Feature Article

Technology, Medical Education, Research and Clinical Service in the 21st Century

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"All of us are fascinated by the future,
because that is where we
will live the rest of our lives."

- Criswell

The occasion of one's birthday is always one for sober reflection and stocktaking. This is so in the life of us humans and should be no less so in life of an institution, especially one as venerable and as important as the University College Hospital, Ibadan, the "father" of all medical institutions and the progenitor of the most significant medical services and research centers in Nigeria. To many people outside Nigeria, there is only one medical institution in Nigeria and that is the University College Hospital, Ibadan. While this is no doubt partly due to its pioneering role in medical education in Nigeria, the outstanding clinical and investigative work of its staff is of no less importance. It is, therefore, quite appropriate that as it graduates into middle age, a period that also coincides with the expectation of a new millennium, it should pause and reflect.

The question on whether the University College Hospital, Ibadan has fulfilled the expectations of its founders is one that should exercise all our minds. However, as we ponder it, we must not forget the equally important one of what the future holds. Illustrious as our past is, and difficult as our present circumstances are, we can and must build our future. Defining an agenda for that task is the objectives of my paper today.

The millennial addendum to the title is fortuitous. As the year 2000 approaches, prophecies and dire warnings are inundating us. However, most of the purveyors of these warnings forget that Pope Gregory VIII (Pope from 1572-1585) decreed the Gregorian calendar that is in use today into existence. This he did for two reasons neither of them celestial in origin.

The Julian calendar, its immediate predecessor was 11 minutes, 14 seconds longer than the solar year with the result that church holidays were not occurring in right season. For example, the vernal equinox of 1582 occurred 10 days early. Secondly, the mode of counting the days was rather complicated hence; it was left in the hands of special officers. These officers sometimes abused their authority by altering the times in order to hasten or delay elections as it suited their purposes. A trick that many of today's despots would have found quite useful! I might as well add that Britain, from whom we inherited the calendar, did not adopt it until as recently as 1752.

We shall therefore, turn our attention determinedly to the future and examine the issues of technology, medical training, research and clinical service in the next century. As we do, we keep in mind the famous slip of Neils Bohr (the great Physicist and contemporary of Einstein) that "prediction is very difficult especially about the future".

FUNDING

Ask anybody today what he intends to do in future and he will tell you it depends on the amount of money he has. It is therefore most appropriate to start by examining the funding options for medical training, service and research in the new millennium especially for a tertiary health centre in a developing country. This triple mandate imposes cost implications that render simplistic solutions impossible. Even if one were to pass the cost of services directly to the sick, it is unjust to do the same for the cost of training and research. The cost of the latter should be shared as equitably as possible among all members of the society. The debate about healthcare financing in Nigeria is largely between those advocating continued direct government funding (so-called free health advocates) and advocates of the introduction of user-fees (the champions of market forces, privatization, etc.).

The reality is that the government has vacillated between these two options without a firm resolve in the last one and a half decades. As its income fell due to a collapse in world oil prices, persistent political instability rendered policy formulation difficult. This lack of policy is responsible for the quagmire of healthcare financing in Nigeria today.

Let us examine each of the options critically. The main premises of the advocates of the introduction of market forces, user-fees, or privatization are:

1. Government is a poor manager
2. The markets are a more efficient means of allocating resources
3. Making people pay for services will ensure efficiency
4. There is no money anyway, so managements have no other choice
5. It allows more choice for consumers and providers

The main criticisms of privatization are:

1. It often fails to achieve greater choice for consumers and providers
2. It fails to increase the efficiency of resource utilization as expected
3. It fails to ensure a higher quality of service
4. It is destructive of the physician-patient relationship
5. It shifts the burden of healthcare to the poor and the sick, and the poor people tend to be sicker and more sensitive to prices than the better off [1,2].

