data and the display, processing and eventual interpretation is computer controlled. The central processing unit of all complex imaging devices is in fact a computer.

Linked to the central processing unit an imaging device such as a gamma camera will deliver the input data. The computer is integrated to a memory where the digital data is stored for processing or for presentation on a screen. The central processing unit is further linked to a keyboard for control and the arithmetic unit enables the processing of data to enhance the interpretations of images displayed on high resolution colour video screens.

Computed tomography

By its name, computed tomography underlines the role of the computer in this technology. From the Greek word "tomos" (to cut) and "graphein" (to write) the concept of tomography can be analysed. Add to this a computer and the principle of computed tomography is summarised.

What does it offer? Computed tomography allows us to have three-dimensional reconstruction of the organs of the body. Kuhl first demonstrated the value of computed tomography of the brain in 1963. The later experiments in computed tomography were done by GN Hounsfield at the EMI Research Laboratories in the United Kingdom where first a gamma ray source was used. The gamma source was replaced by an x-ray tube and the principle of computed tomography was established.

From each projection rotating around the body for the full 360 degrees, an image is obtained and the data stored on computer matrix relative to the position of the projection. When the data from each projection at its different angles is now integrated with each other, and the excess of noise or unwanted data is filtered with a computer, a transaxial tomographic reconstruction is achieved. From these transaxial or horizontal slices a three-dimensional image can be obtained by computer graphics, piling all these slices on top of each other in an orderly fashion.

The above principle is applied in all forms of three-dimensional and tomographic imaging and for clarity some of the terms are mentioned. CT or CAT-scanning is computerised x-ray transmission imaging usually referring to an x-ray tube and scintillation detectors. SPECT or PECT or ECT all refer to transaxial computed tomography where a gamma source is used and is applicable to Nuclear Medicine. PET refers to Positron Emission Tomography which differs from other modalities in Nuclear Medicine only in the nature of the emitted electromagnetic ray.

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### Table 1

<table>
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<tr>
<th>Abbreviation</th>
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<tr>
<td>CT</td>
<td>Computed Tomography</td>
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<td>CAT</td>
<td>Computed Axial Tomography</td>
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<tr>
<td>SPECT</td>
<td>Single Photon Emission Computed Tomography</td>
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<td>PECT</td>
<td>Photon Emission Computed Tomography</td>
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<td>ECT</td>
<td>Emission Computed Tomography</td>
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<td>PET</td>
<td>Positron Emission Tomography</td>
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### Magnetic resonance imaging

The building blocks of all matter, including biological material, is the atom. The ordinary stable nucleus of an atom in its normal state possesses the physical properties of:

- A spin, and
- A small magnetic property.

The building blocks can thus be viewed as small spinning magnets. Hydrogen atoms occur in abundance in biological tissue and they have favourable magnetic resonance properties.

When the biological tissue is subjected to a uniform magnetic field the atoms turn their magnetic force parallel to the field in the same fashion as a gyroscope. A pulse of resonant radio frequency can turn the magnetization of the atoms through a 90 degree angle. The changed magnetic configuration induces a radio frequency electromagnetic force which can be amplified and converted to an electronic impulse from which digital data and images can be generated. The time of this signal recovering from free induction decay may last for several seconds and the time constant of this process is named the transverse relaxation time, $T_2$.

At resonant frequency pulses twice the wavelength of the previous impulse, atom magnetization will rotate by 180 degrees and the reverse to equilibrium is called the spin lattice relaxation time, $T_1$.

Magnetic Resonance Spectroscopy is the application where chemical properties can be analysed on the same principle. With the development of powerful magnets the depth of magnetization of tissue could be improved. In 1973 only tubes of water could be scanned, in 1974 a spring onion was pictured, in 1975 a human finger, in 1976 a human hand and in 1977 the human chest could be imaged.

### Ultrasound

Ultrasound images are generated by using ultrasonic waves from mechanical vibrations with frequencies of 1-15 MHz which is above the range of human hearing. At the boundary between different tissue densities a reflection occurs of these ultrasonic waves. The piezoelectric transducers used in ultrasound have the property of producing ultrasound when electrically excited and in turn produce electric signals in response to ultrasonic waves.

It stands to reason that both for Magnetic Resonance Imaging and Ultrasound Imaging the generation of images from these impulses would be impossible without the application of sophisticated computer hardware and software programmes.

### The Academic Hospital Complex of the University of the Witwatersrand

The cost-effective use of radiological procedures, Nuclear Medicine Imaging, Ultrasound and Magnetic Resonance Imaging can only be achieved through proper training. Presently the demand for specialised medical imaging exceeds the
Computers

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available hardware resources. Magnetic Resonance Imaging is not available in the Academic Hospital Complex but there is a continued effort and support from authorities to acquire such apparatus for the Academic Hospital Complex. Technical developments world-wide in the field of Nuclear Medicine have made it possible to maintain facilities in the Department of Nuclear Medicine at the Academic Complex at a high level at relatively low capital outlay. The present facilities include eight integrated digital gamma cameras each based on a micro processor array with Intel 80386 main processors. Data storage devices vary from 80 to 140 megabyte hard discs and 1.2 megabyte floppy discs as well as 800 megabyte optical discs. Image data processing is done through a 32 bit/64 bit micro processor. Reporting and viewing of data can be done through compatible personal computer display stations which are linked through a local area network to all the mentioned systems. The Ethernet Communication Link facilities fast access and images, files and pre-set protocols can be transferred between systems without interfering with other tasks such as acquisition or processing. The facilities at Hillbrow Hospital, Baragwanath Hospital and JG Strijdom Hospital are linked with the Johannesburg Hospital through a wide area network by RS 232 Modem communication to transmit images over standard telephone lines. The 9600-19200 BAUD transmission rate enables normal images to be transmitted within two minutes for inter-hospital reporting. The personal computer network with external modems linked through Ethernet to the gamma camera processors provide high speed on-line communication transfer rates of 3-5 kilobits per second.

