Some thoughts on medical education in the twenty-first century

Hamid R. Jamshidi a; David A. Cook b

a Educational Development Center Shahid Beheshti University of Medical Education Tehran Iran. b Division of Studies in Medical Education University of Alberta Edmonton Alberta Canada.

Online Publication Date: 01 May 2003

To cite this Article Jamshidi, Hamid R. and Cook, David A.(2003)'Some thoughts on medical education in the twenty-first century'Medical Teacher,25:3,229 — 238

To link to this Article: DOI: 10.1080/0142159031000100256
URL: http://dx.doi.org/10.1080/0142159031000100256

Full terms and conditions of use: http://www.informaworld.com/terms-and-conditions-of-access.pdf

This article may be used for research, teaching and private study purposes. Any substantial or systematic reproduction, re-distribution, re-selling, loan or sub-licensing, systematic supply or distribution in any form to anyone is expressly forbidden.

The publisher does not give any warranty express or implied or make any representation that the contents will be complete or accurate or up to date. The accuracy of any instructions, formulae and drug doses should be independently verified with primary sources. The publisher shall not be liable for any loss, actions, claims, proceedings, demand or costs or damages whatsoever or howsoever caused arising directly or indirectly in connection with or arising out of the use of this material.
EDITORIAL

Some thoughts on medical education in the twenty-first century

HAMID R. JAMSHIDI1 & DAVID A. COOK2
1Educational Development Center, Shahid Beheshti University of Medical Education, Tehran, Iran; 2Division of Studies in Medical Education, University of Alberta, Edmonton, Alberta, Canada

Introduction

The appropriate training of physicians received a great deal of attention in the last few years of the twentieth century. A large majority of universities worldwide adjusted their curriculum to make the process of medical education more realistic. Despite the amount of thought and interest in how we train for effective medical practice, the process has been roundly criticized more than once. Certainly the so called GPEP for effective medical practice, the process has been roundly criticized to make the process of medical education more realistic. The majority of universities worldwide adjusted their curriculum attention in the last few years of the twentieth century. A large number of additional papers explored these suggestions for change in more detail, such as the ‘Health of the Public’ program funded by the Kellogg Foundation (Kaufman & Waterman, 1993) or the discussion by Elam et al. (1995), which elaborated on the findings of the earlier work. Similar observations in Britain (Lowry, 1992) and Canada (Toews, 1990) suggested that there was growing discontent among those concerned with physician training that was not necessarily being alleviated by changes in the undergraduate curriculum, which more often than not simply involved a reshuffling of the existing material from the early years of the program into a problem-based or case-based format (Association of American Medical Colleges, 2000).

At the present time, the curriculum revolution in the early years of training is seen as being largely complete. There remains much work to be done in clinical undergraduate education but progress (or lack of it) is often being dictated by changes in the health system itself. Faced with financial problems in healthcare that transcend national or even ideological boundaries the emphasis has been mostly on routine medical teaching has proved difficult to implement. Depending on the interests and priorities of that particular medical school, one or more of these concepts may become part of the undergraduate curriculum but in the future all of them will need to be considered. In this editorial we would like to raise the possibility that attempts to predict the future of medical care may enable us to do some advance planning for further development of our medical schools. In the first section we discuss the issue of human health and then describe changes in health management. This is followed by a more detailed discussion of technology and ethics in health and we then identify some potential problems with the present system, and suggest ways in which we might modify our training of physicians in the light of current views on healthcare.

Health and factors that affect it

What is health?

There is now general agreement that health is not simply the absence of disease, but has biological, psychological, social and spiritual components that are interwoven inextricably and thus influence each other. This concept is difficult to grasp in the real world of patient care; indeed it is sometimes
It is common to see individual patterns of health and disease as a series of opportunistic events over which the individual has rather little control. While this may have been true at one time, it is certainly not true now or in the foreseeable future. In fact in a report to the Robert Wood Johnson Foundation, the Institute for the Future (2000) suggests that about half the factors determining health are lifestyle dependent, with environment contributing 20%, genetics 20% and access to medical care only 10%. The inevitable conclusion is that medicine must pay close attention to lifestyle and environment if it is really to make a difference to human health. Table 1 shows the preventable causes of death in the United States during the 1990 calendar year (Connelly & Inui, 2001). There is little reason to believe that the pattern has changed significantly in the last 12 years, although in the United States there may have been some decrease in smoking in some segments of the population, which is the leading preventable cause of death (Wagenknecht et al., 1998). If our physicians are to make a significant impact on health, these issues need to be addressed.