The current rising cost of healthcare in the United States of America tends to support these criticisms [3].
A policy option that the management of many tertiary institutions has resorted to is the generation of income from user-fees. However, income from user-fees

constitutes less than 5 percent of healthcare cost in most African countries [4] and user-fees are difficult to implement. They lead to major shifts in the use of health services, increased material mortality and increased incidence of communicable diseases as vulnerable segments of the society are deprived of access to health services [5]. In contrast, the advocates of a tax-funded system (whether out of aggregate tax receipts or specially designated taxes like a National Health Insurance Scheme) claim the following advantages:

1. Healthcare is "free" at the point of use.
2. Patients are not discouraged from attending hospitals.
3. There is even distribution of the cost health services.
4. The bias of provision is towards need rather than affordability.

It is however criticized as being:

1. Inefficient.
2. Restrictive of choice.
3. Discouraging innovation.
4. Incorporating a moral hazard (that is an attitude of "I am paying for it so I might as well make the most of it").

If government funds health services from the proceeds of tax receipts, sale of natural resources (oil, for example) or health insurance (which is a health tax going by another name), the true cost is the opportunity cost of such funds. In reality, therefore, the service is not free.

Before we recommend one system or the other, we should consider what constitutes a just and equitable healthcare system. This is a system that:

1. Guarantees universal access to health services.
2. Provides access to an adequate level of care. This is usually lower than the best level of care technically available in the society as the latter's ability is limited by scarce resources and competing needs. Justice requires that we permit those who so desire, to be able to purchase services beyond what is provided.
3. Provides access without excessive burden. This will depend on the socio-economic profile of the particular society. The system will be unjust if it imposes unnecessary high burden on some or arbitrarily concentrates the burden on some individuals or group.
4. Ensures a fair distribution of the financial cost ensuring universal access to an adequate level of healthcare, as there are moral limits to what we owe our fellow human beings.
5. Ensures a fair distribution of the burden of rationing care.
6. Has the capacity for improvement towards a more just system. Whatever system adopted will not be perfectly just, but it must not degenerate towards being more unjust over time.
7. Ensures the education and training of appropriate numbers and types of healthcare providers.
8. Permits effective pursuit of high quality biomedical research.
9. Allows the cost-effective use of the results of biomedical research.

I will like to submit therefore that a tax-funded system is the best option for Nigeria in the new millennium. In this situation, the State stands as the coordinator and guarantor of equitable access to care, and a fair distribution of cost. Community involvement in the management of health institutions will enhance efficiency, and making patients pay a certain amount before "cover" is triggered will reduce the problem of moral hazard. This "induction" fee can be waived for certain categories of patients (for example, children, pregnant women, patients with communicable diseases etc.) as necessary.

The other functions of health institutions such as public health and health education are also less likely to suffer under this kind of regime. It is difficult to see how "market forces" will fund preventive and social medicine adequately, yet this must remain a priority area of both service and research in the new millennium [6]. A tax-funded system will also distribute the cost of producing health manpower and conducting research evenly. It is naïve to expect that there will be no gaps under such a system, but such gaps can be filled by Charities and private health services providers etc.

The bugbear of tax-funded systems is their propensity to be inefficient. This realization has spurred health economists to consider ways of introducing competition into the system, or at least separate the provision of health services from its purchase. Such competition will encourage efficiency without loss of the commitment to equity and provide ample room for private non-charity providers to flourish. Increasingly healthcare must be seen as a service industry and less often as a social service, with consumers rather than mere beneficiaries; providers rather than overlords.

I will recommend the establishment of a National Teaching and Specialists Hospitals Commission akin to the National Universities Commission to co-ordinate the management of all the Teaching Hospitals, the propensity for political meddling not-withstanding. This board will be responsible for the planning, supervision, monitoring and maintenance of all the tertiary health services in the country. It will adopt and ensure a minimum standard of staff and infrastructure, promote competition, and oversee the development and management of the tertiary health requirement of the country. The UCH and other similar hospitals have suffered from the failure of government to realize that each arm of their triple mandate requires funding. Undue emphasis has been placed on the provision of clinical services. In view of the primacy of training to the existence of UCH, the time has come when the budgetary allocation should reflect this. It is indeed

necessary for the Ministry of Education to be called upon to take a more direct role in this regard.

