REPORT ON THE WORKSHOP ON THE NEEDS FOR RESEARCH IN MEDICAL EDUCATION

Alexandria, 11 - 14 March 1974

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NOTE: The views expressed in this Report do not necessarily reflect the official policy of the World Health Organization.

PARTICIPANTS WHO ATTENDED THE WORKSHOP ON THE NEEDS FOR RESEARCH IN MEDICAL EDUCATION

(held in Alexandria from 11 to 14 March 1974)

TABLE OF CONTENTS

INTRODUCTION

The Workshop was opened at 9.00 a.m. on Monday, 11 March 1974 in the Conference Room of the Eastern Mediterranean Regional Office of the World Health Organization, Alexandria, Egypt. Dr A.H. Taba[1], Director, WHO Eastern Mediterranean Region, expressed his pleasure at finding among the participants so many who had been active in the subject of medical education in the Region in recent years. Dr Taba also welcomed the Observers from the University of Alexandria, headed by Dr M.L. Dowidar, President of the University of Alexandria and Chairman of the Egyptian Committee on Medical Education.

Dr Taba pointed out that medical education in this Region had been undergoing a more critical re-examination of its objectives and of its purposes, during the last decade or so, than ever before.

As medical faculties had been reformed and new ones created, to meet the current needs of every society for more physicians, both medical educators and those responsible for the delivery of health care services, have increasingly demonstrated their concern at the extent to which the educational patterns of the past have proven irrelevant to the needs of the present and the predictable future.

There was a need in the Middle East to improve the available knowledge of what kinds of doctors are needed, as well as to up-grade understanding of how learning takes place. The initiation of effective programmes of applied research in medical education should be seen as being complementary, on the one hand, to the work of Governments and educational institutions in overall health and manpower planning, and on the other to the promising activities seen to be springing up in so many countries in educational planning.

Dr Taba drew the attention of the meeting to the amount of genuine interest in the Region in reform and innovation in medical education and expressed the opinion that the kind of changes that were needed could only come about when there was better knowledge of what existed at present and a deeper understanding of how many and what kind of doctors were needed.

Election of officers and adoption of agenda

1. The following Officers were elected:

   Chairman: Dr G. Motamedi, Chancellor, Isfahan University, Isfahan

   Vice-Chairman: Dr M.N. El Mehallawi, Deputy President, University of Ein Shams, Cairo

   Rapporteur: Dr Alexander Robertson, Adviser on Health Manpower Development, Secretary of the Meeting, was requested to act as Rapporteur, working in close collaboration with the other members of the Secretariat.

2. The Agenda was approved as presented (Annex I).

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[1] For full text of address see Annex V.

Conduct of the Workshop

The Participants (See Annex II) met in six plenary sessions, each topic was introduced by one of the participants or consultants and followed by exhaustive discussion. Certain papers thus presented are given in Annex VI, VII, VIII, and IX. In addition seventeen papers and documents were distributed among the participants (See Annex III) and, finally, a selected set of books and documents on Research in Medical Education (See Annex IV) was displayed for consultation, all of which proved a helpful background for the discussion and formulation of recommendations.

In addition, at the kind invitation of Dr M.L. Dowidar, President of the University of Alexandria, the participants had a chance to visit the Faculty of Medicine of the Alexandria University and also took part in the ceremony of presentation of the book "Civilization and Medicine in Pharaonic Egypt" by Dr Basile M. Caracatsanis.

Finally, Professor Christine H. McGuire, introduced an example of simulation models in evaluation of medical graduates, which was followed by discussion on their costs and applicability in this Region.

The Reports of daily discussions were prepared by the Secretariat presented to the group and discussed the following day and approved. These daily reports were used to prepare the final form of the Report of the Workshop.

I. IDENTIFICATION OF MAJOR PROBLEMS FACING MEDICAL EDUCATION IN THE REGION WITH PRIORITIES FOR APPLIED RESEARCH [1]

The meeting on Issues facing Medical Education as a constructive component of social and economic development in the Eastern Mediterranean Region (Alexandria, 27 - 29 March 1972) [2], identified several central issues and commended a careful study of these to all those concerned with medical education in the Region.

In preparation for the present Workshop, a questionnaire was prepared and sent to thirty-six medical schools in the countries of the Region, of which twenty-five medical schools responded.

It was evident from these responses that certain pressing issues and problems are felt by the leading medical educators of the Region. These could be grouped under the following headings:

(i) The statement of educational objectives and the definitions of goals leading to relevant curriculum construction

(ii) Student selection

(iii) Language of instruction

(iv) Evaluation in medical education

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1 Subject introduced by Dr D.S. Ali, WHO Consultant (See Annex VI)

2 Document EM/Ed.Tr./24) EMRO 0166/R, March 1972.

(v) Student attrition

(vi) Effectiveness of communication in medical education (external and internal)

(vii) Physical facilities, learning resources, modern library facilities, facilities for clinical training in hospital and community

(viii) The teaching/learning process and modern concepts of educational technology

(ix) The cost of medical education

During the discussion of these problems and issues, great stress was laid on the social role of medical education. Certain extrinsic factors were identified which had an effect on the nature and function of medical education. Three specifically discussed were:

(a) The absence in many of the countries of any clearly defined health policy and of a well-structured health delivery system impedes the capacity of the medical school to respond appropriately to the health care needs of the population.

(b) In rapidly changing societies whose predominant feature is the speed at which social and economic development is taking place, and the differential rates of changes in various institutions, medical schools have fallen behind in their capacity to change and adapt.

(c) Under ideal conditions, the role of the medical school should be clearly defined in the context of a health care delivery system and planning process. Strong emphasis was laid on the importance of not regarding medical education as an isolated phenomenon, and on various possible ways of avoiding this through more effective communication between the medical education institutions and those institutions responsible for the delivery of health care.

There is a need for a two-way inter-action between the medical faculties and the responsible health authorities each of whom should be represented in the planning and decision making apparatus of the other. Furthermore, it was recognized that medical faculties have a responsibility which goes beyond the simple production of physicians destined to work in isolation. The physician required in every modern society is one member of a complex health team, although he is usually its leader and, therefore, requires to be so trained.

The implication on the goals of the health institutions, of this tendency in the development of medical education to design physical facilities and continuous revision of curriculum content taking into consideration the managerial responsibilities of the physician, is obvious.

Other issues that the Workshop particularly stressed are briefly described in the following five sub-sections

1. Relevance of educational objectives and teaching programmes to the health needs and services of the country [1]

The group reiterated the often expressed concern that medical education should be considered not as an end in itself, but as a means and a very important one, towards satisfying the manpower needs of the health care delivery systems of countries. The group, while recognizing that there is a common core to the biomedical preparation of physicians everywhere, also recognized that variations are required in the preparation of the right kind of physicians in appropriate proportions to serve the particular needs of widely varying populations, using available resources. There is no single type of physician who will serve all the needs even of any one country, for there are differences between the needs of urban and rural practice, primary and referral care, to mention only some.

To determine the kinds of physician required and consequently to define the educational objectives it is necessary to find the answer to the following questions:

(a) What are the real health care needs of the population?

(b) What is the national health policy and the structure of the health care delivery system?

(c) What are the tasks that the various types of health providers will need to perform in this system?

These three questions are in the domain of health planning, in which there must be participation of the health authorities, the medical profession and of medical educators. Answers to these questions provide a clear picture of what it is that medical graduates should be able to do, where, when and with what. These constitute the educational objectives.

Once educational objectives are defined, it is possible to develop appropriate curriculum content, select the right methodology of teaching and effective techniques of evaluation and appropriate standards of professional competence. This determination has important implications not only for the educational programme, but for the total educational system, i.e. the selection of teachers, the selection of students, the design and proper use of physical facilities, the allocation of budget resources, and so forth. Each of these components is in the domain of a suitably selected activity in applied medical education research. None of these, traditionally determined exclusively by expert academic consensus, can any longer be left to such hazardous approaches. In other words, they cannot be left to chance and each is amenable to systematic scientific analysis.

It was also recognized that in order that appropriate care and attention be given to the approach implied, which is essentially a planning approach there is need in every medical school for a core group of professionals to understand applied research methods in education, on the one hand, and educational planning, on the other. Expertise in this kind of educational planning is needed in every medical school.

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[1] Subject introduced by Dr A. Khogali, Dean Faculty of Medicine, University of Khartoum, Khartoum.

2. Evaluation of teaching medicine in a foreign language:

The group recognized that the issue of the language of instruction was a major one in almost all countries of the Region, and that at this time, for a variety of reasons outside the control and influence of educational institutions themselves, major changes were in course. It was agreed that in order for effective learning to take place, the majority of students, particularly at the under-graduate level, require to be able to follow courses of instruction in their national language.

However, in the case of medicine, as of other aspects of modern day sciences and technology, it was recognized that other factors enter into the question, notably, ability to keep abreast of current developments in "international languages of science". Furthermore, the group attached considerable importance to recognition of the fact that any student of any language background upon entering into the study of medicine is going to have to master a new "language of medicine". Even a student entering medicine and studying in his own tongue must require something of the order of several thousands of new words and terms, to add to his pre-existent vocabulary.

Discussion was based on the assumption that, in general, the countries of the Region were all moving towards the point where most under-graduate medical education would be carried out in the national language concerned, but that for post-graduate training competence in at least one of the major international languages would be essential. For all practical purposes today that language is English, an understanding of which is necessary not only for success in the immediate stages of formalized post-graduate education and the obtaining of higher qualifications, but is also of particular importance for continuing professional education. However, the group stressed the fact that the determination of the language of instruction involves consideration not only of the student's own needs to acquire professional competence, but also the broader issues of effective communication among professionals, between professionals and their patients and their sub-professional collaborators.

Finally, it was further emphasized, that while any national language is suitable for instruction in medical education, an adequate support system is required (just as for instruction in a foreign language), i.e. trained teachers, plentiful textbooks and adequate machinery for translation and dissemination of scientific materials from the main international languages.

The research implications here include acceptance by the group that there is need for much more intensive inter-change and inter-action between medical educators, and experts on communication, particularly those in the science of linguistics. Of special importance are investigations of the most effective methods of assisting students who have acquired a second language relatively late in their education, to develop facility in that language, to the point where it becomes useful for the purposes inferred above. The group recognized the possibility of utilizing both experimental design and descriptive studies and systematic analyses of the experience in the countries where some institutions instruct in the national language and others in a foreign language.

Subject introduced by:

a) Dr G. Motamedi, Chancellor, Isfahan University, Isfahan - See annex VII a
b) Dr M.N. El Mehallawi, Vice President, University of Ein Shams, Cairo
See annex VII b

3 The drop-out and failure rates of medical students (Attrition)[1]

In discussing this issue, attention was directed to methods of determining the extent of the problem, identification of the multiple causes of attrition and its individual and social consequences, both psychological and economic.

Although failure and drop-out might appear to be the consequence of academic problems, in fact, investigation has indicated that it is complicated by such external factors as personal and family circumstances, financial constraints and personal health problems. In addition, environmental factors which affect student performance, lack of clarity about the nature and demands of the medical profession, leads some students who have enrolled in the medical faculty to a delayed realization of their motives and that their true career preference lies elsewhere.

Further, the group emphasized that the traditional technique of examination used to identify failures is inappropriate to the decision which is made Reluctance of many medical educators to abandon the traditional methods of examination and introduce new systems was attributed in part to fear that this might jeopardize accreditation in the relevant councils. In truth, however, the present examination system may have negative effects on the quality of medical education by placing constraints on the content and nature of instruction, encouraging faculties to orient students' learning towards passing the examination rather than for genuine understanding, though, it has repeatedly been demonstrated that such learning is quickly forgotten. In discussing these deleterious effects of conventional examinations, the group also raised the question of the frequency and timing of official examinations and their relation to a system of continuous assessment and feed-back for purposes of student guidance.

The group felt that medical schools should tackle this complex problem of student attrition and study it as a whole, with special emphasis on the examination and evaluation systems. Many of the problems in this area arise from the absence of proper definition of objectives, since, if these are determined, and are given in terms of end-products, it would then be possible to design an examination system that would yield more precise measurement as a basis for making the necessary judgements.

In response to the question· "What is an acceptable rate of attrition?", the group agreed that - given proper selection techniques, appropriate curriculum effective instructional methods, appropriate therapeutic intervention and relevant examination techniques - the attrition rate due to academic factors should be nil.