**Changing demographics**

Although disturbing geographical differences remain, generally people worldwide are living longer. The WHO reported in 1998 that average life expectancy at birth in 1955 was 48 years; in 2025 it is predicted that it will reach 73 years. The proportion of young people under 20 years will fall from 40% in 1995 to 32% of the total population in 2025 (World Health Organization, 1998). The same report states that in 1995, 32% of the global population lived in urban areas and predicted that by 2025 the proportion will have reached 59%. At the very least, these figures suggest that we need to look at recruitment into different specialties, and the distribution of physician resources.

**Who/what should we treat?**

Medicine, as opposed to medical research, has been focused almost entirely on the individual since its earliest development. The individual has been seen as ‘ill’ and medicine has tried, with considerable success, to identify the causes of the problem and manage the situation so that the patient feels better. In the twentieth century, this approach moved successively to higher and higher levels of the ‘health triangle’ shown in Figure 2 and currently there is an enormous interest in understanding the genetic component of disease and the possibility of managing it with gene therapy. Movement down to the level of the community and thence to the entire society has been much more difficult, despite the importance of these levels. It is certainly true that the proliferation of ‘for profit’ healthcare has promoted a broader examination of community and society, but the motivation has been financial rather than related to health, and whether the health of the individual or the community has gained by this perspective is very much in debate (Blendon & Benson, 2001; Simon et al., 1999). It is probably true that we need to pay attention to all levels of intervention and prevention if global health is to improve.

**Disease-centered approach vs. illness-centered approach**

The phrase ‘patient-centered medicine’ has become something of a mantra in medicine and medical education (Stewart et al., 1995), and perhaps with good reason.
Table 1. Causes of preventable death in United States in 1990.

<table>
<thead>
<tr>
<th>Cause of death</th>
<th>Estimated number</th>
<th>Percentage of total deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tobacco</td>
<td>400,000</td>
<td>19</td>
</tr>
<tr>
<td>Diet/activity pattern</td>
<td>300,00</td>
<td>14</td>
</tr>
<tr>
<td>Alcohol</td>
<td>100,000</td>
<td>5</td>
</tr>
<tr>
<td>Microbial agent</td>
<td>90,000</td>
<td>4</td>
</tr>
<tr>
<td>Toxic agent</td>
<td>60,000</td>
<td>3</td>
</tr>
<tr>
<td>Fire arms</td>
<td>35,000</td>
<td>2</td>
</tr>
<tr>
<td>Sexual behavior</td>
<td>30,000</td>
<td>1</td>
</tr>
<tr>
<td>Motor vehicles</td>
<td>25,000</td>
<td>1</td>
</tr>
<tr>
<td>Illicit use of drugs</td>
<td>20,000</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Total</td>
<td>1,060,000</td>
<td>About 50</td>
</tr>
</tbody>
</table>

Source: Connelly & Inui (2001).

Figure 2. The health triangle.

Health will be determined by the interplay of two factors, one based on medical expertise and one based on the experience of the patient in the context of his/her illness. In considering health we need to appreciate that both dimensions play a role and overlap one with the other. It is worth pointing out that the patients bear a significant responsibility for promoting their own health, and part of the role of the physician is to ensure that they accept this responsibility.

A further component that may direct the course of medical education is the nature of the system that provides healthcare.