The above technology supports the limited and expensive human resources to bring the facility to every clinician that needs this modality for patient management. Expanding this principle to other imaging modalities in the Department of Diagnostic Radiology is within technical reach.

Summary

Modern medical imaging which forms an integral part of comprehensive health service can be utilised cost-effectively to the benefit of patients. The proper application is dependent on adequate training of medical and paramedical students, a goal which can only be achieved where these modalities are available. It remains our duty to balance the needs and available resources to maintain optimal medical care and training.

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Latest Research into Cause, Diagnosis and Therapy of Osteoarthritis

At an osteoarthritis symposium held in Quebec, Canada, international opinion leaders met to discuss current scientific and clinical research into the causes, diagnosis and therapy of osteoarthritis.

The meeting commenced by considering a provocative question: Is osteoarthritis a preventable disease? It was agreed that, before we can hope to prevent it, we must learn more about the disease itself. Until recently, osteoarthritis was dismissed as an inevitable result of the ageing process. This view is changing and osteoarthritis is now recognised as an inflammatory condition. Arresting and ultimately repairing this process is the long term aim of clinicians treating osteoarthritis patients.

The gene for Osteoarthritis?

It is proposed that a tiny defect in a collagen gene has been linked to the development of a type of primary osteoarthritis.

Growth factors - their potential role in Osteoarthritis

Research over the last few years has suggested that different NSAIDs have different effects on cartilage metabolism. "This has led to the idea that agents may exist which would promote the synthesis and hence the regeneration of new cartilage". There is a need to classify drugs into two groups - those which affect anabolism, i.e. the synthesis of cartilage, and those which affect catabolism, i.e. the breakdown of cartilage. Tiaprofenic acid was one such NSAID that did not inhibit proteoglycan synthesis, both in laboratory experiments and in the human, and therefore the process of cartilage synthesis is not impaired.

Monitoring the levels of degradative products may be of use in monitoring the progression of osteoarthritis and, in the long term, the efficacy of therapy.

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Monitoring the levels of degradative products may be of use in monitoring the progression of osteoarthritis and, in the long term, the efficacy of therapy.
NotePad Computer Boosts Productivity

What could be more natural than putting pen to paper? An emerging computer concept marries the most advanced PC technologies with the most familiar form of recording information - the pen. The concept is known as "pen-based computing" and has already begun to change the way people think about computers. By making the computer operate more closely to the way people naturally do their jobs it is now possible to have a portable tool that provides increased productivity, efficiency and data accuracy, all at your fingertips.

This technology takes the form of a slim A4 sized computer that uses an electronic pen for data input, with the computer actually recognizing the user's handwriting. This means that the computer is portable and is simple enough to operate for the user to enter information on the move. The medical profession has already been targeted as one area where the new NotePad computer will greatly increase workplace productivity.

The NotePad now makes it possible for a doctor to perform his/her rounds with patient records and history files ready at his/her fingertips. With a tap of the pen the doctor can now perform functions like:

- recall a patient's complete medical history;
- chart and monitor patient progress;
- enter new statistics such as blood pressure, pulse rate, etc., at the bedside;
- keep track of medicine prescribed and/or administered.

The doctor can now spend less time dealing with administration and paperwork and can concentrate on more important areas.

For nurses and pharmacists the NotePad has similar time-saving and productivity benefits. The NotePad's portability makes it ideal for staff on their rounds, for managing and checking stock in a dispensary, and for a variety of administrative tasks. For example the NotePad could be used to capture patients details as they are admitted to hospital. Not only is the NotePad portable but it can also be connected to a standard computer monitor and keyboard and used as a normal desk-top computer for applications like word processing or ac-

The NotePad can be operated standing up.
counts. The NotePad comes with full connectivity, allowing it to connect to printers, fax-modem cards, and other computer systems. Another benefit of the NotePad is that it is the only portable PC that can be used standing up - have you ever tried operating a PC standing up?

National Data Systems, the authorized distributor of NCR products in SA was first off the mark in this new field of technology with their introduction of the NCR 3125 NotePad computer at the end of last year. Beating many of the world’s leading innovators NCR has produced a sleek and impressive piece of technology that has set a high standard for others to follow.

The NCR 3125 NotePad weighs a mere 1.8 kg, is the size of an A4 sheet, and draws on the resources of a 20 MHz 80386SL microprocessor, 8 MB of dynamic RAM and 20 MB of hard disk storage. Battery life is 3 to 4 hours. The NotePad makes use of an electronic pen as the input device rather than a keyboard or a mouse, which allows the operator full control of the computer while on the move. Information is entered by simply writing on the screen and specific actions can be initiated by familiar pen gestures.

The NCR 3125 NotePad will run a variety of operating systems including DOS, Windows, and PenPoint. This means that existing software packages may be run on the NotePad without modification. When working with the PenPoint operating system the NotePad provides the user with a familiar table of contents and tabs to "turn" to any particular section, just as with a paper notepad. With a simple tap of the pen the user can turn the page or move to any section. The NCR 3125 NotePad also uses Microsoft Windows for Pen Computing. With this you can combine the power of Windows applications like Microsoft Excel with the ease of pen and pad. You can literally jot notes directly onto your spreadsheet.

Particular interest has been shown in developing applications for the medical profession. Some existing applications include:

**PenChart for Health Care**
Physician/nurse/PA coding for billing and patient records; use in clinic, hospital and outpatient setting; interface with appointments and accounts receivable software; supplement orders and patient education.