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[1] Subject introduced by Dr M Ayub Khan, Principal, Khyber Medical College, Peshawar University, Peshawar

4. The costs of medical education within the countries of the Region [1]

The group agreed that the subject of the costing of medical education and the preparation of adequate data on the subject, was important for several reasons, not least as providing a basis for long and short-term planning.

Medical education has traditionally grown up on the basis that governments have required to be persuaded, on humanitarian grounds alone, that it was contributing to the general health and welfare. The group felt that at a time when the economies of countries are to a greater or lesser degree planned economies, it was essential to have figures that indicate the investment value of medical schools. The group stressed the nature of health expenditure as being of an investment as well as of an expenditure nature, but recognized that this point of view could be better understood and put across to economists by accurate figures

The high costs involved in modern medical education result in its becoming subject to high policy decisions at the top planning levels of most governments

Furthermore, the group stressed that without adequate costing information, medical faculty administrators were unable to justify the simplest of their cases for expansion of staff or facilities, or to allocate the right proportion of available funds to the right programme priorities

While fully recognizing the extremely complex and difficult procedures which were necessary to arrive at a true costing of medical education, the group urged that efforts be made to develop a system of comparable accounting between the medical schools of the Region, which would allow them to identify and assign costs of the various components thereof, differentiating between, for example, under-graduate education, post-graduate education and research. The provision of clinical health facilities that are required for learning, needs to be differentiated from the current health care delivery responsibilities which have accrued to the medical faculties and are along the lines of those expected from a general hospital.

This endeavour, while of a research nature at the start, should lead to the establishment of regular and preferably comparable accounting systems as a part of the normal administrative practice and evaluation mechanisms of each faculty.

The group felt that sufficient knowledge and experience now exist to permit some simple preliminary action. It should be recognized that considerable data exists, including a certain amount in this Region, and one of the first steps to be taken, with consultation and guidance from a suitable outside source and WHO assistance, is an analysis of what is currently available.

If proper cost data exists, one aspect which can be dealt with is waste, which the group identified as existing in two particular ways. waste within the medical school, resulting from under-utilization of available facilities, laboratories, conference rooms, materials, etc., and potential, eventual waste of the human product of schools due to under-use or inappropriate use of graduate physicians.

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[1] Subject introduced by Dr D.S. Ali, WHO Consultant

The group recognized that whilst most of the points already covered related to information which the medical school needed in order to make its case with various external policy makers, there were also internal benefits within medical education itself to be derived from a proper cost analysis of the medical education process. This would include critical analysis of all expenditures, unit by unit and programme by programme, in a manner that would assist in evaluating the contribution of each to the overall effectiveness of a medical school.

It would also be possible, given uniform basic records, to make comparative studies of medical education costs within and between countries, to assist the decision makers in arriving at wise decisions as to the proportion of physicians, as opposed to other health personnel, to be prepared for use in the health system.

5. The student intake in relation to the potential of teaching institutions and criteria for selecting students under different socio-economic and educational situations [1]

Discussion on this topic centered around a presentation of detailed facts and figures describing the trends in one medical faculty in the Region, which had constituted a case-study of the various factors relating to student selection and intake in relation to the capacity of the training institutions. The group recognized that in view of the widely held concept of physician shortage, there were analogous pressures to expand student numbers and/or to increase the numbers of medical faculties throughout the Region.

The group agreed that student intake was not exclusively a quantity issue, and that the potential of the training institutions could not be defined simply in terms of students: staff ratios, sizes of class rooms, numbers of laboratories and so forth. Many changes are taking place in the composition of the medical student applicant pool, including change in its social and educational background. This affects the learning capacity of the students entering medicine and imposes new expectations and requirements on the medical schools.

The group felt that the number of students admitted to medical faculties required consideration, not alone in the light of existing or potentially available facilities, but in overall realistic health planning terms.

In the face, however, of existing large numbers and of the probable continuing increase, it was essential to re-examine the way in which the existing teaching resources were being used, and to evaluate the relative effectiveness of alternative teaching methodologies and strategies.

The activities of the traditional medical school teacher are confined almost exclusively to the lecture hall and the bed-side, but these need to be complemented and extended by other kinds of teaching methods. Experience from other parts of the world has shown that one of the ways of making the traditional teacher more effective

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[1] Subject introduced by Dr G.E.D. Massoud, Dean, Faculty of Medicine, Alexandria University, Alexandria and Dr M.A.W. Mahmoud, Professor of Radiology and Vice Dean for Post Graduate Studies, Faculty of Medicine, Cairo University, Cairo: See Annex VIII

is to deploy other types of educational resources to extend the effectiveness of the teacher himself. These might include such things as varied instructional material which a student can utilize in independent study, instead of having to rely exclusively upon person to person contact with a limited professorial staff. Additionally, it would be important to explore the use of a variety of community health facilities, including ambulatory care units, instead of simply expanding the number of teaching hospital beds. There is of course, a concomitant need to adapt such alternative resources as these to appropriately pre-set objectives.

There is, therefore, need for intensive applied research into the relative effectiveness of these alternative instructional strategies.

The group recognized that it was no longer possible to continue to use the extremely expensive product of the medical school for the performance of tasks which could be more economically performed by others. But, at the same time, to make the necessary decisions to avoid this requires considerable research into health manpower planning. In particular, the group recognized the falacies that exist in the common use of some traditional measures, in particular the "physician to population ratio" as the one, and often the only, criterion. The group felt that, while in all probability, there would be a continuing expansion in the total number of medical graduates from the Region in the coming years, carefully designed research studies should rationalize their preparation so that the end product would relate to what is needed and that proper use of the physician for the kinds of task for which his long and expensive training should fit him is ensured.

Proper attention to the planned production of physician manpower in relation to a planned health system would serve not only to help in the subject mentioned above but also to alleviate the huge financial and human loss experienced by so many countries through the brain drain phenomenon.

II. OVERVIEW OF APPLIED RESEARCH IN MEDICAL EDUCATION[1]

Certain of the issues and problems facing Medical Education referred to in the previous section, are amenable to scientific exploration and study, through the use of modern techniques of applied research. These techniques, mostly drawn from the educational and behavioural sciences are particularly applicable to four broad areas of research in medical education:

1. Research on the goals of medical education

It is no longer sufficient to rely exclusively on the opinion of experts in the basic science disciplines and clinical specialities to determine what the medical student must know and be able to do. It is necessary to supplement expert opinion with careful definition of the role and functions which the physician must be able to perform in order to make maximum contribution to the health needs of the population.

Information on roles and functions can be derived from systematic collection and interpretation of epidemiological data, an analysis of the tasks actually carried out by doctors in practice, and observation of colleagues on what constitutes effective and ineffective physician performance. It is from sources such as these that requisite data can be obtained for a scientific determination of the goals of medical education.

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[1] Subject introduced by Professor Christine McGuire, WHO Consultant (See Annex IX)

2. Research on student characteristics:

Research in this field is essential for rational decision making in connexion with student selection, academic and career counselling and effective organization of the educational environment to facilitate learning. Techniques of data collection, adapted from the social and behavioural sciences, include aptitude and achievement testing, attitude and interest inventories and related methods for determining the ecology of students.

3 Research on the educational environment of the curriculum and on instructional methods:

Research of this type is essential in order to design the most effective programme for accomplishing the goals of medical education. In general, such research is completely analogous to clinical research on therapeutic efficacy It includes surveys of student reactions to the educational programme, detailed observational analyses and descriptive studies of the educational process and tests of the amount and nature of student learning that has occurredin response to the various educational interventions that constitute the medical school programme.

4 Research on evaluation of student performance

Measurement of the student's ability to perform at the required level of competence necessitates the use of very precise instruments for measuring various aspects of physician performance. Research in this area consists first of analysing carefully and precisely what aspect of competence examinations in current use effectively measure, and secondly of developing new and more valid techniques of measurement which yield more relevant and reliable information about the various aspects of professional performance. These more valid measuring instruments include new types of oral and written examinations, practical examinations, objective audits of clinical performance and various simulation techniques.

* * *

Education is a form of therapeutic intervention and the decision-making process involved in rational educational planning has close affinity with that entailed in scientific patient management. The student's learning needs not only should, but can be diagnosed just as is the illness of a patient, and certain scientifically based prescriptions can be offered in the form of experiences which equate to the therapeutic armamentarium with which the physician is more fully familiar. In this view educational evaluation is seen as analogous to the process of monitoring the patient's response to therapeutic intervention and research in medical education as analogous to any other form of clinical research.

III THE ROLE OF VARIOUS EDUCATIONAL AND OTHER ORGANIZATIONS IN THE REGION, IN RESEARCH IN MEDICAL EDUCATION

In looking at the institutions and agencies required to support the kinds of studies implied above, the group pointed out:

(a) that this was essentially an institutional responsiblity, which required each of the medical schools to develop a core group within the institution that would be concerned with educational planning in general and medical education research in particular. Such core groups already exist in a few centres in the Region, and the

group was of the opinion that these applied research activities have a complementary role to the teacher training activities of such groups;

(b) it was noted that such core groups could and should employ resources in other faculties within their respective universities, as expert collaborators. These would include Faculties of Education, Economics, Administration and the other social sciences. The expert resources of such bodies as health ministries and research institutions should also be used;

(c) it was also recognized that while a primary responsibility lies within the institution, these efforts could be greatly facilitated and the results greatly enhanced by co-operative arrangements within and without the Region, where WHO and Association of Medical Schools in the Middle East could play a catalytic role. These agencies could be particularly helpful in serving, first as a clearing house for identifying individuals and institutions that are working on a particular problem and secondly in demonstrating the results of these efforts and bringing together task forces to design comparable methods of data collection from one institution to another and to facilitate collaboration on research projects of mutual interest.

The group recognized the specific role of regional and national teacher training centres in research related to the learning process, and the particular appropriateness of WHO's contribution in the area of health manpower planning. There is a particularly appropriate role in this area for a properly funded and professionally staffed Regional Association of Medical Schools, owing to the particular nature of the relationship between such an Association and its constituent faculties, as well as its sister organizations in other parts of the world. This association could be particularly effective in bringing together small"task forces" to attack problems of special interest, in a manner that would yield better data for more rational decision making.

The individual faculties as well as professional medical associations have a role to play, not only in developing core units where research can be carried out, but also, in addition to the activities of WHO and ANSME, in promoting interest in the topic and in convening meetings on it, as well as in developing an incentive and reward system for faculty members who produce research in this area.

IV. RECOMMENDATIONS

1. Taking into consideration that medical schools are an integral part, and a very important one, of the total health care system of any country, they are urged to define their educational (research and service) objectives in line with the national health policy and keeping in mind their own mission to prepare medical students for the tasks, that are expected from them as future physicians who will be leaders of the health team at different levels of the structure of the preventive and curative care delivery system.

2. Medical schools are recommended to state their educational objectives in terms of the end products of the educational process, with clear indication of the specific behavioural indices of knowledge, skills and attitudes which would lead to the proper:

(a) development of appropriate curriculum content;

(b) selection of the right methodology of teaching and use of alternative educational resources;

(c) qualitative and quantitative selection of teachers and students,

(d) adoption of effective techniques of evaluation,

(e) design and proper use of physical facilities;

(f) allocation of budget resources,

(g) evaluation of the total programme of the medical school;

(h) development of a mechanism for effective collaboration and communication with the Health Economic planners and decision-makers in the formulation and application of health policy.

3. To achieve such effective definition they are further urged to embark upon programmes of applied research and the collection and analysis of relevant data on the problems identified by the Workshop.

4. Medical schools are urged to establish units, departments or centres consisting of a core of interested professionals drawn from among medical educators and members of other faculties such as - education, economics, administration, social sciences as well as other officials of health, Ministries and Planning organization, with expertise in educational planning and medical education research.

5. Medical schools are urged to facilitate the dissemination of information between themselves and medical educators and administrators as widely as possible

6. All workshops, courses and other teacher training programmes in the Region should embrace a research approach.

7. Medical schools are urged to recognize the work and research in medical education undertaken by the members of their faculties as being of parallel importance and value to the research in their specific disciplines and to ensure that their work in medical education should be encouraged and professionally rewarded and be taken into consideration in promotion.

8. Medical schools and universities are encouraged to organize and convene workshops and seminars/conferences that will be a useful forum for the interchange of knowledge about applied research and a tool for formulating useful solutions to common problems.