Changes in health management

The role of Primary Health Care

In 1978, the Alma-Ata conference organized by the WHO emphasized the need for a heavy emphasis on primary care (World Health Organization, 1978). In fact, even before this, White (White et al., 1961) pointed out that only a small fraction of individuals who become ill are admitted to a teaching hospital. In an even more disturbing update, Green et al. (2001) found that in an average month 800 of every 1000 Americans experience health-related symptoms, 217 visit a physician, and eight are hospitalized. Fewer than one per 1000 is admitted to a teaching hospital. The large medical center, however, contains considerable influence—it is where major and dramatic advances in treatment are made, where the power of the medical establishment is concentrated, and it is hardly surprising that this 1% consumes a disproportionate amount of the available budget, even allowing for the much greater expense involved in running such a center. The restructuring of the system to place more emphasis on primary care is occurring but more slowly than one might expect.

Health economics

The revolution in medical technology, the development and marketing of new and expensive drugs and other interventions, and the expectation of the public that the health system will meet all their needs has driven the cost of healthcare upwards at an alarming rate. In a system that relies on personal insurance to pay the costs of healthcare, the need to maximize profits has led to a vast and expensive bureaucracy, while in publicly funded healthcare in some countries the cost of healthcare is more than 10% of the gross domestic product (Organization for Economic Cooperation and Development, 2002). It has become clear that there will never be enough money available to have the perfect healthcare system, and the issue becomes one of conserving resources and, at the same time, providing the best system possible, rather than the best possible system. Ways in which this can be achieved include more reliance on primary care interventions and the appropriate use of other health professionals, but both these approaches imply that our physician training must prepare our students to operate in this sort of environment.

Change from hospitalization to ambulatory care

Attempts by hospitals to balance their budgets have not always been successful. Curiously, the hospital has the greatest financial success when it supplies the minimum of expensive intervention that is the very rationale for its existence. To reduce costs and provide a more efficient service, hospital stays are being shortened, day surgery is becoming more commonplace, strenuous efforts are being made to reduce complications such as infections that prolong the hospital stay, and greater use is being made of office technology to both plan treatment and communicate with patients and with others in the health team. In the United States, this has led to a decrease of about 130,000 hospital beds in the last decade, representing about 20% of the available beds. It is predicted that between 1997 and 2005 some 850,000 hospital beds will have been phased out (Institute for the Future, 2000). Student education clearly needs to embrace this reality and prepare the student for a world in which hospitalization is less frequent than in the past.

Globalization and health

The concept that health is an issue which transcends geographic boundaries is not new, but it has taken a long time for it to become widely accepted (Schwarz & Wojtczak, 2002; Simpson et al., 2002). Globalization is being forced on us, not only because international media provide
minute-by-minute coverage of health crises elsewhere in the world but because the ease of travel has enabled communicable diseases to spread, insect and other vectors to reappear in unexpected places and also because there is a growing belief among those in many developed countries that they have an inescapable moral obligation to help those in less fortunate circumstances. Education in international health is thus a priority rather than an option (Schwarz, 2001).

In addition, sharing expertise in medical education internationally becomes essential if we are to have the best possible educational system. While it is tempting to suppose that the developed countries will mostly be the providers of the expertise, it is as well to bear in mind that those responsible for medical education in the developing countries actually have a lot to teach us.

A further area that is driving change is medical, information and educational technology.

Technology and health

Medical technology. Enormous strides have been made in medical technology as a result of billions of dollars invested in medical research. While the benefits are incontrovertible, there are also difficulties that have not been adequately addressed (Callahan, 2002). Those who graduated in the last century will not necessarily be familiar with the advances, and continuing medical education has not always been able to rectify this issue (O’Brien et al., 2001). In addition, a second set of problems arises at the machine–human interface, and, despite the highly technical nature of modern medicine, human failure continues to be the leading cause of problems (de Leval et al., 2000). It is tempting to see medical technology as the answer to a lot of problems but it will only provide the answer if we train students to use it. The same applies mutatis mutandis to new therapeutic approaches such as gene therapy including the use of novel delivery systems, advances in imaging, the use of miniaturized devices, advances in transplantation and so on.

Information technology. It seems that the four main areas will be affected by new information technologies and that together they may redirect the development of future clinical care processes. These areas include:

- **Clinical information interfaces:** The ability to provide rapid and focused information from the medical literature in a timely fashion has the potential to make decision making for the physician far easier. Such systems are already available with very rapid response times (Weekley et al., 2000) and when the use of such systems becomes widespread the integration of new knowledge into medical practice will be greatly facilitated. Like any other technology, this sort of system is a tool rather than the entire solution to a problem, and physicians may be slow to accept it (Treister, 1998) but it would be expected to alter the emphasis of undergraduate education, away from memorizing fact.