**Medical Records Manager**
Assist health care professionals with the data entry and electronic storage of medical records.

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The Use of Computers in Epidemiology

Introduction

Epidemiology is a basic medical science which is concerned with health and disease in human populations. Epidemiology methods and techniques are used to obtain information needed to answer a wide range of questions on health related events. Questions that are commonly answered through epidemiology studies include identification of determinants of ill-health in different communities, elucidation of mechanisms of disease transmission and evaluation of the effectiveness of intervention measures including clinical management. Epidemiology methods and techniques are rooted in other quantitative disciplines; particularly demography, mathematics and statistics. Hence successful application of epidemiology requires good understanding of the basic concepts and theory of these disciplines. As computers have become essential tools in these quantitative disciplines, so have they in the field of epidemiology.

Historical perspective

The field of epidemiology has been expanding rapidly over the past three decades. This has been due to the changing patterns of diseases, particularly in industrialized countries, and to the emergence and advances of computer technology.

After the second world war, the patterns of diseases in Europe gradually changed from being predominantly due to infectious diseases to that of chronic diseases and life-style related conditions. Because chronic diseases have multifactorial aetiology, the traditional epidemiology methods and techniques proved inadequate to study these diseases. This deficiency stimulated research aimed at improvements in study designs, analysis and presentation of data. During this period, computer technology became a reality and computers became increasingly used in business environments. As the computer technology became refined and "user-friendly", its utilisation expanded rapidly into government departments and institutions of learning. Hence epidemiologists employed in these departments started to explore the use of computers to process epidemiologic data.

The use of computers in epidemiology initiated two important developments. First, it created demand for improvements in the definition of the basic concepts of epidemiology measurement, refinement in estimations of relative rate and risk, clarification of concepts such as confounding, bias; and effect modification and the development of appropriate software to handle epidemiologic data. Secondly, epidemiologic studies became more quantitative in content and professionals such as computer programmers, statisticians, mathematicians become increasingly involved in epidemiologic studies.

Current use of computers in epidemiology

Computers are increasingly being used to perform a wide range of tasks in the field of epidemiology. Microcomputers are the most used computers in epidemiology and have played a significant role in the development of epidemiology methods and techniques. Detailed review of the uses of computers in epidemiology is beyond the scope of this paper but selected epidemiologic tasks for which computer technology are commonly used will be briefly discussed.

Literature review

The initial step in planning epidemiology study is the development of an appropriate study protocol. A literature review to determine what is known about the subject of study is one of the main tasks in preparing a study protocol. In the past, epidemiologists spent vast amounts of time consulting scores of databases. As these were manual databases their sizes were limited and the procedures for abstracting relevant information were cumbersome and time consuming. Using computers has made it possible to develop large, well-organised databases from which information is easily retrieved. Additionally it is now feasible for epidemiologists to develop subject-specific personal databases.

Sample size determination

Almost all epidemiology studies are based on samples because reliable and valid information can be obtained from properly selected samples, and in most instances available resources are not adequate to study whole populations. In this regard sample size determination is an important task during the preparation of study protocol. Because of the complexity of the formulae for the minimum sample sizes, epidemiologists have in the past relied heavily on statisticians to calculate the required sample sizes. However, there are now many computer-based programmes that can be used to determine sample sizes. This has enabled epidemiologists to function effectively in situations where statisticians are not available.

Questionnaire development

Epidemiology studies can be classified into two main categories: observational and experimental studies. The majority of epidemiology studies are observational and the question-
naire is the most commonly used tool for gathering data. Questionnaire development is therefore an important task in epidemiology. Because it requires several revisions during the preparation of an appropriate questionnaire for a given study epidemiologists have welcomed word processing software which have simplified the task of designing and developing appropriate questionnaires.

Analysis of data

In order to transform epidemiologic data into meaningful information it must be analysed adequately using appropriate statistical techniques. Two kinds of statistical analyses are commonly performed in epidemiologic studies, namely descriptive and inferential. These analyses are based on statistical tests of varying degrees of complexity. As in the case of sample size determination, most epidemiologists have in the past depended heavily on statisticians to analyse their data. This situation is rapidly changing because in simple studies epidemiologists can, with minimal training, analyse their own data using appropriate statistical software and data-base management programmes. However, in large complex studies most epidemiologists do require the assistance of statisticians to perform inferential analyses. The statistical software packages capable of processing large and complex data tend to be difficult for epidemiologists from medical backgrounds to utilise effectively.

Presentation of study findings

Typically epidemiologic findings are organised and summarised into tables, graphs, charts and so on. Much data-base management, statistical and spreadsheet software is available on the market and can be used by epidemiologists to generate tables, graphs and charts of the most important findings. For large and complex studies, special graphics software can be used to visualise complex relationships in three-dimensional bar and line graphs. These computer-based programmes can also enable the epidemiologist to experiment with various ways of presenting the research findings in order to select the most appropriate graphic charts or tables.

The way forward

From the above discussion it is clear that computers have and will continue to play a significant role in the practice of epidemiology. The extent of computer utilisation will depend on the continuing improvement in the hardware and software to meet the changing needs of epidemiologists. For example powerful, portable micro-computers will enable epidemiologists to conduct rapid and inexpensive surveys in less accessible areas/communities such as townships and rural areas in homelands. More efficient and user-friendly software will be able to integrate word processing programmes with complex statistical formulae and graphics, and to translate text from one language to another.

Finally the most important future contribution of computers in epidemiology will probably be related to the improvement in the quality of epidemiologic data and information resulting in better understanding of health problems, increased use of epidemiologic information in decision-making processes and more efficient management of health-related interventions in clinical and community health settings.