9. The group recommended that WHO should (a) continue and expand its role in the initiation, promotion and dissemination of research in medical education in this Region; (b) continue to explore all possible means to make assistance available to medical schools establishing units for medical education through training the educator staff, through the provision of learning resources for teachers training and research, and through the allocation of funds for this research and the dissemination of its results; (c) play a major role as a clearing house for medical research information; (d) continue to assist and collaborate with the Association of Medical Schools in the Middle East, and other regional and international agencies and organizations for the promotion of its activities in this field; (e) continue its support in all possible ways to the programme of the Regional Teacher Training Centre, Pahlavi University, Shiraz, including its research programme in educational planning; (f) continue and follow through the data-base project recently begun by the circulation of a basic questionnaire to all schools; (g) make available to the medical schools consultant assistance in medical economics, with particular reference to the drawing up of guidelines for the schools on costing and cost accounting in medical education.

V CLOSING SESSION AND ACKNOWLEDGEMENT:

At the closing session the draft recommendations were reviewed and approved.

The participants expressed their deep appreciation to Dr A.H. Taba, Director, World Health Organization, Eastern Mediterranean Region, for calling the Workshop and placing the facilities of the World Health Organization at its disposal, and for his personal efforts in promoting medical education in the Region.

The participants warmly thanked Dr G. Motamedi, Chairman and Dr M.N.El Mehallawi, Vice-Chairman for conducting the Meeting so successfully.

The appreciation of the participants for the Work of other WHO staff, in connexion with the Workshop was also expressed, in particular for the excellent administrative and secretarial services provided by Miss C.L. Cartoudis (Conference Officer) and Miss E. Albani (Secretary) and Mrs L. Soliman(Administrative Assistant, HMD Unit).

Dr Taba acknowledged the remarks made by the participants in appreciation of the services of WHO and expressed the Organization's thanks, in turn, to them, for giving time to come to the Meeting and for the many valuable suggestions made in the report. He also thanked the consultants and temporary advisers to the Regional Office for their valuable contribution and assistance.

ANNEX I

AGENDA

1. Opening of the Workshop by the Regional Director

2. Election of Officers, Chairman, Vice-Chairman

3 Adoption of the Agenda

4. Identification of Major Problems facing Medical Education in the Region with priorities for applied research

   - Relevance of educational objectives, teaching programmes to the health needs and services of the country;

   - Evaluation of the language of instruction;

   - The drop-out rate and the failure of medical students in the various medical schools in the Region;

   - The costs of medical education within the countries of the Region;

   - Criteria for selecting students under different socio-economic and educational situations;

     The student intake in relation to the potential of teaching institutions ;

5. The role of various educational and other organizations in the Region, in research in medical education

6. Approval of the provisional report and recommendations

7. Closing of the Workshop

A FEW DETAILED TOPICS TO STIMULATE THINKING ON THE AGENDA·

1. Discussion in depth of the importance of research in medical education for the advancement of the development of health manpower,

2. The encouragement of applied research which would lead and guide to the solution of the serious problems, which would raise the standard and which would introduce new patterns of medical education in the Region;

3. How to encourage and initiate institutions of medical education, centres for educational research, and faculty members, to do research in medical education;

4. Who is to be engaged in doing the needed research in medical education; faculty members, educational experts, psychologists, as well as others; is it an individual or a team work;

5. What kind of incentives should be recommended; promotion, grants or other kinds of rewards;

6. How to use the results of research in medical education, how to exchange information about research done in various countries of the Region. Who is to sponsor its publication and dissemination;

7. How to secure funds needed to cover the expenses of doing research in medical education done by individuals, by teams from various countries, or by an institution;

8. Identification of the major problems facing medical education in its various aspects and fields in the Region.

ANNEX II

LIST OF PARTICIPANTS

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Dr A. Robertson	Health Manpower Development	Regional Office for the Eastern Mediterranean
Dr Ch. M. H. Mofidi	Temporary Adviser	Regional Office for the Eastern Mediterranean
Dr D.S. Ali	WHO Consultant	Regional Office for the Eastern Mediterranean
Miss C. Mcguire	WHO Consultant	Regional Office for the Eastern Mediterranean
Miss C. Cartoudis	Conference Officer	Regional Office for the Eastern Mediterranean
Miss E. Albani	Secretary	Regional Office for the Eastern Mediterranean

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ADDRESS BY DR A. H. TABA
DIRECTOR
WHO EASTERN MEDITERRANEAN REGION

at the

OPENING SESSION OF THE WORKSHOP ON THE
NEEDS FOR RESEARCH IN MEDICAL EDUCATION

ALEXANDRIA, 11 - 15 March 1974

Dear Colleagues,

It is my pleasure to welcome you all to this opening session of our Workshop on the Needs for Research in Medical Education

I am pleased to see so many of you who have thought about this subject, or been active in promoting it, both among the participants and the consultants and advisers May I say at this point, how specially glad we are to welcome in particular Madame Christine McGuire from the Centre for Educational Development in Chicago whose achievements in medical education research have been so significant. We appreciate her help and her assistance

It is also a special pleasure for us to welcome the distinguished representatives of the University of Alexandria, whose Medical Faculty is our close neighbour, and with whom we enjoy such a cordial continuing relationship.

It is always satisfying to take part in one of our periodical meetings on Medical Education. In the long series of such meetings, I would like to think that this one would have a specially significant part.

I say this, not because I believe that the subject of applied research on medical education is one which has yet advanced very far in our Region, but rather because I believe that, through the kind of discussions that we have planned for this week, it will be possible to launch the first steps along an important road.

As we all know, medical education in this Region, as throughout the world, has been undergoing a more critical re-examination of its objectives and of its purposes, during the last decade or so, than ever before.

As medical faculties have been reformed and new ones created, to meet the current needs of every society for more physicians, both medical educators, and those responsible for the delivery of health care services, have increasingly demonstrated their concern at the extent to which the educational patterns of the past have proven irrelevant to the needs of the present and the predictable future.

In some parts of the world, there has been a lot of work in recent years which has given a much clearer understanding of both manpower needs in the medical profession and of the nature of the educational process.

Frankly, we are behind in both these subjects in the Middle East. We need to improve the knowledge of what kinds of doctors we need, and we need to upgrade our understanding of how learning takes place. The initiation of effective programmes of applied research in medical education should be seen as being complementary, on the one hand, to the work of Governments and educational institutions in overall health and manpower planning, and complementary on the other to the promising activities we see sprouting up in so many countries on educational planning.

It is interesting for us to realize, perhaps, just how much genuine interest there is in this Region in reform and innovation in medical education. All of the meetings which we have held since 1962 show this, and so do my visits to and discussions with the medical faculties in our member countries. At the same time, it is quite clear that the kind of changes that are needed can only come about when we have better knowledge of what presently exists and a deeper understanding of how many doctors of what kind are needed where and when.

As you know, during the preparatory phases of this Meeting, we sent out a simple questionnaire, to all the medical schools in the Region, listing some particular topics, or problems, on which we felt that the schools might like to see some further light cast. It was interesting that from such replies as we obtained, there was little or no setting of priorities and strong evidence of deep concern over the whole range of topics that we had listed.

I would now like to say a few words about the kind of things this Workshop is not! We do not, for example, expect that everybody attending will be able, himself, to become actively engaged in the complex technical activity which this particular form of social and educational research represents. We are not here to "teach" you how to do this work.

Rather, I think, this Workshop is much more of what I would call a relatively informal assembly of some key and influential individuals, brought together to explore and exchange ideas about how to initiate interest and subsequent activity in this field in the Region.

Let me again stress the informality and the general nature of the meeting and my hope that your report will concentrate on setting guidelines for the future, on suggesting realistic ways in which the faculties of the Region may embark on work, and on advising us in WHO on how our limited resources can help you.

We have as you will see before you, proposed an Agenda, and we have asked some of you to come prepared to initiate discussions on particular topics, through a series of short informal opening statements. But our planning consists only of guidelines, and I hope that you will feel free to change either the order or the emphasis of the Agenda as you think fit.

I should like to wish you an intellectually satisfying experience, and also express the hope that you enjoy this spring-time visit to Alexandria socially as well. We look forward with interest to the results of your deliberations.

ANNEX VI

A SURVEY OF THE PROBLEMS IN MEDICAL EDUCATION AS STATED BY THE MEDICAL SCHOOLS IN THE EASTERN MEDITERRANEAN REGION

(For identification of major problems facing Medical Education in the Region)

by

Dr Daoud S. Ali*

This report is prepared for the participants in the Workshop on the needs for research in medical education. Through a questionnaire (see Annex), the medical schools were asked to check on a list of group problems which they face in their schools, and to list "other problems" (open question).

Twenty-five medical schools responded out of thirty-six located in twelve countries of the Region.

COMMENTS

1. All schools which responded, reported facing high percentage of problems on the check list. The minimum number of problems was seven and the highest checked all the list of sixteen and added more.

2. All schools, new and old, reported facing problems in medical education. This is an important finding which needs discussion; why a newly established school should suffer from problems right from the beginning? Is it possible to establish a medical school in a way to avoid these problems?

3. Some problems are easy to solve, other problems remain complex, unyielding or awaiting creative attention by methodical educational research. However, if the problems are to be solved, radical innovations in the system of medical education are required.

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* Consultant in Medical Education, Executive Secretary of the Association of Medical Schools in the Middle East.

TABLE I

COUNTRY	NUMBER OF MEDICAL SCHOOLS APPROACHED	MEDICAL SCHOOLS RESPONDED	NAME OF MEDICAL SCHOOL WHICH RESPONDED	SERIAL NUMBER
Afghanistan	2	1	Nangarhar	1
Egypt	7	3	Assiut	2
			Alexandria	3
			Cairo (Kasr-el-Eini)	4
Ethiopia	1	-	-	5
Jordan	1	1	Jordan, Amman	6
Iran	7	5	National - Teheran	7
			Meshed	8
			Isfahan	9
			Shiraz	10
			Jondi Shapur	11
Iraq	3	3	Baghdad	12
			Basrah	13
			Mosul	14
Lebanon	2	1	French - Beirut	15
Libya	1	1	Benghazi	16
Pakistan	7	5	Dow	17
			Fatima Jinnah	18
			Quaid-i-Azam	19
			Khyber	20
			Sind	21
Saudi Arabia	1	1	Riyad	22
Sudan	1	1	Khartoum	23
Syria	2	2	Damascus	24
			Aleppo	25
Tunisia	1	1	Tunis	26
12 countries	36	25		72%

TABLE 2

SERIAL No. & NAME OF SCHOOL	PROBLEM NUMBER SCORES (+) POSITIVE (-) NEGATIVE ANSWERS																No. OF POSITIVE ANSWERS IN EACH SCHOOL
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	XVI	
1 NANGARHAR	+	+	-	+	-		+	+	+	+	+	+	+	+	+	+	12
2 ASSIUT	+	+	+	+	+		+	+	+	+	+	+	+	+	+	+	15
3 ALEXANDRIA	-	+	+	+	+	-	+	+	+	+	+	+	+	-	+	+	13
4 CAIRO	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	16
5 JORDAN	+	+	-	+	+	+	+	+	-	-	-	+	-	-	-	+	9
6 NATIONAL (TEHERAN)	-	+	-	+	-	-	+	+	+	+	+	+	+	+	+	+	12
7 MESHED	+	+	+	-	+	-	+	+	+	-	-	+	-	+	+	-	10
8 ISFAHAN	+	+	+	+	+	+	+	+	+	-	-	+		+	+	-	12
9 SHIRAZ	+	+	-	-	-	-	+	+	+	-	-		+	-	+	+	8
10 JONDI SHAPUR	+	-	-	+	-	-	+	-	+	+	-	+	-	+	-	-	7
11 BAGHDAD	+	-	+	-	-	+	+	+	+	-	-	-	-	-	+	+	8
12 BASRAH	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	16
13 MOSUL	+	+	+	+	-	+	+	+	+	+	+	+	+	+	+	+	15
14 FRENCH BEIRUT	-	+	-	+	-	-	+	+	-	-	-	-	+	+	-	+	7
15 BENGHAZI	+	+	-	+	-	+	+	+	-	-	-	+	-	-	-	+	8
16 DOW	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	16
17 FATIMA JINNAH	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	16
18 QUAID-I-AZZAM	-	-	+	+	-		-	-	+	+	+	+	+	+	-	+	9
19 KHYBER	+	+	+	+	-	+	+	+	+	+	+	+	+	+	+	+	15
20 SIND	+	+	+	+	+	-	+	+	+	-	+	+	-	-	+	-	11
21 RIYAD	-	-	-	+	-	-	+	-	+	+	+	+	-	+	-	-	7
22 KHARTOUM	+	+	+	+	+	+	+	+	+	+	+	+	-	+	+	+	15
23 DAMASCUS	+	+	+	-	-	-	+	+	+	+	+	+	-	+	-	-	10
24 ALEPPO	+	-	+	-	+	-	+	+	+	+	-	+	-	-	+	-	9
25 TUNIS	+	+	+	-	-	+	+	+	+	-	-	-	-	+	-	+	9
No. OF POSITIVE ANSWERS IN EACH PROBLEM	20	20	17	19	12	12	24	22	22	16	15	21	13	18	17	18	

TABLE 3

Problems arranged according to prevalence, as stated by Medical Schools:

1st.	24 (+)	Teachers training and teaching methods
2nd.	22 (+)	Shortage of teaching staff Evaluation of student performance
3rd.	21 (+)	Shortage of modern audio-visual aids
4th.	20 (+)	Statement of educational objectives Curriculum construction Student selection
5th.	19 (+)	Standards of Secondary School Graduates
6th.	18 (+)	Financial problems and lack of information about costs of medical education Shortage of hospitals/clinics for training
7th.	17 (+)	Lack of satisfactory communication in medical education Large number of students
8th.	16 (+)	Shortage of physical facilities Shortage of modern library
9th.	13 (+)	Shortage of student textbooks
10th.	12 (+)	Teaching medicine in foreign language Student failure and drop out

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This picture is an overview of the twenty-five medical schools which responded, but, if we would consider each school separately, the priorities of problems might be the opposite or at least not in that order. So, each school should study its problems and set priorities.