- **Data analysis:** Automation of data mining exercises applied to administrative data sets can help us to gain a better understanding of the future course of population health and the probable success of interventions (Karlsson & Eklund, 2000). Since patient records are increasingly becoming automated, this process can provide rapid and complete data about large populations.

- **Telehealth:** Remote telemetry either via sensors or by transmission of processed data can bring the expertise of a tertiary care center to distant locations. The current technology is relatively expensive but the approach has proved to be workable (Grigsby, 2002). It is difficult to predict the extent to which this sort of service will be applied in the future but if it becomes widely adopted some instruction in the optimum use of telehealth will need to be included.

- **Automation of basic business processes:** The required completion of forms and reports consumes an extraordinary amount of the time of health professionals. Software is available to assist this process and as this becomes more sophisticated the overall efficiency of healthcare would be expected to improve (Adams et al., 2000). Adoption has been quite slow, however, and equally there is no one system that is the clear leader in terms of office automation. This suggests that we will need health workers whose knowledge of computing and data entry is sufficient to make optimum use of business processes. In most curricula, almost no time is current spent in instruction on practice management, although some postgraduate programs have been developed (Brooks, 1996). Students may feel inadequately prepared in this area (Arlow et al., 2002).

Finally, other developments in medicine—and indeed in society as a whole—are in the process of driving issues in medical ethics in new and different directions.

Future issues in medical ethics

Teaching of bioethics has usually been in the form of short separate courses (Coutts, 1991) but there is a strong case to be made for embodying ethics instruction within the curriculum as a whole (Darragh, 2001; McGaghie et al., 2002; Simpson et al., 2002.)

**Genetics and disease.** Determination of the human genetic map enables us to identify those people with a genetically determined risk factor. Should those individual always be told? Should the health system deal with them in exactly the same as those without the risk factor? For example should they pay higher healthcare premiums?

**End-of-life care.** At what point are heroic measures for the terminally ill appropriate, and who decides? Is euthanasia or assisted suicide ethically acceptable? Under what circumstances?

**Data management.** Patient records are ‘confidential’ but security of electronic data is not always easy. Who should have access and when?

**Economic issues.** Is healthcare a universal right? Should the rich be able to purchase procedures that are unavailable to the poor?

**Role of the patient.** If the patient is a member of the healthcare team, can the rest of the team expect them to participate? What should be the reaction of the patient refuses to cooperate?

**Sexual behavior and its consequences.** How should information about sexually transmitted disease be handled? What should the professional attitude be about abortion, and what are the
rights of the healthcare worker who finds it morally unacceptable, or the patient who is seeking an abortion? What should be the professional attitude to homosexuality, and what are the rights of the healthcare worker and the patient in this regard?

Professional conduct. What are the rights and obligations of a physician who detects unprofessional conduct in one of his/her peers?

Legal matters. To what extent should a physician be skilled in medical law? To what extent does the public have the right to demand testimony from a physician? What should be the rights of the patient and the physician in terms of malpractice? What should the profession do to maintain an equitable position that is in the best interests of the public?

Some shortcomings of our present system of medical education

Overproduction of specialists. A frequent criticism of our present programs is that they generate those who are highly trained but in a narrow area. There has been a strong feeling that we need to produce more practitioners who are skilled in primary care (Rosser, 2002). This is a particular problem in rural regions, and a great deal of time and energy has gone into plans that might increase the number of graduates who choose family practice (Rabinowitz et al., 1999; Tandeter & Graneck-Catarivas, 2001; Brooks et al., 2002). Very recently there have been some suggestions that we also need to examine the number of specialists that graduate (Cooper, Granek-Catarivas, 2001; Brooks et al., 2002). Very recently there have been some suggestions that we also need to examine the number of specialists that graduate (Cooper, 2002; Cousin & Vender, 2002), and this is part of a general panic which suggests that within the next few years there will be a serious shortage of qualified physicians in all areas (Cooper & Getzen, 2002).