At the local level, there will be the need to continue, and fine-tune the process of devolution of management to Departments and Units. The "command structure" management technique that has been used so far is inadequate for the needs of a dynamic and responsive organization. It stifles initiative, and ultimately is more expensive for the society. Departments must encourage specialization in order to focus on the few things that they do well. This "focused-factory concept", exemplified by the Shouldice hospital in Toronto where only one type of surgery is performed (herniorhaphy; cheaply and better than most other places) can be copied into mainstream health services[7]. This will make hospitals more responsive to the needs of their clients; promote efficiency, and free management to focus on the "big picture", integrating and co-coordinating the activities of the various Departments and Units.

Health institution must mobilize, and be involved in the community they serve for input into their development. As the role of government reduces, public health facilities in the new millennium will come to depend more on the goodwill of its "friends". These will include alumni and those clients who have been touched by their spirit of service. For example, a significant number of Nigerian Physicians abroad are either UCH – trained or have worked here at some point in their career. They are a potential source of support for the clinical and research functions of this hospital in future.

Merchandising is another area that should become important in future. It will not only be for raising funds but also to encourage bonding to the institutions by the people who have benefited in one way or another from its existence. On a day like this, for example, one would have liked to see UCH ties adorn the necks of the men and UCH scarves on the women.

TECHNOLOGY

Once the problem of funds is resolved, the next question is the means of achieving our objectives. This is where technology comes in. Technology is the application of scientific methods and material to solve human problems. History teaches us that technology has always led science. For example, the steam engine was already in general usage before the science of thermodynamics evolved. Historians insist that technology is an essential condition for humanity, without tools it is not likely that civilization would have evolved. However, technological change has since acquired a life of its own and it is now growing in geometric proportions. Geographical factors and political systems may hold it back, but only for a while. New technology always inspires fear and awe. Witness the recent outcry over the development of cloning; I will like to recall some of the comments when in 1825 George Stephenson proposed a Liverpool to Manchester railway service. A prominent Churchman of the day said "it is direct of society". Sir Asley Cooper, eminent surgeon of the day weighed in rather heavily with "You are entering upon an enormous understanding of which you know nothing. Then look at the recklessness of your proceedings". Lastly, Martin Van Buren, Governor of New York, in a letter to the then President of United States of America said, "railroad carriages are pulled at the enormous speed of 15 mph… the Almighty certainly never intended that people should travel at such breakneck speed". We must be thankful that these opinions did not carry the day. For those wont to dismiss the possibility of using women technology here, let them remember that Nigerian Railway travels faster than 15 mph.

The age of the industrial revolution, which Nigeria missed (the epitaph to our efforts is located at Ajaokuta) has been succeeded by that of information technology (IT) with its twin components of computerization and telecommunications. Computerization arose out of the research of the Second World War while the communication revolution is the product of the Cold War. These two are now intertwined in a way that exploits and enhances their individual strengths. One exciting result of this marriage is the Internet. This "new kid on the block" has caused what Cairncross described as "the death of distance" [8].

The great fall in the price of each has helped the spread of these two tools as figures 1 and 2 below (from the World Bank and the IMF) show. Figure 2 shows that the cost of a transatlantic call has fallen from $300 in 1930 to about $1 today (in 1996 dollars) and this is expected to fall further with increasing use of fibre optic cable. Such cables can carry 1.5 million conversations carried by the cabling technology of the 1960s.

Increased competition among telecom firms will force profit margin down; it is currently over 500% in some instances. The rate of fall in the prices of computers is even more remarkable. To illustrate, if the prices and the improvement in the technology of cars had matched that of computers, the average car today will cost less than $25 and be able to travel 250,000 miles on one gallon. The price of processing power has been falling by an average of 30% in real terms over the past 4-5 decades. Today's $1,500 laptop is many times more powerful than a $10 million IBM mainframe computer of the mid-seventies.

Allied to this is the constant flood of breakthroughs in computer technology. This paper for example is being prepared on an AMD K6 Processor PC- the cutting edge of processing power today. Yet, Intel has already announced the introduction of a new chip called Merced by 1999. Using an EPIC (explicitly parallel instruction computing) based technology, these chips may see off the current generation of chips which are based on CISC (complex instruction set computing) with the familiar x86 acronyms. According

to Moore's Law (named after George Moore – the co-founder of Intel) computing power doubles every eighteen months.