TABLE 4

Problems listed in the open question:

a) Lack of specific rewards for teaching

b) Emphasis on teaching rather than learning

c) Prevalence of passive rather than active learning on the part of the students

d) Students teachers relation

e) Lack or shortage of technicians

f) Effect of postgraduate studies on under graduate studies in the same school

g) The salaries of the professors

h) Political activities of teachers and students

i) Living conditions of teachers and students

j) Subject duplication

k) Complete free education

l) System of examination
Training of examiners
Private practice of teachers

m) Rigid statutes in the face of change
Public opinion and the change
All faculty members must be convinced for changes

n) Lack of knowledge of basis of learning process

o) Medical school economics

p) Space/Time utilization

q) Integrated teaching
Brain drain
Modern medicine in curriculum

r) Lack of anatomical human material
Lack of post mortem exams
Motivation of teachers and students to adopt modern methods of teaching and learning

s) Uniformity in standard of medical education at international level
Teachers exchange programme at international level.

N.B. Most of the stated problems fall in the various groups of problems already listed in the questionnaire.

QUESTIONNAIRE FOR INQUIRY ABOUT PROBLEMS FACED BY MEDICAL SCHOOLS IN THE EASTERN MEDITERRANEAN REGION

NAME OF MEDICAL SCHOOL COUNTRY

Please check the list of problems you think that need to be solved in Medical Education. Mark (+) for positive (-) for negative answers.

		Yes	No
I	Statement of educational objectives and curriculum structure	☐	☐
II	Student selection	☐	☐
III	Large number of student admission	☐	☐
IV	The standard of secondary school graduates	☐	☐
V	Teaching medicine in a foreign language	☐	☐
VI	Student failure and drop-out	☐	☐
VII	Teachers training and teaching methods	☐	☐
VIII	Evaluation of student performance	☐	☐
IX	Shortage of teaching staff	☐	☐
X	Shortage of physical facilities	☐	☐
XI	Shortage of modern library facilities	☐	☐
XII	Shortage of modern audiovisual aids	☐	☐
XIII	Shortage of students text books	☐	☐
XIV	Shortage of hospitals and clinics for training	☐	☐
XV	Lack of satisfactory communication in medical education	☐	☐
XVI	Financial problems and lack of information about the costs of medical education	☐	☐

List problems not included above (open question).

EVALUATION OF TEACHING MEDICINE IN FOREIGN LANGUAGE

by

Dr Ghassem Motamedi
Chancellor, University of Isfahan

Unprecedented advances in all branches of scientific learning are creating increasingly diverse and complex patterns of life all over the globe. This has placed heavy responsibilities on the seats of higher learning throughout contemporary societies, who must provide not only the knowledge that societies need, but also what societies ought to need today and tomorrow. In truth, the subject "Evaluation of Teaching Medicine in Foreign Language" on which I have been kindly asked to express an opinion for this Conference, not only emanates from such a situation but is of vital importance to the whole structure of the teaching of medicine.

From the onset, I wish to maintain that because of a multiplicity of factors, I shall not make an effort to reach a conclusion in this paper; rather, I shall make an effort to pinpoint alternative patterns that we may take into consideration in the use of a particular language for the teaching of medicine.

For the moment let us consider one of the principle functions of language, namely: communication. That is person to person communication, culture to culture as well as global communication. Within the above context, the local or national language not only serves for communication from person to person in facts and ideas but as a vehicle of a particular past and present culture.

The argument for teaching all subjects in the local language (which may not be national) may, therefore, be fear of losing the cultural continuance function

of language, rather than interference with factual or idea exchange. As we all know, the practise of medicine is both an art and a science. It is in the art of medicine that cultural factors have their prominent play. Can we then teach medicine in a foreign language without interterfering with the art of medicine ?

From the standpoint of the science of medicine in the recent past, we know that English, French and German have played a dominant role in teaching throughout the world while Russian and Spanish have been used in specific groups of countries. From our experience, we know that in some countries there does not exist an adequate number of books, journals, etc. in the local language nor can they continuously be provided in the future. It is in the aforementioned countries, where the need of having books and periodicals in a foreign language is warranted. Needless to say that, regardless of the language of instruction in medicine, any teacher or medical practitioner must know one of the three prominent languages (English, French and German), in which the greater part of medical information is available. In choosing a European language, I should like to suggest English as the first choice, today, because the greater preponderance of medical information is now originally written in English, or as a minimum with an English summary. Such countries as India, China, Hungary, Belgium, Japan, the Scandinavian countries to mention just a few, publish their scientific information originally in English. Even WHO, an international organization publishes as a priority, their scientific information in English.

Further, we believe that the function of a Medical School is to equip the student with the basic knowledge and skills of medicine which will allow him, throughout his life, to perfect, improve and change with newer knowledge. If the foregoing is the function of a medical school how then can we fail to provide him with the knowledge of the language of communication, and the means to use this language, through which the newer information is provided.

This is one side of the coin. The other side of the coin, experience tells us, might present us with the serious problem of "brain drain". Speaking for my country almost all Iranian graduates in medicine cannot go to an English-speaking country like the United States because of their weakness in the English language. On the other hand the percentage of medical graduates going to the United States from the Pahlavi University in Shiraz is very high because teaching in that University is in English. You can, therefore, readily see that while one side of the coin is favourable the other side is unfavourable. If we can think of an appropriate solution for solving the overall question of the "brain drain", we would be inclined to favour teaching medicine in a foreign language and in English.

I venture to say that it would be next to impossible for us to find a way to solve the problem through intellectual approaches in conferences we are attending. It is my personal opinion that we should look at all this from a national level and explore as many avenues as are open to us. A question that immediately poses itself is that if we decide to teach medicine in the local language of the country, would it be sufficient to teach in English the different medical terminologies, etc., and to just make the students understand the text books so that they would be able to read the material.

With all these considerations, I believe that the whole subject is of a nature which warrants the need for a very careful study and the best we can do is to have each representative gathered here relate the existing experiences in his own country. It is only by listening to each other that we can reach an understanding as to the course we should pursue.

ANNEX VII (b)

Evaluation of the Language of Instruction

by

Dr M.N. El Mehallawi[1]

Language plays a major role in the process of education.

Instructional strategies and teaching methods may vary, yet if we consider any one of them in detail, we shall find that language is the important tool for achieving the educational objective.

This stands true whether the educational objective is cognitive concerned with knowledge and intellect, affective, dealing with attitudes and values, or psychomotor concentrating on professional skills.

The relative weight of dependence on language as a means of communication between teacher and learner may vary from one method to another

Lecture	Language	Visual
	+ + + +	+
Group discussion	+ + +	+
Programmed instruction	+ + +	+
Demonstration	+ +	+ +
Clinical rounds	+ +	+ +
Laboratory work	+	+ + +
Simulation	+	+ + +

Considering the teaching methods that are in common use in most of our faculties, and noticing that visual aids are not yet sufficiently introduced to our staff, one is more and more convinced of the importance of language in the process of medical education.

The medical educator, therefore, must have a good command of the language of instruction in order to prepare and deliver a lecture or to write a text for student use. His words must be well chosen to present clear pictures and precise meanings. Sentences should be short and clear and there must be a clear flow of ideas. The communication must not be beyond the student's comprehension. In other words both the teacher and the learner must have attained a certain standard of proficiency in their language even if it is the native language of both.

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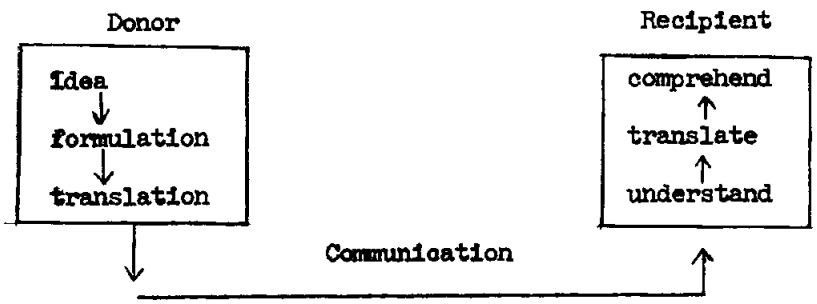
In considering the effect of the use of foreign language for medical education, we need to recognise at first that the difference between two languages is not simply a question of terminology; nor is it only a wealth of vocabulary and some grammatical rules. Linguists insist on emphasizing that language is a much more complex form of human social activity. It is also not only a tool of communication between individuals, but also a tool for silent thought and the imaginative and creative activity of our brains.

A learner receiving his education in medicine or any other discipline in a foreign language is, therefore, exposed to an unusually difficult situation. To mention some of the challenges he has to face, we can recognize the difference in phonology and grammar, an insufficient vocabulary and last but not least, difference in style and unit of meaning, resulting from the difference in culture and civilization.

In situations where teaching is delivered in a language which is foreign both to the teacher and learner, the difficulties are further accentuated because in that case the process of transfer of ideas is a very complex one and can be diagramatically demonstrated as follows.



This diagram illustrates the multitude of stages at which difficulties may arise.

Furthermore, in medical education we may add the importance of the language of the patient. A medical student reading about the symptoms of any disease has to know the exact meaning of words and expressions used in the foreign language in order to get a correct mental picture of the disease. When hearing the description of symptoms from the patient he has to translate it to the foreign language and try to recognize the disease.

Of course it is also obvious that the drawbacks of using a foreign language in instruction will also have untoward effects on the performance of the student in an examination.

But how far can this situation affect the learning process? This is the question to which we have to find the answer. And we must confess from the beginning that it is not an easy job.

Comparison between two faculties of medicine, one teaching in the original language of students and the other in a foreign language may give fallacious conclusions because of the multitude of factors that may affect the result.

Again, if we try to find an answer to our question through analysis of the results of examinations to which graduates from various schools are exposed, like the ECFMG, we shall be confronted with difficulties because factors other than the language of instruction cannot be excluded.

We may, however, suggest one or more of the following procedures:

(a) Comparison of the learning achievement arrived at by using two different teaching methods, one depending mainly on language as the means of communication (text book or lecture) and another method depending mainly on visual aids. This can be done on one single group of students using two similar units of instruction- or on two similar groups of students using the same unit of instruction.

(b) Comparison of the standard of performance of the same student in two separate parts of the examination eg. the written exam, which depends on language and the clinical exam, where the hinderance of the foreign language can be avoided.

(c) Comparison of the total evaluation of groups of students classified according to their standard of knowledge of the foreign language used.

Whatever the results of such attempts at evaluating the effect of the use of foreign language for teaching medicine may be, one has not to forget the importance of "continuous education" (30 years) and one has to consider the great value of the foreign language under circumstances where there is no adequate flow of medical literature in the original language.