Heavy reliance on treatment rather than prevention. The GPEP report in 1984 stressed that medical education places too much emphasis on treatment of the patients and not enough on health promotion (Muller, 1984). This same message has been relayed repeatedly (Pomrehn et al., 2000). The World Health Organization (WHO) has defined health in three levels: primary prevention (education, vaccination, etc.), secondary prevention (diagnosis and treatment) and tertiary prevention (rehabilitation) of which only the second receives much attention in our present programs. Physicians are a powerful but under-utilized resource for preventing illness by promoting a healthy lifestyle (Callahan, 1997).

Lack of training in ethical issues. The ethical issues facing modern medicine are outlined above. In fact, there is a significant amount of ethics teaching in most medical schools (DuBois & Burkmper, 2002) but the effectiveness of the instruction in changing behaviour is usually not known, and the instruction may not always deal with some very important issues. Some people believe that the finances associated with medical practice and the associated businesses have become such an overwhelming factor in healthcare that special attention needs to be given to this area (Sykes, 1998; Alpert et al., 2002).

Lack of training in complementary/alternative medicine. There has traditionally been some resistance to instruction in complementary/alternative medicine (CAM) during formal medical training. There are, however, many reasons why students need some guidance in this area. First, a substantial number of people use such approaches; in a recent survey some 85% or headache sufferers use some form of CAM (von Peter et al., 2002). Furthermore, in most instances the results of this sort of intervention are far from clear. Often, there are no clinical data, and ‘lack of evidence for an effect is not the same as evidence for a lack of effect’ (Stener-Victorin et al., 2002). There is even a school of thought that suggests that at least some forms of healing cannot be assessed by the usual techniques such as randomized clinical trials (Tonelli & Callahan, 2001). As many family doctors will testify, the public expects that those with an MD degree will have at least some familiarity with CAM, and find it frustrating that conventional medical practice has steadfastly ignored other methods of healing.

Lack of training in humanities and social sciences. Another criticism of medical education is that current curricula largely ignore social sciences and humanities, despite the fact that the experience of disease and its course, as well as many aspects of prevention, depend a great deal on an understanding of human nature and culture. Some individuals have stressed that we need more emphasis in behavioral aspects of disease (Hunt, 1997; Okasha, 1997) while others have suggested structured teaching in art (Calman & Downie, 1996) or history (Biddiss, 1997).

A subset of this aspect is spirituality, and, although medicine is intrinsically a secular activity, from the perspective of the patient, health, disease, life and death are often parts of a larger spiritual world. While the physicians do not need to share that world, they do need to understand it if they are to be effective healers. The teaching of spirituality in medical school has achieved some attention but probably less than it deserves (Puchalski & Larson, 1998).

Lack of training in end-of-life care. Students enter medical school with the idea of healing the sick and postponing death. The concept that this is not always possible and that a certain proportion of patients in their care will die is as unwelcome to the student as it is to those in practice. With the significant exception of those who have made a career in palliative care our instructors tend to sidestep the issue, with the result that at a time when the physician can do a great deal to heal the spirit if not the body, students and recent graduates tend to be at a loss. This involves a great deal more than ‘breaking bad news’, and overlaps with cultural and spiritual values, which, as has been mentioned, have also been neglected (Dickinson & Field, 2002).

Failure to train the student to be a member of the health team. It is becoming increasingly clear that, in the future, patient care will be managed by health teams rather than individuals (Patel et al., 2000; Freeth, 2001). This carries with it the idea that the physician must be able to interact effectively with the other members of the team, and yet it is only in the last few years that any attention has been paid to this area. The assumption that such talents will be developed by anyone who has basic medical knowledge is manifestly false (McPherson et al., 2001) but medicine has lagged behind many other areas in developing the concept of effective teamwork (Salas et al., 2001; Leipzig et al., 2002).
Instruction happens mostly in a tertiary care setting. This issue has been widely discussed (Bowen & Irby, 2002). There is general agreement that the patients in a large tertiary care hospital are not representative of the general population (White et al., 1961; Green et al., 2001), and that an increase in exposure in an ambulatory care setting is essential (Hunt et al., 1999; Dent et al., 2001) but transferring this concept to the reality of medical education has not been easy. The crisis in healthcare funding has actually exacerbated the situation: since it is economically preferable to send patients home as soon as possible, those that remain in hospital are often very ill with several coexisting clinical problems. Such patients are not well suited to the early training of health professionals.