References

Nasogastric Tube Placement - A plea for safety

Case report

A nineteen year old male was admitted to the emergency room after a motor cycle accident in which extensive facial and head injuries were sustained. Clinical assessment and resuscitation was carried out by the emergency room physicians. Plain film radiographs of the skull showed multiple facial bone fractures. The cervical spine radiographs were normal. As part of the management in the acute phase a nasogastric tube was passed by the emergency room nursing staff to decompress the stomach of gastric contents to obviate aspiration. Due to the nature of the injury and a Glasgow Coma Score of 6/15 a Computerized Tomogram brain scan was performed.

The Computerized Tomogram brain scan revealed extensive facial bone and base of skull fractures with the nasogastric tube entering the nares, passing up through the superior nasal recess and entering the brain parenchyma via the floor of the frontal cranial fossa (Figure 1, 2). On questioning the emergency room nurse who passed the tube, the nurse admitted that some resistance had been encountered on passage of the Nasogastric tube and despite aspiration of tube contents, no gastric fluid could be obtained.

Discussion

The safe passage of Nasogastric tubes has been an issue in a number of recent articles in the nursing literature. None, however, have stressed the risks of Nasogastric tube misplacement in the presence of base of skull fractures. This case illustrates a rarely seen complication. The cribriform plate is a thin bony plate separating the superior nasal recess and ethmoidal air cells from the brain (Figure 3). Skull base fractures often involve this plate causing bony dehiscence, opening a portal between the superior nasal recesses, ethmoidal sinuses and intracranial contents. As a result every precaution must be exercised when placing nasogastric tubes to obviate extraneous placement of the tube. In this regard only qualified medical personnel under supervision should place these tubes. It has become policy in our institution that only clinicians pass nasogastric

Figure 1: CT Scan: The nasogastric tube (bright density containing luminal air) enters the frontal lobe via the nose. Note the pneumocephalus, surgical emphysema and facial bone fractures.
tubes in cases of skull fractures. This applies even in our intensive care units where the nursing staff are highly trained.

In addition, there are a number of steps to ensure correct placement of the nasogastric tubes:

1. The tube should be passed horizontally along the superior surface of the hard palate into the nose after lubricating the tip. Its passage should be with ease with no difficulty encountered in advancement.

2. If there is any doubt about the passage of the tube into the oropharynx, the mouth should be opened and inspected routinely to ensure its course through the oropharynx.

3. If there is no cervical spine injury, the head should be flexed to facilitate preferential entry of the tube into the oesophagus, rather than the larynx. (This is often not possible as head injury patients are assumed to have sustained cervical spine injuries until proved otherwise).

4. Once the tube is thought to be adequately placed, a number of confirmatory manoeuvres are mandatory.
   - Air insufflation via the Nasogastric tube with abdominal auscultation will confirm intra-abdominal placement.
   - Further confirmation with gastric content aspiration will show an acid pH of less than 3. It must be noted that more distal passage into the small bowel will show an alkaline pH due to pancreatic juices.
   - Allied investigations, if done after the passage of the Nasogastric tube, will often provide definitive evidence of the site of the tube, namely skull and cervical spine radiographs, chest and abdominal radiographs.

In our patient, plain film imaging was done prior to Nasogastric tube placement, leaving only Computed Tomography of the brain to note its extraneous placement. The lack of attention to basic principles resulted in this recognised complication. Strict adherence to the above principles would obviate such a complication which, other than preventing aggravation of the underlying trauma, may also avoid fatality.

Acknowledgements

The author expresses thanks to Professor Albert Solomon for reviewing the manuscript and the painstaking assistance of Helen Wilson for typing the manuscript.

References

Report on a Survey of MBBCh VI Students at Wits Medical School

Introduction

A questionnaire survey was administered to the MBBCh VI class at Wits Medical School during November 1991. 155 out of 171 students returned questionnaires, representing a response rate of 91.2%.

Purpose, rationale and limitations

This survey was undertaken as part of a larger study to investigate the desirability and feasibility of implementing community-based medical education (CBME) at Wits Medical School. Student opinion was of interest as a potentially powerful force for or against such curricular change.

Sixth year students were surveyed because of their ability to reflect back on their medical education. Their responses were not assumed to be representative of those of all medical students, and this survey merely represented a starting point in tapping student opinion.

Demographics of the subject group

The class surveyed was typical of the homogeneous student body at Wits Medical School. It clearly demonstrated what I have come to call "the two-thirds rule". Two thirds of the students were under 25 years old; two thirds entered medical school directly after completing high school while one third had some intervening life/work/study experience. Two thirds came from city backgrounds and one third from town, village or rural backgrounds. Two thirds were from upper middle class origins and one thirds from other socio-economic classes.

The two-thirds rule held true as far as racial breakdown went as well, (although the survey respondents were not asked to indicate their race). A count of the surnames in the overall class list revealed that at least two thirds of them were white. The gender breakdown of the respondents was 43% females, 51% male, and 6% unspecified.

Lee Randall

BSc (OT), MA
Research fellow: Community-based medical education Wits Medical School

The Chi square test for the independence of categorical variables has been used in several instances to analyze the data derived from this survey. However, because of the non-normal distribution curve of the subject sample, the results must be tentatively interpreted.

Findings and discussion

Clinical settings

The students were asked how much time they thought medical students should ideally spend in different clinical settings (including both hospital-based and community-based settings) during their overall medical experience.

All responses were converted to weeks or fractions of a week to render them comparable, and for each setting the range of responses and median response was calculated. The overall responses are shown in Table 1.

The students were also asked to indicate other settings in which they thought medical students should spend time. Settings mentioned included allied health departments and rehabilitation facilities, research settings, specialty clinics and community sites (such as schools, hospices and factories).

