1973

Gov/ Position Papers #2

THE AMERICAN COLLEGE TESTING PROGRAM

October 18, 1973

Mr. James Angel
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Dear Jim:

I am pleased to transmit the enclosed report entitled, "A Plan for the Development of a Medical College Admissions Assessment Program" to the Association of American Medical Colleges.

Sincerely,

Leo A. Munday

Leo A. Munday, Vice President
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LAM/eb

Enclosure

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A PLAN FOR THE DEVELOPMENT OF A MEDICAL COLLEGE ADMISSIONS ASSESSMENT PROGRAM

by

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Presented by
THE AMERICAN COLLEGE TESTING PROGRAM

to

THE ASSOCIATION OF AMERICAN MEDICAL COLLEGES

October 1973

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ACKNOWLEDGMENTS

This report is the outgrowth of our interaction about MCAAP with innumerable people during 1973 and it would be impossible for us to identify the sources of all the ideas we report. However, several important acknowledgments can be made. First, of course, we are indebted to the AAMC staff, especially James Angel, James Erdmann, Ayres D'Costa, Davis Johnson, August Swanson, and Robert Thompson, whose ideas initiated this project and with whom we have worked closely throughout the year. Second, the MCAAP Regional Conferences yielded excellent and thoughtful discussions which certainly influenced much of our thinking and we are indebted to the excellent chairmen of those sessions who guided the discussions: Christine McGuire (Central), Carl Cochrane (Southern), Thomas Meikle (Northeastern), and Charles Spooner (Western).

Third, the regional conference participants who prepared summary papers for their regions provided a most valuable service--Woodrow Morris (Central), Richard Janeway and Carl Cochrane (Southern), Robert Blacklow (Northeastern), and Charles Spooner (Western)--as did all the contributors of individual or other group position papers. Next the members of the MCAAP National Task Force (listed in Appendix C) deserve our acknowledgment for their frank and useful discussions as especially do the Task Force Workshop Chairmen (Robert Blacklow, Nat Smith, Agnes Rezler, and Richard Janeway) and the National Task Force Chairman, Thomas Meikle, who worked so hard to see that we obtained the input needed.

Finally, we acknowledge the helpful suggestions of several consultants to ACT for this project, Leonard Feldt, Robert Glaser, Lyle Jones, Irene Klintberg, Jack Merwin, and Woodrow Morris, and several ACT staff members who provided assistance: Patricia Gartland, Gary Hanson, Philip Rever, and Cynthia Schmeiser.

With all this excellent help the report should have been an outstanding one. To the extent that it is not, we must accept the responsibility.

N. S. C.

R. L. F.

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CHAPTER 1

INTRODUCTION

The Medical College Admission Test (MCAT) is sponsored by the Association of American Medical Colleges (AAMC) and given on a national basis to students applying to most American medical schools. The present MCAT is the historical outgrowth of national medical admission tests in use since 1930 and has existed in its present form since 1962. In the decade since the last revision of the MCAT program, a number of changes have occurred in the American society and its educational systems. In this chapter we review those events which have provided the impetus for change from a test (MCAT) to a broadly conceived new Medical College Admission Assessment Program (MCAAP) and then discuss the events which have occurred in planning the future directions for MCAAP.

THE IMPETUS FOR CHANGE

The health care delivery system in America is in a period of great change. Impetus for the change is complex, coming from social demands and pressures as well as from responses to these demands by the government and the medical profession. The process of change itself depends upon an intricate set of feedback mechanisms, in which society, the profession, medical educators, medical students, and even undergraduate students and their teachers exert mutual influences on one another.

CHANGES IN HEALTH CARE NEEDS

Several factors have combined to effect major changes in society's expectations for health care delivery. Dramatic advances made by medical science in the prevention and cure of disease have increased the public's demands for expanded medical services. The growth of private insurance plans and the expansion of government insurance programs (Medicare and Medicaid) have made it economically feasible for ever increasing numbers of people to have access to quality health care. As a result, adequate medical attention is no longer regarded as a privilege for those who can afford it, but as a necessity and a right to which all Americans are entitled (Carnegie Commission, 1970; Coggeshall, 1965; Millis, 1971; Rutstein, 1967).

D. M. Fraser (1970) noted the important implications of this change in public attitudes:

> It is increasingly a matter of public philosophy in this country that every citizen has the right to adequate medical care. This position has strong political implications: when the individual's right to adequate medical care has been established, the effectiveness of the health-care-delivery system becomes a public, not a private, problem--and it becomes susceptible to public as well as private improvement. [p. 30]

Other factors have combined with this shift in the philosophy of health care rights to produce increased public scrutiny of the present health care delivery system. The consumer activism of the 1960's has extended into the area of health care, with the result that the public has begun to question apparent inefficiencies and high costs in the delivery of medical services. Inflation has contributed to an increase in medical costs and consequently to public displeasure with those higher costs.

This growth in public concern has brought about increased federal involvement in health care, for example, through passage of the $2.8 billion, 3-year Comprehensive Health Manpower Training Act of 1971. However, most of those involved in health care planning agree that the main impetus for reform must necessarily come from within the health professions themselves (Knowles, 1969; Richardson, 1972; Kennedy, 1972; Rogers, P. G., 1972; Rogers, D. E., 1971; MacLeod, 1968; Cooper, 1971; Bruhn, 1971.) As John Millis observed in 1971, the burden for reform rests primarily with medical educators:

> On the one hand, we have promised health services of quality to all our citizens. We have promised this as a basic right and have begun to work out a system to pay for it by both public and private arrangements. On the other hand, we have not educated and trained physicians, nurses, dentists, and all other health professionals in numbers and/or quality to deliver the services which we have now guaranteed to our people. [p. 6]

There are a number of problems in the present delivery of quality health care which have important implications for medical education. First, discussions of a doctor shortage are common. Although there is considerable debate about whether the shortage can be alleviated by redistribution and more efficient use of physician time or whether more physicians must be produced, the 1970 Carnegie Commission concluded, "There is no question, in our judgment, that an acute shortage exists" (p. 36). Further, the Commission recommended that the shortage be alleviated by drastically increasing the number of medical school entrants between 1970 and 1978. In a Joint AMA-AAMC Statement (1968) the two associations agreed on "the urgent and critical need for more physicians" and also recommended an increased medical school enrollment. Thus, the conclusion that a shortage of physicians exists directly influences decisions by the nation's medical colleges about the number of students they need to educate.

Although there is disagreement about the total number of physicians needed to provide the required health care services, there is little argument about the maldistribution of physicians. First, the geographic distribution of physicians does not adequately match the population distribution as can be seen from the state by state distribution of physicians given in Table 1.1. Although the overall rate is 171 physicians per 100,000 population, the 1970 figure varies from low rates of 68 physicians per 100,000 in Alaska and 83 in Mississippi to rates of 385 physicians per 100,000 in the District of Columbia and 238 in New York. In addition to a maldistribution among states, many writers have noted the within state maldistribution in urban low income neighborhoods and in rural areas (Carnegie Commission, 1970; Knowles, 1969; Cordtz, 1970).

Related to the problem of geographic distribution is the distribution of types of practice and medical specialties. In this case, however, there seems to be no generally available index of the types of patient needs by which to gauge an appropriate distribution of specialties. It is known that proportional distributions of types of practice are changing and, in particular, the proportion of physicians in general practice has been declining in recent years as more and more physicians specialize (U. S. Bureau of the Census, 1972). The family practice specialty represents an effort to provide more primary

TABLE 1.1

1970 DISTRIBUTION OF PHYSICIANS BY STATE[1]

State	Number of Physicians[2]	Rate Per 100,000 Population	State	Number of Physicians	Rate Per 100,000 Population
Ala	3,065	89	Mont	762	109
Alaska	207	68	Nebr	1,758	118
Ariz	2,818	157	Nev	578	117
Ark	1,789	93	N. H.	1,060	143
Calif	38,451	192	N. J.	11,033	153
Colo	4,131	186	N. Mex	1,255	123
Conn	5,853	193	N. Y.	43,539	238
Del	771	140	N. C.	5,556	109
D. C.	2,899	385	N. Dak	590	95
Fla	11,043	161	Ohio	15,184	142
Ga	4,959	108	Okla	3,018	117
Hawaii	1,170	151	Oreg	3,190	152
Idaho	708	99	Pa	19,441	165
Ill	15,643	140	R. I.	1,549	163
Ind	5,472	105	S. C.	2,355	91
Iowa	3,323	117	S. Dak	571	86
Kans	2,798	124	Tenn	4,724	120
Ky	3,300	102	Tex	13,788	123
La	4,335	119	Utah	1,481	139
Maine	1,304	131	Vt	877	196
Md	7,128	181	Va	5,622	121
Mass	12,009	211	Wash	5,195	152
Mich	13,084	147	W. Va	1,937	111
Minn	5,819	152	Wis	5,501	124
Miss	1,850	83	Wyo	346	104
Mo	7,149	152			

[1] Source of data is U. S. Bureau of the Census, 1972.

[2] Doctors of medicine and doctors of osteopathy.

care physicians since this is the type of care most in demand in geographic regions which presently are not well served.

Also related to physician maldistribution is the representation of racial-ethnic minorities among practicing physicians. For example, although 11% of the nation's population is black, only 2% of American physicians are black (Haynes, 1969). However, the increase in the percentage of first year black medical students from 2.7% in 1968 (AAMC, 1970) to 7.1% in 1972 (Datagram, 1973) gives some evidence of improvement. There are similar deficiencies in the numbers of Mexican-American or other Spanish-speaking physicians and also in the number of American Indian physicians. Two rationales are typically used to support the inclusion of more minority students in medical schools. First, many patients (the consumers of health care) may prefer a physician from their own ethnic group or, at least, communication between patient and physician may be expedited by ethnic similarities. Second is the concern with equity in medical admissions and with opening the medical profession to groups which have historically been largely excluded. These factors support the need for including more members of racial-ethnic minority groups in medical education--a need to which medical education appears already to be responding.

Another special group--women--has also received new attention in recent years. Although women comprise over one-half the national population, in the late sixties they accounted for only about 6% of all physicians and surgeons and only about 8% of all medical students (Carnegie Commission, 1970). However, the number of women applicants to medical school has been steadily increasing in recent years and the proportion of women entering medical school has steadily increased from 9.1% in 1969 to 16.8% in 1972 (Datagram, 1973 No. 3). The fact that women applicants are well qualified suggests that this maldistribution will be one of the easiest to correct (Datagram, 1973, No. 7).

In summary then, there are obvious differences of opinion over the dimensions of, and the specific strategies to be followed in solving America's health care delivery problems. Yet, a comment by P. R. Lee (1970) in a paper presented at the AAMC Workshop on the Medical School Curriculum in September, 1968, probably represents the general spirit within which current programs of review and revision are being undertaken:

> We cannot radically change and perfect overnight a part of our social framework that has been functioning more or less statically for over a century. But we are on the path toward prompt and orderly change in the health care delivery system. The major obstacle, inertia, has been overcome. Nothing could be more evident than the need for change, and that the need is recognized by all of us, regardless of our personal conviction or professional commitment.
>
> No one holds a master blueprint for reconstruction or modernization of the health care delivery system, but each of us is being called on to help trace that plan, to build from it, and to make it work.
>
> This is the greatest challenge American medicine faces today. [pp. 67-68]

CHANGES IN MEDICAL SCHOOLS

The social responsibility of the medical school has been the subject of much discussion and controversy (MacLeod, 1968; Freidin, et al, 1972; Lee, 1970). At one end of the continuum of viewpoints, recommendations included viewing the medical school--and all professional schools within the university--

in the role of "advocate" for the needs of society (Brewster, 1970) and actually teaching students to be agents of social change (Dixon, 1965). While more conservative viewpoints accept only the social responsibility of medical schools to produce competent and qualified physicians, many efforts have already been made by the medical profession to respond to social needs and demands as summarized by John Knowles (1969) and John A. D. Cooper (1973).

Whatever its exact dimensions, an enlarged involvement of the medical school in the overall health care delivery system is increasingly being viewed as both an ethical and pragmatic imperative (Cooper, 1971; Bruhn, 1971). In addition to enlarging enrollments and developing new medical schools, medical educators have responded to changing needs by instituting such curricular reforms as accelerated and integrated programs, advanced standing admissions, multiple tracking, and core curricula (Littlemeyer, 1968; Matlack, 1972; Hubbard et al, 1970). Specific courses in such diverse areas as the behavioral sciences, medical ethics and social issues in health care (Thurnblad & McCurdy, 1967; Veatch & Gaylin, 1972; Bryant & Cotton, 1972) have also been developed. In addition, curriculum has been increasingly influenced by emphases on continuing evaluation (NBME, 1973) and concern with the desired end-product of medical education--competent physicians who will continue to educate themselves in the rapidly changing technical advances in medicine and who will best serve society's needs (Kane, Woolley, & Kane, 1973; McKee, 1970).

CHANGES IN MEDICAL SCHOOL APPLICANTS

Students are applying to medical schools in ever increasing numbers. Although the number of places in medical schools is also increasing, applications have increased much more rapidly than enrollments. This trend is easily seen from Table 1.2. One result of the oversupply of applicants is that medical admissions has become an intensely competitive process which puts a great administrative burden on medical schools and a great personal burden on applicants. This intensity brings pressure for change--change in the information on which medical schools base decisions to insure that they are equitable and reasonable, and change in the information students receive about the admissions process so they can realistically evaluate their chances for admissions and consider other options. The trend of increased applications has resulted in increasing numbers of rejected applicants. Thus, assisting this latter group of students to find other suitable careers is becoming an important concern.

Another effect of the increased competition in admissions is the outstanding qualifications of accepted applicants. The typical accepted applicant presents impressive academic credentials (Matarazzo & Goldstein, 1972) and frequently has completed sophisticated training in chemistry (Nachtrieb, 1969), biology (Hanson, 1969), and other science areas (Geballe, 1969; Herron, 1969). In a series of studies on the relationship of changes in undergraduate education to medical education concerns, Funkenstein (1966, 1968) notes that today's medical school applicant has had demanding undergraduate training and more opportunities for independent and individualized study than ever before. In addition he is likely to be even more competent, serious and generally aware, and also more committed to social concerns, than his earlier counterparts. His conclusion that these changes in the types of incoming medical students call for concurrent changes in medical schools and medical admissions is shared by others.

TABLE 1.2

CHANGES IN MEDICAL SCHOOL APPLICANTS AND ENROLLMENTS 1962-1971

Academic Year	Number of Medical Schools	First Year Enrollments	Number of Applicants
1962-63	86	8,642	15,847
1963-64	86	8,842	17,668
1964-65	87	8,836	19,168
1965-66	87	8,760	18,703
1966-67	89	8,991	18,250
1967-68	94	9,473	18,724
1968-69	99	9,863	21,118
1969-70	101	10,422	24,465
1970-71	102	11,348	24,987
1971-72	108	12,361	29,172

Sources: Stritter et al, 1971; Datagram, 1973 (No. 3 and No. 4)

The increasing enrollment of racial-ethnic minority students has also been an influence for change within the medical schools. The commitment to enroll such students has brought about changes in medical college admissions procedures and the special problems and needs of these students are beginning to exert an influence on the traditional medical education process (Curtis, 1971; Nelson, et al, 1970; Hutchins, et al, 1967; Bowers, 1968; Nadelson & Notman, 1972).

THE EFFECT OF CHANGES ON MEDICAL SCHOOL ADMISSIONS

As the health needs of the society change, pressure is put on the medical college to assist in meeting those needs through its educational program. At the same time the applicant pool from which the college selects future physicians is changing, and medical students, once in medical schools, exert pressures on the schools to adapt to their characteristics and needs. Throughout these changes, medical colleges continue to carry the burden of insuring that their policies and programs produce well-trained and competent physicians.

A central focus of these multiple forces on medical colleges is the admissions process. In admitting students to its program, a medical college takes its first active step in defining what types of physicians it wishes to produce. Thus the various changes in the last decade in social needs, students, and the medical colleges themselves, have produced impetus for changes in the admissions process. That impetus is reflected in the wide consensus about the need for change from the present MCAT to a new, better, and more inclusive source of information: a Medical College Admissions Assessment Program (MCAAP).

The basic goal of the MCAT has been to provide information to medical colleges about the academic preparation and capabilities of students to meet the rigorous science requirements of the early years of medical school. The original goal was to reduce attrition, particularly in the first two years of medical school, and MCAT information was used to supplement and evaluate information from the undergraduate academic record. With changes in health care needs, changes in medical colleges, and changes in students, a number of concerns have been expressed about the adequacy of the MCAT for the admissions decisions with which medical colleges are now confronted.

One of the concerns is that the MCAT is too narrowly academic to meet present needs (Erdmann, et al, 1971; Hunka, et al, 1966; Wing, 1969; Gough, 1967; Coombs & Vincent, 1971). With the large applicant pool, the availability of academically qualified students is at an all time high. At more medical schools than ever before, admissions decisions can be and are based on a variety of other characteristics important to future physicians. Selection primarily on the basis of academic aptitude quickly reaches a point of diminishing returns when the applicant pool includes large numbers of academically well-qualified applicants, and fine distinctions at the top of the distribution of MCAT scores, for example, are not particularly helpful.

A second concern is that the short-range focus of the MCAT on the medical basic sciences curriculum is inadequate. Physician performance in clinical practice is an outcome of medical education of great importance and the later years of medical school more closely parallel physician clinical practice than the first two years. Admissions committees would therefore like to have information about applicants more relevant to clinical performance. Moves in this direction could include cognitive information more relevant to clinical practice along with other types of information oriented to the same goal.

Other concerns are that admissions information should reflect the most up-to-date assessment technology and should be equitable to all candidates and that better information should be provided to student applicants and their undergraduate advisors to assist students in the important decisions about careers and about medical school applications which they face during their undergraduate years. All these concerns have led to a process of change which has been underway for several years and which has been advanced in 1973 by the identification of specific directions for a new Medical College Admissions Assessment Program (MCAAP).

PLANNING A MEDICAL COLLEGE ADMISSIONS ASSESSMENT PROGRAM

The AAMC has for some time been concerned about directions for needed change in the MCAT. Many of the issues and problems were summarized in the paper, "The Medical College Admission Test: Past, Present, and Future" (Erdmann et al, 1971). In the spring of 1972, the AAMC sponsored a conference on the topic of changes in MCAT which yielded many valuable ideas. A formal commitment to MCAT revision was accomplished in the fall of 1972 with the addition of a program director for MCAAP within AAMC's Division of Educational Measurement and Research. The title, Medical College Admissions Assessment Program, represented a reaction to input received to date concerning the need for a broadened program of assessment and related services rather than just a revised test. The subsequent year of discussion and constituency input has confirmed the wisdom of that decision.

CONSTITUENCY INVOLVEMENT

In the late winter, 1973, two major activities were begun on behalf of MCAAP. First, a large scale information collection campaign was begun, and second a contract was let to The American College Testing Program (ACT) for professional assistance in the development of long-range plans for MCAAP. Throughout the spring and summer of 1973, staff of AAMC and ACT attended meetings and conferences of the many groups who are concerned with medical admissions (Council of Deans [COD], Group on Student Affairs [GSA], Group on Medical Education [GME], Association of Advisors in the Health Professions [AAHP], Organization of Student Representation [OSR], Group on Minority Affairs [GMA], and Committee on Measurement of Personality [COMP]). Programs about MCAAP were presented in order to collect ideas about what, if anything, is wrong with MCAT, how it should be changed, and what areas other than those presently tested should be assessed. (See Appendix A for a list of all regular spring meetings attended by AAMC, ACT, or both.)

Following the regularly scheduled spring 1973, regional meetings and other special meetings, in June and July AAMC organized a series of four regional conferences, one each for the Northeast, Southern, Central, and Western regions. These conferences included regional chairmen and representatives from COD, GSA, GME, AAHP, and OSR along with COMP and GMA ex-officio representatives. (See Appendix B for a list of persons attending each regional conference.) The purpose of these meetings was to begin a clearer formulation of the directions for MCAAP development. Each representative submitted a position paper from his or her organization and after each two-day meeting a summary position paper for the region was prepared. (The collection of these position papers is available from AAMC on request.)

The culmination of the planning process came in the form of a MCAAP National Task Force Meeting on September 26-28, 1973. (Members of the National Task Force are given in Appendix C.) From that meeting came a set of recommendations and guidelines for MCAAP development. (The report of the National Task Force is available from AAMC on request.)

THE ROLE OF THIS REPORT

This report represents the final step in the preliminary planning process. Its purpose is to give form, substance, procedural detail, and time schedules to the recommendations and concerns of various potential MCAAP users, especially as expressed through the MCAAP National Task Force. Because the report goes beyond specific constituent reactions, it should be considered a combination of our interpretation of constituent concerns and our professional judgment about implementation of a broad assessment program. While we believe the report faithfully represents the major thrust of opinions about the needs MCAAP must meet, opinion was diverse and the plan presented here will undoubtedly satisfy no one point of view in every detail. Finally, it must be noted that this plan is, in the end, but one more recommendation for MCAAP--in this case the recommendation of educational researchers and measurement specialists designated to study, along with AAMC staff and report to them, the form MCAAP should take. This report is ACT's recommendations about

MCAAP to AAMC and to the constituents involved in this planning process and does not represent final AAMC decisions or policy.

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CHAPTER 2

THE ROLE OF MCAAP IN THE MEDICAL EDUCATION PROCESS

Throughout the series of 1973 meetings in which MCAAP was discussed, a number of similar viewpoints about the role of MCAAP in the medical education process repeatedly emerged. Those views, as we interpret and consolidate them, provide the background and framework for specific recommendations and are discussed here as an introduction to more detailed individual features of MCAAP.

MCAAP CONSTITUENCIES

The institutions which provide medical education in this country are medical colleges. As such, the primary direct burden of medical education lies with them. These institutions, which exercise considerable individuality of goals and methods, are loosely bound together in the Association of American Medical Colleges for the purpose of accomplishing jointly some activities which cannot be accomplished individually. One major area of joint activity lies in the provision of assessment information and services for use as each institution chooses in the admissions process. Thus, the obvious primary constituent of such an assessment program is the medical college, and many of the services related to MCAAP are directed to that constituent.

However, admissions decisions and the assessment data which are used in those decisions involve other parties in addition to medical colleges. While an AAMC-sponsored MCAAP has a direct governance link to medical colleges, it seemed to be commonly accepted throughout the planning process that MCAAP has other constituencies as well. The broad interpretation of MCAAP constituencies represents both an acceptance of responsibility to parties on whom MCAAP has an effect and also a pragmatic concern that ignoring other constituencies could have an indirect negative effect on medical colleges. Other constituencies recognized, even in the planning process itself, included students (pre-medical and medical), undergraduate college advisors, and the general public (and special interest groups within it such as racial-ethnic minorities).

The specification of constituencies is a very important one because of the different views of the admissions process, in particular, and the medical education process, in general, which each constituency brings. Throughout this report we have considered the role of MCAAP in relation to the four major constituency groups described here: students, undergraduate advisors, medical colleges, and the general public. In doing so, we are often required to bring four distinct viewpoints to bear on MCAAP and its role in the medical education process. While the medical college and its admissions decisions remain the central focus, the broad MCAAP proposed here includes important services related to the role of other constituencies in the medical education process as well.

SEQUENCE OF EVENTS IN THE MEDICAL EDUCATION PROCESS

From a broad perspective, the medical education process may be viewed as a sequence of events beginning with a student's early considerations of a medical career (perhaps in high school) and continuing through college, medical school, postgraduate training, and finally into some area of the medical profession. Throughout that process a number of events occur and different parties participate in different ways and to different degrees in those events. In Table 2.1 seven steps in this time sequence are identified and the role of each of four participants in each step is briefly described.

One participant, the individual student-physician, is directly involved in all seven steps from early career considerations through an actual career in the medical profession. The undergraduate pre-medical advisors have a direct role only in steps 2 and 3 but have general interest and concern in the entire process. Medical colleges have their most direct role in admissions and training (steps 3-6) but interest, concern, and some involvement with the other steps as well. Finally, the general public enjoys or suffers the outcomes of the medical education process by having or not having a good physician available to provide the health care needed. Because of that direct involvement, public concerns also span the medical education process.

MAJOR STAGES OF MCAAP INVOLVEMENT

Within the broad medical education process outlined in Table 2.1, judgments must be made as to which activities and events are related to and can be served by information and services of a Medical College Admissions Assessment Program. These judgments essentially represent a definition of MCAAP objectives. We believe that, through the planning process which AAMC has conducted, considerable consensus has been achieved on a number of objectives for MCAAP. Here we tie those consensus objectives to activities at three major stages in the medical education process as shown in Table 2.2.

TABLE 21

SEQUENCE OF EVENTS IN THE MEDICAL EDUCATION PROCESS

	HIGH SCHOOL	UNDERGRADUATE COLLEGE		MEDICAL COLLEGE		INTERNSHIP, RESIDENCY	MEDICAL PROFESSION
	1	2	3	4	5	6	7
STUDENT-PHYSICIAN ROLE	DECIDE WHAT CAREER Decide What College	DECIDE WHAT CAREER DECIDE WHAT COURSES	DECIDE WHETHER TO APPLY MED SCHOOL DECIDE TO WHICH ONES TO APPLY DECIDE WHICH TO ATTEND IF ACCEPTED DECIDE WHAT TO DO IF NOT ACCEPTED	Decide Further about What Medical Career Role to Pursue Decide What Courses to Take Consistent with Preparation and Goals	Decide Further about What Medical Career Role to Pursue Decide Whether to Pursue Further Study and of What Type Choose a Hospital	Decide Further about What Medical Career Decide What Type of Practice or Role to Pursue Decide Where to Begin Career	Decide about Continuing Education PHYSICIANS HAVE THE CONCERN THAT THE OUTCOMES OF THE MEDICAL EDUCATION PROCESS BE PERSONAL SATISFACTION IN A MEDICAL CAREER, PROFESSIONAL COMPETENCE AND ASSISTANCE IN MEETING THE SOCIETY'S HEALTH CARE NEEDS
ADVISOR ROLE	General Concern that Students with Promise for Medicine Consider a Medical Career	ASSIST STUDENTS IN CAREER DECISIONS ASSIST STUDENT IN COURSE DECISIONS	ASSIST STUDENT IN MEDICAL APPLICATION DECISIONS DECIDE HOW HIGHLY TO RECOMMEND STUDENT	Advisors Have a General Concern with Student Success in Medical School	Advisors Have General Concern with Student Success in Medical School	Advisors Have a General Concern with Student Success in Medical School	ADVISORS HAVE THE CONCERN THAT THE OUTCOMES OF THE MEDICAL EDUCATION PROCESS BE PHYSICIANS WHO CAN PROVIDE NEEDED HEALTH CARE WITH PROFESSIONAL COMPETENCE AND PERSONAL SATISFACTION
MEDICAL COLLEGE ROLE	Medical Educators Have a General Concern that Students with Promise for Medicine Consider a Medical Career	PROVIDE MEDICAL CAREER INFORMATION Medical Educators Have a General Concern that Students with Promise for Medicine Consider a Medical Career	PROVIDE INFORMATION ABOUT THE ADMISSIONS PROCESS RECEIVE APPLICATIONS AND RECOMMENDATIONS INTERVIEW APPLICANTS DECIDE WHETHER TO ACCEPT OR REJECT	Teach Basic Sciences EVALUATE STUDENTS (INTERMEDIATE OUTCOMES)	Teach Clerkships EVALUATE STUDENTS (INTERMEDIATE OUTCOMES) Award Degree	Supervise Interns Residents EVALUATE INTERNS-RESIDENTS (INTERMEDIATE OUTCOMES) FOLLOW UP GRADUATES Award Certification	FOLLOW UP GRADUATES Provide Continuing Education MEDICAL EDUCATORS HAVE THE CONCERN THAT THE OUTCOMES OF THE MEDICAL EDUCATION PROCESS BE PROFESSIONALLY COMPETENT PHYSICIANS WHO WILL MEET THE NATION'S HEALTH CARE NEEDS
PUBLIC ROLE	The Public Has a General Concern that Students with Promise for Medicine Consider a Medical Career	The Public Has a General Concern that Students with Promise for Medicine Consider a Medical Career	The Public Has a General Concern with Who is Admitted to Medical Schools	The Public Has a General Concern that Students Learn Requisite Sciences	The Public Has a General Concern that Students Learn Medical Practice and Be Appropriately Certified	The Public Has a General Concern that Students Learn Medical Specialties and Be Appropriately Certified	THE PUBLIC HAS THE CONCERN THAT THE OUTCOMES OF THE MEDICAL EDUCATION PROCESS BE PHYSICIANS WHO CAN PROVIDE NEEDED HEALTH CARE WITH PROFESSIONAL COMPETENCE

Table 2.2

RELATION OF MCAAP OBJECTIVES TO THREE MAJOR STAGES OF THE MEDICAL EDUCATION PROCESS

STAGES	1. CAREER DECISIONS	2. ADMISSIONS	3. EVALUATION OF OUTCOMES
STEPS IN TABLE 2.1	1, 2	3	4-7
MCAAP ROLE	CAREER GUIDANCE MATERIALS	ADMISSIONS ASSESSMENT AND SUPPORTING SERVICES	RESEARCH
MCAAP OBJECTIVES	To provide information to STUDENTS AND HEALTH ADVISORS to assist in the early career planning of students.	To provide MEDICAL COLLEGES with better and broader information about students to assist the schools in admission decisions. To provide STUDENTS and HEALTH ADVISORS better information about students and about medical colleges to assist in decisions related to admissions.	To perform research on the evaluation of intermediate and long-range outcomes to the extent necessary for the improvement, expansion, and validation of admissions data as well as for feedback of career information for use in career guidance materials.