These are a few of many aspects of current medical education that have been identified as needing attention. It is possible to identify a second set of imperatives based on what we know about health and disease in the general population.

How should medical education respond?

The preceding discussion does not exhaust either the criticisms of our present systems of medical education or the changes in health are that are in progress but even this list suggests that we will have to continue to modify our instruction to better prepare our students for future practice. It is always dangerous to make predictions based on the persistence of present trends, as Mark Twain pointed out in Life on the Mississippi (Clemens, 1883):

In the space of one hundred and seventy six years the Lower Mississippi has shortened itself two hundred and forty-two miles. That is an average of a trifle over a mile and a third per year. Therefore, any calm person, who is not blind or idiotic, can see that in the Old Oolitic Silurian Period, just a million years ago next November, the Lower Mississippi was upwards of one million three hundred thousand miles long, and stuck out over the Gulf of Mexico like a fishing-pole. And by the same token any person can see that seven hundred and forty-two years from now the Lower Mississippi will be only a mile and three-quarters long, and Cairo [Illinois] and New Orleans will have joined their streets together and be plodding comfortably along under a single mayor and a mutual board of aldermen.

There is something fascinating about science. One gets such wholesale returns of conjecture out of such a trifling investment of fact.

On the other hand, short-term predictions based on established knowledge can be a useful guide. With this in mind, the issues facing medical education in the next few years are likely to include some or all of the following.

The advances already made are very likely to be worthwhile. Medical educators have, with remarkable persistence, insisted that the curriculum be modified to include substantial instruction in matters such as communication skills and behavioral science. While we have had the support of many of our medical colleagues, there has also been substantial opposition to the inclusion of these topics. The preceding discussion should support the idea not only that their inclusion is essential but that the emphasis needs to be even stronger. The idea that bioethics needs to be taught rather than accumulated passively was also less than popular in some quarters but again the evidence suggests that we need more instruction, not less. The reorganization of the curriculum in the early years and the changes in instructional methods of the last few years have been an essential part of the broadening of medical education. It has only been through these advances that time has become available in the undergraduate curriculum to teach such things as communication skills or ethics without loss of competence in the area of core factual knowledge.

The instruction may need to move out of the university health center. The need to train the undifferentiated physician in an ambulatory setting has been emphasized repeatedly, and many schools have an increased amount of time in ambulatory settings. The core learning, however, is still centered on the tertiary care center, which is where the curriculum planning and the large majority of the full-time staff are located. While the complete integration of university medical training with the community, as happens in Iran, may prove more difficult to create in the present environment in North America and Europe, it remains an area to be explored. At the very least we need to nurture and expand academic Departments of Family Medicine, and perhaps allow them an unprecedented role in curriculum design, even in the preclinical component of the curriculum. Family practice is not only the chosen career of a high proportion of the graduates but is the heart of healthcare. Exactly how we can improve the status of family medicine in the medical community is problematic but it needs to become a more appealing option. There is also a component of public education involved as well; referral to a specialist is all too often taken as a sign that the condition is being taken seriously by the practitioner, while in fact it may simply cost the system money. This is in no way to decry the need for a number of highly qualified medical specialists but about 50% of deaths are preventable, and when about 80% of preventable deaths arise from lifestyle concerns we need to make sure that the front line is highly skilled in this sort of issue, and, parenthetically, that the specialists have similar skills and an appreciation of the role of the family practitioner in dealing with these sorts of problems.