Combining all the median responses (See Figure 1), it can be seen that overall the students supported the idea of spending some of their clinical time outside of teaching hospitals. However, urban tertiary hospitals retained the bulk of curriculum time, at 64%.

It should be noted that adding all

<table>
<thead>
<tr>
<th>Setting</th>
<th>Median</th>
<th>Range</th>
<th>% of students who feel that no time should be spent in this setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban tertiary hospitals</td>
<td>40.5</td>
<td>nil-5 yrs</td>
<td>1%</td>
</tr>
<tr>
<td>Urban secondary hospitals</td>
<td>9.5</td>
<td>nil-2 yrs</td>
<td>16%</td>
</tr>
<tr>
<td>Rural secondary hospitals</td>
<td>3.9</td>
<td>nil-1 yr</td>
<td>4%</td>
</tr>
<tr>
<td>Urban primary care centres (e.g. clinics, health centres)</td>
<td>3.6</td>
<td>nil-6 mths</td>
<td>9%</td>
</tr>
<tr>
<td>Rural primary care centres (e.g. clinics, health centres)</td>
<td>1.3</td>
<td>nil-6 mths</td>
<td>10%</td>
</tr>
<tr>
<td>Health outreach programmes</td>
<td>1.6</td>
<td>nil-6 mths</td>
<td>13%</td>
</tr>
<tr>
<td>Urban general practice</td>
<td>1.3</td>
<td>nil-6 mths</td>
<td>1%</td>
</tr>
<tr>
<td>Rural general practice</td>
<td>1.3</td>
<td>nil-6 mths</td>
<td>22%</td>
</tr>
</tbody>
</table>
Breakdown of clinical time 
(by percentages)

Figure 1: Breakdown of clinical time (by percentages)

Elective settings 
(by percentages)

Figure 2: Elective settings (by percentages)

the median responses together gives a 
total time of only 63.5 weeks, which 
is far less than the actual clinical time 
available. In general, the students did 
not seem to bear in mind the real time 
available when responding; nevertheless, the responses do provide a 
rough indication of their support for 
community-based education.

Elective sites 
The students were asked in what sort 
of settings they had spent their fifth- 
year electives. The choice of elective 
settings probably has to do with sev-

eral factors, such as kinds of clinical 
experience students value, what elective 
opportunities are available (or known) 
to them, and a desire for more of a particular kind of experience than 
is offered in the rest of the curricu-

In total, 183 elective settings 
were mentioned (some students did 
split electives, at more than one site). 
The breakdown of elective sites is 
shown in Figure 2. The vast majority of 
elective settings mentioned were 
urban and based at the tertiary or secondary care level. One third were 

primary care-related, and of these 
70% were urban general practices. 
The category of "other" includes 
specialist clinics, psychiatric institu-
tions, trauma/paramedic services, 
research settings, mine hospitals, a 
child development centre and university 
departments/clinics.

No relationship was found be-
tween the choice of a primary health 
care elective site and expressed inter-
est in a primary health care career, 
except in the case of general practice. 
Those students who did their elective 
in a general practice showed greater 
interest in a general practice career 
than students who did electives 
elsewhere (P = 0.05).

Existing community-oriented 
blocks 
The students were asked whether 
four existing blocks which have a 
community orientation should be 
elective or compulsory. It was felt 
that the responses would reveal to 
what extent the students thought of 
these blocks as essential learning experiences. This is of 
interest in light of the recent intro-
duction at Wits Medical School of a 
core-and-selectives strategy. The 
students' responses are shown in 
Figure 3.

The rural block and general prac-
tice attachment were most strongly 
supported, with around 70% of the 
students indicating that they should 
be compulsory. However, some com-
ments revealed problems with these 
blocks, for instance:

"... g.p. can be a valuable 
experience but also a waste 
of time if only certain types 
of patients come in".

The Alex Health Centre block was 
fairly well supported, with about 
63% of the students indicating that it 
should be compulsory. However,
Compulsory or elective?

Figure 3: Compulsory or elective?

Career interests
(by number of students)

Figure 4: Career interests (by number of students)

there were some negative comments about this block, for instance:

"Alex Clinic is a waste of time. Sixth years learn nothing and are abused by staff. We just do their work for them while they get paid for going to sleep early. This causes resentment and most students I have spoken to regard their two weeks at Alex Centre as the worst two weeks in the course".

About 50% of the students felt that the Community Block should be compulsory. The relatively poor support for this block seems to be due to organisational problems and student dissatisfaction with the way they were treated and assessed.

One student summed up her/his experience of community-oriented blocks by saying:

"Undergraduate education must be, above all, academically intensive as a learning experience. This is needed for encouraging learning skills and teaching thoroughness. This academic rigour is at present found in few rural or primary care facilities".

Career interests

The students were asked about their level of interest in working in a rural setting, in a primary health care setting, and specifically in a general practice setting after graduating. These settings were chosen from amongst the many possibilities because of South Africa's lack of rural and primary care doctors, and because an expressed objective of CBME programmes is to increase the number of graduates who enter primary care careers (and, in areas where rural doctors are in short supply, entering rural practice). The responses are shown in Figure 4 (scale: 1 = not at all interested; 5 = very interested).

The greatest interest was shown in general practice, with 30% of the respondents expressing great interest in this as a career. Only 5% expressed great interest in working in other primary care settings, and only 9% of the students expressed interest in working in a rural hospital. These results are supported by those of another survey of the same student group (carried out by the Community Health Department during 1991), which found that an overwhelming majority of the students planned urban or private practice careers and only 17% mentioned rural practice as an option.1 A number of comments attested to the fact that students would be readier to consider rural or primary care careers if these were well paid.