While admissions has been the scle realm of involvement of the present MCAT, it should be noted in Table 2.2 that MCAAP objectives relate to other stages as well. Although admissions remains the central focus, throughout the planning process various constituencies have emphasized the need for MCAAP involvement in early career decisions and the evaluation of outcomes because of the intricate relation of those stages to the admissions process.

STAGE 1: CAREER DECISIONS

The medical college admissions process is greatly influenced by the type and number of students who apply. As the number of applications becomes unmanageable there is the need for some students to "select themselves out" of the medical education process prior to application time. At the same time other admissions goals suggest the need for greater representation of certain types of students in the applicant pool. Steps 1 and 2 of Table 2.1 involve several types of decisions by students (often with assistance from their undergraduate advisors) which directly relate to whether they will eventually apply to and be qualified for medical school. Better career guidance at these steps could serve not only the students making these early decisions but also medical schools. Throughout the 1973 meetings on MCAAP planning, there has been wide concern that MCAAP provide better services to students in making these early career decisions. Thus one objective of the new program of services called MCAAP can be stated as follows:

> Objective 1. MCAAP should provide information to undergraduate students and their advisors to assist in students' early career planning.

STAGE 2: ADMISSIONS

Step 3 in Table 2.1 shows a number of activities of students, health advisors, and medical schools related to medical school admissions. The capitalized activities include decisions by students and decisions by medical schools in which broad consensus has existed for an MCAAP role. Again these activities imply basic objectives for the new MCAAP.

> Objective 2. MCAAP should provide undergraduate students and their advisors with better information about the students themselves and about medical schools to assist them in decisions related to applications and admissions.
>
> Objective 3. MCAAP should provide medical schools with better and broader information about students to assist the schools in admissions decisions. Such information should include:
> a. cognitive tests better oriented to the requirements of the medical basic sciences curriculum,
> b. measures related to physician clinical performance, and,
> c. measures related to other valued long-term physician outcomes.

STAGE 3: EVALUATION OF OUTCOMES

Steps 4 through 7 in Table 2.1 involves the education, evaluation, and long-term outcomes of students and physicians. Throughout the process of MCAAP planning, wide concern has been expressed about the need for better evaluation of outcomes (intermediate and long-range) in order to improve and evaluate admissions information. Students are admitted to medical colleges because they are expected to provide some valuable outcomes such as being good physicians and helping to meet the public's health care needs. The definition of those outcomes has direct implications for the types of information used in admissions decisions. For example, physicians need to know a great deal about science and, therefore, science is a crucial part of the medical curriculum. Science achievement then becomes an important intermediate criterion against which an admissions assessment would, in part, be directed and validated. Definition of desirable outcomes is necessary to establish long-range or intermediate criteria against which to evaluate, analyze, and improve all admissions information. Admissions information is useful only to the degree to which it relates to outcomes at several intermediate stages of study and ultimate stages as a physician. The concern with outcomes also implies an objective for the new MCAAP.

> Objective 4. MCAAP should support research on the evaluation of intermediate and long-range outcomes of medical education to the extent necessary for the improvement, expansion, and validation of admissions data as well as for feedback of career information for use in career guidance materials.

A FRAMEWORK COORDINATING MAJOR MCAAP STAGES

In examining the roles of the major constituencies of the medical education process three primary considerations in the stages of career decisions, admissions, and evaluation of outcomes can be identified. The first are the personal considerations of the student-physician which are guided largely by concerns such as "What is best for me?" and "What do I want to do now?" While many nonpersonal factors impinge upon these considerations, the role of the student-physician reminds us of the personal concerns of individuals intimately involved in the entire medical education process. The role of the advisor in part parallels these personal concerns as the advisor assists students in making decisions to fulfill personal goals.

The medical college role suggests other considerations of central importance to MCAAP, namely professional considerations. The primary role of medical colleges has traditionally been to produce professionally competent physicians. While medical educators must confront personal considerations and other forces, it seems clear to us that the professional performance of the student-physician remains the central concern. When advisors assume the task of evaluating students for medical colleges, they, too, adopt the professional concerns of the medical colleges for competent and ethical physicians.

Finally the role of the public suggests a third type of considerations. These are the considerations of public health care needs. These public considerations encompass the professional considerations of physician competence but add the dimension of availability of care to meet public needs.

Thus, these three considerations, personal, professional, and public, enter at each of the stages given in Table 2.2. Just as the outcomes of medical education can be classified into the three categories, so can admissions considerations in Stage 2, and career guidance considerations in Stage 1.

Figure 2.1 presents a graphic representation of these three types of considerations illustrating how the narrowest personal considerations are subsumed by the broader professional considerations and both are in turn encompassed by the very broad public concerns. At each stage, the student-physician may be conceived as standing within the personal considerations looking outward on the professional and public considerations as he or she makes career decisions, medical school decisions, specialty decisions, and the like. The medical school perspective lies within the middle ring of

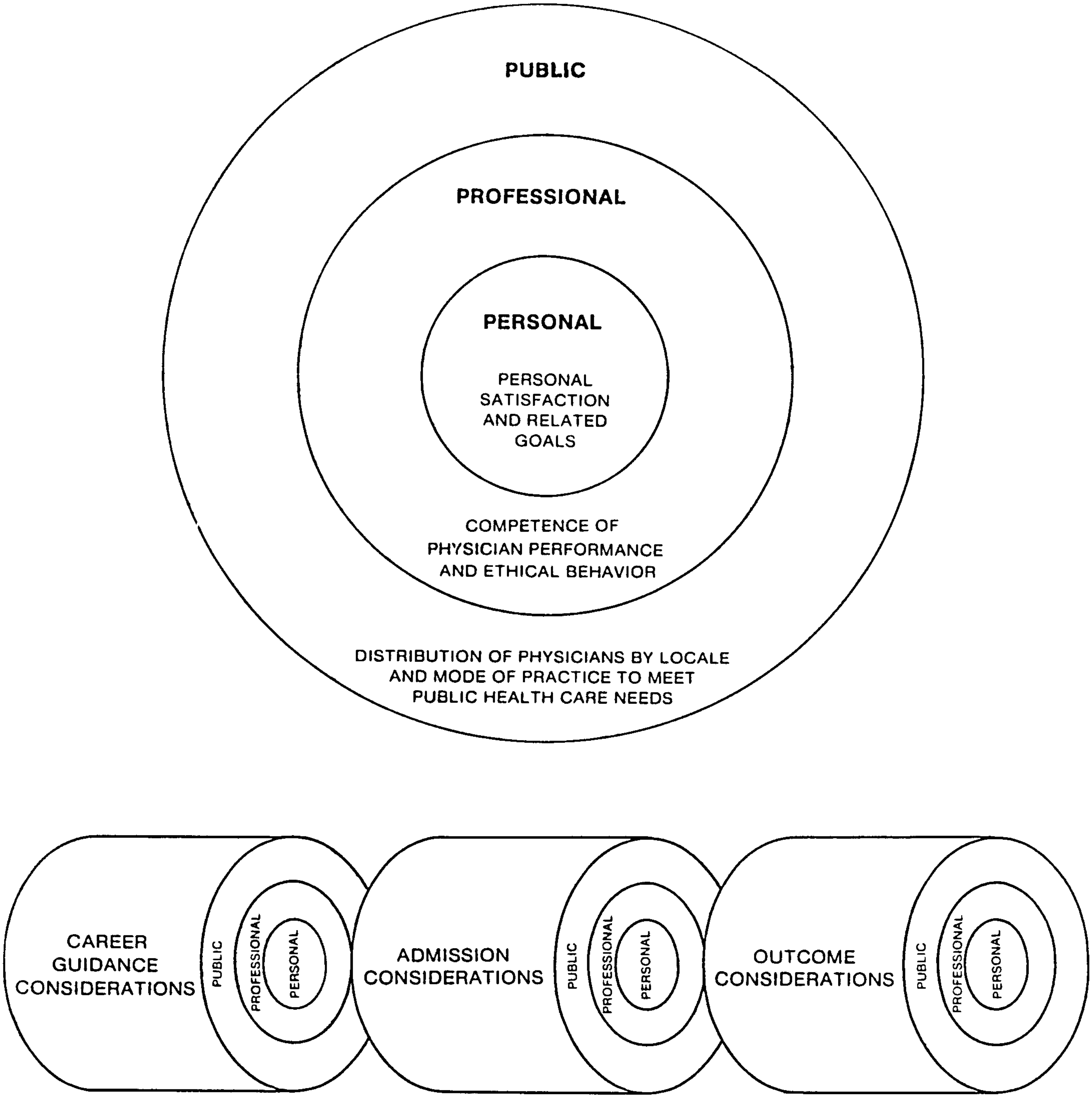


Fig. 2.1. Levels of considerations in the stages of the medical education process

professional considerations from which the public and personal considerations are viewed. From the vantage point of the outer ring, the general public considers how health care needs are being met globally at each of the stages, how professional competence is being insured, and how personal goals are being met.

The possible value of such a framework is primarily in identifying viewpoints and priorities. For example, in career guidance the principal object is the student and much of a student's thinking will revolve about personal considerations. Consequently, career guidance materials must help a student bring those personal considerations into clear focus while also informing and stimulating thought about professional considerations (not just "Do I want to be a physician?" but also "Can I become a good physician?") and public considerations ("Will I be able to contribute to meeting health care needs?").

At the stage of admissions, the framework focuses on the medical college and professional considerations ("Will this student be a good physician?"). At the same time, the framework brings into focus the role of concerns which some medical schools may also have in admitting students to help meet certain public needs for diversity in physician mode and locale of practice or in physician background, for example. Similarly, admission concerns of "Would this person be happy here and fit well in our program?" fall into personal considerations.

In the evaluation of outcomes stage, personal, professional, and public levels are all important. Commonly, most intermediate outcomes focus on professional considerations. However, the sequential tie to ultimate outcomes helps to keep evaluation tied to ultimate goals. For example, the ultimate goal is not to produce a physician who can pass a first year basic science course. That intermediate outcome is important only as it relates to a longer range outcome of a physician with sufficient scientific knowledge to perform satisfactorily in whatever medical role he or she is engaged. Similarly, intermediate outcomes become suitable criteria for validation of assessment variables only to the extent that they are linked to ultimate outcomes. The framework of levels of considerations again applies when, for example, an institution makes a special effort to provide diverse role models (other than medical educators and medical researchers) for its students and evaluates that program in terms of the medical roles its students come to prefer. This represents an evaluation using public considerations. Evaluating student satisfactions and dissatisfactions with a program in order to adapt and improve it brings evaluation to the personal level.

In its broadest form, the desirable outcomes of medical education are physicians who can meet the nation's health care needs with professionally competent and ethical behavior and with personal satisfaction. Within that broad statement and within the public-professional-personal framework there are many different values, viewpoints, and priorities. The purpose of the framework is not to establish one value system, one viewpoint, or one system of priorities but to provide a system within which each participant can evaluate, examine, and determine his or her own values, views, and priorities. Thus, a framework of three levels of consideration in medical education outcomes, admissions, and guidance is presented only to indicate the continuing link from Stage 1 (guidance) to Stage 3 (outcomes) and the different perspectives which the various participants in the medical education process bring to the various stages.

OVERVIEW OF THIS REPORT

The remaining chapters of this report are implementations of the ideas and objectives for MCAAP presented in this chapter.

ORGANIZATION

The report is organized around the three stages of the medical education process to which MCAAP is related: early career decisions, admissions, and evaluation of outcomes. Within each stage, recommendations are made for specific MCAAP activities over the next several years. Each chapter includes recommendations, rationale for recommendations, specifications and development plans, and time schedules for implementation.

DEFINITION OF TERMS

Throughout the report we use the term MCAAP to refer to the broad program of assessment and services at each of the three stages of the medical education process. At the stage of early career decisions we speak of MCAAP services to undergraduate students and advisors. At the admissions stage we speak of the MCAAP Applicant Assessment, which includes the whole range of student data collected for admissions decisions (tests, personal data, letters of evaluation, college transcripts, etc.), and MCAAP services to students, advisors, and medical colleges. At the stage of the evaluation of outcomes, we refer to MCAAP research and services.

INVOLVING THE MCAAP CONSTITUENCY

A broad view of the constituency of MCAAP has been presented in this chapter. This view has already been implemented by AAMC in the MCAAP planning process throughout 1973 in which students, health profession advisors, medical colleges, and other interested groups have been represented. It is ACT's view that this involvement has been invaluable in defining directions for MCAAP to meet the needs of its constituency. Furthermore, we believe that close constituency involvement in the implementation of plans for MCAAP is crucial to the creation of the best possible program as well as to its wide acceptance and use.

As we have laid plans for the implementation of this new program, we have made some assumptions about the types of constituency involvement to illustrate where input is most crucial and how it fits into time and task schedules. National Task Force discussions included references to many constituency committees or action groups. It was our feeling that a proliferation of formal committees would be unmanageable in the practical steps of implementing a program. Therefore we have assumed the existence of an MCAAP Board to work with AAMC in the implementation of MCAAP plans and three standing committees of the Board to provide more specialized input. The three committees generally correspond to the three major stages of MCAAP activities and are referred to in this report as (1) the MCAAP Committee on Career Guidance Materials, (2) the MCAAP Committee on Applicant Assessment, and (3) the MCAAP Committee on Medical Education Outcomes.

There are a large number of points in implementation of various MCAAP components at which even more specialized constituency input is important as a source of information both for the developer of the components and for the formal constituency representatives (the Board and the Committees). At those points we have treated this additional constituency input as consultants to AAMC or the developer identified with the assistance and consent of AAMC and the Board (or its Committees) where appropriate.

The result of these assumptions is to show within our recommended development plans the major points in implementations at which various types of constituency involvement is crucial. We believe considerable involvement is in the spirit of the new MCAAP program and essential to the implementation of the best possible program and its wide acceptance and use by all its constituencies.

TIME SCHEDULES FOR RECOMMENDATIONS

Central to all the recommendations is a time schedule for implementation. After considering the various development tasks involved, ACT recommends that the first generation program include Stage 1 career guidance materials to be introduced in the fall of 1975, new Stage 2 admissions assessments including new cognitive tests and other information to be introduced in the late spring of 1976, and a Stage 3 research plan for studying intermediate and ultimate outcomes of medical education and relating them to admissions variables. It is not expected that all activities ultimately desirable for MCAAP can be prepared by the spring of 1976 for national use. Consequently, the focus and purpose of the ongoing research in Stage 3 is the refinement, revision, improvement, and new development of materials and assessment variables for later inclusion in MCAAP Stages 1 and 2.

CHAPTER 3

RECOMMENDATIONS FOR MCAAP AT STAGE 1: CAREER DECISIONS

Students are forced to make a variety of decisions late in high school and early in their college years which open some career options and close others. Preliminary career decisions at Step 1 of the medical education process are described in Table 2.1. These include decisions having to do with the selection of an undergraduate college and a major field of study. Once in college, these preliminary decisions must be further solidified as actual courses are selected and majors are chosen (Step 2 of Table 2.1). These two steps form Stage 1: Career Decisions (Table 2.2) of the medical education process.

All the participants in the medical education process, from the students through the general public, benefit when these early career decisions are rational and wise. However, the sources of information about careers available to students are usually informal and incomplete. More and better information should be available to students about the many different physician career roles (and other health careers), the potential pleasant and unpleasant aspects of these roles, and their demands and requirements. Some medical schools have taken action to try to bridge this information gap. For example, Toole et al. (1970) described an ambitious 6-week summer program of classroom instruction and practical experience at Bowman Gray School of Medicine designed to give high school seniors and college freshmen and sophomores "insight into what a career in one of the health professions [the neurosciences] entails ... so that they could make career choices based on experience rather than hearsay" [p. 420]. While such programs are never likely to be available to all potential medical students, much more information than is now available needs to be provided not only about careers as physicians but also about the growing range of occupations in allied health care fields.

Informed career decisions not only require external information about careers but also information about oneself. Thus, self-evaluation information may be of help to students who are making career decisions. However, even in this area students need information and assistance. Students have a variety of questions of the sort: What characteristics are most important for a particular career? What are my strengths and weaknesses? For wise career decisions it might prove helpful for students to systematically evaluate themselves, their desires, values, interests, and abilities, and make judgments about how these characteristics might relate to a successful and happy involvement in a career in medicine.

Finally, students need a great deal of practical information about the steps and hurdles involved in becoming a physician and how those steps affect decisions about college courses and other activities. What are medical school requirements? When and how do I apply? What is the MCAAP? When are admissions decisions made? What is the total medical education sequence?

While students usually seek career information from many informal sources, their undergraduate advisors are one of the most useful and easily available resources. These advisors are an important link between medical colleges and students and have a crucial role to play in providing information and assistance in this early career guidance stage.

Medical schools have an important stake in the career decisions students make early in their college careers because these decisions determine the applicant pool from which future physicians will be selected. This "self selection" predetermines some parameters of the medical college selection. Presently, the number of applicants to medical school is steadily increasing as is the number of rejected applicants. More and better information for career decisions might steer some unqualified applicants away from the application process. Also, it could help qualified students consider alternative career options which can be pursued in the event that their applications to medical schools are not accepted.

On the other hand, the need for better career guidance information does not necessarily imply a reduction in the applicant pool; in fact, the pool may need to be expanded in certain ways. If more and better information were available to students at the time they were considering their career options, the result could be that students with a variety of types of backgrounds and interests might determine to choose a career in medicine. For example, students might be informed that many medical schools are interested in both science and non-science majors, and that the primary consideration is that a baseline science interest and achievement is met. Similarly, students with acknowledged interests in specific types of practice, particularly in types of practice where the need is great, could be encouraged to pursue a career in medicine. Moreover, the need for physicians of all racial-ethnic backgrounds and both sexes could be communicated to potential applicants.

The basic goal of the medical schools in sponsoring better information for student career decisions is to foster an applicant pool in which the desired types of students can be found and yet not have the pool so large as to handcuff the selection process. With this goal in mind, medical school representatives, students, and advisors frequently recommended a role for MCAAP in Stage 1: Career Decisions. In this section, recommendations for the specific nature of that role are provided and procedures for implementing the recommendations are described.

CAREER GUIDANCE MATERIALS FOR STUDENTS

For some types of career guidance information, it is both convenient and economical to communicate directly with students. For other types, the massiveness of the information base requires that it be maintained by a central source such as an undergraduate advisor. In this section, we present recommendations which call for using published materials to communicate with students early in their college years.

STUDENT CAREER GUIDANCE BOOKLET

It might be desirable that every student considering a medical career discuss that career decision with undergraduate advisors, make visits to many medical schools, and talk with people in most types of medical careers in order to assemble the information needed for a wise and rational career decision. Although some students do engage in many of these activities, it is not likely that many students will take all these actions (even if they realized their importance) because of the inconvenience and expense involved. Consequently, the need for a much simpler information source for students was frequently discussed in the MCAAP planning process and that need can be expressed in the form of a recommendation.

> Recommendation 3.1. MCAAP should provide a career planning booklet including self-assessments of interests and abilities for use by first and second year undergraduate students considering a career in medicine.

In this section we describe a career guidance booklet, tentatively entitled "Choosing a Medical Career," designed to serve the unique needs of students at the stage of early career decisions who are considering the possibility of pursuing a career in medicine.

There are several major goals which we believe a career guidance booklet should accomplish and these goals determine the content proposed here. First, the booklet should alert students to the variety of variables which might influence a career choice and the implications of present career choices for future decisions. Second, the booklet should contribute to careful self-assessment by students to determine their own desires and realistically evaluate their strengths and weaknesses. Third, the booklet should provide factual information about physician careers and related careers in the health professions. This information must not be in the form of sterile statistics but should focus on characteristics of the career which relate to students' present career decisions. Finally, the booklet must help students translate tentative career choices into courses of action that will enable them to seek out the information they need to confirm or overrule their tentative choices, while at the same time keeping their options open. This fourth goal includes providing a realistic picture of the steps in becoming a physician--the decision points and the hurdles.

These four general goals are translated into a four part booklet, a content outline for which is given in Table 3.1. The first section is an introduction

TABLE 3.1

CHOOSING A MEDICAL CAREER

A Guide for Students Considering a Career in Medicine

I. Introduction to Career Considerations

A. What is a Career?

B. Career Choice--A Continuing Process
1. Multiple decision points
2. Opening and closing options

C. The Myth of the One and Only
1. Most people can do well and be happy in a variety of careers
2. Many different roles are available under one career title
3. A career is not static--most people change their career role several times

D. Factors in Career Choice
1. Many factors should be considered
2. Using this guide

II. Personal Characteristics to Consider in Career Decisions

A. Personal Goals and Values
1. What things are most important to you? (Job, Family, Recreation, Status, Money, Service, etc?)
2. How do your goals and values relate to career decisions about medicine?

B. Vocational Interests
1. Areas of vocational interest and relation to jobs
2. Assessing your vocational interests (a self-assessment)
3. Interpreting your self-assessment
4. Relating interests to medical careers

C. Your Abilities and Career Requirements
1. Checklist of capabilities needed by physicians (some general, some specific to type of physician)
2. Assessing your capabilities (including a self-assessment based on the type of abilities assessed by the MCAAP Applicant Assessment tests)
3. Relation of abilities to career stages (training hurdles, type of medical role)
4. Improving your abilities--actions to take and factors to consider

TABLE 3.1 (continued)

III. Information about Medical Careers

A. Overview of Physician Careers
1. Roles (practice, teaching, research, administration)
2. Specialties
3. Special social needs

B. Physician Career Description
1. Description of activities
2. Training requirements
3. Numbers and projected future needs
4. Usual locales of practice (type of delivery of care)
5. Work load and income possibilities

C. Other Health-related Careers
1. Survey of career types
2. Brief descriptions of activity, training, etc.

IV. Where Do You Go From Here?

A. Making Some Tentative Choices

B. Planning College Courses
1. Meeting medical school requirements
2. Keeping options open

C. Gaining additional information
1. Where to go?
2. Who to see?

D. Steps in Becoming a Physician
1. Time sequence and decision points
2. Other factors to consider (admissions, financing, certification, etc.)

to ideas of careers and the factors to consider in career planning. The second section attempts to help students examine and evaluate themselves--their goals and values, interests, and abilities. This section includes a self-administered interest assessment and a self-administered assessment in some of the ability areas tested in the MCAAP Applicant Assessment. The third section provides information about medical careers, focusing on different physician careers but providing some survey information about other options in the health professions. Finally, the booklet concludes with a section entitled "Where Do You Go From Here?" which presents a discussion of the next steps to take in career planning. These steps include making tentative career choices, getting more information about them, and, if those choices include a career as a physician, preparing for medical school.

The booklet cannot, of course, be exhaustive, especially in Section III (Information about Medical Careers) or its length would diminish its usefulness. Therefore, in that section in particular, students would be alerted to a variety of other sources of information. We believe that an 8 1/2 X 11 booklet, 52 pages in length would adequately meet the most important career guidance needs of students at Stage 1 while remaining brief enough to sustain interest and encourage reading.

SPECIAL STUDENT BOOKLETS

One of the special concerns of the MCAAP constituency for the early career planning of students was that, where appropriate, some especially desirable types of students be encouraged to pursue the goal of becoming a physician. This concern was addressed to some extent in the booklet above but warrants additional action and a second recommendation.

> Recommendation 3.2. MCAAP should take specific action to encourage qualified and interested minority racial-ethnic group members and women to pursue careers as physicians.

To meet this recommendation, we propose two shorter booklets, one directed toward potential women applicants and the other toward members of racial-ethnic minorities.

The basic goal of the two special booklets would be to encourage the continuing interest of potential medical school applicants from the two special groups while at the same time providing a realistic view of opportunities and hurdles. The booklet for women would address current trends in the education of women physicians, the special problems faced, and special programs or assistance which may be available. The booklet directed to members of several major minority groups (blacks, Chicanos or Mexican-Americans, American Indians, Puerto Ricans, and perhaps others) would inform potential applicants about trends pointing to greater representation of these groups in medical schools, about special programs in some medical schools, about available financial assistance, and other topics.

Both booklets would be short and meant only to supplement the larger booklet. However, the shorter booklets would be widely available at no charge and might therefore reach these groups prior to the larger booklet for which a charge would be assessed. We believe a booklet or brochure of approximately 8 pages, of size 8 1/2 X 11 each, would be adequate to accomplish the major purposes.

SUPPORT MATERIALS FOR UNDERGRADUATE ADVISORS

Materials addressed directly to students provide only one possible avenue for improving student information and hopefully student career decisions. A second important avenue for providing more detailed information is through students' undergraduate advisors. In this section we propose two types of materials for undergraduate advisors to assist them in providing the information students need at the stage of early college career decisions.

GROUP COUNSELING AIDS

The recommendations above involve direct communication with students through published booklets. However, not all students will read, respond to, or be influenced by such written materials. Therefore other forms of presentation are important and the undergraduate advisor is the most available and promising route by which to reach students with audio and visual presentations. Many advising programs already sponsor group meetings for students whose goal is medical school. Such sessions provide an excellent opportunity for visual presentation of many of the topics discussed in the three student booklets already proposed. These possibilities provide the basis for the next recommendation.

> Recommendation 3.3. MCAAP should provide group counseling aids for undergraduate advisors to assist them in effective presentation of student career guidance information.

In response to this recommendation, resource materials in the form of visual aids would be developed for use by undergraduate advisors in group advisory sessions. These materials would be designed specifically for providing aspiring medical school students with useful career guidance information.

Since many undergraduate advisors are likely to have independently developed such materials for group presentations, a starting point for this MCAAP project would be to draw upon existing resources, and then to revise and supplement them with other materials. Once the materials were completed, they could then be made available for use in undergraduate advisory programs.

The content of the visuals would be designed to complement and supplement the student booklets already described. In addition, procedures for presenting local information about previous medical school applicants from the undergraduate college and how they fared at nearby medical schools would be developed. Such visuals might also include, when available, data describing the personal and academic characteristics of students at local medical colleges. The complete set of materials would include a brochure of instructions and a packet of the visual aids (slides, transparencies, etc.).

RESOURCE MATERIALS ON THE HEALTH PROFESSIONS

One of the most important student needs is information about the available careers in medicine and in other health professions. While some such information can be provided in the student guidance booklet, that information can at best be only cursory because of space limitations. The undergraduate health advisor is the obvious link between the student and more extensive, detailed information about the large number of health careers.

Much material about health careers is now available. However, it appears in a multitude of different places and in a variety of different forms.

Some such material is incomplete and even out-of-date. Thus, if undergraduate advisors wish to supply students with broad information about careers in the health professions, they are presently faced with the nearly impossible task of assembling, on their own, the many necessary sources of information. To improve this situation, the following recommendation is made.

> Recommendation 3.4. AAMC should sponsor in conjunction with other health profession organizations a project to consolidate information about health-related careers.

The activities of the jointly sponsored project would include assembling available resource materials on health-related occupations, putting them into compatible form, developing new materials where necessary, and publishing and distributing the consolidated resource materials to undergraduate advisors.

Two desirable features of the new consolidated materials should be noted. First, the job information should not be promotional or made to sound overly glamorous. A realistic tone should be adopted to describe the type of work done, the skills needed, the training required, the job openings and opportunities expected in the future, the expected income, and other such information. Second the materials should be up-to-date and should undergo periodic review and up-dating. One possibility for facilitating this would be to treat each occupation on a separate sheet or leaflet. This would also make it easy for health advisors to copy the material for students especially interested in that job.

DEVELOPMENT PLAN FOR STAGE 1 MATERIALS

Several types of materials have been proposed for use by undergraduate students and their advisors in student career decision making at Stage 1. In this section, a plan and schedule for the development of these materials is proposed. The developer required to implement the plan might be staff within AAMC or an agency on contract to AAMC. In either case the developer has the task of soliciting the necessary input and advice, accomplishing draft versions of the content, coordinating content review, producing final copy for approval, and overseeing the printing and possibly the distribution of the materials.

The target date for the availability of the various materials recommended in this chapter is September 1, 1975. The time and task schedules in this section are designed to meet that target date.

The preliminary content descriptions for the materials given in this section are meant to be tentative and illustrative. Actual development requires systematic input from several crucial sources to insure that the materials meet real needs, are readable and interesting to targeted groups, and provide accurate information. The development plan includes the steps for obtaining this crucial constituency input both through interaction with the Committee on Career Guidance Materials and the MCAAP Board and, where appropriate, through more extensive groups of students, health advisors, and medical college personnel.

STUDENT MATERIALS AND VISUAL AIDS--DEVELOPMENTAL UNIT A

Throughout this report we have grouped (and consecutively labeled) interrelated activities into major units for development. We recommend that all elements of a single developmental unit be designed by a single developer. In this section, we treat the student guidance booklet, the special booklets for women and minority students, and the visual aids for use by undergraduate advisors in group sessions as a single developmental unit.

The major tasks involved in the development of these materials are identified in Figure 3.1 along with a time schedule which calls for completion of the materials by September 1, 1975. In the remainder of this section we describe and elaborate on the developmental tasks required.