What effects will these developments have on the way we live and work? The immediate effect is that of enhancement of efficiency. We will be able to do much more than we are doing now, and in less time too. The savings that will result far outweigh the initial cost. Other predicted effects are:

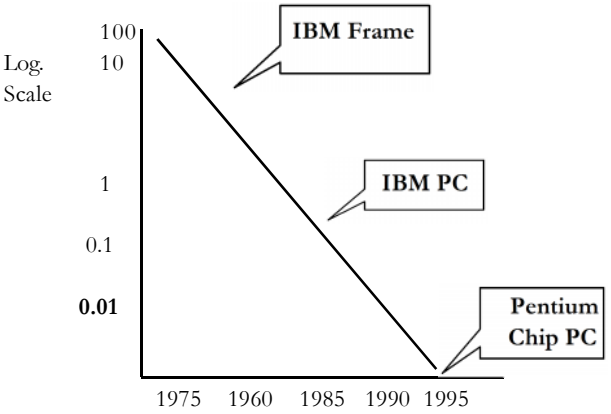

Fig. 1: The cost of information processing. $ per instruction per second 1975 = 100

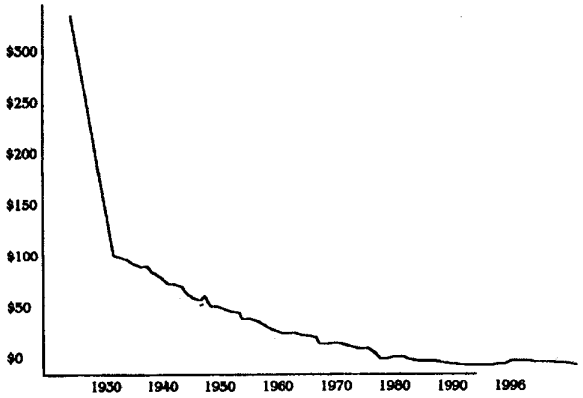

Fig. 2: Cost of a three minutes telephone call from New York to London

All these are possible today; imagine what we will be able to do 10 years from now, talk less of 50.

In a few years, we will look back at some of today's therapies and marvel at their crudity. Just as we marvel now about bloodletting and other ancient treatment techniques. At the clinical level, information technology will allow large multicentre studies of treatment as evinced by the recent collaborative work that defined Magnesium Sulphate as the best treatment for Eclampsia. Today, in order to treat an ailment affecting only one system we use techniques that are non-selective or at best minimally selective. This increases the cost of treatment and the incidence of side effects. In future, it will be possible to exploit peculiar features of individual tissue and target therapy appropriately. Better techniques of production of chemicals will lead to refinements in drug composition. For example using the appropriate racemic type of a compound will maximize its efficacy and reduce the incidence of side effects.

Minimally invasive surgery will continue to spread along with robotics-surgery. As at now, most of the morbidity and the consumables associated with surgery relate to the creation of access. With minimal access techniques, this will be reduced and surgery will become safer and cheaper.

The influence of the IT revolution on the administration of healthcare services will also be dramatic. The quality of any management depends, among other things on the amount and quality of information it has, and its ability to use it. Current technology has simplified the acquisition and utilization of data in ways hitherto unimagined. Ten gigabytes of hard disk costing about N150,000 (1997 price), weighing about as much as a N50 Naira load of bread but smaller in size, can contain the records of all the patients that have ever been seen in this hospital.

Daily hospital attendance, utilization of the services, inventory control, income and expenditure analyses, audit of staff, finance and resources, projection of future requirements, ordering of goods and services can all be done electronically. Character and voice recognition technologies will lead to the replacement of telephone operators and receptionists, and enhancement of security by granting access only to those it recognizes. For example the new UCH I.D. Card is computer-coded and can be used as a key to a variety of services and facilities in the hospital. In engineering, diagnostic software will enhance the repair of equipment, while routine maintenance and jobs will be automated.