It is obvious that this is an important question for all the faculties of medicine in the Region. It is relevant to the subject of this workshop because it deserves to be studied through research with scientific accuracy instead of being discussed on the basis of impressions and generalizations. The results of such research may be of help to the planners of medical education.

ANNEX VIII

THE STUDENTS INTAKE IN RELATION TO THE POTENTIAL OF TEACHING INSTITUTES

BY

Dr G El Din Massoud[1]

In Egypt, university education is free and is under the control of the Government, which takes responsibility for employing all university graduates.

The total number of university students in Egypt in the year 1972/1973 was 195 095, 135 595 male (69 5 per cent) and 59 499 female (30.5 per cent). The male to female ratio is 100 43.9.

The acceptance of this large number of students in the universities is planned to fulfil the requirements of the country for its development and to supply the needs of Arab and African countries with the different specialities.

Selection of applicants to medical education is based on the credits of the applicant in the final examination on completion of high schooling. Those who enter medical education in Egypt are a select group and constitute the top grades of those completing high schooling. The number of students accepted to the medical schools is decided by the government to fulfil the requirements of the state plans.

In the year 1972/1973·

The total number of medical students in Egypt was 27 004; 19 899 male (73.7 per cent) 7 105 female (26 3 per cent). The male to female ratio is 100 · 35.7
The total number represents 13.8 per cent of all university students.
The factors which control the intake of students by the faculties of medicine in Egypt can be summarized as follows:

1. The number of doctors needed for the national health plan In Egypt, the ratio of doctors to population is 1·3000. The health plan aims at attaining a ratio of 1:1000 in ten years time In fact, the number of students accepted in each faculty is decided by the authorities primarily on the basis of fulfilling the requirements of the health plan, which needs increasing numbers each year. In the year 1971/1972 2 772 graduated from the faculties of medicine in Egypt.

2. In addition, faculties of medicine have to accept extra students to cover the needs of other Arab and African countries for Egyptian doctors.

3. In order to fulfil the requirements of the health plan, the expected number of doctors who emigrate should be considered when deciding the number of acceptance to the faculties of medicine. The number of emigrant doctors is always increasing for many reasons, some of which may be of benefit both to the country and to the medical profession.

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4. The development of the medical profession in recent years has changed the concept of the graduates of the medical schools from a general practitioner to a basic doctor, who needs to continue his studies to play an effective role in the health services This leads to two reflections·

(a) The increasing number of post-graduate students in each faculty; in Alexandria, the total number of post-graduate students (Table II a,b,c) in the year 1972/1973 is 290. Of these, 258 are studying for diplomas ; and 32 for M.D and M.S degrees. This number is increasing in the last fifteen years as shown in table I.

(b) To keep the health services at the required level, doctors undertaking post-graduate studies should be replaced by graduates and this in turn increases the intake by the faculties.

5. In planning for the acceptance of students in the faculties of medicine to face the health plan of the country, the increasing number of female doctors should be considered. The responsibilities of the female towards the community as a wife and mother actually interfere with the time and effort she can give to the job. This necessitates increasing the number of graduates to keep the efficiency of the work as well as to maintain the obligation of the female doctor towards her family and community.

6. The responsibility of the faculties of medicine towards other Arab and African countries necessitates the acceptance of a good number of foreign students in these faculties (Table V). In the year 1970/1971, the total number of foreign students in the faculties of medicine in Egypt was 2 564 out of a total of 23 773. This represents 10.8 per cent. In the same year, 420 foreign doctors graduated in Egypt. The total number of graduates that year was 2 772, so that foreign doctors represent 15.1 per cent of the total graduates.

In Alexandria, the total number of foreign students in the year 1971/1972 was 331 or 11.2 per cent of the total number of students. We expect a progressive increase in the number of foreign students in the coming ten years.

In fact, the above-mentioned factors controlled the intake of students by the faculties of medicine in Egypt.

In Alexandria, the number of students and the number of post-graduates has increased yearly during the last twenty years (Tables I a,b,c & II a,b,c).

The progressive and rapid increase in the students intake in the faculties of medicine should be associated with a proportionate development of the abilities of the teaching institutes. These abilities can be grouped under five categories:

1. The number of the teaching staff, in order to keep a reasonable student staff ratio (Table III-b).

In Alexandria, the number of teaching personnel including the number of teaching staff and demonstrators has been increased considerably during the last twenty years. (Table III a,b). The student staff ratio is shown in table IV. This ratio looks reasonable but the actual problem arises from the distribution of the staff between the clinical departments and the departments of basic sciences. In addition, this ratio does not include the post-graduate students.

2. The number of beds available for teaching and training in Egypt, is 72 976. Of these, 11.9 per cent only belong to the university and are available for teaching and training. This means that 8 707 beds are available for teaching purposes.

In Alexandria, the university hospitals have got 2 222 beds, for teaching purposes, the student/bed ratio is shown in table IV, which also shows the increase in the number of beds and the student/bed ratio in the last fifteen years.

3. The equipment which is necessary for teaching and training should be proportionate to the increase in the number of students.

4. Teaching large number of students needs a continuous and up-to-date supply of audio-visual aids including equipment, micro-films, slides, models, closed television circuits, modern library, tapes and radiotapes, ... etc.

5. The in-take of large number of students should be accomodated by supplying the schools of medicine with the necessary buildings.

6. The facilities of the school should include the different services needed by the students.

In studying the student in-take in relation to the facilities of the teaching institutes, the following points arise for discussion:

1. An increase in the number of students accepted for medical education will continue for many years. To face this, should we increase the number of students admitted to each faculty and try to enlarge these faculties to accomodate more and more number of students or should we increase the number of medical faculties?

2. Is it possible to increase and develop the potential of each faculty at the same rate as increase in the number of students?

3. Can development and improvement of the school potentiality be maintained following the traditional methods of medical education, or is it necessary to modify our methods of teaching and evaluation in order to apply principles of education in medicine in the hope of maintaining the standard of the students.

4. Is it possible to increase the student in-take and to keep the teaching and training within the limited number of beds belonging to the universities or should we extend the teaching and training to the beds and clinical material available in the hospitals, belonging to the Ministry of Public Health and other institutions?

Table I-a.

The number of students in the Faculty of Medicine, Alexandria, starting from 1942 to 1973

Year	Students		Total number	Remarks
	Male	Female		
1942	203	7	210	These numbers include students in the School of Pharmacy and Dental School.
1943	374	21	395	
1944	438	22	460	
1945	523	25	548	
1946	587	32	619	
1947	656	42	698	
1948	945	66	1011	
1949	988	64	1052	
1950	1157	88	1245	
1951	1149	107	1256	
1952	1135	124	1259	
1953	1288	154	1442	
1954	1386	182	1568	
1955	1506	160	1666	
1956	847	88	935	
1957	894	78	972	
1958	1041	108	1149	
1959	1147	95	1242	
1960			1336	
1961	1261	162	1423	
1962	1323	168	1491	
1963			1623	
1964	1557	272	1829	
1965	1718	365	2083	
1966	2388	374	2014	
1967	2168	487	2655	
1968	2155	697	2852	
1969	2324	611	2935	
1970	2058	671	2726	
1971			2961	
1972	2330	687	2917	
1973	2963	818	3781	

Table I-b.

The mean number of students in every 5 years starting 1942

Period (5 years)	Total No.	Mean	% increase in the No of students/5 years.
1942/46	2232	446	100
1947/51	5262	1052	236
1952/56	6870	1374	308
1957/61	6122	1224	275
1962/66	9040	1808	405
1967/71	14129	2825	620
1972/73 (2 years)		3349	750

Table I-c.

Number of students graduated from the Faculty of Medicine starting 1942.

Year	Males	Females	Total	Year	Males	Females	Total	Year	Males	Females	Total
1942	-	-	-	1953	86	5	91	1964	181	34	215
1943	20	3	23	1954	109	18	127	1965	202	33	235
1944	10	-	10	1955	127	5	132	1966	234	62	296
1945	15	1	16	1956	98	15	113	1967	302	41	343
1946	8	-	8	1957	116	10	126	1968	295	85	380
1947	15	-	15	1958	118	19	137	1969	274	73	347
1947	47	-	47	1959	120	17	137	1970	375	122	497
1949	61	3	64	1960	131	14	145	1971	471	120	591
1950	69	4	73	1961			143	1972	125	12	137
1951	94	5	99	1962			192	Total			4975
1952	88	4	92	1963	112	32	144				

Table II-a.

Number of postgraduate students
(Diploma, M.D. & M.S.) starting 1942.

Year	Diplomas			M.D. & M.S.			Remarks
	Males	Females	Total	Males	Females	Total	
1942	-	-	-	-	-	-	
1943	-	-	-	-	-	-	
1944	-	-	-	2	-	2	
1945	-	-	-	-	-	-	
1946	3	-	3	-	-	-	
1947	2	-	2	-	-	-	
1948	39	-	39	12	-	12	
1949	50	1	51	21	-	21	
1950	64	-	64	23	1	24	
1951	111	3	114	27	1	28	
1952	147	6	153	29	-	29	
1953	60	6	66	33	-	33	
1954	185	5	190	27	-	27	
1955	113	7	120	21	-	21	
1956	116	4	120	9	-	9	
1957	64	6	70	21	-	21	
1958	57	8	65	24	-	24	
1959	67	2	69	25	2	27	
1960	149	12	161	25	2	27	
1961	153	11	164	31	-	31	
1962	133	14	147	32	1	33	
1963	127	11	148	37	2	39	
1964	176	16	192	35	1	36	
1965	180	13	193	27	1	28	
1966	176	20	196	24	2	26	
1967	182	25	208	29	2	31	
1968	194	27	221	42	7	49	
1969	217	39	256	24	10	34	
1970	252	38	290	24	2	26	
1971	274	52	326	24	7	31	
1972	214	44	258	24	8	32	

TABLE II-b

% increase in the number of postgraduate students calculated per five years.

Period (5 years)	Diplomas			M.D. & M.S.		
	Total/5 yr.	Mean/yr.	% increase	Total/5 yr.	Mean/yr.	% increase
1942/46	3			2		
1947/51	288	57	100	85	17	100
1952/56	649	130	228	119	24	140
1957/61	519	104	182	130	26	150
1962/66	846	169	290	162	32	190
1967 /71	1299	259	450	181	36	280
1972		258	450		32	190

Table II-c.

The number of postgraduates starting 1942.

Year	Diplomas	M.D. & M.S.	Thesis M.D. & M.S.	Year	Diplomas	M.D. & M.S.	Thesis M.D. & M.S.
1942	-	-	-	1959	63	10	5
1943	-	-	-	1960	74	6	4
1944	-	-	-	1961	67	14	6
1945	-	-	-	1962	72	8	3
1946	1	3	3	1963	96	7	5
1947	-	-	-	1964	94	8	4
1948	2	7	1	1965	128	13	9
1949	3	6	5	1966	128	15	11
1950	17	4	3	1967	121	14	14
1951	16	3	2	1968	137	12	12
1952	32	11	6	1969	135	23	23
1953	39	3	2	1970	172	23	23
1954	33	4	3	1971	183	19	19
1955	54	4	3	1972	167	22	22
1956	56	1	1				
1957	119	13	5				
1958	75	5	3				

Table III-a.

The mean number of staff and demonstrators per five years.

	Mean staff number	% increase	Mean No of demonstrators	% increase	Total mean number	% increase
1942/46	79	100	28	100	107	100
1947/51	80	101	40	143	120	110
1952/56	107	134	70	250	177	165
1957/61	139	176	80	285	219	204
1962/66	164	207	113	400	277	258
1967/71	233	300	193	680	426	398
1972/73	289	306	225	830	514	480

Table III-b.

Student Staff Radio / 5 years

Year	No of students	No of staff	No of demons-trators	Total No	Stud/Staff ratio	Stud/Dem. ratio	Stud/total ratio
1942/46	446	79	28	107	5.6/1	15.9/1	4.1/1
1947/51	1052	80	40	120	15.6/1	26.3/1	8.7/1
1952/56	1374	107	70	177	12.8/1	33.9/1	7.8/1
1957/61	1224	139	80	219	8.8/1	15.6/1	5.4/1
1962/66	1808	164	113	227	11.3/1	15.4/1	6.3/1
1967/71	2825	233	193	426	12.1/1	14.6/1	6.5/1
1972/73	3349	289	225	514	11.7/1	14.6/1	6.3/1

Table IV.