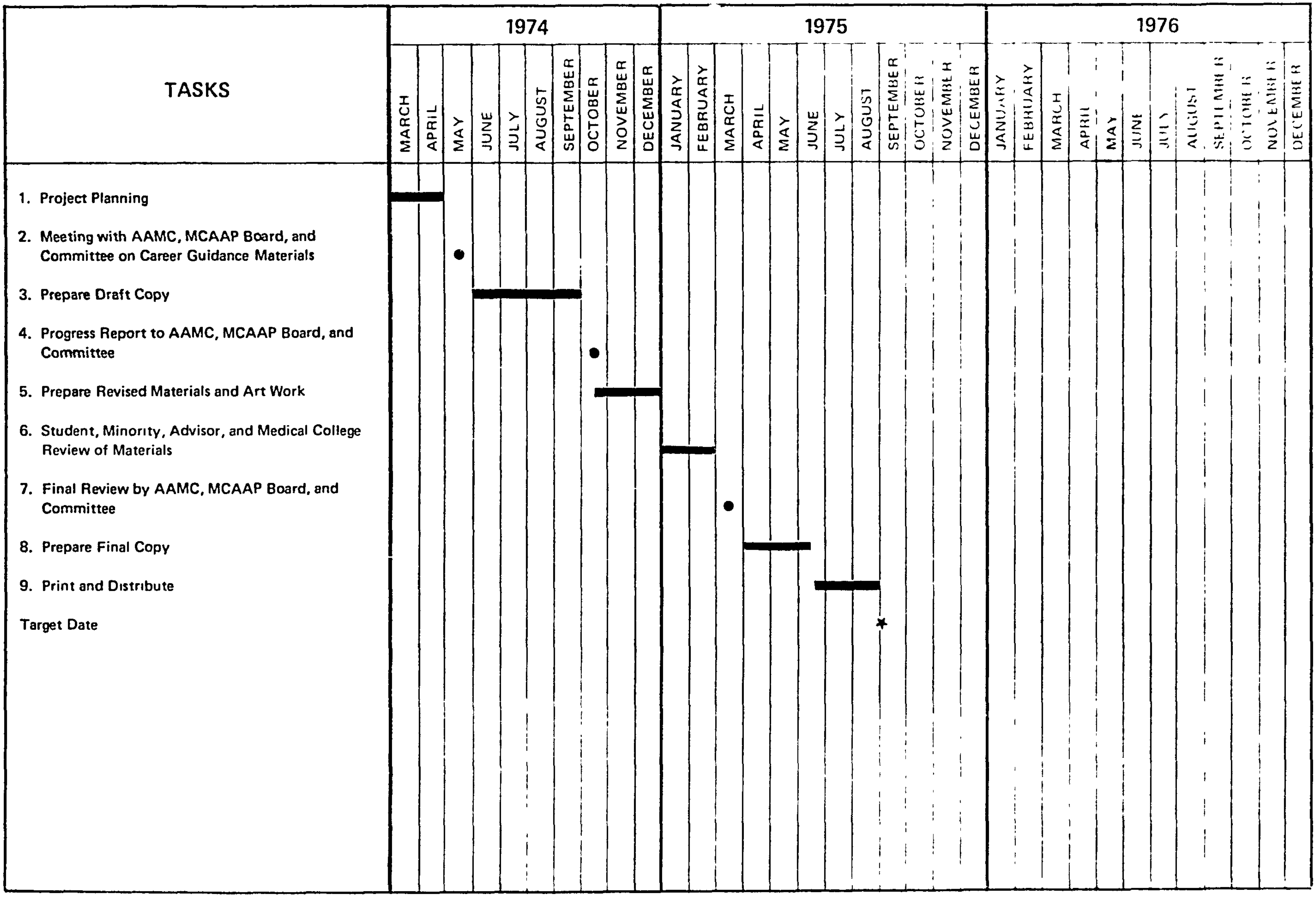
PRELIMINARY DECISIONS

The first stage in each development plan throughout this report involves preliminary planning and decisions by the AAMC staff, the MCAAP Board, and ultimately the Executive Committee of AAMC. This report will not address this process but will begin with the point at which a decision has been reached to proceed in a particular direction. We have assumed that such decisions will be made by March 1, 1974. When the decision is to seek an outside agency as a developer, we have assumed a Request for Proposal will be released on or about that date.

PLANNING THE PROJECT

Once a "go" decision is made, careful and thorough plans must be made by the developer. If the project is to be implemented through a contractor, this process would occur in the preparation of a response to a Request for Proposal. If the project is to be implemented in another fashion, the group responsible for implementation will still require this thorough planning stage. In Figure 3.1, approximately two months are allocated to this first step in the developmental plan.

Fig. 3.1. Time and task schedule for the development of student guidance booklet, special booklets, and group counseling visual aids—Developmental Unit A.



INITIATING THE DEVELOPMENT

Once the developer has been selected, the first stage in initiating the project is a meeting with representatives of the developer, AAMC staff, the MCAAP Board, and the MCAAP Committee on Career Guidance Materials. Although it is apparent that if the full membership of the MCAAP Board and the Committee attend the meeting progress will be inhibited by sheer numbers of participants, we assume that appropriate decisions can be made to assure a meeting with a workable number in attendance. The purpose of these meetings is to discuss specifics about desired content of the three types of materials and to arrange and allow for additional constituency input where needed.

DRAFTING MATERIALS

After this initial meeting, the developer would proceed with the first drafts of the various materials. During this process, the developer would seek additional input from students about their needs, the types of language to which they react positively, and related matters. Additional input would be sought from health advisors on similar topics, including the common student misconceptions encountered by advisors and how to correct them. Provision would also be made for discussion of other topics within the advisor's region of interest and concern. Of course, special advisor input would also be sought on the visual aids. Input from medical college personnel would also need to be solicited, especially in the area of the correctness and realism of information provided students about medical education.

PROGRESS REPORTS

Draft copy of materials would be presented to AAMC staff, the MCAAP

Board, and the Committee for review and suggestions at an intermediate stage in the developmental process.

REVISIONS AND REVIEW

The suggestions stemming from the progress reports would be incorporated into a revision of the text for the booklets and of the form of the visual aids. Art work would be done and mock-ups of the materials would be submitted to students, advisors, and medical college personnel for review and finally again to the AAMC staff, the Committee, and/or the Board.

PRINTING AND DISTRIBUTION

This final review process would result in a stage of final revisions followed by preparation of materials for printing or other production. The booklets would then be printed and the packets of aids for advisors would be produced for distribution according to the distribution plan described in a later section.

MATERIALS ON HEALTH OCCUPATIONS--DEVELOPMENTAL UNIT B

The first two steps in the development of resource materials parallel the first two steps in the development of student career guidance materials and group counseling aids. These involve project planning (which might take the form of the preparation of a proposal by possible contracting agencies) and initiating the project with a meeting of representatives of the developer, AAMC staff, the MCAAP Board and the MCAAP Committee on Career Guidance Materials.

The new element in this process arises from the possibility that the project will be a joint activity of AAMC and other health profession organizations. While we see the joint venture as desirable, it does require careful coordination of planning and implementation with other organizations. This coordination should likely begin before a developer is even identified and would continue throughout the project. It seems likely that the developer would, in fact, report jointly to all sponsoring organizations.

The basic development tasks are outlined in Figure 3.2 and include assembling all available materials, determining a common format, revising and preparing new occupational descriptions where necessary. Progress reports, review by relevant constituencies (e.g., students at whom the materials are directed, health advisors who will coordinate their use, and representatives of the professions described to insure accuracy), and printing and distribution complete the process by the September 1, 1975 target date.

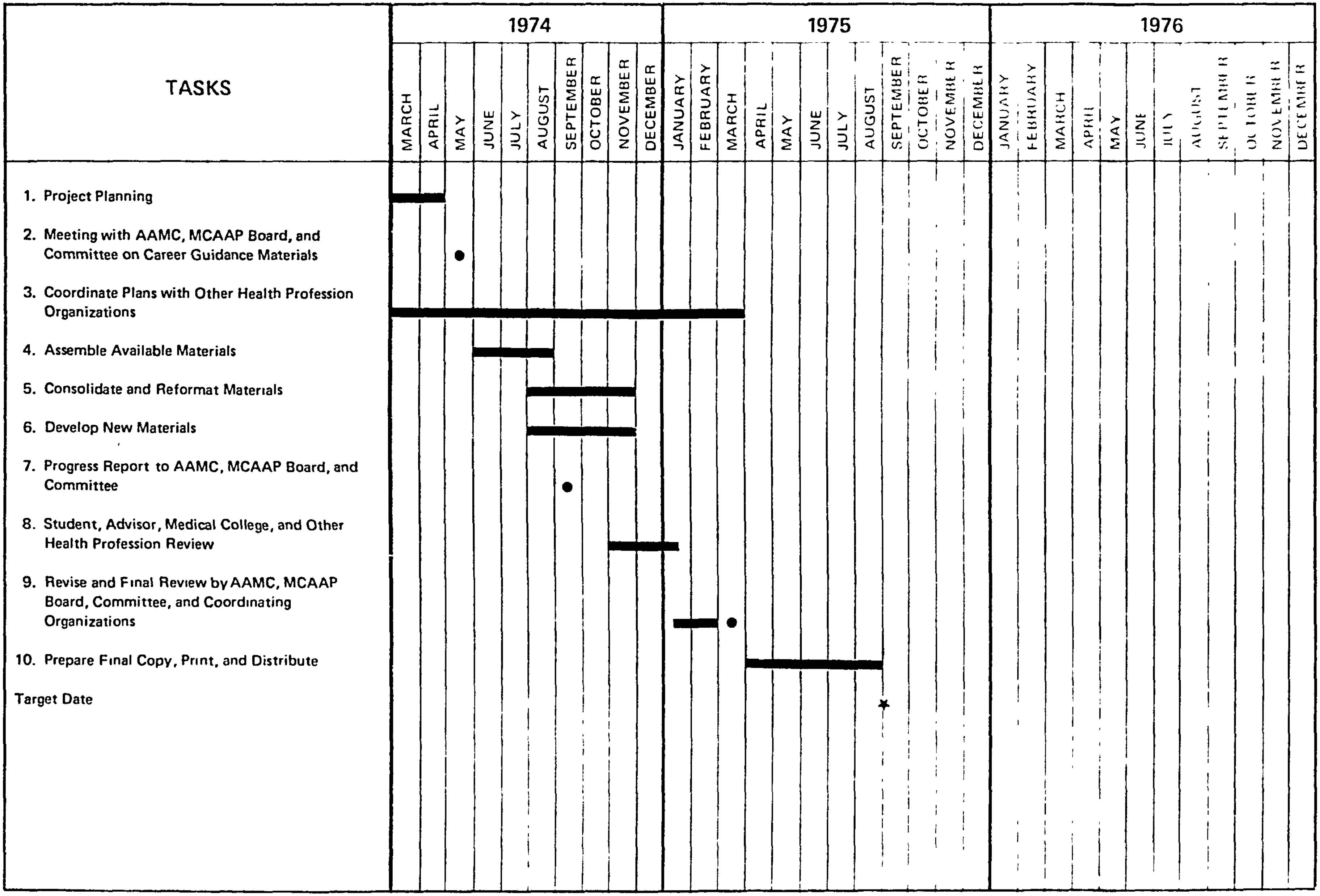
DISTRIBUTION PLAN

In this section we briefly sketch possible ways to insure that the materials in this section reach their target groups. We view this MCAAP activity in career guidance materials as self-supporting from the revenue generated by sales of the student guidance booklet, group counseling aids, and resource materials on health occupations. We suggest that the two special booklets for women and minority students be available at no charge.

MATERIALS FOR STUDENTS

The goal of a distribution plan for the student guidance booklet, "Choosing a Medical Career," is to make the booklet easily accessible to students at a reasonable price. Several actions are recommended. First, we suggest that two copies of the booklet be sent to each college campus--one to the office of health profession advisors; one to the counseling center. Each booklet

Fig. 3.2. Time and task schedule for the development of resource materials on health occupations—Developmental Unit B.



would be accompanied by a set of order forms for additional booklets and a display to draw student attention to the availability of the booklets. Second, all related AAMC publications would devote space to describing the booklet and how to order it. Third, similar materials would be sent to all college book stores so that bulk orders could be placed for sale through the book stores.

The special booklets would have a similar distribution plan except that several copies of each would be sent both to the office of health profession advisors and the counseling center for distribution directly to students as appropriate. Forms for additional copies would also accompany the booklets and AAMC publications would "advertise" them.

MATERIALS FOR ADVISORS

The availability of group counseling aids and resource materials on health occupations would be announced on an enclosure in the previously described mailing to health profession advisors and counseling centers as well as through other relevant AAMC publications. Each set of materials could then be ordered from AAMC at some prescribed cost. Preliminary versions of the materials could be described at the spring, 1975 AAHP meeting to alert advisors of their pending availability.

REFERENCE

Toole, J. F., Coombs, R. H., Robertson, R. & Stein, L. Attracting young people into careers in the health professions. Journal of Medical Education, 1970, 45, 415-420.

CHAPTER 4

RECOMMENDATIONS FOR MCAAP AT STAGE 2 ADMISSIONS DECISIONS BY MEDICAL SCHOOLS

Several types of activities occur at the admissions stage in the medical education process. The most obvious is that medical schools receive applications for admissions and make decisions about which to accept and which to reject. However, at this stage there are also several student activities: selecting medical schools for application, deciding which school to attend or what alternate career path to follow if no acceptance comes. In addition, there are a number of administrative activities which surround the admissions process: determining local admissions criteria, identifying characteristics of new classes, initiating student files, and examining trends both locally and more broadly.

These various activities imply at least three types of informational needs at the admission stage: information for medical school decisions, information for student decisions, and information for administrative purposes. In this chapter we examine the information needs of medical schools as they make admissions decisions and then give consideration to the types of assessment which can be used to meet these needs. The next two chapters examine the informational needs for student admission decisions and for administrative purposes.

Admission decisions by medical schools focus on evaluating an applicant's promise for professional competence as a physician, although personal and public concerns may also arise. To make this evaluation, several different types of assessment may be used. Students are assessed through college transcripts, cognitive tests, personal survey data, letters of evaluation, and interviews. In this chapter we examine these several types of assessment and make recommendations for MCAAP activities in relation to each.

This chapter necessarily covers many important topics and is consequently quite long and involved. The chapter is organized into four major sections. In the first section, First Generation MCAAP Cognitive Tests, we discuss the various suggestions for cognitive tests which have come from the 1973 MCAAP meetings. We then present our recommendations for new tests to be implemented by May, 1976. This section also includes a discussion of the procedures which we recommend be implemented for developing the new MCAAP tests.

The second section of the chapter, Other Admissions Data, addresses types of data other than cognitive tests used in medical school admission decisions: namely, letters of evaluation, personal survey data, and interviews. The third section, Support Services for Medical Schools, provides recommendations for services to medical schools including discussion of scoring and reporting services, a technical handbook, a guide for admissions committees, and an optional educational program for admissions committees.

The chapter concludes with development plans for the three major developmental units of the chapter: the development of new cognitive tests and their technical support, the development of a form for a uniform letter of evaluation, and the development of an educational program for admissions committees on the use of MCAAP data.

FIRST GENERATION MCAAP COGNITIVE TESTS

The present Medical College Admission Test (MCAT) has existed in its present form since 1962. It consists of four subtests, Verbal Ability (75 items, 20 minutes), Quantitative Ability (50 items, 45 minutes), General Information (75 items, 25 minutes), and Science (86 items, 60 minutes). It is the historical successor to a series of nationwide tests for the selection of medical students begun in 1930 under the sponsorship of the Association of American Medical Colleges (AAMC).

Since its inception, the primary goal of the test has been to lower the medical school attrition rate. To achieve this goal, the MCAT included two traditional "aptitude" tests, one verbal and the other quantitative. It also included two tests in the classical "achievement" mode, one a measure of science knowledge and the other a survey of knowledge in the humanities, arts, music, etc. The latter, called the General Information Test, was instituted in the early 1960's to emphasize the desirability of a broad pre-medical preparation not limited solely to the sciences [Erdmann, et al, 1971, p. 939]."

COGNITIVE TEST NEEDS IN THE 1970's

Given this background for the present MCAT, we need to review those changing purposes and concerns of the 1970's which have led to a general consensus on directions for changing the MCAT. One way to begin is to ask: "Which goals for the MCAT have not changed?" An answer to this question is that at least two major goals remain the same.

PREDICTING PERFORMANCE IN THE BASIC SCIENCES

First, medical colleges continue to want an examination that will effectively identify applicants who can successfully complete the medical basic science curriculum, and thus enable them to maintain the present low attrition rates. Thus, at the various meetings on MCAAP, heavy emphasis was placed on the construction of science tests which measure whether or not students are adequately prepared for the medical basic sciences curriculum. Often these suggestions were framed in terms of the need for criterion-referenced tests. As we indicate later in this chapter, criterion-referenced tests generally point backward to the accomplishment of previously set goals and are more appropriate for evaluating the undergraduate science learning of the student than pointing forward to whether or not that learning is adequate for medical schools. However, there was considerable unanimity of opinion for justifying science content of cognitive tests on the basis of medical school basic science requirements.

In assessing qualifications for the medical basic sciences, many users noted the importance of evaluating the student separately in the three major areas of science course requirements: biology, chemistry, and physics. Separate tests would allow medical schools to make several new types of judgments. Subject areas marked by weakness could be noted so that preventive action could be taken. Subject areas of greatest importance (e.g., biology rather than physics) could be given greatest weight in assessing preparedness. And students' preparation in relation to their undergraduate courses in the three areas could also be judged.

ENCOURAGING DIVERSITY IN ACADEMIC AND CULTURAL BACKGROUNDS

The second goal that remains unchanged is that medical colleges are still concerned with diversity of preparation; that is, they want to admit students representative of a broad range of academic concentrations, not just those majoring in the sciences. One concern frequently expressed was that science test scores were heavily emphasized, even in the upper MCAT score ranges, and therefore science majors were favored even though many non-science majors had adequate preparation for medical school. The focus of science tests on essential requirements for medical school rather than on arbitrarily spreading scores out on the basis of factual knowledge of questionable relevance was seen as a helpful step which could be taken to improve this situation.

This goal of diversity has also come to include the need for diversity in cultural background as much as to variation in the type of educational experience. Since the General Information Test is oriented to a limited type of cultural background, it has become a limiting rather than a diversifying element. Thus, the strongest consensus observed among the users of the present MCAT was that, in its present form, the General Information Test no longer serves a useful function.

Instead, the new concern for diversity led to discussions of ways to allow applicants to demonstrate exceptional accomplishment in any of a variety of areas. The basic desire was that a student especially outstanding in some area (say music, for example) have the opportunity to demonstrate that exceptional competence to balance the science-oriented data on which admissions committees heavily rely. Of special interest was a vehicle for minority applicants to demonstrate accomplishments outside the traditional core academic areas.

The one means for implementing these goals which received the most attention was a proposal for allowing students to select among the achievement tests of the Graduate Record Examinations (GRE). However, academic achievement tests pose several hazards: (1) they cover only some types of achievement (namely, academic achievement) and would not necessarily help the exceptional pianist or jazz trumpeter, for example; (2) they would certainly not help the minority student coming from a substandard academic background; and (3) they might or might not relate to any outcome of importance and thus would have to be studied and validated like all other parts of the assessment.

PREDICTING LONGER RANGE MEDICAL PERFORMANCE

While the goal of predicting success in the medical school basic sciences curriculum remains, in the 1970's it is seldom viewed as the sole, or even primary goal of an admissions test. Moreover, there is considerable concern with important, longer range performance criteria. Aspects of the performance of a practicing physician form the ultimate constellation of criteria and intermediate constellations appear during the residency and late medical school years. Since the applicant pool is very large and since many students can be found who can achieve satisfactorily during the first two years of their medical school programs, we now have the luxury of being able to look even further ahead.

This shift in focus to longer range criteria results, however, in a corresponding refocusing of the desirable content of the cognitive tests. When academic performance is the principal criterion, traditional variables related to academic performance such as measures of verbal and quantitative aptitude were natural indicators to use. Thus, these measures were part of the MCAT. However, if a major purpose of the test is to evaluate student capabilities related to physician clinical performance, then content which incorporates academic factors but is also oriented toward the eventual clinical tasks becomes more appropriate.

During the many conferences on MCAAP in 1973, users frequently identified several areas of cognitive skills and accomplishment of great importance both in the medical basic sciences curriculum and in later medical activities in the clinical years and beyond. Here we briefly survey the major areas thought to be especially important in relating to long-range criteria of physician performance.

Reading

Throughout the MCAAP planning process, users frequently expressed the concern that reading, understanding, analyzing, and interpreting written material are crucial verbal activities both in the science curriculum and in later medical activities. The student and the practicing physician confront reading tasks in their formal education and in their continuing self-education. Even more important, there are numerous reading tasks in day-to-day activities of a physician ranging from reading patient histories to reading about the characteristics of a new drug. Thus, reading was generally agreed upon as an important area for a cognitive test.

Quantitative Skills

Not only do students and physicians need to read, they are also required to use various quantitative skills. While some quantitative computation is required of both the medical student and the practicing physician, the more important quantitative skill requirements include the interpretation of quantitative data in charts, tables, graphs, etc., quantitative and logical reasoning, and problem solving. These provide quite a different focus than the elementary survey of quantitative computational skills included on the present MCAT.

Problem Solving

There was great interest in the general area of problem solving throughout the planning process as many people judged problem solving activities as crucial to the competent functioning of a physician. In the medical context, either in interaction with patients or in research, problem solving may be defined as the ability to successfully perform a series of steps including the collection of data pertinent to identifying a problem, the analysis of each piece of data in relation to the total problem, the synthesis of all relevant data and the drawing of conclusions, and finally, the determination of a course of action. Indeed, much of the physician's work involves these skills.

While there was considerable agreement about the general importance of the area there was no clear view of what a problem solving test should look like. Although the work of Rimoldi, et al, (1962), Rimoldi, et al, (1964), McGuire and Babbott (1967), Helfer and Stater (1968), and the National Board of Medical Examiners (Hubbard, 1971) showed promising directions, none of the approaches appeared ready for immediate application on a national medical admissions test. For example, the format in the first two references requires the revealing of certain portions of information at the student's option (which would require some experimentation to accomplish on the larger scale basis required) and concentrates on the problem solving process as much as on successful results. Similarly the NBME approach is a complex one which also involves assumptions of considerable medical knowledge.

Communication Skills

Another area which users judged to be important in physician clinical performance involved oral and written communication skills. The concern for written communication skills was focused primarily on the clinician's need to process large amounts of data and to organize that data in a concise way which communicates the major important points. Thus, such a test might assess the applicant's ability to synthesize and organize a set of data, say a two or three page essay, into a concise abstract. Since physicians must communicate orally both with patients and colleagues, concern was also expressed for including a test of oral communication as part of the MCAAP cognitive tests.

The major difficulties with including tests of oral and written communication as a part of a national testing program have to do with their administration and scoring. The administration of an oral test would require a considerable investment in the time and resources of medical school staff and the scoring of both oral and written communications is extremely difficult and demanding of a large investment of time.

Science

With the long range view to physician performance, the consensus view for new MCAAP science tests was that they should be less a survey of elemental factual achievement and more a survey of knowledge about and ability to apply scientific information, concepts, and principles to new situations. Thus, as in each of the other areas, the focus would be on critical knowledge or skills needed not only in the basic sciences curriculum but also in the continuing activities of students and physicians in clinical medicine where they are required to apply scientific principles to diverse situations not just recite isolated facts.

FIRST GENERATION RECOMMENDATIONS FOR MCAAP

We have examined the important concerns of the MCAAP constituency as they relate to cognitive tests which assess students' preparation for the medical basic sciences curriculum, which encourage diversity in academic and cultural background, and which are relevant to long term aspects of physician performance. We have also stated reservations where questions arise as to the feasibility of immediate or even eventual implementation of some types of measures. On the basis of these expressions of need and our judgments about feasibility for implementation, we make the following recommendations for the first generation MCAAP cognitive tests to be implemented by the national test date in May, 1976.

Recommendation 4.1. The MCAAP cognitive tests should include a test of reading comprehension. Such a test should relate to those reading skills needed in medical school and thereafter and should replace the MCAT Verbal Aptitude Test.

Recommendation 4.2. The MCAAP cognitive tests should include a quantitative test concerned with the abilities in data interpretation, reasoning, and problem solving. The test should replace the MCAT Quantitative Aptitude Test.

Recommendation 4.3. The MCAAP should include three separate science tests, one each in biology, chemistry, and physics. The three tests should assess the knowledge and application of concepts and principles and should replace the MCAT Science Test.

Recommendation 4.4. The MCAAP cognitive tests should not include a test like the MCAT General Information Test.

Recommendation 4.5. An experimental unit should be included on the MCAAP Applicant Assessment for the tryout of a problem solving test. The goal of such experimentation would be the eventual inclusion of a problem solving test in the MCAAP once a satisfactory and validated form is found.

The thrust of the first four recommendations is that immediate steps be taken to develop an assessment instrument which is comprised of the following cognitive tests:

(1) Analytical Reading

(2) Quantitative Analysis

(3) Biology

(4) Chemistry

(5) Physics

ANALYTICAL READING

In this section, we provide detailed content specifications for the proposed Analytical Reading Test. Subsequent sections provide similar specifications for the other cognitive tests. Because these specifications would serve as the blueprints for construction of the MCAAP tests, two major points regarding their development require elaboration before we proceed.

THE ROLE OF MCAAP CONSTITUENCY IN DEFINING SPECIFICATIONS

First, the various constituency meetings did not discuss tests at the detailed level required to formulate content specifications, and rightly so. Consequently, the specifications which follow represent an extension and elaboration of ideas directly discussed by those groups; that is, ACT's professional judgment and experience is reflected in the specifications. Since expert professional judgment is usually required at this level of detail, it is common for testing experts to propose the content specifications as part of the test development sequence. However, experts in the substantive field, in this case medicine, should be intimately involved with the developer in the process of designing and ultimately in approving the specifications.

The test development sequence we propose (see later section) provides for this input through MCAAP test panels. The membership of these panels would consist of representatives of the appropriate groups involved in medical education. Therefore, the content specifications presented in the next several sections should be viewed as preliminary specifications subject to review and modification by the test panels.

THE CONTENT SPECIFICATION FRAMEWORK

A second important point about the content specifications concerns the general approach taken to develop them. Typically, there are two dimensions to the content specifications for a test. One dimension is concerned with the subject matter topics included in the test and the second involves the types of skills required of the examinee. Specifying the subject matter is relatively straightforward. However, there are many possible ways to classify the types of skills and for each test we have selected skill classifications which reflect the needs of the particular area being tested. Three separate sets of skill classifications are suggested, one each for Analytical Reading, Quantitative Analysis, and the three science tests. Together, these two dimensions discussed above form the content specification framework for the MCAAP tests.

MCAAP CONSTITUENCY INPUT INTO CONTENT SPECIFICATIONS FOR ANALYTICAL READING

Users of the present MCAT have described the need for a test of an applicant's ability to read, understand, analyze, evaluate, and draw inferences from written materials. The statement of this need is based on the general belief that reading competencies are of continuing importance in medical performance beginning with the medical student and continuing on through the practicing physician. Ideally and theoretically, the content of such an Analytical Reading Test would be determined by a careful analysis of the reading requirements related to medical performance. In the future, such analyses can, in fact, be used as input for modifications and adjustments in the test. However, using knowledge presently available, consensus is strong that these reading competencies approximate the requirements for study and practice in medicine and that this consensus can adequately serve as a valuable starting point for defining content specifications for an Analytical Reading Test.

TOPIC SPECIFICATIONS

As previously noted, there are two major dimensions of test content to be specified. The first of these is the subject matter topic of the written material used in the test. Conference participants frequently made recommendations about the subject matter of the reading passages. For example, strong support was present for the view that the subject matter should focus on scientific and medically related topics. Recommendations for the content of the reading passages arise from the reading demands placed on the medical student and practicing physician. These demands include the reading of basic sciences materials, medical topics, and social science literature. The emphases of these three general areas are outlined in Table 4.1. Although the MCAAP Panel which was mentioned earlier will be assembled to write the test specifications and to set exact distributions of passage content, a preliminary recommendation for the distribution of items across each subject matter area is also given in Table 4.1.

It should be noted that all of the information required to respond to questions on the Analytical Reading Test will be contained within the passages. That is, the test will not require the examinee to demonstrate

TABLE 4.1

READING PASSAGE TOPICS FOR THE ANALYTICAL READING TEST

1. Basic Science Topics (33%)

These passages include descriptions of issues or experiments in the basic sciences, especially biology, biochemistry, and chemistry. The passage content, while relevant to the basic medical sciences would not necessarily have any direct link to the treatment of disease or to other likely medical applications.

2. Medical Topics (33%)

These passages include discussions of issues or descriptions of experiments with explicit medical applications and also include descriptive summaries of selected medical cases (e.g., histories, diagnoses, treatments, and outcomes). Examples of topics are: results of a drug dosage study, the history of the development of an important medical treatment such as a surgical procedure or a vaccine, and case studies of persons having rare diseases.

3. Social Science Topics (33%)

These passages include descriptions of social science issues or experiments relevant (not necessarily explicitly) to patient-physician relationships of health care delivery systems as well as public issues effecting the field of medicine. Material may be drawn from sociology, psychology, and the various other social science fields.

specific knowledge of the three topic areas described in Table 4.1. Each topic area will simply serve as the medium through which examinees will demonstrate that they have achieved various levels of functioning with respect to reading. The goal, of course, is that the topic area simulate a real medium in which student and physician reading skills are required.

READING SKILL SPECIFICATIONS

Various types of items might have their origin in passages of the type described in Table 4.1. Therefore, a precise statement as to the kinds of questions desirable in an MCAAP Analytical Reading Test is required. Constituency recommendations have helped to identify the general types of reading skills which should be measured. Here we formalize those suggestions into the second dimension of the content framework.