There is no doubt that there will be alterations in the job market. Low-skilled work will become rarer and will earn less relative to others, while the new technologies will expose more workers to international competition. Retraining will become necessary in order to ease the transition. As the economy becomes more knowledge-based, the well educated will be at an advantage. Harvesting knowledge will always pay more than harvesting yams [10]. For those worried about potential mass unemployment, another bit of statistics may be consolatory. In 1820, 75% of Americans were farmers and it was feared that the introduction of tractors would create massive unemployment. Today, only 3% of Americans are farmers and they certainly feed more than Americans. Yes, certain jobs will be lost but a lot more will be created. Only those who fail to adopt will lose.

Clearly, we are standing on the threshold of momentous change and there is need to evaluate these advances before adopting them. Technology must remain a means to an end. The allure of glistening hardware must not blind us to careful consideration of cost, benefit analysis. Telemedicine opens new

medicolegal, ethical, and moral issues. For starters, who will license cyberspace physicians? What effect will Telemedicine have on local physicians? Might it lead to a disincentive to develop their skills? How is electronic information related to the patients' record? What effect will the interposition of a computer have on the patient-doctor relationship? What effect does asynchronous one-way communication have on patient care and what are its medicolegal implications? What about the jobs that will be lost? What is explanation for the slowing in the rate of productivity gain in the developed countries after computers were widely introduced compared to before their advent? We must grapple with these issues in future. Mistakes will be made but as Lewis Thomas said "Human knowledge advances by a process of trial and error, or as is more usually the sequence, error, then trial" [11-14].

1. The pattern of diseases now prevalent in western societies. Most of these are chronic diseases that can only be controlled rather than cured.
2. The introduction of new technology that has made the acquisition of data and information relatively easy.
3. The need to ensure the optimal utilization of expensive and new diagnostic and therapeutic equipment.
4. Rising patients' expectations fuelled by news of recent advances published in the mass media.
5. Rising professional expectation.

Yet, there must be some reservations as to ability of the profession to subject everything to the crucible of scientific inquiry. As all researchers know, the absence of evidence is not evidence of absence. Many factors influence the outcome of research. These include:

1. The bias of the researcher.
2. The choice of experimental mode
3. The method of analysis
4. The interpretation of the result.

There are other difficulties associated with the transfer of laboratory results to actual clinical situation. All clinicians are familiar with the situation where your patient is pronounced "virtually dead" by the laboratory test, weeks after he has joyfully returned home. Other non-verbal, psychological factors affect outcome of management and this varies with patients and time.

Nevertheless, there now exist the infrastructure to support evidence-based practice. These include the Cochrane Collaboration, Medline, Oncolink®, etc. These provide the information needed to make decisions based on the best evidence available. It has recently been argued that the traditional practice of depending on the memory of the specialist should be reviewed in favour of more ready recourse to archival information. It is further argued that there is a "voltage drop" between the time of storage of information in the brain and the time of recall. Other factors such as the clinicians' mood, recent experience etc. may influence his ability to apply information.

Allied to this is the development of patient management protocols. These are "best practice guidelines based on the best available data and are aimed at delivering high quality of care in a cost-effective manner". They have however been criticized as being too regimented and inflexible. Clinicians have argued that no two patients are exactly alike. Questions have also been raised about the medicolegal implications of these protocols. What happens when a doctor based on his knowledge deviates from a protocol only to find out he was wrong? Might he not be found guilty of malpractice?

What about the hospital itself? What will the focus of its clinical activities be in the new millennium? I submit that it shall be on these lines:

1. A re-energization of preventive and social medical practice. This will be multi-departmental and will focus on disease prevention, increasing the community's awareness of common diseases, health education and screening.
2. Development of facilities for the care of patients with chronic disabling diseases is set to rise and this will generate demand for hospices and palliative care.
3. Development of domiciliary healthcare services. This is allied to the above reason.
4. A rediscovery of its goal of being a centre for training and research. Clinical services important as it is must become secondary to these primary functions.

RESEARCH

There is a tendency to treat research as an esoteric activity that has no place in the health services of a developing country. Nothing can be farther from the truth. The reasons for ardent pursuit of research include:

1. Ninety percent of the world's potential life lost is in the developing world, yet they account for only 5% of global health research funds.
2. The pattern of diseases, their mode of presentation and outcome often differ from region to region, and between races.
3. The health profile of countries differs from one another. In most of the Western countries today, top research dollars is going into the investigation of diseases of aging and such like, issues that are not yet important to us.
4. In view of the poverty of many developing countries, pharmaceutical companies are not investing in new drug development for the treatment of diseases endemic in these areas, as they fear that it will not be profitable.