The % increase in the beds in the University Hospitals starting 1942 (per 10 years period)

Year	No of beds	% increase	No of students In Clin.year	Student/bed ratio	Remarks
1942	522	100	180	1 : 1.0	
1952	964	185	630	1 : 1.5	
1962	1288	247	750	1 : 1.9	
1972	2446	470	1500	1 : 1.5	300 beds in Ministry of Public Health are included.
1973	2518	490	1800	1 : 1.4	

Table V.

Number of foreign students in the Faculty starting 1942

Year	Number	Year	Number	Year	Number	Year	Number
1942	-	1950	-	1958	141	1966	333
1943	-	1951	-	1959	167	1967	390
1944	3	1952	23	1960	156	1968	391
1945	-	1953	43	1961	241	1969	395
1946	-	1954	91	1962	170	1970	405
1947	-	1955	102	1963	177	1971	331
1948	11	1956	96	1964	213	1972	536
1949	81	1957	124	1965	276	1973	363

Nationality

Palestine - Jordan - Syria - Libya - Sudan - Saudi Arabia - Kuwait - Lebanon - Iraq - Tunisia - Algeria - Yemen - Aden - France - Italy - Bahrain - India - Pakistan - Ethiopia - Iran - Greece - Malta - Spain - Germany - USA - Cyprus - Hungaria - South Africa - Malasia - Mauritania - Nigeria - United Kingdom.

ANNEX IX

AN OVERVIEW OF APPLIED RESEARCH IN MEDICAL EDUCATION PROBLEMS, PRINCIPLES AND PRIORITIES*

Christine H McGuire+

Over the past decade we have witnessed the development of critical shortages in health manpower in every region of the world. These shortages, though perhaps always to some degree extant, have obviously been intensified by rapidly increasing populations and sharply rising expectations across the globe. Less obviously, such shortages have also been exacerbated by the response of medical educators to concurrent changes in their scientific disciplines--a response that has been characterized by almost universal demands to increase the selectivity of entrants into the profession, to extend the period of required professional training and to further fragment that training in proliferating groups of loosely related sub-specialties Clearly, this response has had the consequence, however unintentional, of shortening the average lifetime of professional service, of reducing the variety of health problems a highly specialized professional feels competent to manage and, hence, of restricting the supply of available health manpower at the very time that demands for such manpower are escalating.

It is not surprising therefore that most nations have responded by dedicating more and more resources to the expansion of educational facilities in the health professions. What is surprising is that, for the most part, this expansion has been designed simply to increase the annual output of physicians trained in the conventional image--an image that has already been recognized throughout the world as inappropriate for meeting the diverse health care needs of the total population. What was needed was a critical and imaginative application of research from educational and other behavioral sciences in the design of radically different programs to train new kinds of health professionals and to educate both old and new more efficiently and effectively. What was done was to expand existing institutions and to create new ones of the same type. If experience is any guide, it is more than likely that these increased facilities will be unable to produce physicians in the needed numbers, and that those which are produced will, like their predecessors, congregate in locations and in specialties where they will make the relatively smallest net contribution to meeting the health care needs of the country. In

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short, what we are seeing in most places is the uncritical perpetuation of a system of medical education that has had demonstrable shortcomings everywhere it has been tried--shortcomings that have left practically every country in the world suffering not only from shortages of physicians, but also from their maldistribution with respect both to geography and to specialty.

This is not to deny that there have been some departures from the conventional pattern of 1-2 years pre-medicine, followed by 1-2 years of basic sciences, 2-3 years of clinical sciences and 1-5 years of specialty and sub-specialty training--a pattern which is now essentially worldwide. But, for the most part, modifications in the conventional program have been limited to such minor adjustments as adding a year here or there, combining pre-medicine with basic sciences or basic sciences with clinical experience to accelerate by a year or two, reducing hours in some disciplines and adding them in others, developing a somewhat more interdisciplinary approach in some areas, stressing somewhat more a comprehensive approach to patient care, introducing a few new subjects (e.g., genetics, human sexuality), replacing some requirements with electives, changing grading practices from the use of numbers to letters or even to words (e.g., pass, fail, honors), and supplementing traditional instructional modalities with small group and/or self-instructional techniques. Modifications such as these are all too reminiscent of Nero's "fiddling"; they do not represent basic reforms guided by systematic application of the findings from current research in medical education. Nor have the few totally innovative programs of physician education introduced in recent years been systematically directed by the insights obtained from this applied research. Even less have the effects of any of these changes been monitored by the utilization of techniques that are now readily available for gathering evidence that would facilitate more rational decision-making.

I have dwelt at this length on the patterns that have characterized our response to the needs for expanded health manpower because I believe that careful consideration of the research techniques and findings now available would have resulted in very significant modifications in the nature of education both in medicine and in other health professions. It is not yet too late to utilize these methods and results to inform the decisions that are still to be made. To this end I should like to call to your attention some of the newer techniques that are being increasingly employed to collect data and some of the implications of those data in four areas of research in medical education which I regard as critically important to you in your role as decision-makers in medical education

Research on the goals of medical education

Research on the characteristics of medical students

Research on the setting for learning, curricula and instructional methodologies

Research on methods of evaluating professional competence

Research on the Goals of Medical Education

Basic research on learning indicates that students learn more, learn it more efficiently and retain it longer, when the objectives of an educational program are clear, when they are perceived by students as relevant to their own interests and motivations, and when they are shared by both faculty and students. Research in higher education indicates that this finding is as true of students in professional schools as to students at lower educational levels. The problem for the medical educator consists in selecting from among many worthy goals those of highest priority and then making these expectations explicit to students.

There are essentially two ways of making this selection: One consists in relying on the judgment of experts to determine what a neophyte in the profession ought to know and ought to be able to do. In the past we have relied almost exclusively on this method for determining the goals of medical education. As a result we find the curriculum crammed with an ever burgeoning quantity of new and highly specialized knowledge which the student perceives as irrelevant to his own goals and which, in fact, may be of little value to other than the super sub-specialist. Certainly expert opinion is an important source of information about the knowledge and skills which trainees should be able to demonstrate, but it is also possible to make this decision on the basis of scientific evidence about what competent physicians need to know and need to be able to do in order to deliver responsible patient care. A number of procedures have now been developed for collecting such data to provide an empirical basis for developing a behavioral description of the essential components of professional competence to guide a faculty in setting their goals and designing their curricula. Three of these may be of special interest to this group. the critical incident technique, the method of task analysis and the analysis of epidemiological data.

The Critical Incident Technique. This method consists in collecting comprehensive data about specific behaviors that characterize professional effectiveness and ineffectiveness and using these data to make an objective, empirical determination of the essential performance requirements of the profession. This technique is an outgrowth of studies in aviation psychology made in the United States during World War II. In that programme it was found that in reporting the reasons for eliminating a trainee, pilot instructors

and check pilots frequently offered such cliches and stereotypes as "lack of inherent flying ability," "poor judgment" or unsuitable temperament." In an effort to determine the specific qualifications of personnel that contributed to success or failure, combat veterans were asked to report incidents observed by them that involved behavior which was especially helpful or especially inadequate in accomplishing the assigned mission. This request concluded with the statement "Describe the officer's action. What did he do?" The several thousand incidents submitted in response to this inquiry were analyzed and categorized to provide a relatively objective and concrete description of the "critical requirements" of combat leadership.

In applying this method to the medical profession, several thousand incidents describing observations of especially effective or especially ineffective colleague behavior are collected from several hundred physicians representing various age groups, geographic areas, types of affiliations and specialty interests. For example, in a critical incident study of intern and resident performance (i.e , of the general, undifferentiated physician) commissioned by the U.S. National Board of Medical Examiners, the American Institutes of Research who conducted the study collected over 3,000 incidents from physicians across the country. The incidents submitted involved all areas of behavior cognitive, affective and psychomotor. They identified, for example, such general requisites of competence as "Skill in Gathering Clinical Information," i.e., in taking a competent history and in performing an adequate physical examination, or "Skill in Using Special Diagnostic Methods," i e., in ordering and interpreting x-rays, biopsy specimens and the like, "Skill in Relating to the Patient and in Gaining His Cooperation in a Plan of Management." In an analogous study conducted by our own Center of the critical performance requirements in orthopaedic surgery, over 1,700 incidents were collected from over 1,000 orthopaedic surgeons representing various practice settings and subspecialty interests. An empirical classification defining 94 critical performance requirements, grouped into 9 major categories of competence, was derived from the incidents. This operational definition of the essential components of competence could then be employed to determine the goals of specialty training, the design of programs for their achievement and the criteria and methodology for their evaluation. If our educational planning were regularly directed by such operationally defined, empirically derived goals, I dare say our educational programs would look substantially different.

Task Analysis. A second method of determining the essential components of professional competence which should define the goals of medical education consists in detailed task analysis of what physicians in various

practice settings actually do, and in deriving from that statement of tasks a statement of the requisite knowledge and skills which they must have in order to perform these tasks competently. Such a task analysis may be based on careful, systematic observations of a representative sample of physicians in different practice settings, or it may be based on diary studies from the daily logs of a representative sample of physicians who report in minute detail the way in which they spend their professional days over a specified period of time, or on some combination of these two approaches.

Wherever this method has been employed, the results have been most enlightening. For example, in a limited pilot study of pediatricians in a typical small U.S. city, researchers found that all the physicians had different but consistent patterns for taking a history and performing a physical examination. Of the 481 patient visits observed, 222 were well children; an average of 10.2 minutes were spent with these children (range: 7.5 minutes to 13.6 minutes) in contrast with an average of 8.1 minutes spent with ill children (range: 7.4 minutes to 10 minutes). Of the 259 ill children, 104 (i.e., 40%) were diagnosed as having an infection of the upper respiratory tract, 15 had chronic illnesses and 5 had potentially life threatening diseases. For the total group of 481, optic fundi were examined only 9 times and rectals were performed in only 6 cases; 2 physicians did not percuss the lung fields for any patient. The greatest amount of time was spent in discussion of nutrition and child development. The single most frequent topic on which advice was rendered in well-child care concerned toilet training. The authors of this study concluded, "Few aspects of well-child care appear to require the skill of a physician...the question is also raised as to whether current training programs are aggravating the physician manpower shortage by overtraining in relation to community health needs."*

This is a question that I believe could be reiterated in every specialty in every country; only task analysis or comparable empirical sources will give us the answer.

Epidemiological Studies. One of the most interesting of the newer approaches to the use of such sources in determining the goals of medical education consists in combining three arbitrarily weighted factors--disease incidence, individual disability and social disruption to define priorities in health care needs and, hence, in educational effort. As

*Bergman, A., Probstfield, J. and Wedgewood, R. Performance Analysis in Pediatric Practice: Preliminary Report. Journal of Medical Education, Volume 42:262 (1967).

initially developed by Dr. John W. Williamson* the three factors are computed as follows: disease incidence consists of a simple tabulation of the frequency of the disease (e.g., pneumonia) or other medical condition (e.g., pregnancy) in the target population. Individual disability involves a determination of the extent of patient impairment or risk associated with a given medical condition; an Individual Disability Weight (IDW) is calculated for each condition from three elements: the average length of hospital stay, mortality rates and complication rates. Social disruption represents an estimate of the impairment that would be produced by a given disease or condition in the larger social group of which the patient is a member; it is based on such factors as cost of illness, age of patient and number of dependents, socio-economic standing and the like. For each discharged patient a Total Priority Weight (TPW) is calculated combining these elements. This Total Priority Weight is then arbitrarily apportioned among patient diagnoses. Finally, a cumulative total for each diagnosis is calculated from the total patient sample. The resultant ranking represents a quantitative estimate of priority or health care needs for the population at risk.

It is clear that even with unlimited resources not all of these needs can be met in the present state of our knowledge. The next step therefore consists in defining the area of total health care needs which can be met, given our present understanding of disease and our present resources for therapeutic interventions. This area therefore defines the target area for application of professional understandings and skills and helps to define educational priorities. The goals of medical education for the basic undifferentiated physician can therefore be defined as encompassing those areas of health care needs which cause the greatest total preventable disability--i.e., those which cause the greatest total disruption that could be reduced or minimized by early diagnosis and appropriate intervention.