As described in Table 4.2, the items proposed here would test two major categories of reading skills and abilities, namely, comprehension and analysis. Both of these categories are included because they represent abilities which seem to be crucial to the successful performance of a medical student, resident, or practicing physician. Statements as to the precise abilities and skills implied by these two categories are included as sub-categories within Table 4.2.

The question of selecting a desirable distribution of emphasis over the two major categories then becomes one of judgment of relative importance and of practicality of obtaining items of the two types. Our preliminary judgment (which in the test development sequence would be subject to MCAAP Panel review) suggests the distribution shown in Table 4.2,

TABLE 4.2

SKILL CLASSIFICATIONS FOR ANALTYICAL READING TEST

I. Comprehension (40%)

Comprehension involves the ability to acquire and understand the ideas and information communicated by the passage. It represents a very low level of understanding which is more precisely specified in terms of the behaviors described below. They include the ability to:

A. determine the meanings of words or phrases (e.g., science or medical terms) in relation to adjacent context

B. accurately paraphrase or translate essential parts

C. identify the underlying objective(s)

D. recognize important ideas and differentiate them from less important ones

E. identify conclusion(s)

II. Analysis (60%)

Analysis, in this context, is defined as the ability to treat the passage as a collection of ideas, each of which takes its primary meaning from its relationship with the other ideas in the passage and from the combined effect of all of the ideas. It represents a rather high level of understanding and can best be defined by the behaviors below. They include the ability to:

A. recognize unstated assumptions

B. distinguish facts from hypotheses

C. compare and contrast ideas

D. recognize the interrelationships of ideas

E. determine underlying principles and causes

F. use information to make inferences and predictions

G. modify hypotheses and conclusions based on access to new input data

H. recognize actions consistent or inconsistent with the implications of the passage

QUANTITATIVE ANALYSIS

Although general consensus existed at the various meetings on MCAAP as to the need for including a quantitative test as a part of an enlarged MCAAP, little discussion was centered on the form which such a test should take. However, two points of focus emerged from the meetings. First, just as the Analytical Reading Test addressed the applicant's ability to acquire information and ideas drawn from a verbal context, a parallel concern is that a quantitative test examine the ability to perform similar tasks in settings which are essentially non-verbal and quantitative. The underlying rationale for such a test is that physicians are confronted with a great deal of quantitative information which requires interpretation (e.g., EKG's, laboratory results, etc.). Thus, it is important to evaluate an applicant's ability to read graphs, charts, and tables, and accurately translate and interpret the information contained therein.

Second, a thorough assessment of the applicant's skills should include a measure of his reasoning and problem solving ability. The sciences, in particular, were frequently mentioned as the subject fields from which these problems should be drawn. Moreover, the desire was that focus be placed on the applicant's reasoning and problem solving ability rather than on his basic computation skills. Again, this is in keeping with the perceived function of the medical student/physician who frequently must apply quantitative reasoning and problem solving skills to the solution of problems.

On the surface, the scope and content of the Quantitative Analysis

Test may appear to overlap with that of the Analytical Reading Test discussed earlier. However, we would emphasize that although items for both tests would be drawn from essentially the same topic areas, and require some of the same types of skills, the Quantitative Analysis Test would be framed in the context of non-verbal, highly quantitative data reported in the form of charts, graphs, tables, etc., whereas items for the Analytical Reading Test would depend on written passages requiring a high level of verbal ability. Comparison of the sample items for both tests (see Appendices D and E) should help to clarify the very real differences between the two tests.

TOPIC SPECIFICATIONS

As with the specifications for the Analytical Reading Test, specifications for the Quantitative Analysis Test are expressed in terms of two dimensions, the first having to do with the subject matter used in the test, and the second with the types of skills to be assessed. Participants in the various AAMC conferences and the National Task Force meeting were supportive of the position that the subject matter of the quantitative section of the MCAAP be directly related to the context in which it is experienced by medical students and physicians, namely, in topics of the basic sciences, mathematics, medicine, and social sciences. Table 4.4 outlines the subject matter topics from which items assessing the important types of quantitative skills will be drawn.

TABLE 4.4

SUBJECT MATTER TOPICS FOR THE QUANTITATIVE ANALYSIS TEST

1. Basic Science Topics

   This category includes quantitative content (problems, graphs, charts, tables, etc.) from biology, chemistry, and physics, especially as related to the medical basic sciences curriculum.

2. Medical Topics

   This category includes quantitative problems, graphs, charts, tables, etc. from the outcome of experiments and studies specifically focused on medical applications or situations.

3. Social Science Topics

   This category includes quantitative problems or data from medically-related social science fields. Relevant topics could be included, for example, from sociology, psychology, or economics.

QUANTITATIVE ANALYSIS SPECIFICATIONS

Given the topic areas identified in Table 4.4, the next step is to specify more precisely what abilities the items are to measure. Thus, the two goals for the Quantitative Analysis Test just described have been translated into the skill classification categories described in Table 4.5. The first category, translation, is most concerned with the applicant's ability to identify the specific information contained in a graph or chart, whereas, the second, interpretation, focuses on the ability to analyze and draw meaning from that data. The third category concerns skills in reasoning and problem solving which involve the skill to develop strategies for or find solutions to quantitative problems.

The appropriate distribution of emphasis over the two sections is, of course, tentative and subject to the approval of the Committee on Applicant Assessment. However, we recommend that 30% of the items in the Quantitative Analysis Test be allotted to translation, 30% to interpretation of data, and 40% to reasoning and problem solving.

QUANTITATIVE ANALYSIS SPECIFICATION FRAMEWORK

The two dimensions of content for the Quantitative Analysis Test have been defined in Tables 4.4 and 4.5. The framework for test specification which emerges when these two dimensions are merged is found in Table 4.6. As before, the primary cell entries give the proportional emphasis on each cell.

ACT recommends that 50 minutes be allotted for the Quantitative Analysis Test. This should offer sufficient time for the test to include

TABLE 4.5

SKILL CLASSIFICATIONS FOR THE QUANTITATIVE ANALYSIS TEST

I. Translation (30%)

Translation involves the relatively low-level ability to understand and identify quantitative information communicated by graphs or charts. Specific behaviors required of the applicant are outlined below. They include the ability to:

A. extract information explicitly contained within graphs or charts
B. identify the primary purpose(s) of graphs or charts

II. Interpretation (30%)

Interpretation involves treating the set of individual facts reported in a graph or chart as a unit. Individual facts take on new meaning as they complement and interact with other facts, thus requiring an ability which reflects a high level of understanding. This ability is described by the behaviors listed next. They include the ability to:

A. recognize trends
B. compare and contrast data (given two graphs)
C. recognize the interrelationships of individual elements of data
D. use data to make inferences and predictions
E. modify hypotheses and conclusions based on the input of new data

III. Reasoning and Problem Solving (40%)

Reasoning involves the ability to find solutions to quantitative problems and/or to develop strategies for solving such problems. Although emphasis is on the strategy rather than the solution, competency in basic mathematical skills is required. This category includes the ability to:

A. identify and understand a stated problem
B. identify the concepts and procedures necessary for formulating a strategy for problem solving
C. use appropriate quantitative skills to solve a problem

TABLE 4.6

SPECIFICATION FRAMEWORK FOR THE QUANTITATIVE ANALYSIS TEST*

	Topics			
Types of skills	Basic Science	Medical	Social Science	
Translation	.12 (6)	.12 (6)	.06 (3)	.30 (15)
Interpretation	.12 (6)	.12 (6)	.06 (3)	.30 (15)
Problem Solving	.16 (8)	.16 (8)	.08 (4)	.40 (20)
	.40 (20)	.40 (20)	.20 (10)	1.00 (50)

*Primary entries represent proportion of the items on the Quantitative Analysis Test. The figures in parentheses give the number of items assuming a total test composed of 50 items.

approximately 50 items. Once again, however, the length of the test would be subject to change based on preliminary studies of test speededness. The allocation of these 50 items is reported in parentheses in Table 4.6.

SAMPLE ITEMS FOR QUANTITATIVE ANALYSIS

Illustrative items for each type of ability to be assessed by the Quantitative Analysis Test are provided in Appendix E. We believe that the skills described in the specifications can best be tested using two formats. The first format would include the presentation of data in graphs, charts, tables, or figures. Questions testing translation and interpretation would be based on that data. The second format, which would be used for problem solving and reasoning items, would present medically relevant situations requiring problem solving to derive the correct answer.

BIOLOGY, CHEMISTRY, AND PHYSICS

The need to assess student competency in the basic sciences was emphasized throughout the AAMC sponsored meetings on MCAAP. Thus, discussion centered on the changes that might be made in the present MCAT Science Test to make it more useful for users. The major outcome of these discussions was a recommendation that three separate science achievement tests be developed, one each in the areas of biology, chemistry, and physics. The primary reason for dividing science into these three content areas was that the resulting tests could then be used for diagnostic purposes, specifically to enable evaluation of the applicant's level of preparation in the three science areas.

A second concern discussed at the various MCAAP meetings was that the three tests should assess the applicant's knowledge of scientific concepts and principles and the ability to use those concepts and principles in new settings. This recommendation was a response to dissatisfaction with the current MCAT Science Test which includes a disproportionate number of items measuring the applicant's recall of detailed factual information.

The third basic concern of the MCAAP constituency was that the content of the new science tests be directly tied to requirements of the medical basic sciences curriculum or of later clinical performance. This emphasis related to the desire for a concept-oriented rather than a fact-oriented test. Also, concern was expressed that the level of knowledge required for the science tests should not exceed that required for entry to medical school and thus favor the advanced science student. The concern here is with identifying the fundamental science preparation required, not with discriminating among students in terms of their detailed scientific factual knowledge.

TOPIC SPECIFICATIONS

Because the three science tests will differ only in subject matter and not in the abilities they will assess, content specifications for all three tests will be considered at one time. Following the two dimensional approach described earlier, specifications for the Biology, Chemistry, and Physics tests are expressed first in terms of the subject matter used in the tests and second in terms of the types of abilities to be assessed. On the surface, addressing the first dimension seems to be a relatively simple task since the content of the items on each test is defined by the subject area implied by the name of that test. However, development of the three tests must be tempered by the knowledge that there are variations in the emphases of different science courses bearing the same name. For example, biology courses in two different colleges may emphasize quite different content. Thus, care must be taken to assure that unfair advantage is not given to any particular group of students and that the science tests assess only those skills which are necessary and relevant to medical education. The task of defining the specific content for the science tests will be the responsibility of three test panels. Each of the panels will include medical science educators from undergraduate colleges and medical schools.

SCIENCE TEST SPECIFICATIONS

The second dimension of topic specifications, which is concerned with the types of abilities to be assessed, reflects the recommendation that assessment focus on evaluation of the applicant's ability to apply scientific principles and knowledge of concepts to new settings. Following this notion, we suggest the skill classification schema given in Table 4.7.

Three major categories of skills--application, analysis, and synthesis--are described in Table 4.7. These categories define specific skills which are related to the process of scientific reasoning and problem solving. Table 4.7 also suggests a possible distribution of emphasis over the three categories. Primary weight was given to the first two categories because we believe they most closely reflect the types of

TABLE 4.7

SKILL CLASSIFICATIONS FOR THE BIOLOGY, CHEMISTRY, AND PHYSICS TESTS

I. Application (45%)
In this context, application is defined as the use of scientific concepts, principles and laws in specific situations. It includes the ability to:

A. select the appropriate principle or law needed for solving a specific problem
B. adapt a concept or principle to solve a problem in an unfamiliar setting
C. verify a stated outcome on the basis of known scientific principles or laws

II. Analysis (45%)
Analysis refers to the ability to identify the essential elements of a scientific experiment or report. It includes the ability to:

A. determine outcome(s)
B. identify unstated assumptions
C. distinguish facts from hypotheses
D. determine the consistency of hypotheses and conclusions with given information and assumptions
E. determine the validity of a reported outcome in terms of the procedures used and/or the information reported

III. Synthesis (10%)
Synthesis, in this context, involves the ability to combine given information with known concepts, principles, and laws, or to use information alone to form generalizations and/or generate new hypotheses. Synthesis includes the ability to:

A. develop strategies for testing hypotheses (performing experiments)
B. develop new hypotheses by combining new information (outcomes) with known principles or laws.

skills called for by participants at the regional MCAAP meetings and at the National Task Force meeting.

Although the same skill classifications would be used for all three science tests, and thus the same types of skills would be assessed by each test, it is important to remember that the tests would be achievement tests and that each would require knowledge of a unique content area. Thus, for an individual examinee, differences in scores on the three science tests would provide information about differences in his level of preparation. For example, if the examinee performed very well in the chemistry and physics tests and very poorly in biology, this would probably signify that his level of preparation, in terms of what would be needed for medical school, is adequate in chemistry and physics but inadequate in biology. Moreover, the differences between his scores on the three tests would be a function of different levels of preparation in the three science areas, and not in the types of skills measured by the tests.

Because there may appear to be similarities in the types of skills described in Table 4.7 for the sciences and those described in Table 4.2 for the Analytical Reading Test, we emphasize that the science achievement tests would require knowledge of the subject matter areas, whereas the reading test would require no subject matter knowledge. Moreover, the science tests will essentially consist of discrete items, that is, items which are not dependent upon lengthy passages like those used for the Analytical Reading Test. As before, the sample items for each test in Appendices D, E, and F, should be useful in discerning the distinct differences among the skills to be assessed by the various MCAAP tests.

BIOLOGY, CHEMISTRY, AND PHYSICS SPECIFICATION FRAMEWORK

Because of the commonality in the types of skills to be assessed by the three science tests, Table 4.8 includes a single specification framework which would be used for all of the science tests. The primary cell entries represent the proportion of items from each classification category which we recommend be included on the three tests.

Because the three science areas each represent a broad domain of content and skills, each of which must be adequately sampled, we recommend that each test be allocated 45 minutes of test time. This should be sufficient time for approximately 50 items per test. Table 4.8 also indicates the number of items to be included within each classification category.

SAMPLE ITEMS FOR BIOLOGY, CHEMISTRY, AND PHYSICS

Three possible item formats for the science tests are illustrated in Appendix F. The first type is the discrete, stand-alone, multiple-choice item, which would be primarily used to assess the direct application of concepts, principles and laws to novel situations.

The second type of item consists of a list of four or five concepts, principles, or laws followed by a set of phrases. Each of the phrases is related in some way to one of the concepts, principles or laws; the examinee is required to determine the connection. The level of knowledge and generalization required is primarily a function of the particular set of concepts, principles or laws and the corresponding phrases. Although it is possible to develop a set of items which test simple knowledge of concepts, principles, and laws, it is also possible to develop a set which may require the applicant to apply

TABLE 4.8

SPECIFICATION FRAMEWORK FOR THE SCIENCE TESTS*

	Science Test		
Types of skills	Biology	Chemistry	Physics
Application	.45 (23)	.45 (23)	.45 (23)
Analysis	.45 (22)	.45 (22)	.45 (22)
Synthesis	.10 (5)	.10 (5)	.10 (5)
	1.00 (50)	1.00 (50)	1.00 (50)

*Primary entries represent proportion of the items on the Science Tests. The figures in parentheses give the number of ot items, assuming tests consisting of 50 items.

those same concepts, principles, or laws to unfamiliar settings. It is this same purpose which such items would serve in the various science tests.

The third type of item would involve a format simulating a laboratory experiment. Four or five items would be preceded by a drawing of a laboratory experiment or a short scientific passage (at most 4 or 5 sentences). Specific questions would draw on the applicant's ability to interpret and generalize from the given information and/or whatever additional information is provided through the individual item stems. At least one sample of each of the items types is provided in Appendix F. Each item is classified as to the type of skill it assesses.

SUMMARY DESCRIPTION OF THE MCAAP TESTS

The previous three sections of this chapter have outlined in great detail the proposed scope and content of the MCAAP tests which have been recommended as a replacement for the present MCAT. Table 4.9 provides a general summary of each test, including its purpose, the proposed number of items, and the time allocated for its administration.

TENTATIVE SCHEDULE FOR ADMINISTERING THE MCAAP APPLICANT ASSESSMENT

In order to provide a glimpse of how a national test date for the MCAAP Applicant Assessment might be organized, we offer the tentative schedule outlined in Table 4.10. The various assessments included in the table are the five cognitive tests reported earlier in this section, a unit for collecting some biographical and personal data, an experimental unit on personal survey data, an experimental problem solving test, and a pretest unit. The latter four assessments are described in

TABLE 4.9

SCOPE AND CONTENT OF THE RECOMMENDED MCAAP TESTS

Test	Purpose	Number of items	Time allocated
Analytical Reading	Assesses the applicant's ability to read, comprehend, analyze, evaluate and draw inferences from written materials.	75	60 minutes
Quantitative Analysis	Assesses the applicant's ability to translate and interpret non-verbal quantitative data, and to reason and solve problems by using previously acquired quantitative skills in new settings.	50	50 minutes
Biology	Assesses the applicant's knowledge of scientific concepts, principles, and laws and the ability to use that knowledge in new settings requiring scientific reasoning and problem solving skills.	50	45 minutes
Chemistry		50	45 minutes
Physics		50	45 minutes

TABLE 4.10

TENTATIVE SCHEDULE FOR ADMINISTERING THE MCAAP APPLICANT ASSESSMENT

May, 1976

Activity	Time
Check-In Time	8:00-8:30
Opening Directions	8:30-8:35
Biographical Unit	8:40-8:55
Analytical Reading Test	9:00-10:00
Rest Period	10:00-10:10
Quantitative Analysis Test	10:15-11:05
Pretest Unit[1]	11:10-11:30
Lunch Break	11:35-12:30
Check-In Time	12:30-12:55
Biology Test	1:00-1:45
Chemistry Test	1:50-2:35
Rest Period	2:35-2:45
Personal Survey Data Unit[2]	2:50-3:10
Physics Test	3:15-4:00

[1] There are several possible modes for pretesting items as a part of the Applicant Assessment. The choice of this mode was arbitrary and only for illustrative purposes.

[2] This experimental unit would be replaced with an experimental unit on problem solving skills in the October, 1976 administration.

considerable detail in subsequent sections of this chapter.

TEST DEVELOPMENT PROCEDURES

This section is primarily concerned with the procedures to be followed in the development of the five recommended cognitive tests (Analytical Reading, Quantitative Reasoning, Biology, Chemistry, and Physics). Discussion is first addressed to the system of test panels which will facilitate test construction. Then, the sequence of steps followed in the development of the tests is described. Finally, a recommendation regarding the number of new test forms to be developed and a rationale for that recommendation is provided.

TEST PANELS

Items for each of the five cognitive tests recommended to be included in the MCAAP will be drawn from specific content areas. The three science tests, for example, will include items from biology, chemistry and physics, respectively. Because the content of a specific course, say biology, will vary from school to school, often as a function of the particular textbook used, procedures must be incorporated within the test development process to insure that items constructed for the test assess only those skills which are relevant to the medical school program. Moreover, test items should undergo continuous review to assure that they reflect current knowledge in the subject areas as well as include commonly accepted vocabulary and terminology.

The individuals who are most knowledgeable about the medical school curriculum and thus are best able to define the precise skills and content knowledge which should be assessed by tests included in the MCAAP, are the medical educators directly involved in teaching in the medical schools. Those individuals most knowledgeable about the undergraduate curriculum are college teachers. These facts, coupled with the concern for the development of tests which measure significant skills and reflect current knowledge, are compelling reasons for these educators to be directly involved in the MCAAP test development process. It was in this spirit that the MCAAP National Task Force strongly recommended the formation of test panels to participate with the test development contractor in the construction of the MCAAP tests.

> Recommendation 4.6. Test panels with membership including undergraduate college and medical school teaching staff should be created to assist in the development of new MCAAP tests.

Number of Test Panels

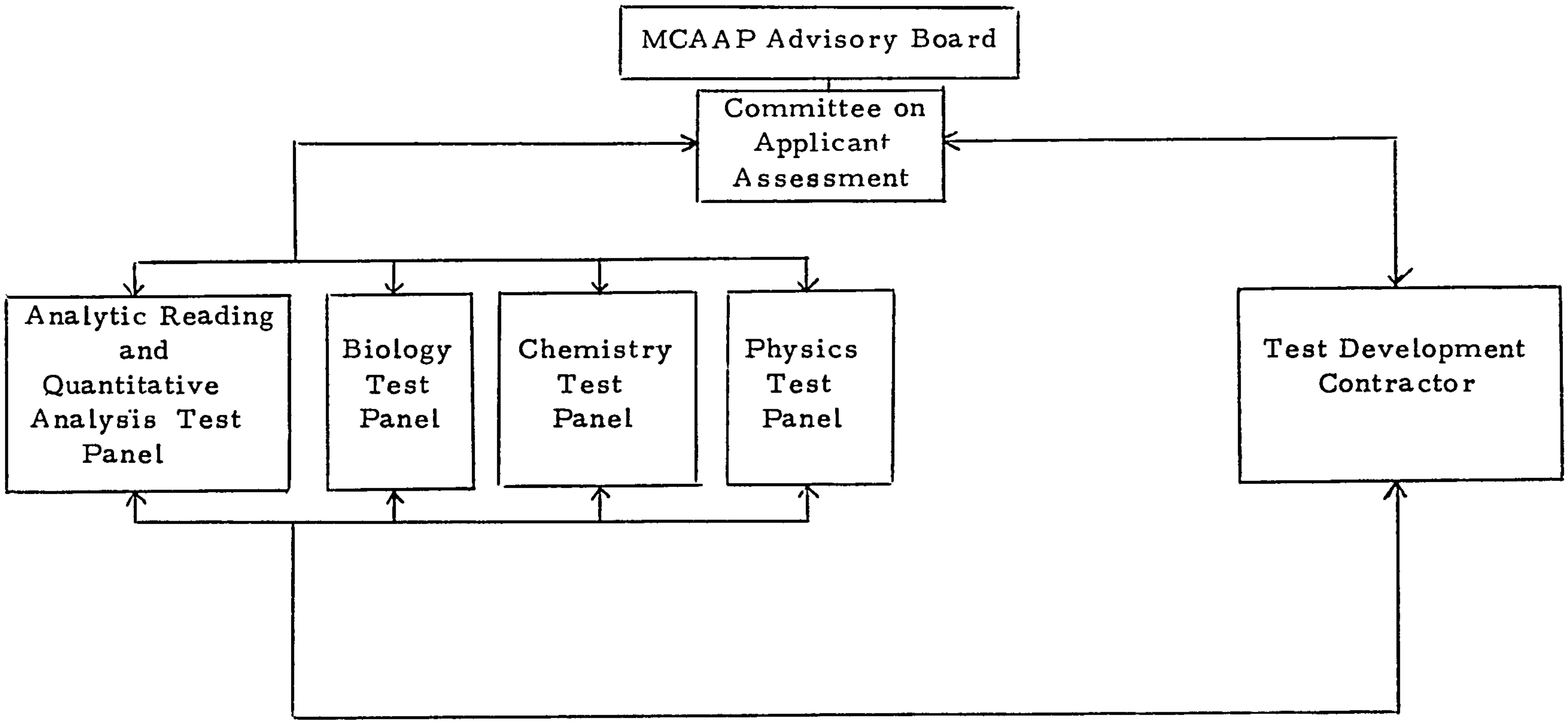
To insure sufficient input from the faculty of medical schools and undergraduate colleges, we recommend the organization of 4 test panels, a single panel for each of the science tests and one panel which would serve for both Analytical Reading and Quantitative Analysis Tests. One panel is deemed sufficient for these two tests since both tests are multi-discipline with respect to their content. Figure 4.1 illustrates the Committee and Test Panel structure and the nature of their relationship with the test developer.

Criteria for Test Panel Membership

A variety of skills and viewpoints must be present on the panels if the tests are to reflect the wants and needs of the MCAAP constituency.

Figure 4.1

RELATIONSHIPS AMONG THE PARTICIPANTS IN MCAAP TEST DEVELOPMENT



Specifically, the members of the test panels would include representatives of the medical school and undergraduate college teaching faculties, members of minority groups, and persons from the different types of educational institutions throughout the various geographical regions of the country.

Because we view the four test panels as the working groups who would have substantive input into the development of the MCAAP tests, and because the panels must adequately represent the various MCAAP constituency groups, we recommend that each panel be comprised of 10 individuals and that the membership of each panel satisfy the guidelines suggested above.

Functions of the Test Panels

The primary responsibility of each of the test panels would be that it provide the input needed by the test developer to assure that the scope and content of the tests were precisely aligned with current curricular emphases in the medical schools and undergraduate colleges. Because the five tests vary in their emphases, it is likely that the specific roles played by the different panels would also vary. However, we see all of the panels as performing essentially the following two tasks:

1. Working with the contractor to develop preliminary and final specifications for the test.

2. Reviewing individual items and reviewing and approving the final tests.

As a first step in the development of the MCAAP tests, a careful analysis of the abilities to be assessed and the content to be emphasized must be undertaken. We believe that it is especially important that the developer work closely with the test panels at this stage of the test development process. The outcomes of this close collaboration should be a precise statement of the specific content areas and the abilities to be assessed by each test.

The sets of specifications described above would then serve as the guidelines for item writers. We anticipate that from 25 to 30 item writers would be required every year for each of the MCAAP tests. Members of the test panels interested in the actual writing of items could also contribute to this aspect of the test development process.

Once items have been written, they must be carefully scrutinized both by the test panels and by the developer to insure that the intent of the test specifications has been met. After this is accomplished, the test contractor would edit and revise the items to insure that they meet the appropriate technical standards, then pretest the items using a sample of medical school applicants. Then, after the items for each test have been pretested and subsequently revised, they would undergo a final review by and ultimately receive the approval of the test panels.

PRODUCTION SCHEDULE FOR NEW FORMS OF THE MCAAP TESTS

Many factors should be taken into account when a decision is made regarding the production schedule (rate of development) of new forms of the MCAAP tests. In particular, the decision would have direct implications for test security and for how often the scope and content of the tests would be updated.

In the first instance, considerable concern has been expressed about problems of security with the present MCAT. An obvious approach to solving the problem would be the development of a new form of the test (either with all new items or with a mix of new and used items) for each national test date. Such a plan would effectively eliminate the opportunity for any medical school applicant to gain advantage over his peers by having prior access to the MCAAP tests.

In the second instance, periodic and frequent development of new forms of the MCAAP tests would insure that the content of each of the tests was kept current and that needed adjustments in the emphases placed on the various types of skills measured by the tests were made. The combined weight of these factors lead us to the following recommendation.

> Recommendation 4.7. Two new forms of the MCAAP cognitive tests should be completed each year, one for use on each of the two annual national test dates.

Initially, each new form of the tests would require entirely new items. However, once sufficient forms have been developed and an adequate item bank established, we would propose that future forms of the tests incorporate used items.

TRANSITION TO MCAAP TESTS

Whenever a transition from an old test to a new one occurs, care must be taken in several areas to insure a smooth transition. In the case of the transition from the MCAT to the new MCAAP tests (presumably in the spring of 1976), there are two major concerns to address. We believe the dominant problem in the transition will be one simply of familiarizing users with new procedures, new score scales, and the like. For this reason, we view several types of educational efforts as occurring between now and 1976. These include continuing the "MCAAP Report," providing programs at regular constituency meetings, providing a special "Guide for Admission Committees," and providing an optional educational program for such committees (see the later section of this chapter on Support Services for Medical Schools). The second concern is the provision of adequate technical back-up for the new tests. This latter concern is the topic of this section and results in the following recommendation.

> Recommendation 4.8. MCAAP should provide technical support for the new cognitive tests prior to their implementation.

The necessary technical support for the cognitive tests involves several types of information. The first type of information concerns the test content which we believe will be widely accepted as an improvement over the present MCAT. The second type of information involves the test development process being used. The use of test panels of recognized leaders in medical education and in undergraduate science teaching would certainly provide evidence of test quality and inspire user confidence. Third, empirical data about the new tests should be provided. This data would include the relation of the new MCAAP test scores to MCAT scores, estimates of reliability of the new scores, and several types of empirical validity as described in the Developmental Unit C later in this chapter.

OTHER ADMISSIONS DATA

Several other types of assessment in addition to cognitive tests and college records are sources of information for medical college decisions. These other forms of assessment, including, letters of evaluation, personal survey data, and interviews, are used for several purposes. As with the cognitive tests, a primary concern of these assessments is eventual professional competence. This concern is an important component of the letters of evaluation, and some aspects of the interview and personal survey information (biographical, application forms) have a similar purpose. However, as the number of well qualified applicants to medical school increases, acceptance and rejection decisions can also take into account concerns with personal and public outcomes. For example, using biographical data to select women applicants or applicants from racial-ethnic minorities relates to a public-level consideration. Sometimes the assessment information in letters or interviews is used for personal-level concerns, for example, to judge whether a student will be happy in the type of setting available.

In this section, we examine three types of admissions assessments including letters of evaluation, personal survey data, and interviews. As we discuss each type, we will also attempt to identify their purpose(s) in terms of the type of outcome to which they are either assumed to relate or can be shown to relate.

LETTERS OF EVALUATION

Letters of evaluation are a common fixture in medical college admissions decisions and many schools rate them among the most valuable assessment information available on an applicant. However, letters are subject to several problems. There are many different forms and styles of letters contributing, at the least, to inconvenience and, at the worst, to misinterpretation of information or to incomplete information. The goals and purposes of the letters are often poorly defined. The letter writers rarely know precisely what the school wants to know and the school itself may have many different and poorly defined uses for the letters. Thus, participants in several of the regional meetings and the MCAAP National Task Force recommended that efforts be undertaken to improve the letters of evaluation. This recommendation can be summarized as follows:

> Recommendation 4.9. A uniform letter of evaluation should be developed for optional use by undergraduate advisors and medical colleges.