The case for research is therefore quite strong. In the new millennium, research must be an important part of the agenda of this hospital and modality for funding

it must be clearly worked out. Such research must concentrate on:

1. Appraising local health needs and priorities
2. Evaluating the strength and generalisability of the evidences on which treatments are based.
3. Cost-benefit analyses of health intervention measures.
4. Feasibility of new health interventions.
5. Socio-cultural influences on health interventions.
6. Clinical and administrative audit.

While on the one hand research will be easier to conduct because of development in information management tools, the need to recruit a large sample will make collaborative work necessary. Rigorous review of the various aspects of the research process will become the norm. For example, many leading journals have adopted the CONSORT statement on research methodology. This requires authors to provide enough information for readers to know how the research was conducted [16]. With electronic publishing, researchers may soon be required to submit all their raw data in future so that others can evaluate them and reach their own conclusions from the same data. There will be more research into alternative medical practices in order to identify what is useful. Qualitative research will also increase as the importance of the socio-cultural milieu as a determinant of outcome in health interventions becomes more apparent. Already it is obvious that the epidemiological profiles of many diseases are changing. There will therefore be a continuing need to define these as they relate to the diseases that are already prevalent in our environment, while we continue to characterize newly emerging ones. Basic science research will also be necessary though these will continue to suffer a lack of funding support. The anxiety to continue them must be tempered with careful monitoring and supervision of all its aspects. Recent revelations about AIDS research in East Africa and revelations concerning the Tuskegee project in a monitoring-conscious America should alert us to the need to supervise and regulate research.

TRAINING

Training was the *raison d'être* of this hospital and several others like it in the country today. Yet, in the tough economic climate in which the country has found itself, this aspect has suffered the most. The new millennium ought to see a conscious and decisive effort to regain this lost ground. It will not be easy. The point needs to be made and reiterated that there is a need for adequate budgetary provision for this primary role of our teaching hospitals. Without the overhead imposed by the training requirement, the hospital will be able to do more with its meager allocation.

This activity itself is in crises now. There are clinical features of systems failure such as overcrowded lecture halls, cult activities, poor performance of the products of the system, incessant industrial unrest and closures. Attempts to individualize and treat these symptoms are akin, to the proverbial preference for the treatment of tinea versicolor in a patient with Hansen's disease. It is bound to have similar impact on the prognosis. Studies have shown that many a student enters the medical school full of enthusiasm and energy but exit it drained of most of their motivation. They are overloaded with much information and are tested by techniques that often rewards the possessor of information about rare conditions or useless but impressive-sounding verbiage. Ward rounds, that quintessential teaching method much favoured by the profession often lasts longer than the attention span of the average student can cope with, and is disruptive of other ward activities. The problems of the postgraduate student are similar, if not worse, with many complaining of not receiving any teaching at all [17-18].

Certainly, these factors along with the depreciating infrastructure and inadequate funding are contributing to the falling standard of medical education in Nigeria today. This is one area where antiquity may be a disadvantage. Having used a particular model for so long, one may be reluctant to accept the need for change. Yet, all around us, change is occurring. What changes are envisioned for training in the next millennium?

1. Medical training must focus on cultivating a lifetime habit of learning in the student rather than the passive acquisition of information that soon becomes outdated. Dr. Samuel Johnson, that great Cham of English Literature put it quite well when he said, "Knowledge is of two kinds. We know a subject ourselves or we know where we can find information about it".
2. The current heavy curriculum needs to be reduced. There should be more short sessions of problem-based learning, group discussions and student led seminars.
3. Mentoring must become a part of the training program for students. Such mentors should help both the professional and personal lives of the mentee. The mentors must be trained on mentoring otherwise; there will be no benefit to either party.
4. Medical educators will need to be trained in teaching methodology. It is incredible that people who train others in such a vital field do not have any formal training in education. Though Lecturer Consultants tend to be the *crème de la crème*, yet their native ability and skill can be improved by further education.
5. Methods of assessment should be such as reward desirable behavior rather than otherwise. It should incorporate positive feedback mechanism so that the student does not have to wait until a "final examination", with all the physical and emotional stress for both candidates and examiners, before learning about his weakness. The role of terminal examinations needs to be downplayed in favour of continuous assessment with feedback.
6. The doctor of the next millennium must have more training in the social and communication sciences, law, ethics, human rights and responsibilities,

business and personnel management. These will enable him to be more socially active in the knowledge that social factors often influence the outcome of health interventions and healthcare workers can be effective social advocates. It will also help him to make a success of his life, as the skills learnt will be useful to him in all spheres of his life apart from the professional one.