In his early studies using this methodology to review hospital practice in two large community hospitals in widely separated metropolitan areas in the United States, Dr. Williamson found that pregnancy, involving uncomplicated delivery, ranked first or second in priority in both hospitals, that cerebral vascular accidents ranked among the first five diagnostic categories in both hospitals and that fractures of the lower extremity ranked among the first five in one hospital. I mention

*Williamson J. et al. Journal of American Medical Association, Volume 201:938 (1967) and Volume 204:303 (1968).

these particular conditions [illegible] their own educational institutions there is a general tendency [illegible] the amount of clinical instruction for the general medical student [illegible] of these areas. For example, instruction in orthopaedic surgery is now an elective in our institution, despite the fact that trauma in general accounts for a very significant proportion of the total preventable disability in our society.

While the study I have reported above was limited to hospital practice, the same methodology could readily be applied to any level of health practice. Indeed Dr. Williamson's current research involves just such an extension. Secondly, while the findings from such epidemiological studies and the particular weights to be assigned such factors as individual disability and social disruption will, of course, vary markedly in different parts of the world, the approach is clearly applicable to any population for whom health manpower are being trained. But, it is our suspicion that in all parts of the world, utilization of such data will modify the goals and priorities of our educational institutions and the emphases in our medical curricula, by focusing far greater attention on ambulatory medicine and on more common causes of disability than are frequently seen in our teaching hospitals.

Implications of Applied Research on Goals and Priorities

In the foregoing [illegible] aspects of methodology, I have tried to suggest that the means are now at hand for supplementing expert judgment with data derived from empirical studies to assist us in defining the roles and, hence, the requisite competencies of the graduates of our programs. I have no doubt that, should such studies be generally undertaken and should their findings be optimally employed in developing explicit goals and objectives of education in the health professions, we would see revolutionary changes in the kinds of health professionals produced, and in their education programs. Furthermore, I am convinced that such changes would have far greater impact in meeting the health care needs of our populations than the simple expansion of educational facilities of the conventional type.

Research on Student Characteristics

In contrast with the relatively limited and only recent attention that has been given to research on the goals of medical education, student characteristics have long been an object of intensive research and study, particularly as these characteristics relate to the problems of selection and attrition.

Research on Cognitive Characteristics

Predictive studies forecasting the probabilities of success for students with different entering characteristics represent the oldest and perhaps the best established area of research in this field. For the most part these studies have focused on using prior academic performance (with or without supplementary data from tests of scholastic aptitude) to predict success in medical school. In general, the criterion of "success" has been limited to academic record in medical school. It is not surprising that most of these studies reveal that prior academic performance, when appropriately weighted to take account of variations in the standards of different preparatory schools, is the best predictor of medical school grades. Of greater significance is the repeated finding that the correlation between previous academic record or aptitude test scores and academic standing in medical school rarely exceeds .5-.6; even this modest figure is progressively diminished as students proceed from the basic sciences to the clinical disciplines. Most important of all it has repeatedly been shown that class standing in medical school has no significant correlation with any criterion of physician performance. In short, we have been able to predict who will make good grades in the early years of medical school; we have been less successful in predicting who will make good grades in clinical years and we have met with essentially zero success in predicting who, from a large pool of qualified applicants, will make good physicians.

Research on Interests, Attitudes, Values and Personality.

As a result in some areas of the world, research on student selection is focusing less on the intellectual and academic attributes of the applicant population and focusing very much more on the personality, values, and interests of that population. This shift in emphasis has been accelerated by the conviction that, in order to have any significant impact on the geographic and specialty distribution of health manpower, we will need not only to redefine the goals of medical education but also in our selection of students to look more carefully at the attitudinal and other non-cognitive variables which influence career choices. Increasingly, such data are being sought for three purposes: to assist admissions committees in selecting students who are most likely to become primary health care providers, to furnish curriculum makers with concrete information about occupational, vocational and educational aspirations of students that will aid them in planning curricula to meet varied career goals; and to assist the teacher in implementing an instructional strategy that takes full advantage of what everyone already knows, namely, that students of

all ages learn more, learn it faster and learn it at less cost to the teacher if the latter can capitalize on the interests of the former.

In gathering specific information about the nature of student goals and interests we have relied primarily on the learner to tell us through his responses to the arsenal of ever more detailed questionnaires, activities indices, interest inventories and the like with which we bombard him. Research on this aspect of student need has been dedicated on the one hand to making these instruments both more subtle and more comprehensive, and on the other to developing more sophisticated analyses of the relationships between patterns of student responses and success in a career, to the end that data about conscious interests and needs can be used with ever greater confidence in student selection and career counseling

However, it is my own personal judgment that research results to date do not justify heavy reliance on interest and need assessment for purposes of making decisions about individuals except perhaps at the extremes. Rather the most important implications for curriculum planners, teachers and counselors lies in the repeated finding that there is much more diversity in the life styles and in the patterns of interest and values within professional groups, and much more individual variation in career goals within student groups than we have been led to believe. It is time that our colleges of medicine were organized not only to recognize, but also to respond to and to take advantage of this rich resource in fulfilling our responsibility of educating health personnel to meet pressing societal needs.

Research on Personality in Relation to Learning Environment.

Related to this growing interest in a study of personality has been a concurrent upsurge of interest in looking at variations in student attitudes, values and personality as placing variable demands on the educational environment In this work student characteristics are seen as unconscious demands on the environment and environment is seen as presenting an assortment of expectations and activities, pressures and rewards, facilities and people, all of which require some kind of adaptive response from the student. In contemporary personality theory student performance is seen as a function of the congruence between the student's unconscious needs and the potentially conflictful demands of the environment.

Research in this field has been dedicated primarily to the purpose of testing this hypothesis and a special methodology has grown up around it. Very briefly, this methodology consists in administering to groups of students a personality inventory of the "needs-assessment" type and a

corresponding "environment inventory." In early investigations the two inventories were usually designed to be entirely parallel insofar as a priori reasoning could make them so. For example, if the personality inventory included a series of statements to identify high need for structure, emotional support, achievement or some other satisfaction, the environment inventory administered to the same students would then include a series of statements to determine whether the environment is capable of responding to these same needs, or whether it is such as to create pressures of a conflicting nature. However, in his 1969 summary of the research based on this model Pace, who was one of the early investigators, concludes that, in general, the expected relationship between personality needs and environmental demands represented by the intended parallelism between personality and environment inventories, "has not been empirically demonstrated as fully as had been hoped."*

What has been documented is that educational environments do differ greatly, and what happens to students does depend in some measure on the particular character of the environment, but the influence of different patterns of environmental press on different patterns of personality need is exceedingly complex and its implications for educational planning and decision-making are far from clear. Indeed, Pace himself observes that "Many personality traits may or may not be relevant to objectives of higher education and the appropriateness of their use as criterion measures in studies of college impact is at least open to question."**

Even if this question were to be resolved, it is my own personal view that a far more vexing one presents itself. In professional education, specifically medical education, how shall we structure the environment to deal with personality needs which may be of negative value in the profession students expect to enter. For example--can we afford to create a medical school environment that reinforces a high need for structure when it is our task to educate students for a profession that requires lifetime learning in an independent, unstructured setting? Can we afford to create a medical school environment that reinforces a high need for certainty when it is our task to educate students for a profession that requires each to live with a high level of uncertainty? Perhaps the real question is--to what extent can we utilize findings from research on the relation between environmental press and personality needs to design a climate for learning that maximizes

*College Environments, In Encyclopedia of Educational Research. 4th Edition, Robert Ebel, ed. American Educational Research Association, 1970, p. 170.

**Ibid. p. 172.

the probability of accomplishing our institutional goals? Certainly, even at its present level of development research on need and environment, when considered in relation to contemporary theories of learning, has major implications for educational decision-making

Research on Student Needs for Purposes of Diagnosis and Counseling

Closely associated with the investigation of attitudinal and personality variables has been an increased interest in research on methods of diagnosing student achievement in a manner which identifies any potential obstacles in the student's path toward the required level of mastery and which furnishes the basis for continuing counseling and educational prescription to him. Educators have long known student achievement in any area falls into a normal distribution curve. They have also repeatedly demonstrated that these individual differences in both level of attainment and rate of learning new material are exacerbated over time in the conventional, fixed, rigidly scheduled curriculum characteristic of most of our educational programs Current research suggests, however, that the introduction of a program of systematic, diagnostic testing which is used to generate specific educational prescriptions can lead to a significant reduction in the range of individual differences in both ultimate achievement and in the time required to reach a given level of competence.

These studies suggest (1) that virtually all students of normal intelligence in any class are capable of achieving a high level of mastery, and (2) that if ample time is made available to each student to achieve mastery of the introductory units of instruction, individual differences in the amount of time required to reach that level are progressively diminished for subsequent units of instruction. While these effects are most pronounced in courses of instruction that require sequential organization of concepts and principles--e g , algebra--they seem to occur even in courses of instruction in which no such organization is necessarily apparent--e.g , medicine.

In my view this finding has more profound implications for the educational decision-maker than any other finding of contemporary educational research. For, if it can be demonstrated in medicine, it implies nothing less than the total reorganization of our educational system and its associated instructional strategies, to be replaced by a completely individualized program based on scientific educational diagnosis and prescription analogous to the process of individual diagnosis and prescription we follow in clinical medicine. In such a system any implication of present rigidities will need to be eschewed with religious fervor

If this reform were to occur, the responsibility of the educational decision-maker will become what it must be: first, to define the nature of

the tasks to be learned; second, to document the characteristics of the learners along the several dimensions discussed above, third, to create those conditions which maximize the probability that the required learning will take place. For, once the task has been specified and the characteristics of the learners identified, the conditions under which learning is most likely to occur can be clearly set forth

Research on the Setting for Learning, Curricula and Instructional Methodologies

Fundamentally, the goals of education are not unlike the goals of therapy; i.e., to facilitate maximum functioning of the organism. Hence, the methodology for evaluating educational interventions is in essence analogous to that employed in evaluating any other therapeutic agent, and the pitfalls of research in this area are parallel to those in any field of clinical research. The three approaches to research on educational programs that are currently most widely employed and that appear to hold the greatest promise can be distinguished in terms of the primary object toward which data collection efforts are directed. student perceptions about the program, the nature of the educational process and the quality of the educational product. Each approach has its analogue in clinical research and, like the latter, its characteristic data type and source.

Figure 1: Approaches to Research on Educational Programs

Approach	Data Source	Clinical Equivalent
Assessment of perceptions	Reports of student reactions	Evaluation of patient's subjective feelings
Assessment of process	Observations of student-teacher interaction	Evaluation of therapeutic rationale in terms of pathophysiologic principles
Assessment of product, outcome or effect	Tests of student performance	Evaluation of therapeutic efficacy

Studies of Student Perceptions

This approach is designed to answer the question "How did the students feel about the quality of the teacher, the teaching and the program?" Formal or informal student reactions and/or ratings constitute the data for answering the question Typically these data are collected by interview and/or questionnaire that may range from highly structured to completely open-ended inquiries. Some institutions employ a standard rating form in which the student records his evaluation of some aspect of the program, ranking it in relation to others. Some institutions use questionnaires in which the student merely indicates what he liked or disliked, what he found valuable or useless, what experiences he would prefer to have expanded or reduced and the intensity of these feelings. In some instances these rating forms and questionnaires may be combined with a third type of instrument in which the student is asked about the specific feelings or actions which were engendered in him by some aspect of a program. In general, such questions are selected on the basis of contemporary learning theory and represent those aspects of the student-teacher relationship which are thought to influence the efficiency and effectiveness of learning. For example, a student may be asked, "Did you feel free to ask the instructor a question about something you did not understand?" "How often were you stimulated to think about additional applications of concepts and principles the instructor was discussing?" "How often did you go to the library to follow up on an idea that interested you?" and the like.

Provided the data are properly interpreted as simple statements of consumer satisfactions and dissatisfactions, applied research on student perceptions can be extremely valuable for two purposes (1) to assist in the diagnosis of some of the causes of inadequate achievement and (2) to contribute to the identification and creation of conditions that will enhance motivational and other affective responses that facilitate learning. However, such data cannot be used to judge the educational efficacy of a program.

Studies of the Educational Process

In contrast with the assessment of perceptions which deliberately seek opinions about the merits of various elements in the educational program, process assessment is designed to determine what actually occurred in a particular program of instruction. The basic question which it attempts to answer is. "What is the nature and quality of the setting and of the communication between student and teacher that took place in that setting?" Data in response to this question are obtained either from systematic, impartial, skilled observation or from student responses to objective inventories identifying particular elements in the learning environment and asking the

student to indicate the extent to which each of these elements existed. The elements which are identified for observation or for student description are those which are thought to be important in facilitating or inhibiting achievement of the desired outcomes. For example, the students may be asked "How often did the instructor actually observe you while you were examining a patient?" "How often did the instructor provide feedback to you on the accuracy of your performance?" "How much opportunity did you have to practice a particular skill?"