Several suggestions for the content of an evaluation form or letter have been made. First, it was deemed crucial that letter writers be informed about what was expected of them. There should be no guessing games or hidden agenda in the forms. Guidelines for preparing an evaluation should accompany the form. Second, a clear statement of the writer's evaluation of each candidate in relation to others he has evaluated should be made. If some overall rating were solicited; for example, very high, high, average, or low, then evaluators should rate each candidate and also note the distribution of their ratings for all other candidates.

Letters of evaluation have different objectives which should be considered in the development process. A general objective is an evaluation of an applicant's characteristics in a number of areas related to medical training and practice. Some of these characteristics parallel assessments obtained through the cognitive tests and college record. Other characteristics (e.g., motivation, stamina, ethical standards, etc.), are not easily assessed through other means. Still others involve the assessment of characteristics not directly related to performance as a student or physician but which, for other reasons, might be important. Examples are outstanding ability or achievement in some field interrelated to medicine (such as music, history, or dance) or special activities in politics, child care, or other public service functions. The goal of the development process would be the identification of the objectives users have for letters of evaluation and the implementation of those objectives through an easy-to-use form adaptable to many purposes. To achieve this goal the development process should include the input and advice of many concerned parties (e.g., AAHP members and GSA members).

PERSONAL SURVEY DATA

Under the heading "personal survey data," we include several types of information. The first type is the basic biographical data (age, sex, racial-ethnic identification, family background, etc.) which is used primarily for administrative or research purposes. Other types of personal survey data more relevant to admissions decisions include statements of personal goals and interests and surveys of personal activities and achievements. The type of statement collected on an application form asking about the student's goals in becoming a physician and the questions on the present MCAT Questionnaire about desired physician role or specialty are examples of these types of data. The AMCAS essay is another example of personal survey data.

Within the broad area of personal survey data there are several possibilities for improvements and future additions. As with the letters of evaluation, the mystery of blank spaces on a form to be filled in without adequate direction must be eliminated. Students should be given clear directions about what type of statement or essay is being sought. In addition, we believe that many possible future directions for measuring personal, noncognitive characteristics can be accomplished through this medium. This is especially true for the assessment of characteristics which are bipolar in nature. While one probably would not want to rely on a student's self-evaluation on a variable for which being "high" apparently related to being "good," a student's self-evaluation might be very useful in judging, for example, whether he or she was more oriented to scientific, laboratory research or to day-to-day interaction with patients. We particularly call these possibilities to the attention of those involved in the study of long-range outcomes and the development of admissions data relevant to them (see Chapter 7). To facilitate this development we recommend the following:

> Recommendation 4.10. An experimental unit should be included on the MCAAP Applicant Assessment along with the cognitive tests for the purpose of gathering personal survey data for study and eventual validation.

INTERVIEWS

Interviews are one form of assessment for which great differences of opinion exist. Interviewers often leave an interview with a definite conviction about the candidate and, therefore, quite naturally act on that conviction. However, the basis for their conviction is often very hard to document and empirical studies rarely support the predictive value of such interview impressions. Thus, we approach the question of medical school admissions interviews with two conflicting feelings. First, we are convinced (as was the National Task Force) that interviews could be done better. However, at the same time, interviews are a very expensive form of assessment and good interview techniques are even more expensive. Thus we are doubtful of the relative positive return of a large investment of time and money in this area.

As a compromise, we suggest that, at a minimum, several steps be taken to assist those schools who interview applicants. First, we recommend that support materials for undergraduate advisors and medical schools include descriptions of how to improve interviews. Such procedures might include the use of multiple interviewers, standardizing the interview situation, defining the type of information being sought, etc. Second, we suggest that applicants be thoroughly informed about the purpose of the interview and the role it plays in an admissions decision. Third, we propose that interview results be documented and subjected to analysis and validation along with all other admissions assessments. Fourth, we suggest that applicants be asked to evaluate their interviews. Fifth, we concur with the suggestion of the National Task Force that special attention be given to the interviews of racial-ethnic minority students and women and that a national registry of trained interviewers from ethnic minority groups be established and made available to interested medical schools.

SUPPORT SERVICES FOR MEDICAL SCHOOLS

We have described the various kinds of assessment data available to medical schools for their use in admissions decisions. Throughout the 1973 meetings on MCAAP planning, strong recommendations have been made for supporting services for the new program to assist medical schools in making better and more equitable use of the data available to them. In this section we describe four support programs designed to provide this type of assistance to medical schools as they use assessment data for admissions decisions and for other purposes.

SCORES AND REPORTS FOR MEDICAL SCHOOLS

One of the basic supporting services which MCAAP will provide medical schools is the reporting of scores and other results from various portions of the Applicant Assessment. In this section we address two important questions related to these services: In what form should the MCAAP test scores be reported? and What information should be included on a complete report of the MCAAP Applicant Assessment?

TEST SCORE SCALES

To facilitate proper use and interpretation, test scores must be reported in a form consistent with appropriate use. The form in which to report the MCAAP test scores was the subject of lively and frequent discussion throughout the various MCAAP planning meetings. Here we examine some of the major considerations involved in a decision about test score scales and present a recommendation for MCAAP.

Discussions about MCAAP scores frequently centered on the relative merits of criterion-referenced scores. Because there was considerable confusion about what these two terms mean and about the differences between how a test is constructed and how it is scored, we begin this section with a discussion of these important issues.

Criterion-Referenced Tests

A criterion-referenced test is one that yields measurements that are directly interpretable in terms of the tasks performed by the examinee. Development of such tests begins with a thorough and specific definition of the criterion domain. Interest in criterion-referenced tests has resulted from the use of tests in the classroom setting, where the domain of the test was commonly defined in terms of all of the objectives of an instructional unit--all the skills and concepts which were supposed to have been taught. The next step in the process is to construct test items for every objective of the domain. For example, if the domain of an arithmetic unit included objectives on the addition of two-digit numbers, then items testing every facet of each objective would be constructed. A high degree of inter-item consistency presumably holds among the items bearing on a single objective. If an individual has achieved a high degree of proficiency in the behavior involved, he will exhibit this proficiency on almost every item that bears on the objective. The completed criterion-referenced test would include items measuring each important facet of every objective.

While this formula for a criterion-referenced test makes excellent sense when testing is used to determine whether students have achieved the objectives of an instructional unit, its application at the level of medical school admissions raises many problems. For example, even the task of constructing a criterion-referenced test where items are sampled from the domain of a college biology course is a vast undertaking. Such a domain would include many, many elements, and the resulting test might require days for a student to complete. At the level of medical school admissions, a criterion-referenced procedure might include the specific definition of a domain not only of what a student should have learned from a basic core of college courses, but also those things which are essential requisites for any medical school. Thus, the problem of defining a domain is massive, even without concern for the lengthy test which would result.

In the meetings on MCAAP planning, many people suggested that the MCAAP tests should be criterion-referenced tests. We believe, however, that criterion-referenced tests in the sense defined above were not intended. Instead, people generally seemed to mean that the MCAAP tests should test skills and knowledge which are important requisites for medical school and the test content and individual items should be justified on that basis. The cognitive tests proposed here are intended to satisfy this requirement. The major areas to be tested and the component parts of each were all selected on the basis of constituency judgment that those areas represented important skills and knowledge required in some part of the medical education process. While not criterion-referenced in the sense that this term is now used by measurement authorities, the MCAAP tests might be called "content-justified --they are justified primarily on the basis of the importance and relevance of their content, not just on the basis of statistical characteristics designed to differentiate between applicants or to spread out score distributions.

Criterion-Referenced Score Scales

Once the problem of how the test should be constructed is resolved, the next step concerns how the test scores are reported. A criterion-referenced test as previously defined leads to a criterion-referenced score scale in which the test score is reported in terms of what portion or how much of the criterion domain a student has accomplished. Throughout the MCAAP planning process, suggestions were made that the MCAAP tests be scored on a criterion-referenced score scale. However, without a criterion-referenced test one cannot have a criterion-referenced score scale which can be interpreted in the way described above. Instead, we believe this recommendation resulted from the desire that MCAAP scores represent how well a student is prepared for medical school and that beyond that basic level of preparation no distinctions should be made.

The problem with the application of this idea is that there is no meaningful way to describe the level of preparedness except by descriptive objectives (poorly prepared, well prepared, etc.) or by probabilities of survival in training. Moreover, medical schools differ in their requirements and in their courses. Just as it would be difficult if not impossible to define a single set of essential skills required for successful performance at all medical schools, so it would be difficult to set a single level for any sample of skills which would indicate adequate preparation for any specific medical school.

Probability of successful completion of medical training--whether it be a criterion-referenced interpretation or not--would have considerable appeal to admissions committees. Such an interpretation allows for variation among medical schools and would provide a kind of empirical check on the types of judgments about requirements which would have to be made in implementing the previous notion. However, before it can be implemented, this approach requires local medical school studies of the relation of scores to criteria. In addition, it requires suitable criteria measures and it is likely that there would be multiple criteria of interest to the schools.

Norm-Referenced Score Scales

While some argued in favor of variations on criterion-referenced-types of tests and scores, others argued that the basic purpose of the test was still to rank people and that, therefore, norm-referenced scores were crucial. Even within norm-referenced score scales, however, there are many options.

The present MCAT score scale ranges from 200 to 800, although 600 scale units are never used. This is true because there are fewer than 600 items and hence fewer than 600 possible different raw test scores. Many concerns were expressed about the MCAT score scale. There was concern that statistically meaningless score differences were being treated by users as real and important differences and that the 600 unit scale implied a precision which was not, in fact, justified. An additional concern was that even large score differences in the upper regions of the scale had no practical implications in terms of students' ability to perform successfully in medical school. All examinees scoring at very high levels (say above 700) have adequate preparation for the medical school basic science curriculum, insofar as this can be inferred from the test scores. Therefore, in terms of the science requirements for medical school, there is no reason to give preference to the student scoring 775 over the student scoring 700. There was interest, however, in maintaining score differences in the lower region of the scale, particularly for use in assessing the chances of success and the special needs of some minority applicants.

An MCAAP Score Scale

After carefully considering these many and sometimes conflicting concerns and desires of the MCAAP constituency, we make the following recommendation as a first step in meeting the needs.

> Recommendation 4.11. A new MCAAP norm-referenced score scale should be developed which would minimize the misuse which might result from a false appearance of precision.

In the new score scale, the number of score units should be determined in relation to the size of the standard error of measurement. For example, in the present MCAT, a typical standard deviation of 100 and reliability of, say, .91 results in a standard error of measurement equal to 30 score units. We believe that a score scale should be selected for which the resulting standard error of measurement is at least under 5 score units and preferably only about 2 units. This recommendation, which is consistent with newly developed professional test standards (APA, in press), will help avoid an improper appearance of precision and will likely result in a test score scale of somewhere between 20 and 50 units. Using data on the new tests which will be obtained in the test development process, a single score scale for all the MCAAP tests can be determined. The use of confidence bands in the score reports may also help eliminate misuse by indicating explicitly the error and imprecision in the scores.

This type of norm-referenced score scale would provide an opportunity to take several additional steps to meet other concerns of the constituency. Using this score scale, data could be accumulated to try to discover points in the score scale above which all students have adequate cognitive preparation for a particular medical school or for a group of similar medical schools. In the future, through the services described in Chapter 6, it would be possible to report scores for a particular school in terms of "qualified for the basic sciences curriculum" or other levels of lesser qualifications.

At the same time, the proposed score scale preserves information which might usefully relate to other longer-term criteria. For example, physicians pursuing a medical research career may have quite different science level requirements than some other physician career roles. In such a case, while upper MCAAP test score regions may not differentiate applicants in terms of their preparation for the basic sciences curriculum, it may be relevant information if the applicant wishes to become a medical researcher.

In summary, we believe that the implementation of a new norm-referenced scale is crucial to help eliminate score misuses and that such a scale would provide the needed flexibility to accommodate other constituency concerns through additional research and special reporting procedures.

MCAAP COGNITIVE TEST SCORES

Presently, four MCAT scores are reported to the applicant and to the medical schools of his choice. We propose that the score reports for the MCAAP Applicant Assessment follow this same model and provide individual scores for each of the five MCAAP tests. We further propose that the appropriate MCAAP user constituency be consulted regarding the value of and their interest in an optional sixth score, one providing a total score for the three science tests.

MCAAP REPORTING SERVICES

Medical schools presently receive very simple reports of the four MCAT scores as one of several sources of information available about their applicants. One of the goals of the MCAAP Applicant Assessment is to assist colleges by providing more and better applicant information to schools. As this is accomplished, an obvious next step is to report this broader information in a coordinated form for easy use by medical schools.

> Recommendation 4.12. MCAAP should provide a consolidated report of its Applicant Assessment to medical schools including cognitive tests results, college record, biographical and personal survey data, and results from letters of evaluation.

Such a consolidated report form is especially important as more types of assessment information are available on applicants. We recommend the design of a centralized data system for accomplishing such reports. A description of such a data system, and its relationship to the present AMCAS, are described in Chapter 6.

A consolidated score report of various types of assessment linked through such a data service would also allow for the implementation of the types of special score reports described in the previous section. Results of the various types of assessment can be empirically linked to intermediate (and eventually long range) outcomes, for example, to identify special problem areas a student may encounter.

TECHNICAL HANDBOOK FOR THE MCAAP APPLICANT ASSESSMENT

Any reputable national assessment program is subject to certain professional standards for assessment instruments. The recognized standards for the field of educational assessment are those developed jointly by the American Psychological Association, the American Educational Research Association, and the National Council on Measurement in Education. New standards are being developed by these organizations at this time (APA, in press) which call for extensive and thoughtful technical back-up for any large-scale assessment program.

With a new assessment program, technical evaluation becomes even more crucial. Such evaluation, however, serves more functions than just certifying an assessment for general use. It also provides the basis for continuing improvement of assessment instruments. Because of the important internal role which technical evaluation of an assessment plays and because of the external sanctions for such an evaluation we recommend the following.

> Recommendation 4.13. MCAAP should provide for a continuing, extensive program of technical analysis and evaluation of the MCAAP Admissions Assessment (including cognitive tests and other data) resulting in the publication of updated technical handbooks at regular intervals.

A preliminary technical handbook should be available in the spring of 1976 before the first national use of the new MCAAP assessment. The preliminary handbook should concentrate on the cognitive tests and should include complete content descriptions, sample items, and descriptive comparisons with the MCAT. In addition, correlational data with MCAT scores should be presented to supplement the descriptive data in assisting users in interpreting the new scores. Finally, preliminary data on statistical characteristics such as reliability and several types of validity should be provided.

The preliminary technical manual should be supplemented with brief technical reports as additional data becomes available and should be replaced with a more complete technical handbook probably in 1978. The more complete handbook would include technical analyses of all types of MCAAP admissions assessments including college records, cognitive tests, letters of evaluation, personal survey data, and interviews. Table 4.11 provides a possible outline for the 1978 Technical Handbook which would incorporate data accumulated over the first two years of MCAAP use. While the technical level of the handbook reduces its primary audience to researchers and technical specialists, its information provides the basis for briefer, more pertinent publications for various MCAAP users.

MCAAP GUIDE FOR MEDICAL COLLEGE ADMISSIONS COMMITTEES

In numerous discussions of the new MCAAP, concern was expressed about the lack of information for admissions committees regarding what the present MCAT is like, what it means, and how it should be used. For the new MCAAP, the following recommendation is made to help alleviate this important deficiency.

> Recommendation 4.14. A publication about the MCAAP Applicant Assessment should be developed to assist medical school admissions committees in the proper and effective use of MCAAP data.

This publication would build upon the technical results of the Technical Handbook as they relate to the pragmatic interests and concerns of admissions

TABLE 4.11

TECHNICAL HANDBOOK FOR THE MCAAP APPLICANT ASSESSMENT

I. Introduction to the New MCAAP

   A. Rationale for the Program
   B. General Description of Its Elements
      1. Cognitive Tests
      2. Letters of Evaluation
      3. Personal Survey Data
      4. Interviews

II. Development of the Applicant Assessment

   A. Procedures Used
   B. Content Descriptions

III. General Evaluative Data

   A. What Does Each Part Measure?
   B. How Reliable are the Scores?
   C. To What Does Each Part Relate?
      1. Concurrently
      2. Predictively

IV. Evaluation of Uses of the Applicant Assessment for Medical School Admissions Decisions

   A. What Are the Different Uses?
   B. General and Additional Data for Evaluating Uses
   C. What Are the Dangers for Misuse?

V. Evaluation of Uses of the Applicant Assessment for Student Decisions

   A. What Are the Different Uses?
   B. General and Additional Data for Evaluating Uses
   C. What Are the Dangers for Misuse?

VI. Evaluation of Uses of the Applicant Assessment for Administrative Purposes

   A. What Are the Different Uses?
   B. General and Additional Data for Evaluating Uses
   C. What Are the Dangers for Misuse?

VII. Special Considerations

   A. Analysis of Uses of the Applicant Assessment with Special Groups (minorities, women)
   B. Limitations and Special Future Data Needs

committees. The guide should have several characteristics: (1) it should be as brief as possible; (2) it should be readable and not overly technical; (3) it should be useful and deal with the real decisions committees must make; (4) it should educate on proper and improper uses of assessments and the implications of common types of uses; (5) it should familiarize the committee with actual content of the assessments (such as the type of test questions included in the cognitive tests parts); and (6) it should assist committees in coordinating the use of various data sources to best accomplish the admissions goals of its medical school.

EDUCATIONAL PROGRAMS FOR ADMISSIONS COMMITTEES

Several MCAAP planning meetings included discussions about the need for optional special educational programs for admissions committees. These recommendations are especially pertinent with the introduction of new assessment measures. There are many possibilities for the form such educational programs could take and from those possibilities we have chosen to recommend the following approach.

> Recommendation 4. 15. MCAAP should sponsor a national registry of trained persons available to assist local admissions committees on a consulting basis in the effective use of MCAAP data.

Many admissions committees have the need for someone to come to their school and provide assistance on how to make the best use of the information they receive on medical school applicants. Providing such services through AAMC staff would be very expensive. A reasonable alternative would be to establish special training sessions at a central location to which some admissions committee members would come. However, this approach could neither reach all committee members nor the committees as a group. As a consequence we have proposed an approach to attempt to reach interested local admissions committees in a relatively inexpensive way. The proposed approach calls for identifying four to six medical college personnel in each of the four regions of the country who would be given special training and support materials in a two-day session and would then be available to medical colleges on a consulting basis to work with their admissions committees in using MCAAP data effectively.

DEVELOPMENT PLAN

Previous sections of this chapter have focused on recommendations for MCAAP at Stage 2. This section will provide a description of the sequence of tasks which are necessary in implementing those recommendations. The developmental plan is divided into three units: (1) steps required for construction of the MCAAP cognitive tests, technical research and the development of support publications, (2) procedures for the design of a uniform letter of evaluation, and (3) development of materials and mechanisms for training medical school admissions committees in the effective use of admissions data. Each unit involves interrelated tasks which can best be accomplished by a single developer.

The initial step in developmental planning for each of the three units will require preliminary decisions by the staff of the AAMC, the MCAAP Board, and the Executive Committee of AAMC. As in Chapter 3, we will assume that the necessary decisions to implement each of the developmental units have been made by March 1, 1974. Once again, we assume that if a contractor is to be engaged to undertake the specified work, a Request for Proposal will be released on or about that date.

DEVELOPMENT AND TECHNICAL DOCUMENTATION OF THE COGNITIVE TESTS--DEVELOPMENTAL UNIT C

We have assumed that a contract for Developmental Unit C would be let by May 1, 1974 following a two month planning stage. The next step in implementing the plan would be a meeting with representatives of the developer, AAMC staff, the MCAAP Board, and the Committee on Applicant Assessment in attendance. This meeting, would provide members of the participating groups the opportunity to discuss and modify the developer's plans and to receive new constituency input as well.

The major outcome of the meeting would be a further defining of specifications for the three major components of Developmental Unit C, which include:

1. the five cognitive tests,
2. preliminary technical research on the tests,
3. support publications for the tests

The remainder of this section describes the procedures for implementing these three test development related activities.

TIME CONSTRAINTS AFFECTING DEVELOPMENTAL UNIT C

Prior to providing a detailed description of steps in the test development sequence, a related concern, the length of time required for constructing two forms of each of the five cognitive tests, is discussed. The preferred time frame for developing two forms of the tests is approximately three years. Since the target date for use of the first new form of the tests is May, 1976, it is clear that this goal can be achieved only with an extraordinary effort on the part of the developer since the developmental sequence will have to be compressed to about two years and will undoubtedly require special resources. However, even with these additional resources, completion of the tests for use in May, 1976 will place great demands on the developer. For this reason, we recommend that the AAMC take action to award the contract for Developmental Unit C at the earliest possible date.

Since the developmental sequence for the two test forms to be completed by May, 1976 is not typical of the sequence which will be followed for the development of subsequent forms of the tests, and since some steps in the development of the second set of forms will overlap steps of the first set, Figure 4.2a includes the time and task schedule for both sets of forms. To facilitate discussion, the two forms developed for use in 1976 are referred to as Forms A and B and the next two are referred to as Forms C and D.

TEST DEVELOPMENT

The sequence of tasks for developing the five cognitive tests are listed in Figure 4.2a. The most crucial of these tasks are discussed next.

Meetings with the Test Panels

Early in the test development process, representatives of the developer would meet separately for two days with each of the four test panels. Prior to meeting with the test panels, the developer would prepare materials which would serve to focus the panel members' thinking on the important decisions to be made at the meetings. The outcomes of these meetings would include a

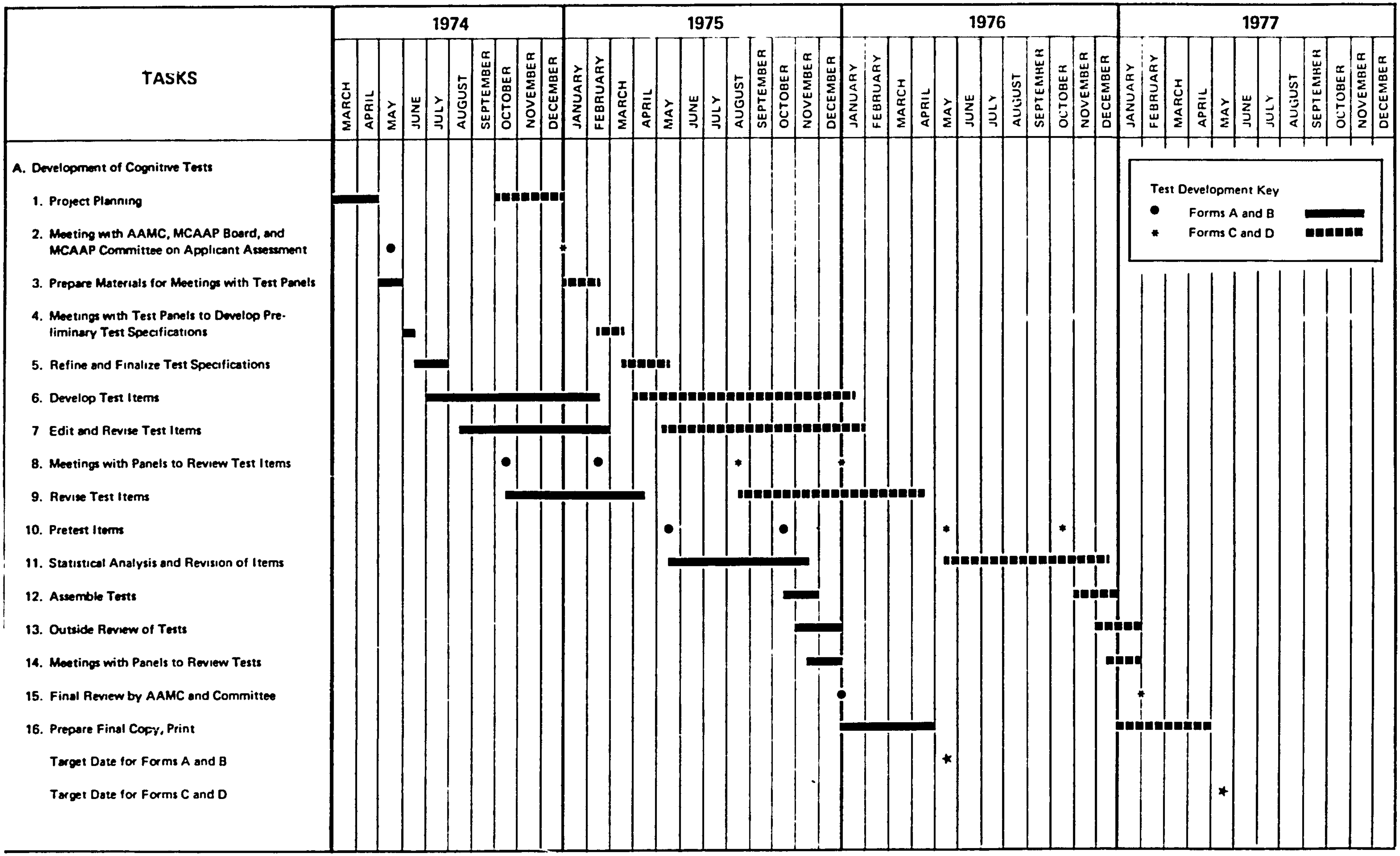
1. definition of the content for each test and the emphases to be placed on the various domains of that content.
2. decision as to the types of skills to be assessed by the test and the weight to be given to each.
3. preliminary statement of the scope and content specifications for test.

These crucial first steps in the test development process would be completed by mid-June, 1974.

Finalize Test Specifications

It is unrealistic to assume that final test specifications for each of

Fig. 4.2a. Time and task schedule for development of the cognitive tests—Developmental Unit C.



the tests can be developed in two-day joint meetings of the developer and the test panels. Moreover, during these four meetings, each of the panels will not have focused their effort on stating specifications at the detailed level required for item writers. Thus, the developer would develop those more detailed specifications subsequent to the meeting. However, since it is crucial that the test panels review, recommend changes in, and ultimately approve the final test specifications, copies of the expanded specifications would be provided each panel member (through the mail) for review and approval subject to recommended modifications. Final specifications for all five tests should be in hand by early August, 1974.

Development of Test Items

The next critical step in the test development process is the construction of test items. The final sets of test specifications generated jointly by the developer and the test panels will serve as the guidelines for item writers. To develop items for each of the tests, we recommend that five item writer groups be organized. As indicated earlier, the members of each of the item writer groups would be drawn from the ranks of medical school and undergraduate college educators, and each would include minority members and representatives of the various types of schools. Moreover, because members of the test panels participated in defining test specifications, they would be welcome additions to those groups should they elect to participate at this level. Although we propose that the developer have responsibility for directing the work of the item writers and for their reimbursement, the test panels, AAMC staff and the Committee on Applicant Assessment would participate in identifying able candidates for this important and difficult task. Because of the large number of test items which must be developed, most of which will require considerable creativity and ingenuity on the part of the item writers, approximately 7 1/2 months have been scheduled for item development. All items should be in the developer's hands by mid-February, 1975.

Review and Revision of Items

Once items have been completed by the item writers and submitted to the developer, they would undergo a series of reviews, both by the developer's measurement specialists and by the various test panels. Because a very large number of items would be constructed during the 7 1/2 month time period allotted for item development, two meetings with each of the four test panels will be required to assure adequate time for review of all of the test items. The time schedule in Figure 4.2a calls for a first meeting of the panels in October, 1974. At this time, approximately one-half of the items to be constructed should have been received by the developer. The review of the remainder of the items should take place in February, 1975.

The specific goal of these meetings is that the items be evaluated to determine if they satisfy the item specifications which were fundamental to their design. Throughout the review process, many items would be identified which require revision and in some instances, replacement. This aspect of the test development process would extend through mid-April, 1975.

Pretest Items

Items developed by even the most experienced and highly skilled item writers will not always be adequate for use in the MCAAP tests. Even after items have undergone close scrutiny by testing specialists, some items which appear to be technically sound may, in fact, not "work" when they are actually administered. For example, some items may prove to be unclear or confounding to a large number of examinees, causing them to respond incorrectly to the item even though they may be knowledgable in the skill area being tested. Such items, and others with different types of flaws, must be identified and then revised or replaced. The best way to identify these items is to administer them as a pretest. The types of data resulting from pretesting and how they are used are described in the next section.

The pretesting process for the MCAAP tests would be accomplished by administering the newly developed MCAAP items to groups of medical school applicants. We recommend that the items which would ultimately be used on the first two forms of each of the MCAAP tests be assembled into pretest units, each about 20 minutes long, and administered along with the present MCAT on the AAMC national test dates in May and October of 1975. The pretest units would be printed at the same time as the MCAT, thus enabling the incorporation of these units within the regular MCAT booklet.

Pretest Item Analysis and Item Revisions

Once the items have been pretested, the examinees' responses to each item would be statistically analyzed. The purpose for this analysis of the items would be to determine whether individual items were acceptable for use in the MCAAP tests, or whether they should be revised or replaced. The item analyses proposed would provide traditional indices of item difficulty and discrimination power, a breakdown of the number of examinees selecting each of the responses for every item, the number of examinees omitting each item, and the number of examinees not reaching each item for lack of time.

Although standard item analysis indices would be determined, the use of these indices would likely be atypical; that is, the indices would not be interpreted in the usual way. Since members of medical school applicant pools are generally very well qualified and most have the necessary academic ability to succeed in medical school, items for the MCAAP tests would not be selected to maximize discrimination among all examinees, but rather to separate the applicants into two groups, those having or those lacking the requisite abilities for success in medical school. A brief discussion of how the item data would be used follows.