The Chi square test was used to see if there was a relationship between students' expressed interest in rural and primary health care careers and their demographic characteristics such as age, geographic original and

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socio-economic background. The only relationship found was a slight one (P = 0.10) between socio-economic background and interest in primary care work. It appears that students from lower socio-economic classes might tend to be more interested in a primary health care career than students from higher socio-economic backgrounds.

The issue of academic standards

Questions about where medical education should take place inevitably bring up the issue of the standard of that education.

Students' interest in academic standards was reflected in the election campaign for the 1991 Students' Representative Council at Wits, when two competing parties both raised the issue of standards. The "Academic Standards" partly called for "degrees which are worth more than the paper they are written on which continue to be internationally recognized". The "Setting Standards" party asserted that high standards should have to do with excellent, relevant and non-racial education, with appropriate student support services.

The students were asked whether they agreed or disagreed with a statement that academic standards at Wits Medical School should have to do with excellent, relevant and non-racial education, with appropriate student support services. The students were asked whether they agreed or disagreed with a statement that academic standards at Wits Medical School would drop if medical students were to spend less time in tertiary care settings and proportionately more time in secondary and primary care settings. The fact that half of the students agreed with the statement suggests that students might resist a CBME approach because of fears that it will lower the standard of their education. Such fears may be rational, but may also have to do with a bias in favour of what is familiar. One or two students commented that while academic standards may decrease, students may actually gain greater practical skills if they spent more time in secondary and primary care settings. Another student commented that CBME would not necessarily cause a drop in academic standards if "not all academics (were) in central urban teaching hospitals".

The students were also asked whether they agreed or disagreed with a statement that if most of their time was spent in primary care settings this would have a negative effect on the international recognition of their degree. 70% of the students expressed agreement and 25% disagreed. The Community health department's survey of the same student group (see previous footnote) found that 14% of the students had plans to emigrate, 41% did not know if they would emigrate, and only 45% had no plans to emigrate. This suggests that students' concerns for the international status of their degree are likely to be strong, and will lead many of them to oppose any curricular change perceived as threatening to that status. However, there are dissenting voices, such as the student who asserted that "we need South African doctors!"

Educational methodologies

Community-based medical education, as it has evolved at medical schools around the world, most often involves the use of several innovative educational methodologies. The students were asked to indicate their support or lack of support for these, by selecting that statement with which they most strongly agreed from each of ten paired statements. Some students refused to make a choice between the statements, either by selecting both or by not responding at all. This led to a typical non-response rate of 10% per statement pair.

Three broad areas were considered. Firstly, students were asked for their opinions regarding certain approaches to teaching. Although Wits Medical School does incorporate some innovative strategies into its curriculum, for the most part it has a traditional approach, with a sequential curriculum (basic sciences followed by clinical sciences) and didactic, lecture-based teaching style. The students generally showed a higher degree of support (85.5%) for the innovative strategies of problem-based, small-group learning and an integrated curriculum (in which basic science and clinical science subjects are integrated) and a lesser degree of support (7.1%) for the kind of curriculum that currently exists.

Several students commented that a combination of approaches would be best, and one student noted that whatever teaching strategy was used, it is essential to have good teachers. 97 students (62.6%) preferred the idea of an integrated curriculum, while 44 (28.4%) preferred a sequential curriculum. One student noted that the current curriculum leads to students having "quite a dissected view" of medical knowledge, and that integrating subjects would make more sense. Another felt that "first year is a total waste of time", while a third student commented that in an integrated curriculum, at least students know what they're learning basic science for.

Secondly, two questions touched on assessment methods. Wits Medical School, like most medical schools, is more oriented to written and oral examinations than to clinical performance evaluation. However, 81.3% of the students clearly indicated their support for assessment techniques which focus on clinical competency. One student questioned who would decide on a definition of clinical competency, and another noted that this must be "PROPER - at present ward evaluations are a joke". This was echoed by another student, who felt that the overall approach used is less important than the soundness of the methods employed. Yet another student felt that it was appropriate to use a dual strategy, marking students both in comparison with each other and in relation to a pre-set definition of clinical competency.

Thirdly, the students were asked whether their education should specifically prepare them to make community diagnoses or predominantly prepare them to work with individual patients. 120 students (77.4%) felt that a community orientation was important, while 20 (12.9%) felt that learning to diagnose illness in individual patients was sufficient for them to make community diagnoses as well. One or two respondents felt that they "don't need to know how to make community diagnoses unless working or interested in that field". Another respondent equated making community
diagnoses with "controlling mass numbers and attempting to play at politics".

Two questions were asked about multidisciplinary education (co-operative teaching on the same topic by several disciplines) and inter-professional education (combining medical, allied health and nursing students). Unfortunately these questions were found to be flawed and the responses have been dropped from the analysis. From comments it appears that students feel that these strategies may or may not be appropriate, depending on what is being taught.

Finally, the students were asked to indicate which they felt would be the most important determinants of how they practise after they graduate. 118 students (76,1%) indicated that they would use the clinical facts they had learned would be most important. This attests to the significance power of students' clinical role models.

Summary and conclusions

In summary, this very homogeneous student group, which has experienced a largely traditional medical education, has a generally supportive attitude towards a community orientation in the curriculum. They evidenced a positive attitude towards the innovative educational methodologies which tend to accompany CBME programmes, but expressed some fears and reservations about CBME itself.

They recommended a breakdown of clinical time along the lines of 85% hospital-based and 15% community-based. The most important point concerns the quality of community-based educational experiences. The current community-oriented blocks (which are not truly community-based since they do not involve extensive community partnerships) contain some problem areas which need to be addressed.