7. He must be taught how to cope with stress and avoid the use of unwholeness methods. Doctors, because of the stress associated with their work, easy accessibility, and the financial means are prone to abuse of drugs.

The duty of a seer is never an easy one. If he is proven right, then he has been prophetic, if wrong, at least he would have provided some comic relief. Whatever the next millennium turns out to be some things will never change. As Sir William Osler said "Medicine arose out of the primal sympathy of man with man and out of the desire to help those in sorrow, need and sickness" [19], therefore, "most patients when they are ill are more interested in kindliness than creatinine clearance, in understanding rather than iron binding capacity" [20]. I cannot put it better!

In conclusion, it has been said that, "when one reaches middle age, inertia sets in". As the University College Hospital, Ibadan, reaches middle age, I am reminded of the prayerful words of a favourite song that says, "May you stay forever young". So happy birthday and may you indeed stay forever young.

culled from the symposium titled "UCH in the New Millenium". Part of activities celebrating the 8th UCH day and the 40th Anniversary of the Hospital.

References

1. **Buchanan, A.** Privatization and just health care. Bioethics, 1995; 9:220-239.
2. **Himmelstein, D.** Woolhandler S. Cost without benefit, administrative waste in the United States of America health care system. N. Engl. J. Med. 1986; 314:441-445.
3. The Economist 1997;345(8040):94
4. **Dezhi, Y.** Changes in healthcare financing and health status; the case of China in the 1980s. Florence: Innocenti, 1992 (Occasional Paper No 34).
5. International Child Development Centrentral and East Europe in transition: Public policy and social conditions.
6. **Gwatkin, D. R.,** Heuvuline P. Improving the health of the world's poor. BMJ, 1997: 315 (30):497.
7. **Herzlinger, R.** Market Driven Health Care: Who wins, Who loses in the Transformation of America's Largest Service Industry. Addison-Wesley, 1997.
8. **Caircross, F.** The Death of Distance: How the Communications Revolution will change our lives. Harvard Business School Press 1997.
9. **Gates, W.** The Road Ahead, Microsoft Books 1996.
10. **Woodward, P.** Winners and losers, The Economist 1996; 340 (7985):S24-33
11. **Delamothe, T.** BMJ on the Internet. BMJ 1995; 310:1343-4.
12. **Coiera, E.** Medical Infomatics. BMJ 1995; 310:1381-7
13. **Larpote, R. E.** *et al,* The death of biomedical journals. BMJ 1995; 310: 1387-90.
14. **McLaren, P.,** Ball C. J. Telemedicine: lessons remain unheeded. BMJ 1995; 310:1390-1.
15. **McMichael, A. J.,** Haines A., Global climate change: the potential effects on health. BMJ; 7111:805-9.
16. **Altman, D.** Better reporting of randomized controlled trials: the CONSORT statement. BMJ 1996; 313:570-571.
17. **Adebamowo, C. A.,** Ezeome E. R., Ajuwon A. J., Adekunle O. O: Stress and Distress: Surgical Training in Third World. Presented at the 37th World Congress of Surgery. Acapulo, Mexico. August 1997.
18. **Coles, C. R.** Differences between conventional and problem-based curricula in their students' approaches to studying. Med. Ed. 1985; 19:4.
19. **Osler, W.** The principles and practice of Medicine. D. Applestosn, New York. 1892.
20. **Stokes, J.F.** Aims of evaluation. In Gilbert J. A. L. (Ed). Proceedings of conference on evaluation in Medical Education. Bulletin Commercial Printers. Edmonton. 9-17.