Issues that are probably under-represented in the present medical curriculum

Facilitation of lifestyle change. The physician is in a powerful position to prevent the development of disease but to be effective these sorts of techniques must be emphasized and taught. In fact this is a fertile area for future research, but, for example, the matrix model of Prochaska (Di Clementi et al., 1991) provides a practical guide to the approach to the patient with an addiction problem, particularly in the case of tobacco dependence. Techniques of this sort need to be taught and the students need opportunities to practise preventive medicine. They also need to see it in action in the clinics and in the hospital. The practising physician requires a sound and compassionate understanding of human nature at least as urgently as he or she needs an understanding of the pathophysiology of disease and its medical management.
The teaching of bioethics needs to be firmly practice-based. Almost every medical school pays attention to bioethics in its undergraduate curriculum but the ambience of the school is so frequently oriented to the core medical knowledge that this crucial area tends to get dismissed by the students as either obvious or irrelevant to the key task of gaining medical knowledge. This situation would be expected to change when the ethical issues surface, not in isolation but as an integral part of the decision-making process. As an aside, the same holds true for issues of preventive medicine, communication skills and so on. We have made enormous strides in ensuring that these topics are taught, and in some schools they are truly integrated into the learning of medical facts. For the majority, however, they still remain separate courses rather than an integral part of patient management, and it is hardly surprising that, under these circumstances, students consider these topics as a separate areas of study, and generally give them lower priority.

Students need to learn how to work in a team. Problem-based learning has made it easier for individuals to learn about group process by participating in it, and with the increasingly high standard of facilitation there is reason to believe that process skills may be improving. On the other hand, there is often little chance to learn about the other professions and still less opportunity to practise team skills in an interprofessional group. There is evidence that such skills and attitudes can be learned (Bayne et al., 2000; Mires et al., 2001) and increasingly such skills will be a necessary part of practice. In our experience with interprofessional education, we find that there is at least as much resistance to this sort of training in health professions other than medicine. Such mistrust tends to be exacerbated in universities where there is competition for space, funding and students, and a necessary first step is for the health sciences faculties to learn to collaborate effectively. Fortunately in most academic centres there are units that provide a model for collaboration between the professions; stroke teams, burn unit teams and similar groups provide an excellent environment for students to see the health team in action, and this role modelling can be very powerful.

Healthcare systems, health economics and management. This area is notoriously unpopular in undergraduate medicine and scarcely more appealing to those in practice, who may have to work within a system that they are powerless to change and that fails both the physician and the patient. Doctors are not trained to be health economists, managers or entrepreneurs and, if our medical education process is effective, they should be skilled healers and a means of increasing the health of their patients. Understanding the history and the advantages and disadvantages of different healthcare systems is only relevant if the knowledge can become a force for change. Perhaps this area needs to be taught from a more iconoclastic perspective, and the students given some training on how to change the system. It is commonly said that the reasons for the difficulties in healthcare have arisen partly because the physicians have lobbied successfully for their own interests but less successfully for the interests of their patients. This is an oversimplification but we certainly need to generate in our medical schools a group of patient-centered physicians who will be both loud and persistent in promoting the best system possible.

Globalization. While there are elective opportunities for some students to work abroad at some time during their education, the majority of students lack international health experience. Increasingly, however, it is clear that we need a much better understanding of the cultures and health of those in other countries. Again, courses in international health are useful but no substitute for the actual experience, and we need to encourage our students strongly to experience the way that other countries deal with health. There is a disturbing tendency to see exercises like this as ‘missionary activity’, and we need to make sure that our students learn to appreciate different values and approaches, rather than attempting to foist their medicine on the culture they are visiting.

One area often singled out as neglected is technology. It has been omitted here not because technological change is unimportant but because many incoming students are more comfortable with this aspect than their instructors. If the facilities are available, and particularly if the instructors use the facilities frequently in the presence of the students, this area may well take care of itself. An emerging aspect which is exciting, but whose full potential remains unknown, is the concept of an International Virtual Medical School (Harden & Hart, 2002).

What needs to be de-emphasized?

Steve Abramson once remarked that the problem with the curriculum is that it is an organism without an excretory system. If we are going to pay more attention to some areas, other areas must be abbreviated, or the duration of the training extended. The latter option is generally unpopular, so the question remains: what can be compressed or omitted, without cost?