Another point of concern for students is the international recognition of their degree. This is a complex issue touching on the kinds of students selected into Medical School, the socialisation process which takes place during their education, the broader political and economic situation in the country, and the kinds of career opportunities available and attractive to graduating doctors. There is no simple or quick solution to this issue. Implementing a community-based curriculum without other changes taking place could be counterproductive and ineffective.

For instance, changes such as a greater valuing of primary health care at all levels, an increased sense of commitment to South African communities on the part of medical students, and accelerated development of community-based health facilities may be essential.

A further area of interest to students is the provision of a certain degree of choice in their educational career paths. One student commented that Wits is known to train specialists and this is the kind of education she/he wants, while several others requested greater primary care input. Choice can be provided in various ways - for instance, by having different medical schools around the country offer different types of programmes, or by offering alternative tracks within a single medical school. Many leading medical schools internationally have opted for the alternative track model, for instance, providing a research-oriented track and/or a community-based track in addition to the traditional hospital-based track. Other schools which have previously had twin tracks have over the years distilled out the best of each and combined them back into a single track which is believed to include sufficient depth and breadth to meet all students' needs. Offering CBME at Wits Medical School, either in the form of an alternative track or as an expansion of the current hospital-based programme, would increase the choices available.

In conclusion, students with attitudes such as those of the group surveyed would not be likely to be a prime force against CBME, but would act as "rational resisters", demanding certain assurances and pre-conditions before they embraced such an innovation.

References

Accessibility to Health Care the Ideal

The strengthening of local infrastructure for the provision of primary health services is a top priority for the authorities because it is the only way in which an affordable and accessible health service can be provided for all, says the Chief Director, Health Care of the Department of National Health and Population Development, Dr Leon du Toit.

Dr du Toit said the Department is committed in its efforts to promote the benefits of good health for all, including the more vulnerable in society, such as the aged, children and the poor. Good health must not be seen as something only for those who can afford it. It must also be available and accessible for all citizens.

The proposed multiracial local authorities with its broad financial base will probably be a kingpin in the health service of the new South Africa.

It is envisaged that all Primary Health Care services, including curative services, will be the responsibility of local authorities. The current artificial separation between curative and non-curative service can no longer be justified.

Decentralisation of health care has several significant benefits:

- It focuses the attention on the community;
- It improved community participation and community involvement;
- It promotes a more equitable system;
- It improves the motivation of local personnel;
- It promotes intersectoral cooperation;
- It accelerates the implementation of programmes;
- It is cost-effective because duplication is eliminated;
- It promotes the local generation of funds; and

- It promotes local control over services.

The involvement and participation of communities in Primary Health Care is an essential requirement for success in promoting good health and preventing diseases. It is particularly important that women play a key role in education and in the dissemination of information and knowledge regarding health.

Decentralisation is important for the health services as a whole, but is more so for the primary health care level where the local community is more closely connected with a local health care provider.

The promotion of good health and the prevention of diseases present a very important opportunity to reduce the ever-increasing portion of South Africa's resources allocated to the treatment of preventable disease and functional disability.

The National Health Policy therefore says that the only way in which an affordable health service can be provided to all in South Africa, is through the strengthening of Primary health Care. The strengthening of Primary Health Care is in accordance with the guidelines of the World Health Organization (WHO).

Its key principles are:

- Accessibility;
- Affordability;
- Efficiency;
- Acceptability; and
- Equity.

The involvement and participation of communities in Primary Health Care is an essential requirement for success in promoting good health and preventing diseases. It is particularly important that women play a key role in education and in the dissemination of information and knowledge regarding health.

The projects for the training and utilization of community health workers are important components in the dissemination of information and knowledge of the everyday aspects of health care.

Dr du Toit said health is not the responsibility of the health services alone. It is dependent upon the actions of various other sectors, such as the level of literacy, the availability of safe water and basic sanitation, housing and adequate nutrition.

"The promotion of good health and the prevention of diseases is therefore dependent on good intersectoral co-operation".

The training and preparation of all health personnel - from the community health worker and the nurse to the doctor, the dentist, the pharmacist and the medical researcher - has an important contribution to health care.

"Good health and the prevention of disease start with the individual, the family and the local community. It also includes the employer".

One of the great challenges for health services is to promote preventative health care. This includes the containment of AIDS, sexually transmitted disease and other infectious diseases, deaths among children and a variety of preventable diseases.

Dr du Toit said critical success factors for the idea of "Health for All by 2000" is health education, the provision of food and adequate nutrition, and the availability of safe water and basic sanitation, mother and baby health services and family planning, immunisation, dealing with minor illnesses, supply of basic medicines and the prevention and control of local endemic diseases.

®Voltaren 75 Tablets

®Voltaren is one of the best tolerated non-steroidal anti-inflammatory drugs available and has been on the South African market for 19 years. More than 270 million patient-months of clinical data have been accumulated worldwide testifying to both the efficacy and tolerability of the product.

To improve convenience, compliance and control of pain for rheumatic and osteo-arthritis patients, we eliminated the one thing your patients will not miss - the midday dose.

Voltaren 75 Tablets, twice daily, for the treatment of rheumatic and arthritic conditions, have been introduced.

This new Voltaren dosage form provides a convenient therapy for patients with rheumatoid arthritis, ankylosing spondylitis, osteoarthritis and spondylarthritides, i.e. degenerative forms of rheumatism.
Sphygmomanometry Goes Hi-Tech

The clinical measurement of blood pressure has come a long way since Reverend Stephen Hales first performed arterial catheterization on a horse in 1733. Today non-invasive sphygmomanometry is probably the most widely used technique in clinical medicine.