In the classical test development sequence, an item is usually not included on a test if its difficulty index does not fall within a certain range. For example, three items assumed to be testing the same skill may yield three quite different difficulty indices. If only one item is to be used, all other factors being equal, the item with the "best" difficulty index would probably be selected. We would propose a slightly different use of the difficulty index for MCAAP items. Given the same situation described above, we recommend that the item selected be the one most clearly relevant to success in medical school. With this approach, the item difficulty indices simply highlight the differences in the items and thus call them to the attention of the developer. Of course, in the case that all three items were of comparable importance to medical education, then preference would be given to the item which would contribute to better discrimination among the applicants.

The item discrimination index, which is related to the item difficulty index, would enable the developer to determine whether incorrect alternative responses for an item are working well and thus drawing less able examinees to select them, and whether items are ambiguously worded and therefore drawing highly able examinees to select incorrect alternative responses. Interpretation of the discrimination indices for MCAAP items would have to be tempered by the knowledge that a large proportion of the pool of applicants to medical schools can demonstrate a high level of competency in most of the abilities measured by the MCAAP tests.

The final outcome of these statistical analyses is that individual test items would be carefully scrutinized to eliminate ambiguous, technically unsound items and to provide input into editorial work for improving the items. Moreover, information regarding the pretest units as a whole can be gathered, thus enabling the developer to judge other important attributes, for example, the speededness of the tests. These steps in the test development process would be completed by late November, 1975.

Assembly and Final Review by MCAAP Groups

Following item pretesting and revision, the MCAAP tests would be assembled. Test assembly essentially involves the selection and organization of items along lines which best fit the test specifications approved by the test panels early on in the test development process. Once assembled, the tests would undergo review by the test panels, the AAMC, the MCAAP Board and the Committee on Applicant Assessment. Input from these groups would be used to make final revisions and adjustments in the MCAAP tests.

Review by Minorities and Testing Experts

In addition to a review of the tests by appropriate MCAAP groups, we recommend that members of minority groups within the MCAAP constituency and testing specialists independent of the developer review the tests. The minority reviewers would have as their objective the identification of problems in wording or nuance which might put minority candidates at a disadvantage, whereas the testing experts would provide a final check on the technical quality of the test.

Revise and Print

Once all the test reviewers have submitted their critiques, the developer would complete a final revision of the tests. The entire review and revision process would be completed in time for the tests to be sent to the printer in February, 1976. The completed tests would be ready for use on the target date in May, 1976.

Development of Additional Forms of the Tests

The developmental sequence for Forms A and B of the MCAAP tests would be compressed to approximately two years. The plan outlined in Figure 4.2a for forms C and D reflects the preferred time allocations for the various developmental steps. Most of the additional time indicated in the chart would be allocated to item development and review. We recommend that construction of forms C and D and all subsequent forms of the test follow a developmental cycle of slightly less than three years.

TECHNICAL RESEARCH ON THE MCAAP TESTS

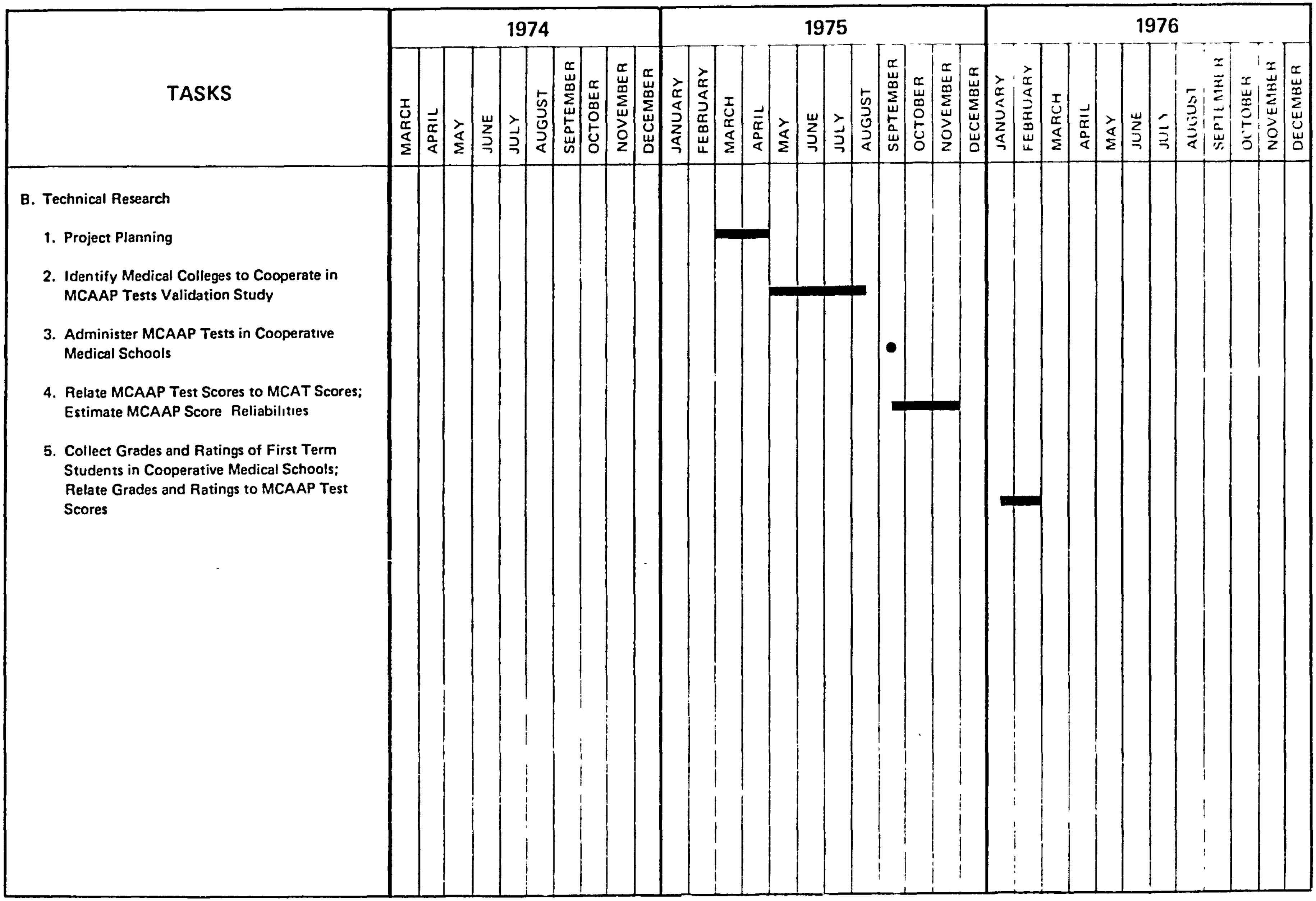
The second component of Developmental Unit C involves technical research on the MCAAP cognitive tests. Figure 4.2b outlines the research tasks which must be completed and a time schedule for accomplishing them. The developmental plan described in this section would only be applicable to technical research on the tests during the transition period. Once again, time is the constraint which requires interim procedures since new tests must be ready for use by May, 1976.

The desired outcome of the research to be carried out at the transition stage (from MCAT to MCAAP) is that medical schools be provided further evidence as to why they should place confidence in and use the MCAAP tests. The required evidence would be obtained by carrying out the three studies described next.

Correlation of MCAAP Test Scores with MCAT Scores--Study A

Individuals involved in admissions decisions at most medical schools are accustomed to receiving and using MCAT score reports. Thus, data relating MCAAP scores to MCAT scores could be helpful in the transition period. To determine these relationships, scores of individuals who have taken both the MCAT and the MCAAP tests would be needed. To obtain those scores, we propose that as many as 10 cooperative medical schools be identified. These schools would request that their first year entering class take the new MCAAP tests shortly after their arrival to medical school. Thus, both MCAT and MCAAP scores for this group of medical school students would be available to the developer. Once these data were available, individual correlations between the subtests of the MCAT and the corresponding MCAAP tests would be computed.

Fig. 4.2b. Time and task schedule for technical research on the cognitive tests–Developmental Unit C



Reliability Estimates for the MCAAP Tests--Study B

The reliability of the MCAAP tests will be a mutual interest of both developer and user since it represents the extent to which the tests precisely measure the skills and abilities required in the test specifications. Thus, an estimate of the reliability of the MCAAP test scores is necessary if users are to have confidence in the MCAAP tests during the transition stage. For this reason, estimates of the internal consistency of the tests would be made using the MCAAP score data collected in Study A.

Validity of the MCAAP Tests--Study C

Because the MCAT scores are frequently used by medical schools as a predictor of student academic performance in the early parts of the basic science curriculum, some evidence of this type of validity for the new MCAAP tests is both appropriate and desirable. Two types of data would be necessary for demonstrating the empirical validity of the MCAAP test scores in this manner. The first of these, student scores on the MCAAP tests, would be accessible through the data collected for Study A. In addition to MCAAP score data, information regarding student performance in the early basic science curriculum would be obtained for the same students. Because some evidence of test validity should be available when the first tests are administered in May, 1976, it will be necessary to use the performance data on medical school students who were tested with the MCAAP in September, 1975 and who had completed one term of medical school by late January, 1976.

The time and task chart in Figure 4.2b allocated several months to acquiring the cooperation of medical schools for these studies. MCAAP testing in these schools would be scheduled for September, 1975. The first and second studies would be completed shortly after the tests were administered and scored, and the third study would be completed only after all evaluations of first term performance were recorded. Research data from all of the studies would be available and reported prior to the first administration of the new MCAAP tests.

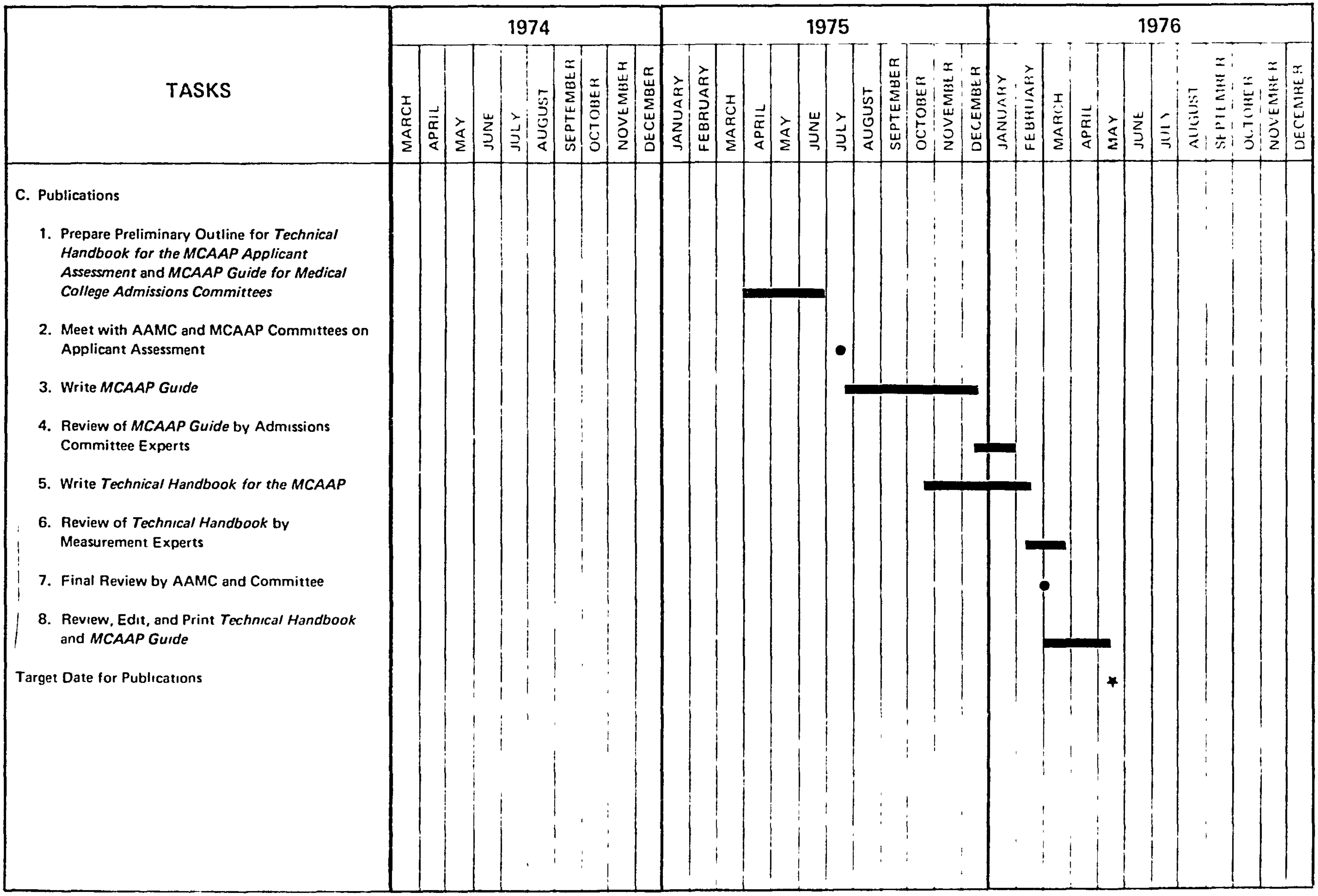
SUPPORT PUBLICATIONS FOR THE MCAAP TESTS

In this section, a plan for developing two publications related to the MCAAP is described. Figure 4.2c provides a description of the steps in their development. The first publication, a preliminary technical handbook for the new MCAAP was described earlier in this chapter (see Support Services for Medical Schools). The contents of the second publication, a handbook designed especially for use by members of medical school admissions committees, was outlined in the same section. Both of these publications would reflect the current state of MCAAP development at the time they are written, and thus would focus mostly on the cognitive tests. Later versions of both handbooks would be more comprehensive, including assessment information beyond the cognitive tests.

Preliminary Planning

Since the target date for completion and delivery of the two handbooks is May, 1976, preliminary specifications including detailed content outlines for both handbooks would be prepared during the three month period from April, 1975 through June, 1975. In July of the same year, the developer would meet with the AAMC staff, the MCAAP Board, and the Committee on Applicant Assessment to review and finalize specifications for the two publications.

Fig. 4.2c. Time and task schedule for the development of support publications—Developmental Unit C.



Writing, Review, and Printing of the MCAAP Guide

A preliminary draft of the Guide would be designed by the developer and submitted to the AAMC, the MCAAP Board, and members of the Committee on Applicant Assessment for their review. Moreover, two medical educators experienced in the admissions process would participate in the design and review of the Guide.

Writing, Review, and Printing of the MCAAP Technical Handbook

Although much of the text for the Technical Handbook can be written concurrent with the Guide, the writing of some sections of the Technical Handbook must await results from the three research studies outlined in the previous section. Thus, a preliminary draft of the Technical Handbook is likely to be completed no earlier than early February, 1976. When completed, it would be distributed for review by the Committee on Applicant Assessment and to two measurement experts external to the developer and familiar with the content and scope of technical reports of the type being developed.

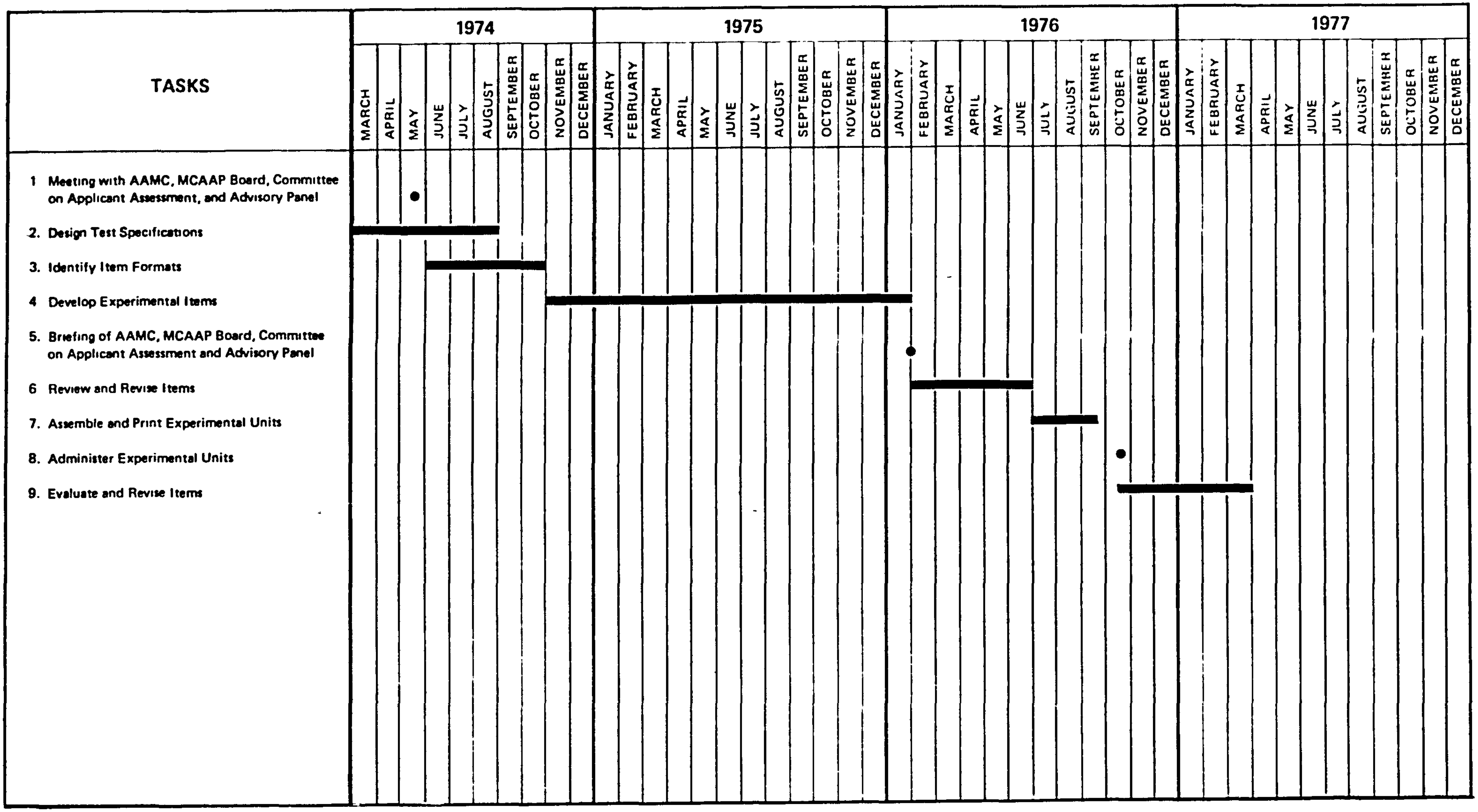
Once review input is received from the Committee and the experts, a final review and revision of the Technical Handbook would be carried out by the developer. This process would be completed in time for a meeting with AAMC staff, the MCAAP Board, and the Committee on Applicant Assessment in early March, 1976. The purpose of the meeting would be review and final approval of the Handbook. After any adjustments which might be called for at the meeting, the Handbook would be sent to the printer in time for it to be completed and distributed by May, 1976. Figure 4.2c indicates that the schedule for completing and printing the Handbook is extremely tight, allowing for almost no departure from the time frame indicated. This is a function of the goal that the <u>Handbook</u> be available in time for the administration of the form of the new MCAAP tests.

EXPERIMENTAL UNIT ON PROBLEM SOLVING ABILITY

Earlier, we identified problem solving ability as a potentially significant assessment variable for admissions decisions (see p. 4-9). The reason for our interest in this area lies with the intuitive relationship of problem solving skills to the skills required of the medical student/physician. To investigate the strength of this intuitive relationship, we propose that an experimental unit on problem solving skills be developed. Development of such a unit presupposes that relevant outcome measures (see Chapter 7), for example, medical student performance in clinic would be developed concurrent with the problem solving unit. This simultaneous development of outcomes measures is crucial since student evaluation on these measures would then serve as the criterion for validating the problem solving tests.

Figure 4.2d provides a time and task schedule appropriate for developing an experimental unit in time for administration as a part of Form B of the MCAAP Applicant Assessment in late 1976. The development plan assumes that a special advisory panel would be assembled to advise and work with the developer in designing appropriate measures of problem solving ability. The panel would consist of eight individuals experienced in the development of tests of problem solving ability and would include medical school faculty involved in the clinical aspects of student training.

Fig. 4.2d. Time and task schedule for the development of experimental unit on problem solving ability—Developmental Unit C.



DESIGN OF A UNIFORM LETTER OF EVALUATION-- DEVELOPMENTAL UNIT D

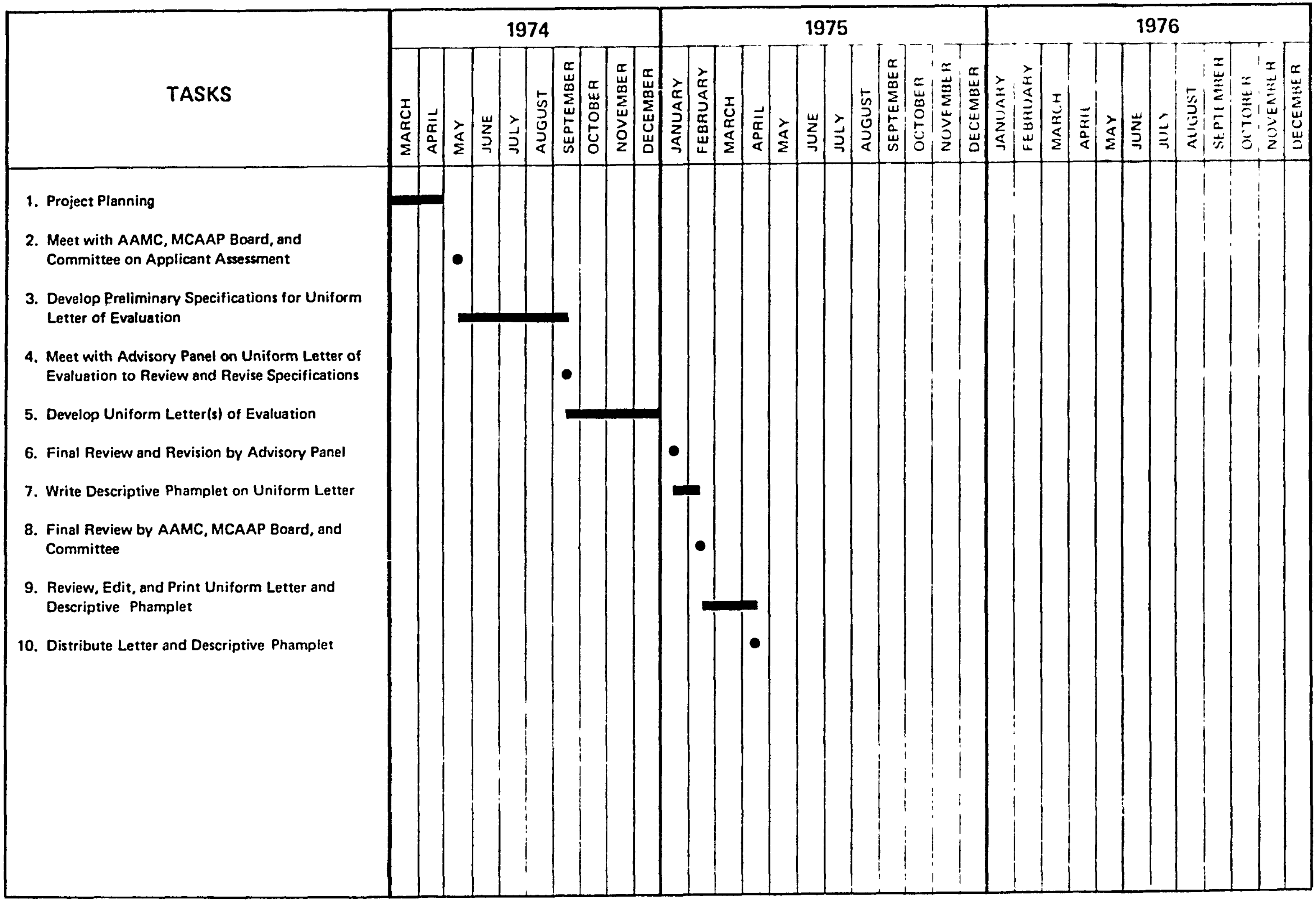
The first step in the development of a uniform letter of evaluation is a joint meeting of the developer with the AAMC staff, the MCAAP Board, the Committee on Applicant Assessment, and an advisory panel consisting of members of the various groups most effected by the use of letters of evaluation. The panel would consist of 10 people, and its membership would include admissions committee members, pre-med advisors, minority representatives, students, etc. The meeting would serve to formalize a plan for development of a uniform letter of evaluation.

DEVELOPMENT AND REVIEW

As a first step in the development process, the developer would draft preliminary specifications of a form for a uniform letter of evaluation. These specifications would then be distributed to members of an advisory panel for their review. The panel would consist of about 10 individuals, each of whom represents a group affected by the use of the letter of evaluation in the admissions process. These would include members of medical school admissions committees, pre-med advisors, and students. Minority representatives would be included to provide input into how the evaluation form could be designed so that it better taps information on minority students that would be useful to admissions committees. Figure 4.3 details the development of the evaluation form.

A meeting with the advisory panel would be held in September, 1974 to draft final specification of a form for a uniform letter of evaluation. Next, the developer would design one or more model forms of a letter of evaluation which might reflect alternative approaches for meeting the design specifications.

Fig. 4.3. Time and task schedule for the design of a uniform letter of evaluation—Developmental Unit D.



The developer would also design a two or three page pamphlet for medical school admissions committees explaining the features of the new form, the rationale that governed its design, and suggestions for how it might be used most effectively.

FINAL REVIEW, PRINTING, AND DISTRIBUTION

Once the letter and descriptive pamphlet have undergone final review and have been approved, both would be printed. Complete sets of the materials would be distributed by the developer to all interested parties in the name of AAMC. Distribution would be underway by early April, 1975.

DESIGN OF EDUCATIONAL PROGRAMS FOR ADMISSIONS COMMITTEES: DEVELOPMENTAL UNIT E

The need for special education programs on the effective use of data provided by the MCAAP will be particularly important when it is administered for the first time in May, 1976. Moreover, some form of continuing education program in the uses of MCAAP data will be important since new types of data are likely to be added as research in the admissions area yields new insights. There are several possible vehicles for accomplishing this educational process. The Guide for Medical College Admissions Committees described in Developmental Unit C is one mode of communication which can be very effective.

A second technique, one recommended by the MCAAP National Task Force, calls for the AAMC to sponsor programs at meetings of interested groups (e.g., GSA and GME), thus to inform their members about procedures currently in use and about progress in new areas. Moreover, the Task Force strongly urged the formulation of a national registry of persons available to local admissions committees and trained in the effective use of MCAAP data. It is this latter recommendation to which the development plan in Figure 4.4 is addressed. That is, the substance of planning for Developmental Unit E is focused on the development of materials and procedures which can be used to train a cadry of persons to serve, on a consulting basis, in the national registry. The target date for completing such an effort was selected to coincide with the anticipated need for such help when the new MCAAP Applicant Assessment is first used in May, 1976.

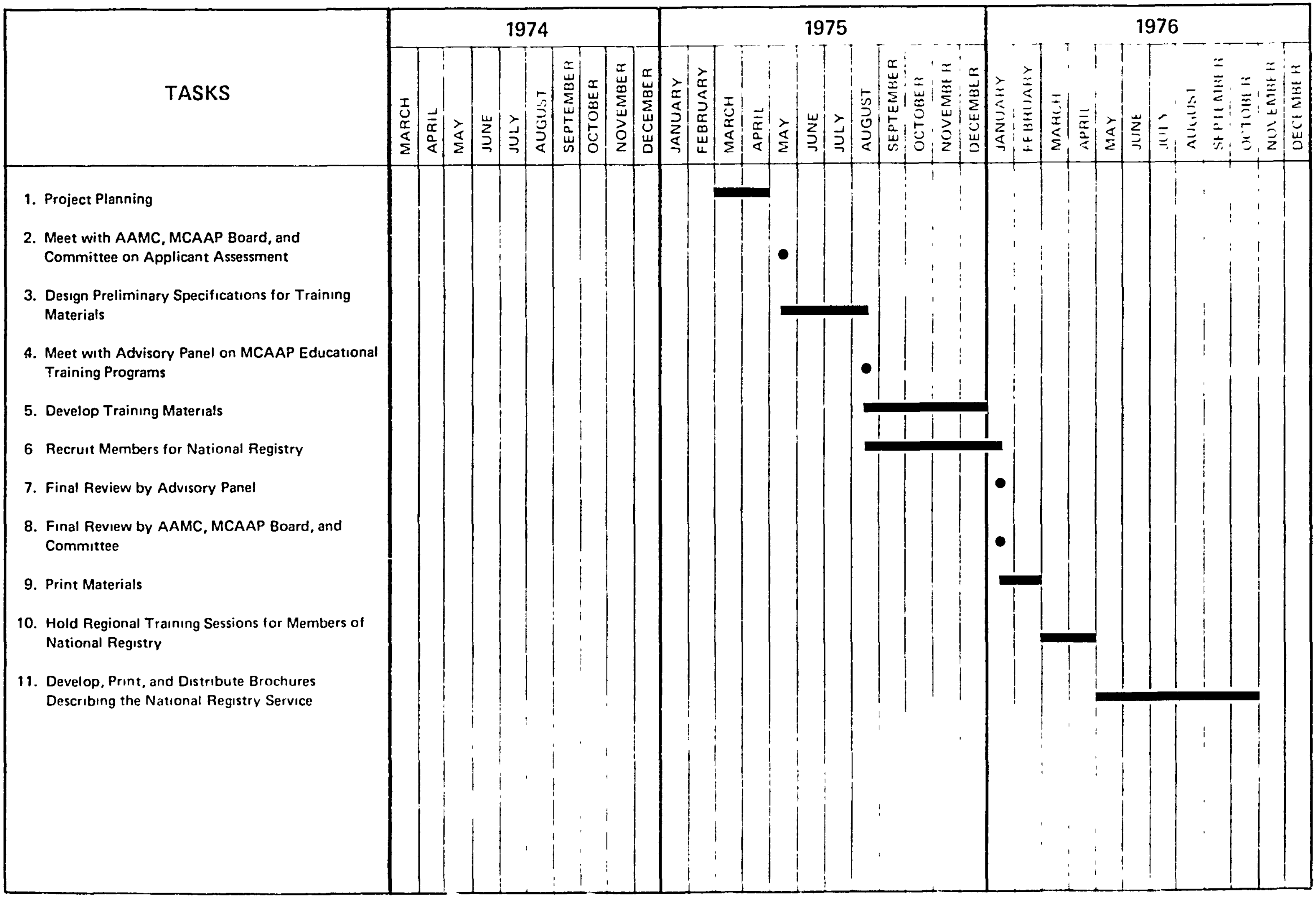
DEVELOPMENT AND REVIEW OF PRELIMINARY SPECIFICATIONS

Early on in the project, developers would meet with AAMC staff, the MCAAP Board and the Committee on Applicant Assessment to determine the scope of the training program. Specifically, the types of training materials to be developed and possible procedures for training national registry staff would be discussed and some guidelines for subsequent work would be set. After the meeting, the developer would formalize the specifications and then meet with an advisory panel to review and revise them and lay plans for the development of materials. The advisory panel would consist of about ten individuals representative of the various groups interested in how MCAAP data are used by admissions committees. Heavy representation on the panel would be accorded to experienced medical school admissions personnel.