Unfortunately, repeated experimental studies of the relative effectiveness of varied instructional methodologies--lecture, small group discussion, programed instruction, self-instructional materials and the like--have produced conflicting evidence and inconclusive results. Certainly, it may have been naive to expect any definitive outcome from experiments that on reflection appear to represent a simplistic search for the educational panacea--an all purpose miracle method, a pursuit that has proved no less futile than the quest for that medical chimera--the all purpose miracle drug Rather than a "final answer," what has emerged from research of this type is clear evidence (1) that students learn in many different ways and at very different rates, (2) that the appropriate methodology depends on the nature of the educational objectives sought, and (3) that, whatever the instructional methodology utilized, the greatest learning takes place when students are actively involved in the learning process and when the material to be learned has the greatest apparent relevance to the students'own objectives. Consequently, it follows that the most effective program is one which provides genuine opportunity for these individual differences in learning style and learning speed, and in which the specific materials and instructional techniques have been chosen with a view to particular objectives that have been made explicit to both faculty and students.

Studies of the Educational Product

Whether a particular set of materials, techniques and conditions for learning is, in fact, optimal can be determined only by examining their consequences. It is to this issue that studies of educational product or outcome are addressed. All product assessment is designed to answer the question "To what extent is the educational (therapeutic) agent effective in accomplishing the educational (therapeutic) goals?" If it is true that teaching is undertaken mainly for the purpose of producing student learning, it follows that program effectiveness can ultimately be assayed only in terms of the extent to which this intended outcome is achieved, and program efficiency can be judged only after the costs are documented and charged against the changes in student knowledge, judgment, skills, habits and attitudes which are realized.

Two types of data are therefore indispensable in answering the question posed in this approach that derived from comprehensive measures of relevant aspects of student performance, and that obtained from careful cost accounting of teacher and student time expended, other resources consumed and undesired side effects induced by the educational program

The techniques used to assess performance range from conventional tests of information, through sophisticated simulations of clinical problems, to long-term, systematic observations of the learner in varied professional settings, as elaborated below in the discussion of research on the evaluation of professional competence However, since the evidence is mounting that, given adequate time, personal instruction and self-instructional resources, most anyone of normal intelligence and emotional stability can master any element among the objectives of higher education, no program evaluation is complete in the absence of cost data, and of cost/benefit calculations. In the final analysis therefore program evaluation necessarily entails economic considerations in determining whom a country can afford to educate and at what level of mastery, i.e., at what cost in resources. Unfortunately, at present the only usable data tend to be those concerned with the direct money costs attributable to the construction and maintenance of specialized facilities (e.g , lecture halls, student laboratories) and materials (educational films, slides, self-instructional programs). In the absence of hard data to the contrary, it is difficult to escape the suspicion that, because their costs are hidden, we continue to cling to conventional types of educational programs and to traditional methods that are not only ineffectual but may also be inexcusably uneconomic since these methods rely so heavily on the most costly resources of all--professional time and patient disability

Research on the Evaluation of Professional Competence

We have now come full circle This paper was introduced with a discussion of research on the goals of medical education, it will conclude with a discussion of research on the outcomes of medical education. Research on techniques of improving methods of evaluating professional competence requires first that the goals of the educational program be clearly specified, that they be defined in terms of behavioral changes that are to be brought about in the learner, that test situations be designed to sample these behaviors and that these test situations be administered to the learner to determine whether he is able to perform in the desired manner and at the prescribed level of competence. Research in this field has taken two forms First, careful, systematic analysis of existing techniques of assessing student achievement and educational outcomes and second, the development of new and more effective methods of evaluating those outcomes of particular importance

Repeated analyses of conventional examinations indicate that the traditional methods have serious shortcomings First, these studies have shown that virtually all such examinations, both oral and written, both objective and subjective, measure only a very limited and perhaps the least important aspect of competence namely, the ability to recall, rapidly and under stress, isolated fragments of information Even the most costly techniques of oral examination have repeatedly been demonstrated to involve little more than repetition of the information which the examiner wants to hear Secondly, the more subjective of these examinations (the oral and the essay) have repeatedly been demonstrated to yield such unreliable results as to be, for all scientific purposes, essentially useless For example, careful studies of the correlation between grades assigned by different examiners regularly reveal an unacceptable level of interrater agreement Careful analyses of a series of oral examinations suggest that they are subject not only to unreliabilities due to differences in standards between different examiners, but are also subject to the unreliability of sampling only a variable few of the many questions that could be asked. Finally, most practical examinations suffer from both of these deficiencies. namely, such a low level of inter-observer agreement that the grades may vary significantly depending on the observer and secondly, such great variability in the examination conditions as to result in totally unstandardized samples of student behavior. No reputable scientist would base decisions on such poor instrumentation.

Recent research has therefore been directed toward the development of more relevant, valid and reliable methods of evaluating various aspects of competence The methods that have been developed encompass new types of paper and pencil tests, unconventional oral and practical examinations, reliable record audits, objective observations of performance in actual hospital and clinical settings and, of special significance a fascinating variety of simulation techniques Most of us are familiar with simulation technology as employed in the education of business executives, airline pilots and even astronauts (space flight simulators). However, despite the extensive literature on its value, simulation has been employed in only very limited areas of professional education Perhaps such limited exploitation is in part due to the vision of astronomical costs conjured up by the word "simulator." Yet, reduced to its essence, simulation consists merely in placing an individual in a realistic setting where he is confronted by a problematic situation that requires his active participation in initiating and carrying through a sequence of inquiries, decisions and actions. The situation must be designed so that each of these activities triggers appropriate feedback which can be utilized for subsequent decisions about pending action, decisions which will in turn modify the problem in different ways depending on the unique configuration of reactions and interventions each person makes In this fashion a simulation can be evolved through many stages until it is terminated when the individual reaches an acceptable resolution or is faced by disruptive alternatives brought about by his own decisions and actions.

Recently, this essence has been captured in various simulation modalities that are economically and technologically feasible to use in both the instruction and assessment of three critical components of physician competence skill in interpreting clinical and laboratory data, judgment in patient management and skill in dealing effectively with patients and colleagues In testing interpretive skills, we are increasingly utilizing simulated clinical and laboratory data by means of photographic reproductions, sound simulators, sound movies and videotapes, three-dimensional models which have been developed to accept varied pathology, and even automated robots that can be programed to present combinations of findings which can be modified in an almost infinite number of ways In the assessment of problem solving skills, we are using written simulations of the clinical situation, computer assisted simulations, automated robots and even live simulations in which an actor, a housewife, another student, or almost anyone can be "programed," to simulate a patient in an interview setting. The student's skills in data gathering, in crisis management, triage, office and patient management and his skills in communicating with the patient and in getting the patient's cooperation in a plan of management can be objectively observed, and his deficiencies objectively documented We have even undertaken to develop simulated interviews with colleagues to test the student's skill in dealing with referral and consultation requests or simulated interviews in which he may be required to demonstrate that he can communicate effectively with one or more members of the health team by giving instructions to a simulated nurse, or requesting assistance for his patient from a simulated dietitian or social worker, or making a presentation and responding to the reactions of individuals who have been programed to take the role of other members of the health team in a simulated staff conference.

The essence of this technique is that it tries to imitate in a carefully standardized, controlled situation the kind of decision-making process which the physician must go through in a real life situation and to require of him the variety of responses that the real life situation would require. These simulations are intended to imitate, not to duplicate, life; this is both their greatest strength and, in the minds of some, their greatest limitation.* Opinion aside, present research reveals the following advantages of simulation techniques in evaluating professional competence

*It is important to recognize that simulation is not an appropriate method for teaching or for testing all asepcts of performance. For example, simple recall of factual information is more economically and directly measured by conventional techniques of objective testing. At the other extreme, professional habits can be assayed only by careful and repeated observation over a long period of time in diverse settings.

(1) Examinations composed of such problems appear to the student as far more relevant than typical oral or conventional multiple-choice tests; such perceived relevance is at the very least psychologically beneficial (2) This perception of relevance can be achieved without being dependent on the accidents of nature and the flow of real problems available at the particular place where, and the specific moment in time when, a practical examination is to be given. (3) Simulation makes it possible to predetermine precisely the exact task which students are to be required to perform, to focus on the elements of primary concern and to eliminate irrelevant and confusing complexities that would contaminate the assessment (4) Simulation enables an examining body to standardize the task for all examinees and to do so without subjecting one or a few patients to repeated harassment by large numbers of students. (5) By standardizing the tasks and focusing on the most significant aspects in each, it is possible to sample the student's performance on a representative group of problems within a reasonable time frame. (6) When the exact tasks that are to compose an examination are precisely defined and pre-selected, it is possible to develop carefully specified criteria for judging student performance, to train examiners in applying these criteria and, thus, to achieve an acceptable degree of interrater reliability in scoring the examination. (7) In contrast with reality, simulation offers all students the opportunity to assume full medical responsibility for the work-up and management of "patients" without any risk whatsoever to anyone! (8) Furthermore, in carefully developed simulations, a lifetime of chronic disease can be collapsed into a half-hour problem, at each stage of which the student can be required to demonstrate his judgment and can be provided with feedback about his interventions in a form which is more instructive than life itself usually yields. (9) Finally, this prompt, specific and unambiguous feedback, characteristic of well designed simulations, makes examinations composed of such problems a powerful tool for the enhancement of learning.

In short, the evidence from studies of the use of simulation at several levels of medical education and with a variety of types of groups suggests that when these techniques are properly exploited, simulation exercises give considerable promise of being an extraordinarily powerful tool not only for purposes of evaluating more relevant aspects of professional competence, but also for purposes of instruction in, and research on, that most complex objective of all--problem-solving and clinical judgment. In our own studies of undergraduate, graduate and practitioner performance using these newer assessment techniques, the findings strongly suggest that substantial numbers of our students leave our colleges of medicine without yet being able to apply the fund of knowledge available to them, to employ adequate problem-solving strategies, to follow a systematic approach in their own decision-making, to respond comprehensively to patient needs or to make regular and effective use of the paramedical, consultant and community resources at

their command. If these deficits do indeed exist in any significant percentage of our graduates, the implications for reform in curricula and in instructional strategies is clear At the very least, research on student evaluation has provided us with a methodology for determining the nature and extent of performance deficiencies in any individual or in any class. Its limited exploitation in medical education is not basically a scientific or even an economic issue, it is a social-psychological one.

The Present Status of Applied Research in Medical Education

Like other research, educational research is motivated by three strong drives first, there is the intellectual curiosity which we all share about "how things work"--i e., the domain of basic research. Second, there is always a need to solve urgent practical problems--i e., the arena of applied research. Finally, there is a never ceasing need to collect data that will assist the educational decision-maker to make more rational choices--i.e., the territory for institutional or agency monitoring and study In considering research stimulated by these motives, it is interesting to note that in the past we have often tended to create a sharp dichotomy between basic research and applied or action research and have allowed invidious distinctions to prejudice us against the latter, as if research motivated by pure intellectual curiosity were somehow more valuable to the community than that motivated by urgent problems that must be attacked or by desperate needs to allocate scarce resources more efficiently I think it clear from the foregoing that I, for one, reject the values implied in these traditional distinctions; indeed, I have found that research in health professions education is particularly challenging and stimulating for the educator precisely because there are urgent problems to be solved, there are decisions to be made and, fortunately, the professional ethic characteristic of the medical scientist leads the responsible policy maker in that area to ask for evidence and, by and large, to respond to the implications of the data supplied him

In this kaleidoscopic summary of the status of applied research on the goals of medical education, the characteristics of students, the efficacy of programs and the evaluation of professional competence, I have tried to suggest that we now have reliable techniques for collecting data and a wealth of specific findings to inform our decision-making. We are at the point where we can make rational educational choices based on the same scientific criteria that guide our clinical judgments. The means are at hand for us to adapt the methodology and collect the data relevant to the needs and conditions in our respective countries. It is my view that in this effort, research on the goals of medical education should be given the highest priority to assure that our decisions about the education and evaluation of our students are such as to meet the most urgent health care needs of our people

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