Basic science needs to review its mandate. There is still a tendency for the basic science component of education in the early years to be indistinguishable from that designed to provide the basic training of a research scientist. This is usually justified by the correct observation that medicine is a science but if we wish to teach medical students to think scientifically we need them to be able to reason with limited data rather than to accumulate enormous amounts of fact. Of course fact is important. If there is what Bordage & Lemieux (1991) called ‘reduced knowledge’, clinical reasoning will be imperfect; the idea that all we need is principles without any detail at all is untenable. But we do need to make sure that what we are teaching is clinically important, and that the information is retained and reinforced in such a way that it will actually be useful. We need to ask how much detailed anatomy is needed. With recent graduates and family physicians as well as specialists and the basic scientists themselves, we need to open a realistic discussion of how many different drugs student need to know about, how much detail of metabolic or humoural pathways, how many different micro-organisms—and so on. The best teaching gives a framework on which the physician can build future knowledge but, as has often been discovered in the process of curriculum change, we can prune considerably without damaging the ability of the student to function effectively in a clinical situation.
At the undergraduate level, we are not training specialists. The discussion about the basic science component of undergraduate education applies also to the clinical training. Postgraduate education is, in many cases, longer than undergraduate education, and so it makes sense to prepare undergraduate students very well in the broad principles of medicine and in the diagnosis and management of conditions frequently encountered, and to encourage them to develop skills in identifying situations that fall outside their experience. They also need enough of the flavor of the specialties to make sensible career decisions but perhaps we have to de-emphasize the more exotic conditions and spend more time on basic clinical skills.

Conclusions
The appropriate training of physicians was emphasized during the latter part of the twentieth century and major changes have been made, particularly in the early years curriculum. Despite this, there are evident problems in our existing methods of educating medical students, and changes in society in general and healthcare in particular have generated additional pressures for further changes in medical education. In this editorial we have attempted to identify the forces promoting change in medical education, and have suggested some areas that need further emphasis and development. These include the strengthening of the educational role of community health and family medicine, an increased emphasis on instruction in behavioral issues, increased emphasis on preparation of physicians to function in a team environment and an increased appreciation of the role of the physician as a catalyst for positive change in healthcare delivery, both locally and globally.

Of course, curricula are already moving in many of the directions suggested, mostly because a few energetic individuals are driving the process ahead. Possibly the key to accelerating needed change is the rapid accumulation of experimental data in medical education. The vision has very often been correct, and it is encouraging that changes made on the basis of intuition have often proved beneficial when evidence has ultimately accumulated. There is no substitute for experimental data, and we would be much further ahead if each intervention had been examined to determine what outcomes were achieved. It is tempting to suggest that future developments in the process of training physicians will depend on the supply of leaders whose vision, energy and effort will produce change. It is also reasonable to suppose that the development of education leaders will depend critically on the recognition and rewards they can expect. However, it seems that we will best be able to design curricula for the coming years if there is a real commitment to educational research. Perhaps the most encouraging sign of all is the burgeoning number of graduate programs in medical education research.

Educational change is a complex process, particularly when large numbers of people from diverse cultural backgrounds are involved. There are several roads and many branches between the present situation and an ideal future. Such things as money, attitudes of society, competing interests or inertia may block the path and force a temporary retreat but the uniformly high quality of those seeking medical training, and the urgent need to improve global health, will lead to an ongoing development of a more successful system.

Acknowledgements
The authors thank their colleagues, particularly Drs E.N. Skakun and S. Aaron, for their helpful comments. The opinions expressed in this article, however, are strictly those of the authors. Thanks are offered to the Medical Education Research Fund of the University of Alberta for the provision of a scholarship to HJ.

Notes on contributors
Hamid Jamshidi is a pharmacologist and is currently director of the National Board for Medical Education in Iran, and Deputy for the Iranian Association of Medical Education. The initial concepts for this paper were developed during study leave at the University of Alberta.

David Cook has been the Director of the Division of Studies in Medical Education at the University of Alberta since 1991. He and Dr Jamshidi worked together for a year, looking at desirable features of clerkship education and discussing the role of community-based medical teaching, hence this article.

References
foundation for competent and reflective practitioners, Medical Teacher, 24(2), pp. 136–141.