DEVELOPMENT OF TRAINING MATERIALS

Given the outcomes of the preceding meeting, the developer would have approximately five months to develop the materials required for training members of the national registry. The scope of the materials to be developed would range from visuals which can be used by the registry consultant when he works with admissions committees to a work manual on the uses of the

Fig. 4.4. Time and task schedule for the design of educational programs for admissions committees—Developmental Unit E.



MCAAP data for admissions decisions.

RECRUITMENT OF MEMBERS OF THE NATIONAL REGISTRY

We recommend that from 4 to 6 registry members be available in each of the four AAMC-defined regions of the country. To accomplish this goal, recruitment should begin as early as August, 1975 and conclude no later than January, 1976. This activity would occur concurrent with the development of training materials.

REVIEW, REVISE, AND PRINT MATERIALS

Once the training materials have been developed, another meeting of the advisory panel would be called for the purpose of reviewing and ultimately approving the materials. This meeting would be scheduled for early, 1975, and would be followed by final revisions by the developer. Then, early in February, the developer would submit the revised materials to the AAMC staff, the MCAAP Board, and the Committee on Applicant Assessment for their approval. Once this has been done, the materials would be printed in time for the training workshops discussed next.

NATIONAL REGISTRY TRAINING WORKSHOPS

Throughout February and March of 1976, four national training workshops for members of the national registry service would be conducted by the developer. Each workshop would require approximately 2 days and would include thorough training in two areas (1) information about the MCAAP and its use and (2) techniques for effectively training others (admissions committees) in the use of MCAAP data.

BROCHURE DESCRIBING THE NATIONAL REGISTRY SERVICE

In order that admissions committees become aware of the availability of the registry service and that they also learn what they have to gain by using the service, we recommend that a brochure describing the service and the specific advantages likely to result from using it, be developed, printed, and distributed to members of the admissions committees at medical colleges. Initial mailings of these brochures would begin as early as March, 1976 and continue on a sustained basis through the fall of 1976.

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CHAPTER 5

RECOMMENDATIONS FOR MCAAP AT STAGE 2: ADMISSIONS DECISIONS BY STUDENTS

The second of the three major informational needs at the admissions stage is the need students have for information relating to the types of decisions they must make. Students reach this stage, typically in their junior year of college, having already made a large commitment of their time and energy to pursuing a career in medicine. At this point, their commitment must be further extended by a decision to apply to certain medical schools. The decision to file an application and the selection of schools with which to file it are the first types of admissions decisions which students make. The next decisions are those which follow the receipt of MCAAP scores and acceptances or rejections from medical schools. In this chapter we discuss some proposed materials for students and undergraduate health advisors to assist students in making these important decisions.

MATERIALS FOR STUDENTS

The recommended materials for students can be divided into two sections. First is a pre-assessment booklet and the second a post-assessment booklet, both designed to help students before and after they take the MCAAP tests.

PRE-ASSESSMENT STUDENT BOOKLET

Prior to taking the MCAT, students presently receive a registration packet including instructions for registration and a small booklet which contains a listing of test centers, medical school code numbers and seven 4" X 9" pages of sample MCAT questions. Thus, existing pre-MCAT materials focus mostly on the mechanics of test registration and of familiarizing students with sample test items, and offer no real guidance to the student for selecting the medical schools to which he should apply.

We believe that there are two major types of data not currently provided to students at this stage in the admissions process which could be used by students to make wiser decisions regarding the medical schools to which they should apply--data about themselves and data about the various medical schools. In addition, we believe students need better preparation for taking the tests of the MCAAP Applicant Assessment and more information about the entire medical school application process. To meet these needs we make the following recommendation.

> Recommendation 5.1. MCAAP should provide a pre-assessment booklet for students which include simulated MCAAP tests. The booklet would be designed to prepare students for the tests, to assist

> them in choosing medical schools to which to apply, and to inform them about all aspects of the application process.

In this section, we describe the proposed "MCAAP Pre-Assessment Booklet" which students would receive at no charge as a part of the registration packet.

First, the pre-assessment booklet would help prepare students for the MCAAP Applicant Assessment by describing its various parts including a statement as to the number of items and length of each, and by providing sample questions in a simulated test. Second, it would assist students to make decisions regarding which schools to submit applications to by using the simulated tests as a crude estimate of real scores and then matching their characteristics to similar sources of information about students in medical schools. Information about the distributions of characteristics of entering students at different medical schools would be especially useful here and we suggest the booklet refer to the AAMC publication "Medical School Admission Requirements" which is available to students from AAMC at a cost of $5.00 and is the obvious vehicle for this type of information about medical colleges. We commend the efforts underway by AAMC to provide such distributional data and strongly recommend their inclusion in the "Requirements" publication as soon as possible. The third function of the booklet would be to provide students with some guidance about the application process as a whole and about registration for the MCAAP Applicant Assessment in particular. A possible outline for the content of the booklet is provided in Table 5.1.

The simulated MCAAP tests are a feature which would accomplish several functions. The sample tests would permit the student to gain familiarity with the types of items in the tests and in so doing would mitigate some of the

TABLE 5.1

PRE-ASSESSMENT STUDENT BOOKLET

I. Preparing for the MCAAP Applicant Assessment

A. Description of the Assessment
B. Sample Questions--A Self-Administered MCAAP Applicant Assessment
*C. Scoring and Interpretation of the Sample MCAAP Applicant Assessment

II. To Which Medical Schools Might You Apply?

A. What are the Important Factors in Such a Decision?
B. What are Your Characteristics?
C. What are the Characteristics and Requirements of Medical Schools? (Direct Students to "Medical School Admission Requirements")

III. Preparing an Application for Medical School

A. Filing an Application (AMCAS)
B. Registration for the MCAAP Applicant Assessment

IV. Test Centers

V. Medical School Code Numbers

*Not included in the 1976 booklet, but to be included in 1977 and thereafter.

offerings of "coaching courses" for the test. In addition, the simulated tests would allow students to obtain a rough estimate of how well they can expect to fare on the real tests. This latter information is especially important in deciding to which medical schools to apply when used in conjunction with information about current enrolled students at particular medical schools. Because these sample tests would require extensive numbers of items from retired test forms, and because all forms of the MCAAP tests will be new as of May, 1976, the booklet prepared for those test dates would have to be a preliminary version of the ultimate booklet. While some sample items would be given, procedures showing how the student could use his sample scores to estimate his scores on the MCAAP tests would not be implemented during the first year.

We estimate that a 36 page booklet 8-1/2" X 11" in size would ultimately be required to accomplish the goals described here. Such a booklet would alter the registration packet and involve more expense in printing and mailing, but we believe it would serve a valuable function and could help eliminate some indiscriminate, multiple applications by students.

POST-ASSESSMENT STUDENT BOOKLET

Students presently receive a one page explanation with their MCAT scores. Thus the amount and type of interpretive information provided is rather limited. This is a crucial time for students to evaluate how realistic their decisions have been to date and to consider the decisions which lie ahead. It is also the last feasible opportunity for the MCAAP to assist those students whose applications to medical schools will be refused. For these reasons, we make the following recommendation.

> <u>Recommendation 5.2.</u> The student report of scores on the MCAAP Applicant Assessment should be accompanied by an interpretive booklet which identifies decisions yet to be confronted by the student and provides information regarding possible options.

Table 5.2 provides an outline for the possible content of the interpretive booklet. As proposed, it would require at least eight pages of size 8-1/2" x 11" and would again alter present mailing procedures.

TABLE 5.2

POST-ASSESSMENT STUDENT BOOKLET

I. Interpreting Your MCAAP Scores

   A. Description of the MCAAP Measures
   B. Score Scale and What it Means
   C. Implications of Your Scores for Medical Admissions

II. Where Do You Go From Here?

   A. Evaluate Your Chances of Admissions
   B. Decisions About Which School to Attend if Accepted
   C. What to Do if Refused Admission
      1. Other Career Options
      2. Should You Try Again?

MATERIALS FOR ADVISORS

Concern and involvement by MCAAP with students prior to their admission to medical school has led quite naturally to greater involvement with undergraduate pre-professional advisors. This involvement has been reflected throughout the MCAAP planning process and in this report. At the stage of admissions decisions by students, the MCAAP responsibility to advisors appears again, this time in the need for a guide for undergraduate advisors. Consequently, we offer the following recommendation.

> Recommendation 5.3. An MCAAP guide for undergraduate advisors should be developed to assist them at all levels of student advisement.

The proposed guide would serve several functions, focusing primarily on the admissions process but also relating to advisor Stage 1 activities in early career decisions of students. It would be the one primary communication between AAMC and the advisor and would therefore cover all the topics related to MCAAP. The first three major sections included in the proposed outline in Table 5.3 involve information to help the advisor assist students (1) in early career decisions with reference primarily to the Stage 1 materials described in Chapter 3, (2) in selecting which medical schools to apply to and in preparing for the MCAAP, and (3) in interpreting MCAAP scores and making decisions after receipt of admissions decision notifications from schools. The fourth section provides information to assist the advisor in the preparation of letters of evaluation.

TABLE 5.3

MCAAP GUIDE FOR ADVISORS IN THE HEALTH PROFESSIONS

I. Assisting Students in Early Career Decisions

A. Information about "Choosing a Medical Career"
B. Sources of Information about Medical Careers
C. Conducting Group Counseling Sessions

II. Applying to Medical Schools

A. Sources of Information about Medical Schools
B. Information about MCAAP Applicant Assessment

III. Interpreting MCAAP Scores

A. What Do the Scores Mean?
B. Where Does a Student Go From Here?

IV. Preparing Letters of Evaluation

A. What Do Medical Schools Want from You?
B. Whose Side Are You On?

DEVELOPMENT PLAN

The pre-assessment and post-assessment materials are closely interrelated and are therefore treated as a single developmental unit separate from the advisor's guide. The two student booklets are also very closely tied to the development of the cognitive tests and therefore their development must be carefully meshed with the development of Unit C of Chapter 4.

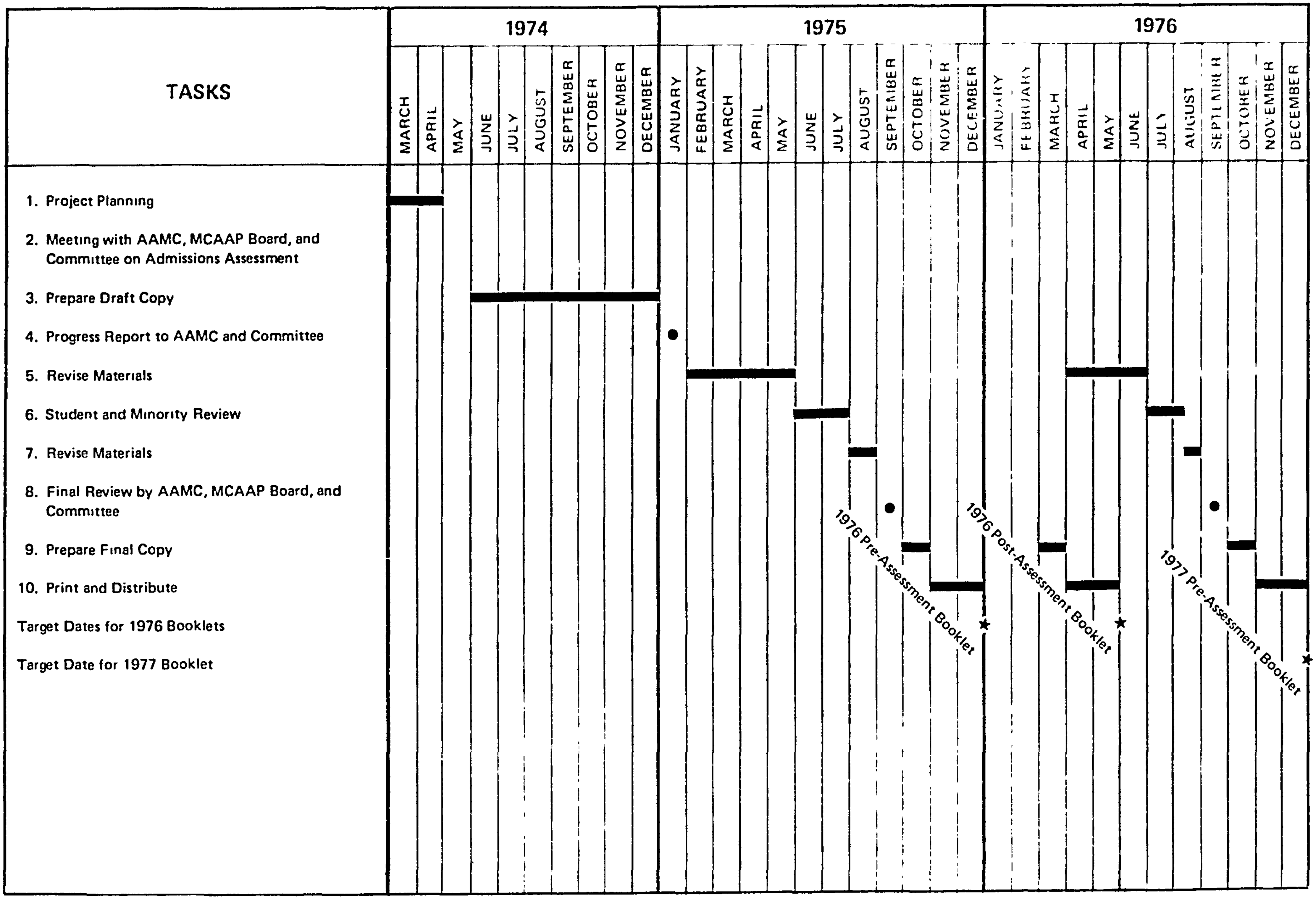
STUDENT MATERIALS--DEVELOPMENTAL UNIT F

Figure 5.1 gives a time and task schedule for the development of the pre-assessment and post-assessment booklets. The schedule parallels the activities in the development of a student guidance booklet (Chapter 3) and therefore we will not repeat discussion of the activities here. Since the 1977 pre-assessment booklet would have to be revised to incorporate the sample tests, the schedule for those revisions is also included in Figure 5.1.

We believe that the MCAAP Committee on Applicant Assessment is the appropriate committee of the MCAAP Board for collaboration on the development of these materials and accordingly, have included it in the developmental plan. Extensive review by students is especially crucial for these booklets as is a review by minority students. Thus, both are included in the developmental plan.

Completion of the first pre-assessment booklet would precede the first administration of the new MCAAP scheduled for spring, 1976. The

Fig. 5.1. Time and task schedule for the development of pre-assessment and post-assessment student booklets—Developmental Unit F.



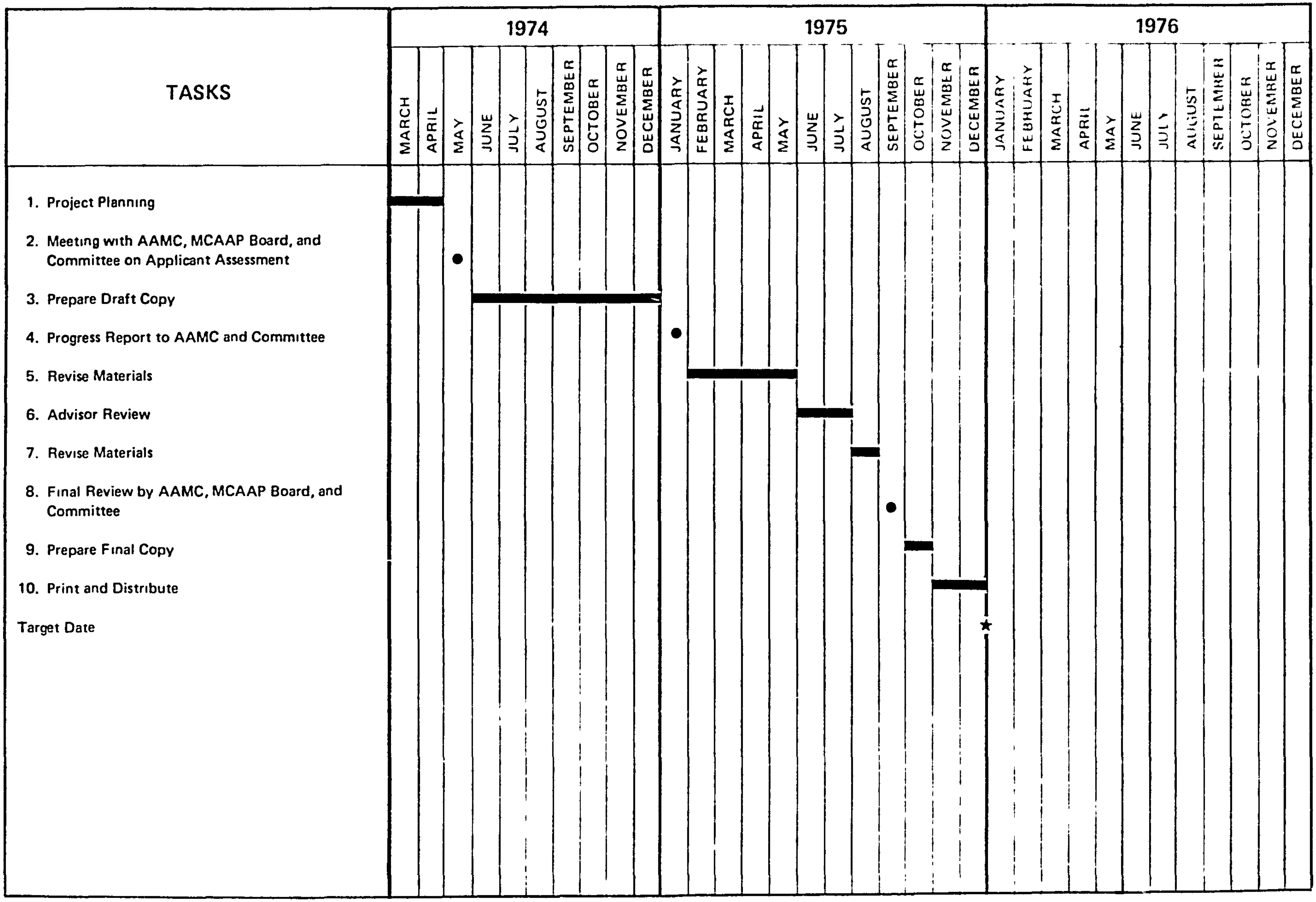
time schedule for release of the booklet corresponds to the current schedules for release of registration materials. The post-assessment booklet would accompany score reports from the spring, 1976 test date.

ADVISOR'S GUIDE--DEVELOPMENTAL UNIT G

Figure 5.2 gives a time and task schedule for the activities in the development of an advisor's guide. Again the activities are similar to those discussed in Chapter 3. The MCAAP Committee on Applicant Assessment was judged most relevant to this activity although the Committee on Career Guidance Materials would have interest in various parts of the publication. Special advisor review of the materials was included in the developmental plan to insure that the materials developed are both relevant and interesting.

The time schedule calls for the release of the guide to parallel the release of student registration materials in January, 1976.

Fig. 5.2. Time and task schedule for the development of MCAAP guide for undergraduate advisors in the health professions—Developmental Unit G.



CHAPTER 6

RECOMMENDATIONS FOR MCAAP AT STAGE 2: ADMINISTRATIVE USES OF ADMISSIONS DATA

In this chapter we address a topic which has received only passing attention in the MCAAP planning process. However, the topic has become an important one as the various elements of a new MCAAP have emerged and as the close relationship of MCAAP to the present American Medical College Application Service (AMCAS) has become apparent. This is the topic of a centralized Administrative Data System.

Presently, there are numerous sources for various pieces of admissions data. Cognitive test data are collected through the MCAT; biographical data comes both from MCAT and AMCAS; several other types of admission blank information come from AMCAS; letters of evaluation come directly from representatives of the student; and undergraduate college records come from the college or through AMCAS. Multiple sources lead to possible overlap and unnecessary repetition for the student applicant and to possible confusion and awkwardness in the handling of data by medical schools. At the same time the fragmentation makes effective examination and evaluation of the various types of data difficult or even impossible. For all these reasons, we recommend the following.

> Recommendation 6.1. AAMC should establish a centralized Administrative Data System to facilitate student applications, to provide a coordinating data service to medical school admissions committees, to provide an administrative data service to medical

schools, to provide a service for local medical school research and validation of all admissions data, and to provide for nationwide analysis and improvement of admissions data.

We emphasize here that, more than any other recommendation in this report, this recommendation comes at our own initiative and through our own analysis of a need. We view such a system as a service which would be made available to medical schools in part or in whole, as they wished, to meet their own particular needs. The implementation of this recommendation would involve wide constituency involvement and the flexibility of the system to accommodate uses desired by medical schools would be its most crucial characteristic. Further, we are aware of and concerned about the possible misuses of massive data banks. As discussed in Appendix G, proper attention to protecting the privacy of student information would be a central task in the development of such a system.

While some individuals will fear any system even approximating a data bank, it should be noted that the system proposed here is really neither revolutionary nor frightening. The first three parts of the system parallel the present AMCAS but involve more types of data and more flexibility for medical schools. The fourth and fifth parts of the system are similar to many types of validity services which have been in existence many years (e.g., Law School Admissions Council, ACT, ETS). In fact, most large scale national assessment programs have validity services for their users. We believe such services would be immensely valuable to future development of MCAAP assessments and to medical schools in evaluating local data.

THE FUNCTIONS OF AN ADMINISTRATIVE DATA SYSTEM

The five basic functions of an Administrative Data System are outlined in the preceding recommendations. In this section, we examine each function separately.

APPLICATION SERVICE FOR STUDENTS

One great advantage of a centralized application service such as AMCAS is the service it provides students applying to medical schools by requiring only one point of student input. The primary difference between the system proposed here and the present AMCAS is that the application service would be but one part of a larger constellation of services, all drawing upon the same data sources, and the data sources would be more varied. For example, the application service of the Administrative Data System would perform the first consolidation of the various types of data which compose a student's application. Scores from the MCAAP tests and personal survey data would feed into the system along with college transcripts, biographical data, and other admissions blank types of information about students. When a uniform letter of evaluation is developed, it too could enter the centralized system at this point.

DATA REPORTING SERVICE FOR ADMISSIONS COMMITTEES

The first output stage of the system would be output in the form of student data reports for admissions committees. The main contrast with the present AMCAS service would be in the flexibility provided to meet each school's individual need and the capability to incorporate previous research results directly onto the report. Because the various data sources would be consolidated in the system, a medical school admissions committee could select which types of data it wished to have on its applicants and even, to some extent, in what format it wished to have the data reported. The basic list of data from which schools could choose would include different portions of the college record, the different tests of the MCAAP Applicant Assessment, letters of evaluation, biographical data, and other personal data. The committee would then receive reports with all the same information in the same format for all applicants as discussed in Chapter 4. The reports could also include some preliminary grouping of applicants according to specifications provided by the school, if desired, or test score reports could be adapted to local data as suggested in the section on score scales in Chapter 4. In addition to the coordination of various types of data to assist admission committees, the enrolled student basic data records (on cards, tapes, etc.) would form the beginning of school student personnel records.

DATA SUMMARY SERVICE

The third function of the data system would be an administrative data summary service for medical schools and undergraduate colleges which also parallels, in part, a present AMCAS service. In addition to the data accumulated from the student for the application, later input to the system could be provided by medical schools about the admissions decision and enrollment status for each student. Then the system could produce summaries of student characteristics according to the needs of each school. For example, in addition to simple summaries of enrolled students, accepted students could be contrasted with those rejected, or trends in student characteristics could be examined. The undergraduate college could receive similar summaries of the characteristics and admissions outcomes of its students.

RESEARCH AND VALIDITY SERVICE FOR MEDICAL SCHOOLS

The fourth function of the service, one not now accomplished by AMCAS, is a research and validity service for medical colleges. Most medical schools support internal research on students and educational programs. The research and validity service of the Administrative Data System would be designed to assist the schools in some of the routine, yearly aspects of such research. Again flexibility would be the key to the system. It should be designed so that schools can examine the relation of admissions data to various kinds of criteria or outcomes, and the system should allow additional local types of admissions data to be input at this stage as well as a number of different short- and long-range outcome measures. Such a service would make it possible to examine the unique relationships of data in each school and to compare the relationships of different admission variables with different types of outcomes. The system would also make it possible to attach local meanings to different test score levels in terms of the degree of preparedness for particular courses, for example, as discussed above and in Chapter 4.

RESEARCH AND VALIDITY SERVICE FOR MCAAP DEVELOPMENT

The fifth and final function of an Administrative Data System is a side benefit of the fourth. Through a research and validation service for medical schools, the necessary data would be accumulated to examine and validate MCAAP assessment data on a national scale. Such research is crucial to the proper technical back-up of an assessment program and would feed directly into the technical publications discussed in Chapter 4. In addition, this type of data would be invaluable in improving MCAAP assessment data to better accomplish the purposes set for them.

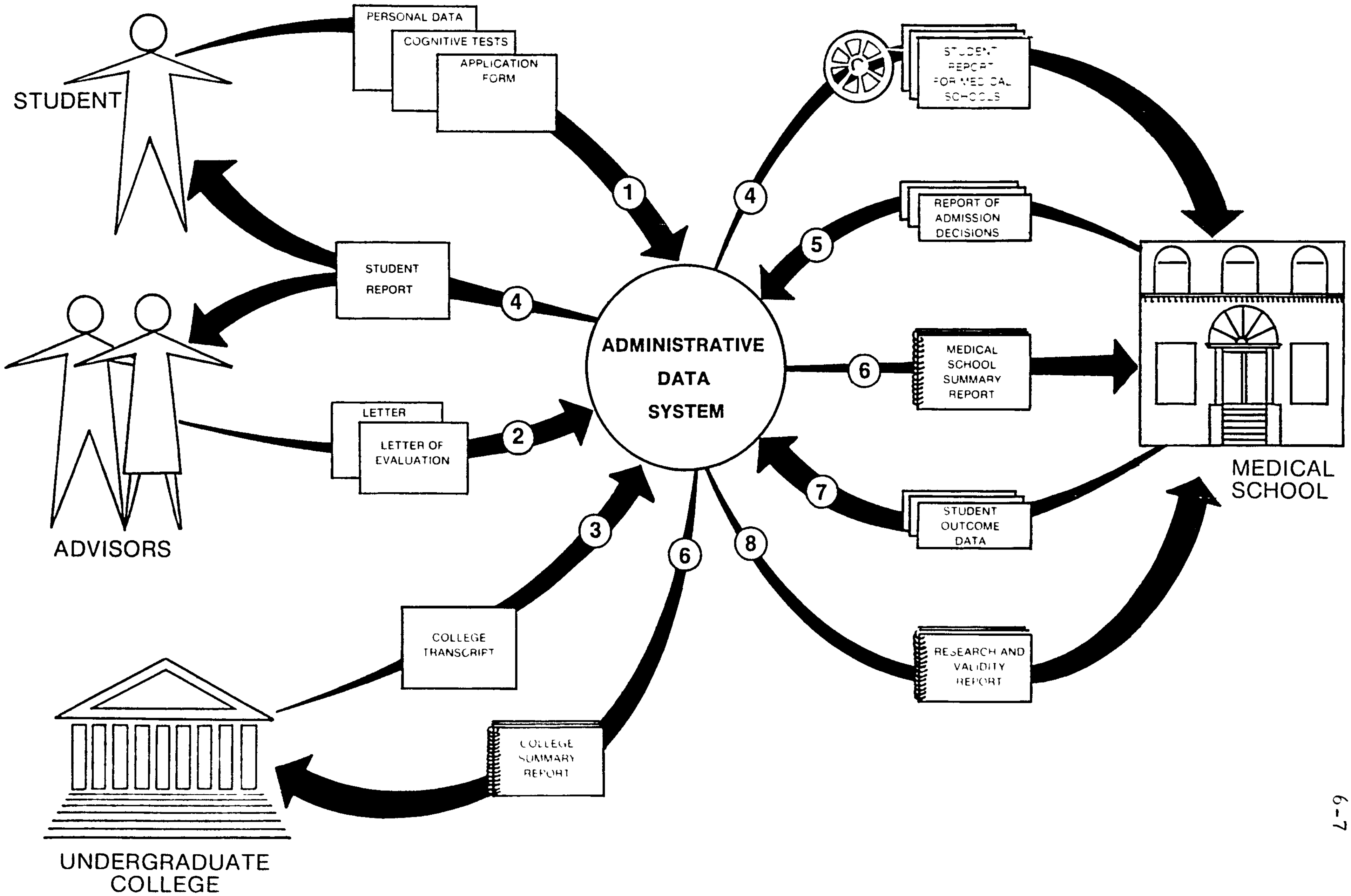
SUMMARY OF THE DATA SYSTEM INPUT-OUTPUT

The Administrative Data System described here involves the coordination of several stages of data input and several types of data output. Figure 6.1 presents a graphic illustration of the multiple input-output functions such a system could accomplish. Input comes first from students, advisors, and undergraduate colleges followed by output to students and medical schools of their choice. Then medical schools supply input on admission decisions resulting in summary output back to the medical school and the undergraduate college. At one or more later stages the medical school again supplies input in the form of criteria or outcome measures which is followed by a report back to the schools from the research and validity service.