In order to standardise this procedure Korotkoff described 5 different auscultatory sounds that are still used today to determine the cut-off points for the systolic and diastolic pressures. Several authors have criticised the inaccuracy of the Korotkoff method when used in a noisy environment and the fact that it relies on human hearing (with its inherent limitations), not to mention the occurrence of inter-observer and even intra-observer error that interfere with the repeatability of the results.

In order to eliminate human error several devices have been designed in the past using amplitude sensors within a standard BP cuff to detect the transient brachial artery turbulence created during cuff inflation-deflation. However, when put to the test using comparison to cardiac catheterization, which represents the "true" experimental reading, these devices have failed direly to measure values within the minimum confidence levels of error and have thus taken exile to a less critical consumer market.

After years of frustrated research PulseMetric Incorporated has finally emerged with a truly superior product called DynaPulse, which utilizes an oscillometric waveform identification method to present the "true" experimental reading, these devices have failed direly to measure values within the minimum confidence levels of error and have thus taken exile to a less critical consumer market.

During a DynaPulse measurement procedure the cuff is positioned and inflated to a pre-determined value. DynaPulse then automatically deflates the cuff at the correct rate and records and displays the systolic, diastolic and mean arterial pressures, the pulse rate, a "Korotkoff" trace and an analyzed pulse waveform similar to that obtained from a cardiac catheterization procedure. This waveform has only recently been shown to undergo characteristic changes in cardiovascular diseases such as atherosclerosis, aortic stenosis and incompetence, CCF, AV-dissociation, cardiomyopathy, etc. The DynaPulse software also allows you to create a file for each patient, recording details like blood sugar, cholesterol levels etc., as well as display successive BP Measurements as a trend to determine the efficacy of any medication instituted.

Whereas true auscultatory appreciation of all five Korotkoff sounds is obtained only after years of clinical experience, DynaPulse can be connected to any IBM compatible PC and mastered within just a few minutes. The DynaPulse package comes complete with a high quality BP cuff, oscillometric hardware, serial port connection and software. It also contains a detailed Physician's reference manual with enough technical jargon to satisfy even the most discerning cardiologist. The most surprising feature of DynaPulse, however, is its price. The entire package will not set you back much more than a reasonable stethoscope would. If you are interested in obtaining this hi-tech sphygmomanometer, please contact Heather or Colin at MICROREF, tel (011) 880-4279 or (011) 442-6861, fax (011) 880-7983.

Grant to Computerise Adler Museum

University of the Witwatersrand's Adler Museum, situated in Johannesburg, houses one of the finest collections of medical, dental and pharmacy artefacts and books - a collection equal to any of its kind internationally.

The Adcock Ingram Group has supported the objectives of the museum, both financially and morally, for more than 20 years. The company's annual grant over the past three years, amounting to R19 000, has been used to computerise the museum.

The Computer project, initiated by the Adler Museum's curator Ms Andy Brown, replaces manual systems with the latest technology. DataEase - a database programme popular with museums, catalogues, cross references provides speedy access to the museum's vast collection of artefacts, and books, journals and reprints. This programme also maintains a record of museum members, mailing lists and generates form letters.

The history of medicine reference library has been computerised enabling efficient retrieval of books by author, title and subject.

"Computerisation has enabled us to initiate an easily accessible bibliography on the history of medicine in South Africa".
Sports Nutrition a Pre-Requisite for Performance

Several papers presented at the yearly Nutrition Society/Vitamin Information Centre Seminar stressed the cardinal role sports nutrition plays in athletic performance.

Prof Tim Noakes highlighted the necessity of fluid ingestion during exercise to prevent the detrimental effects of dehydration on athletic performance.

The factors that determine the sweat rate during exercise are incompletely understood. The most important factor seems to be the metabolic rate during exercise but there are wide individual variations.

The maximum sustainable (over hours) sweat rates that are measured in endurance events are seldom greater than 1 000 ml per hour and are probably closer to 500 ml per hour in the majority of competitors. Most athletes ingest between 300-800 ml per hour during exercise.

There is some evidence that intestinal absorption of both water and carbohydrate is reduced during exercise.

If this is correct, one cannot advise runners to ingest "as much fluid as they possibly can during exercise". Potentially detrimental effects of large volumes of unabsorbed water lying dormant in the gut includes gastrointestinal distress and translocation of a large amount of sodium into the undigested water with the potential development of hyponatremia.

Carbohydrate ingestion during exercise enhances performance in events lasting more than 2 hours. The optimum carbohydrate is starch with a high amylopectin content which makes the starch insoluble; soluble carbohydrates of whatever source, are poorly absorbed during exercise probably because of reduced intestinal fluid absorption during exercise.

Optimum rates of carbohydrate ingestion during exercise are probably 2-3 g per minute, especially near the end of exhaustive exercise. Such high rates of carbohydrate ingestion can be sustained with the repeated drinking method involving the ingestion of a 400 ml bolus of fluid at the start of exercise and 100-150 ml every 10 minutes thereafter.

It is probable that athletes should initially ingest solutions with low carbohydrate content (5-10%), and increase the concentration to 15-30% during the last two hours of very prolonged exercise.

The solution ingested during exercise should contain sodium chloride preferably in the physiological concentration of 100 mmol/L per litre. This is because the body it regulates sodium and not its water content and is unable to correct the dehydration caused by sweating unless the sodium deficit is replaced.

Prof Noakes stressed that the quantity of fluids taken by athletes will be affected by the individual sweat rate which is influenced by the metabolic rates, the gastric emptying which is determined by ingested volume and the rate of intestinal absorption which can be influenced by small frequent drinks.

There is no evidence that sodium deficiency has anything to do with salt deficiency. The condition called hypoatraemia of exercise, is more an abnormality of volume regulation than of sodium deficiency.

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