DEVELOPMENT PLAN FOR DEVELOPMENTAL UNIT H

Actual plans for the implementation of the Administrative Data System described here would require far more detailed specification than given in these pages. Therefore it is not feasible to provide detailed time and task charts for implementation of the system. In fact, the first step in implementation would involve specific constituency input about the needs medical schools have. With that, detailed specifications would have to be drawn.

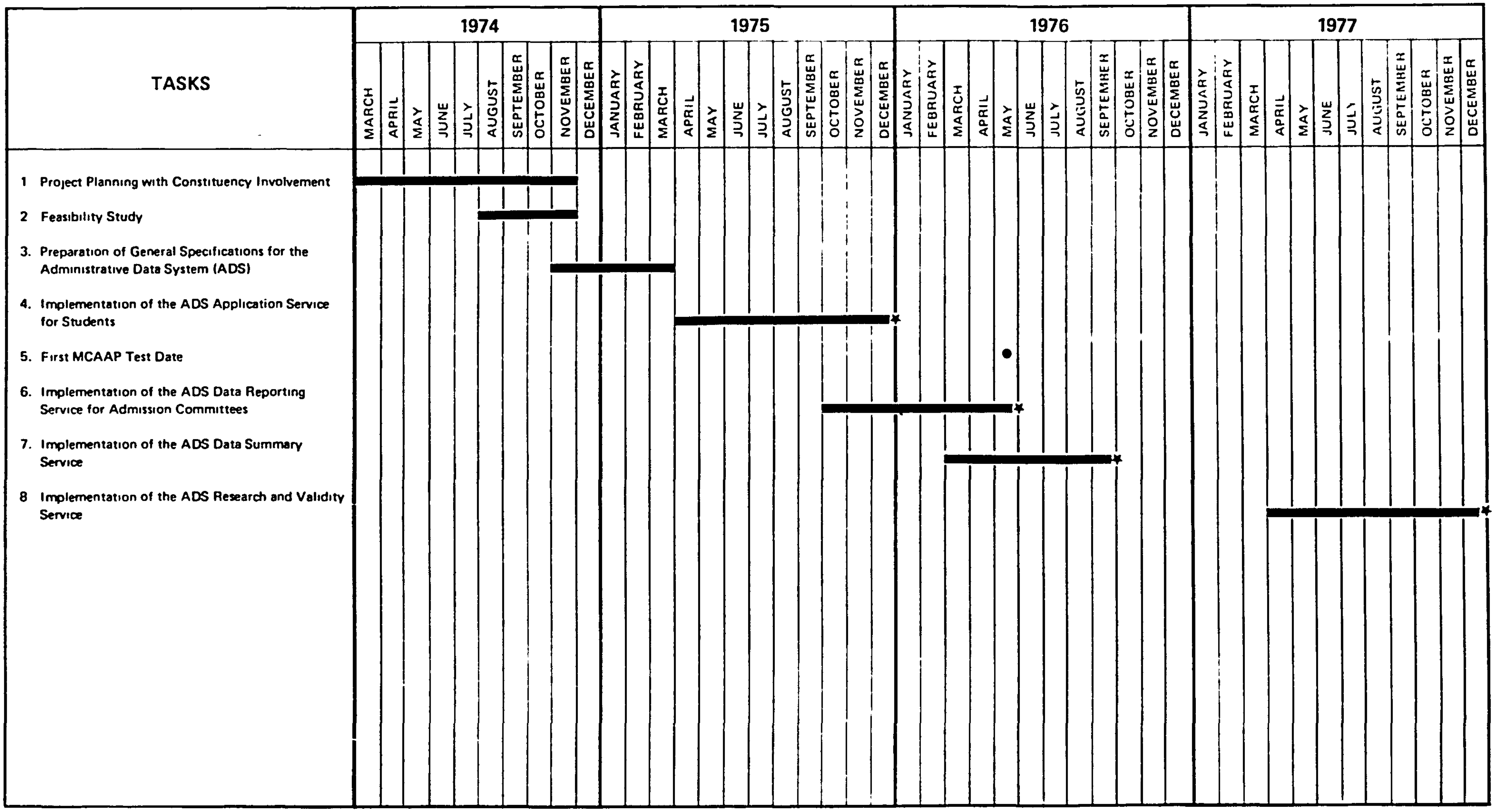
Fig 6 1. The input-output functions of the Administrative Data System



It is conceivable that it would be possible to make some alterations in the present AMCAS system and then add a research and validity service to it. This possibility would have to be explored and compared with the possibility of essentially starting over with a highly flexible system capable of all the functions described here.

Figure 6.2 gives a very general time and task schedule for development of an Administrative Data System to incorporate the broad role of MCAAP with an AMCAS-type role. The major steps include constituency planning, study of available options, preparing specifications, and implementation. Because the first applicants tested with the new MCAAP assessment in 1976 would not enter medical school until the fall of 1977, a new research and validity service would not need to be in operation until late in 1977 or early in 1978. It would be desirable to have revisions in the application service and new medical school reports ready for the first MCAAP test date in May, 1976 and the target dates in the schedule reflect these two goals.

Fig. 6.2. Time and task schedule for the development of an administrative data system.



CHAPTER 7

RECOMMENDATIONS FOR MCAAP AT STAGE 3: EVALUATION OF OUTCOMES

Throughout this report the medical education process has been viewed as extending from early career decisions about medicine which high school and undergraduate students make to the outcomes of medical education in the form of physicians in various career roles and activities. In addition, we have proposed roles for MCAAP throughout the process. The MCAAP role in the evaluation of intermediate and long-range outcomes is an especially important one if data for admissions decisions are to be improved and put to better use. Thus, in this chapter as throughout the report the focus is on the admissions process, and an active role for MCAAP is proposed at Stage 3 to facilitate and improve that process.

Admission committees have to make decisions about which students to accept and which to reject. In making those decisions, committees express, at least implicitly, ideas about certain desirable types of outcomes and about data on students which relate to such outcomes. The statement, "I think we should accept student A because...", reflects a general assessment of a student in light of an underlying conception about desirability. We believe that formalizing those conceptions about desired outcomes and evaluating the degree to which those outcomes are realized is a crucial step in the improvement of admissions data and admission decisions.

A basic concern was expressed throughout the MCAAP planning process for broader assessment in areas beyond the cognitive dimensions now provided by the MCAT. The changing nature of medical practice and health care needs bring into focus new characteristics of physicians needed to fulfill the diverse demands upon the profession. With a growing pool of applicants whose level of sophistication and undergraduate training prepare them with increasing efficiency to master the scientific foundations of medicine, there is a need to devise assessment techniques to identify additional characteristics pertinent to competent clinical performance and other roles needed to meet public needs. The participants in the MCAAP planning process often discussed the pressing need for research into the development of broader criteria (or outcome) measures for the purpose of validating present assessment and suggesting directions for new assessment measures. These concerns can be framed into a recommendation.

> Recommendation 7.1. MCAAP should sponsor and coordinate research on the evaluation of multiple outcomes of medical education for the purpose of evaluating present admission assessment variables and developing new ones.

It should be noted that the role for MCAAP which we recommend is not one simply of basic research on the evaluation of outcomes. While our recommendation includes such research, it mainly draws on the ongoing research of others. Instead the role we propose is for a very directed kind of research accompanied by activities to apply research findings to the improvement of existing development of new admissions measures which may relate to desired outcomes. Thus, while the research activities occur at Stage 3, the development activities feed directly back to Stage 2 (admissions) and the development activities provide the primary motivation for the research.

A STRUCTURE FOR RESEARCH AND DEVELOPMENT

Because the research and development proposed for MCAAP is quite goal-oriented (the goal being improvement and expansion of the Applicant Assessment), it is crucial to have the activities well structured. A program of broad support for various types of basic research in medical education outcomes would probably be valuable but is not being proposed here. The MCAAP activity which we recommend is one of coordinating and drawing upon the applicable research results of a number of different sources and translating those results into specific developmental projects on types of measures which may have use in the Applicant Assessment.

Figure 7.1 gives a possible structure for these activities. AAMC staff would draw upon the ongoing research activities of the National Board of Medical Examiners, the Committee on the Measurement of Personality, individual medical school research, and research results from the proposed Administrative Data System Research and Validity Service. In addition, AAMC might commission specific research projects on a contract basis or seek funding to support specific projects such as the AAMC Longitudinal Study, possibly in conjunction with researchers outside AAMC. The goal of all these activities would be to collect information on the evaluation of outcomes which can be used to analyze existing assessment variables or to suggest the development of new ones.

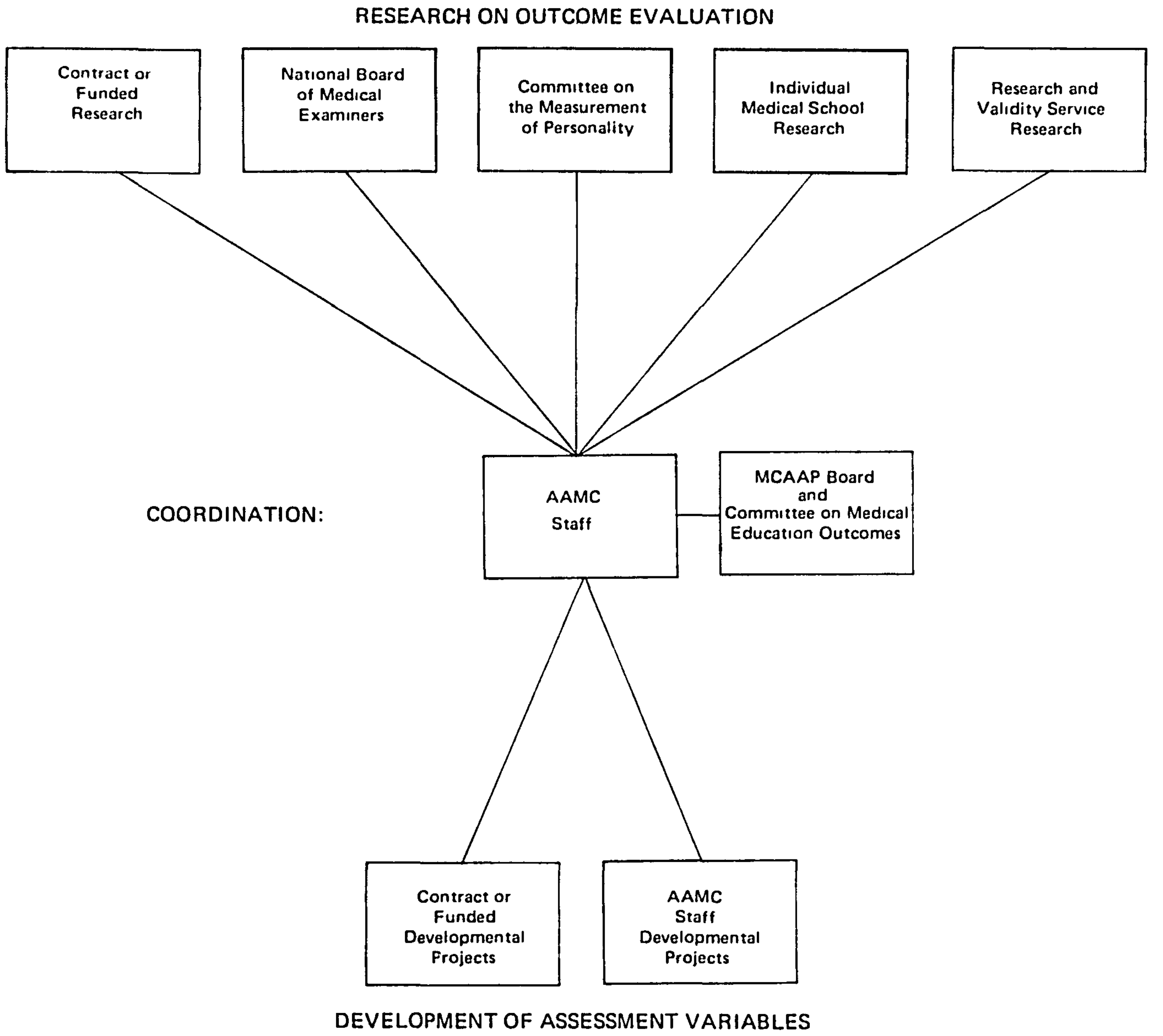


Fig. 7.1. A structure for MCAAP research and development.

Thus, the research on outcomes would be sifted and coordinated to lead directly to analysis of existing assessment variables and the development of new ones. We view the developmental projects as being undertaken directly by AAMC staff or in conjunction with a contracting agency or with other external developers.

Throughout both portions of the activity the AAMC staff would have the advice and direction of the MCAAP Board and/or Committee on Medical Education.

RESEARCH STRATEGIES AND GOALS

To accomplish specific results through MCAAP involvement at Stage 3, there must be not only an organized structure but also well-defined goals and carefully thought-out strategies to reach those goals. Recommendation 7.1 defines what we see to be the basic goal of MCAAP activities at Stage 3: to develop or identify better outcome measures for the purpose of evaluating present assessment variables and developing or identifying new ones. In this section we consider strategies to follow to accomplish this basic goal of improving and broadening admission variables.

There are several different strategies with which this goal could be attacked. One approach would be to try out a large number of new types of predictor variables and try to discover to what outcomes if any they relate. This is a kind of "shotgun" approach and one which has been recommended by some participants in the MCAAP planning process. However, we believe that this is not the best strategy to use for several reasons. First, it limits one largely to existing predictor measures most of which were developed for entirely different purposes and uses. Second, it is likely to lead to the acceptance of whatever criterion or outcome variables now exist even if they do not represent some of the major desirable areas. Third, as a strategy it is basically a matter of getting the cart before the horse. If variables are desired which will relate to new and broader outcome measures, it seems imperative to us to find out first what some of those outcome measures are.

Therefore, we propose the strategy of beginning first with the outcome measures then moving to the development of predictor measures. This strategy does not imply a huge, long-range research project on developing outcome measures, but it does imply at least beginning with better definitions of the outcomes of interest. In fact, a first step we recommend is the development of a kind of taxonomy of medical education outcomes, a taxonomy which would deal with the many different roles and activities of physicians and the different perspectives of different parties involved. Within such an outcome taxonomy, priorities could be established for starting the investigation. Then, as the specification of outcomes begins, attention should also be given to the development of outcome measures and simultaneously to predictor variables which are likely to be related to those measures.

Further, the strategy we propose involves looking first for predictor variables as similar as possible in context and form to the outcome measures. For example, if one priority outcome in clinical performance involves how well the physician interacts with patients, making them comfortable and inspiring confidence, then one might logically look to evaluations of physicians in patient interaction as a long-range outcome measure, to evaluations of residents or fourth year medical students in patient interaction as an intermediate outcome, and to evaluations of student applicants in some types of people-interaction as an admissions variable.

In summary, the overall research strategy we propose at Stage 3 of the medical education process begins with the specification and definition of outcomes of medical education, then moves to setting priorities within those outcomes, next involves the development or identification of outcome measures, and finally the nearly simultaneous development or identification of admission variables which simulate as closely as possible the outcome measures.

DEFINITION OF MEDICAL EDUCATION OUTCOMES

There were two major themes among various participants in the MCAAP planning process which suggest two major categories of outcomes of importance. The first theme involves better evaluation of physician performance, especially clinical performance. The concern here, using the framework of Chapter 2, was primarily with the professional-level activities of the physician. The desire was to evaluate broader aspects of physician competence, for example, not just the knowledge of medicine but skill in its application to real people in real situations. The second major theme concerned the public level of outcomes, especially matters such as the distribution of physicians by type of specialty and geographic locale of practice. Here, the belief was that some medical schools may wish to try to meet these types of public needs and that MCAAP should try to provide information to assist those schools if possible.

We believe that the already-discussed public-professional-personal classification of outcomes can provide a useful broad framework for the taxonomy or definition of types of medical education outcomes. Within such a taxonomy, particular attention should be focused on the two priority areas identified above, the professional-level concern with clinical performance and the public-level physician distribution concern.

The taxonomy of medical education outcomes could likely be developed through a federally-funded or foundation-funded project. We would see the taxonomy being accomplished by a panel including representatives of the following groups: AAMC staff, the MCAAP Committee on Medical Education Outcomes, the National Board of Medical Examiners, the federal government (probably NIH), special public interest groups (minorities, state legislators, etc.), and public members to provide the "patient perspective."

DEVELOPMENT AND IDENTIFICATION OF OUTCOME MEASURES

As the development of the taxonomy proceeds, certain priority areas of outcomes can be identified for direct and immediate attention. In particular these include outcomes concerning physician clinical performance and physician distribution and perhaps others. This identification of priorities would be accomplished through the AAMC staff and MCAAP Board and/or Committee, all of which would have involvement in the ongoing taxonomy developments.

Within the established priority areas, the next effort would be the identification and/or development of outcome measures, especially measures suitable for use at intermediate stages. This effort would be coordinated through AAMC staff perhaps with the assistance of a contractual or funded research group. As illustrated in Figure 7.1, a number of sources of information and development efforts would be used: namely, NBME, COMP, individual medical school research, funded AAMC research such as the Longitudinal Study, and others.

DEVELOPMENT AND IDENTIFICATION OF ASSESSMENT VARIABLES

As outcome measures are developed and/or identified, the effort to develop and/or identify assessment variables can begin. We would see this activity most likely on a contract basis although AAMC staff might undertake it or external funding might be sought. In Figure 7.1, this activity occurs at the lower level with coordination by AAMC staff and the MCAAP Board and Committee. In practice, it would probably be desirable to have the outcome measure research and development directly linked to assessment measure research and development through one overall project encompassing both steps.

APPLYING OUTCOME AND ASSESSMENT MEASURES

Before the value of new assessment measures can be judged, much data will need to be accumulated on both the assessment and the outcome measures. Rather different strategies will need to be applied to the collection of each type of data.

OUTCOME MEASURES

Outcome measures would most logically involve assessments by medical faculties of graduate and undergraduate clinical students. Thus, it will be essential to work directly with and through medical school faculties. To accomplish this, every effort should be made to secure the complete cooperation and assistance of faculty members. This would probably best be done by working closely with and through interested persons at selected medical schools. Faculty training sessions would likely be held and the basic purpose of the outcome assessments (i.e., to improve applicant assessment) should be emphasized. Eventually a major goal would be to have a number of medical schools apply certain outcome measures and feed the results into the Research and Validity Service.

ASSESSMENT MEASURES

To evaluate possible new assessment measures, data must be accumulated on medical applicants and eventually linked to outcome measures, both older traditional ones such as grades and class standing and newer broader ones. It is for this reason that we recommended (in the section in Chapter 4 dealing with personal survey data) that an experimental unit be included in the new MCAAP assessment for the purpose of experimentally testing new assessment measures. The relation of these new measures to outcome measures could be assessed through special projects to collect various outcome data and through the Research and Validity Service.

RESEARCH AND DEVELOPMENT--A CONTINUING EFFORT

Although the procedures described here call for special new activities in the next several years, we would not like to see this thrust followed by a cessation of research and development activities. We believe a viable national assessment program must be continually the object of thoughtful research and ongoing improvement and development. Our recommendation for an ongoing Research and Validity Service is one accommodation to this belief. Therefore, we make the general recommendation that AAMC plan to devote continuing resources to this aspect of MCAAP.

DEVELOPMENT PLAN

Although the research and development strategy has been divided for the sake of discussion into several segments, it is crucial that all the segments be united into one overall coordinated effort. We have placed AAMC staff and the Committee at the central coordinating point in the structure given in Figure 7.1. While this coordinating role is essential, it is not sufficient to insure the kind of integration required. Therefore, in the development plan presented here we assume a developer with staff expertise in research methods, measurement, and instrument development to be involved in all the stages from taxonomy development to implementation of new measures. While the developer might be AAMC staff, if so, it would likely involve an additional staff unit since the degree of involvement would preclude the simple addition of these duties to those already required of present staff. On the other hand, the developer might be an outside agency with which AAMC would effect a contract. The developer would work with AAMC coordinating staff, the MCAAP Board, and the Committee in the planning stages and assume various tasks in the implementation of the various stages.

DEVELOPMENT OF AN OUTCOME TAXONOMY

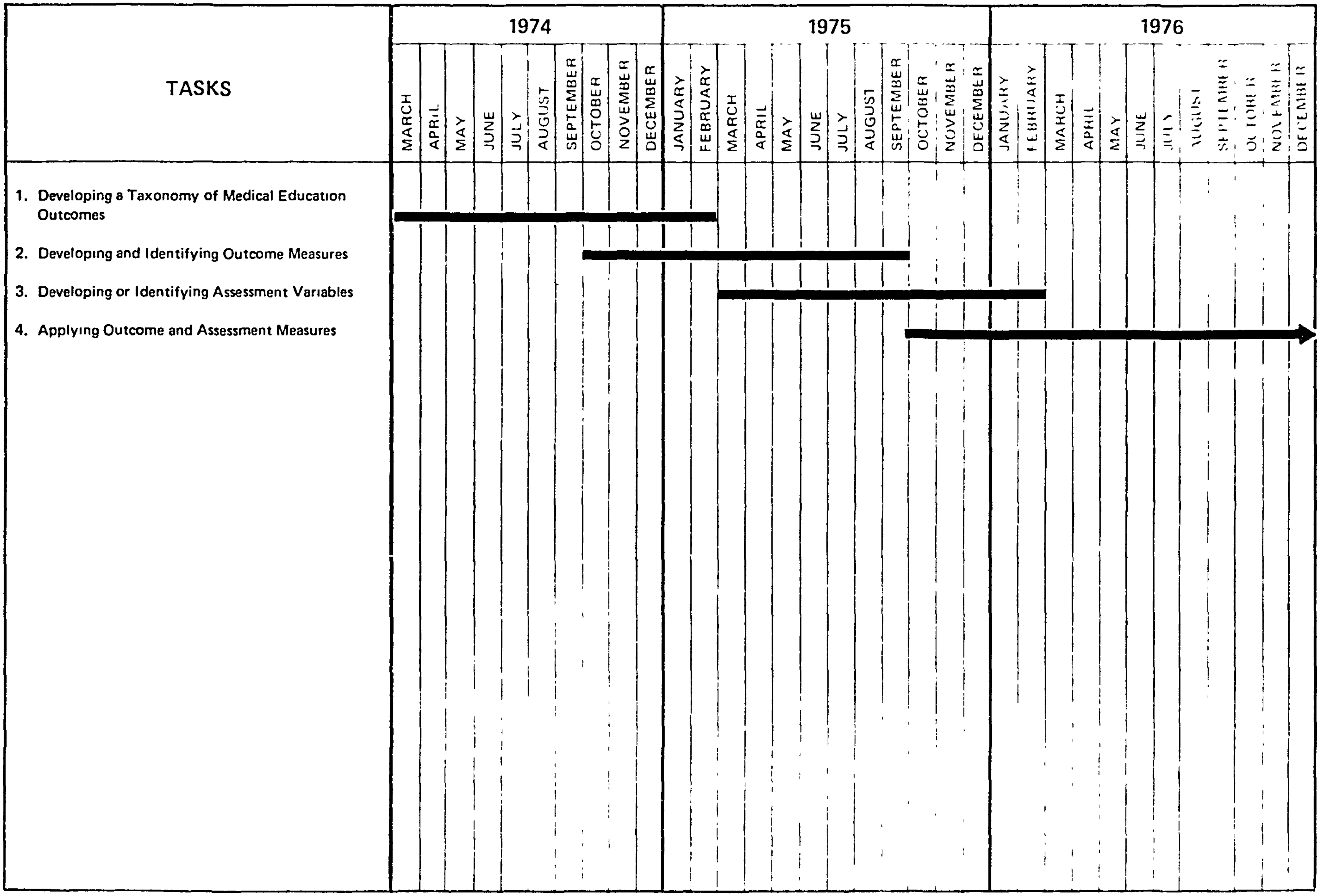
The project to develop a taxonomy of medical education would be a major national project probably jointly sponsored by AAMC and other organizations such as NBME and funded by some external source. The tasks required to accomplish such a project begin with project organization in which possible cooperating organizations are identified and contacted. Then a proposal must be prepared and funds must be sought. We see these activities accomplished jointly by AAMC and the developer with the developer preparing the proposal. Once funded, several national meetings of the panel would be required with possible smaller group work sessions in between. The developer would provide several sorts of support to the panel such as preparing background materials and meeting summaries and keeping an overall direction and framework on the efforts. The outcome of the panel's work would be a published document which the developer would assemble from the panel's efforts and which would be published under the panel's authorship.

An overall general time and task schedule for all the developmental segments is given in Figure 7.2. In that schedule, approximately one year is allotted to the taxonomy. The first three to four months would involve planning and funding. The middle four to six months would be devoted to the development of the taxonomy and the last two to three months to the published results.

MEASURING OUTCOMES

As the taxonomy develops, AAMC staff and the MCAAP Board and Committee would make judgments about areas within the taxonomy to receive highest priority in terms of MCAAP. Within those areas, all available information and research would need to be collected by the developer. Within that body of information, promising measures would be identified by the developer for further investigation and new measures would be developed.

Fig. 7.2. Time and task schedule for the development of new outcome and applicant measures and their implementation.



Further information on promising measures (new or old) might be gathered by AAMC-sponsored research at several interested medical schools.

In Figure 7.2, another year (overlapping with the first) would be devoted to this process of review, development, trial application, and revision of outcome measures.

APPLICANT MEASURES

Paralleling the development of outcome measures would be the development of applicant measures by the same central developer. Again the process involves identifying the directions of the promising outcome measures, reviewing the research literature and unpublished sources for related applicant variables, developing new variables where needed, preliminary experimental trials, evaluation of tryout results, revision, and finally implementation in a tentative experimental form. The schedule in Figure 7.2 allows a year for this process with the goal the development of experimental applicant measures for inclusion in an experimental unit on the first new MCAAP Applicant Assessment in May, 1976.

APPLYING OUTCOME AND APPLICANT MEASURES

The application process begins at the conclusion of step 2 (development of outcome measures). In its first form the process involves the encouragement of new outcome measures in several interested medical schools. The data could be used to evaluate several types of presently used admissions data and could perhaps be tied to early validation studies of new MCAAP data.

The next step in application comes in the evaluation of the new applicant measures as they eventually relate to the new outcome measures. Again, this involves several special projects at interested medical schools and after 1978 the use of results from the Research and Validity Service.

When enough studies have been accomplished to insure the technical adequacy of the new measures, they may become a part of the MCAAP Applicant Assessment and be reported to medical schools (at their option) along with all the other MCAAP data.

CHAPTER 8

SUMMARY

In this report we have examined the role of MCAAP at three major stages in the medical education process: early undergraduate career decisions, admissions, and the evaluation of medical education outcomes. Within each stage we have recommended future activities for MCAAP. Accompanying these recommendations are time schedules which call for the implementation of Stage 1 activities in the fall of 1975, and many Stage 2 activities including new cognitive tests in the spring of 1976. Other activities at Stage 2 and Stage 3 are scheduled to begin in 1974 but would not yield implementable results until after 1976. In this section we present all the recommendations which are scattered throughout this report as a summary of our proposals for MCAAP.

STAGE 1: EARLY CAREER DECISIONS

Recommendation 3.1. MCAAP should provide a career planning booklet including self-assessments of interests and abilities for use by first and second year undergraduate students considering a career in medicine.

Recommendation 3.2. MCAAP should take specific action to encourage qualified and interested minority racial-ethnic group members and women to pursue careers as physicians.

Recommendation 3.3. MCAAP should provide group counseling aids for undergraduate advisors to assist them in effective presentation of student career guidance information.

Recommendation 3.4. AAMC should sponsor in conjunction with other health profession organizations a project to consolidate information about health-related careers.

STAGE 2: ADMISSIONS DECISIONS BY MEDICAL SCHOOLS

Recommendation 4.1. The MCAAP cognitive tests should include a test of reading comprehension. Such a test should relate to those reading skills needed in medical school and thereafter and should replace the MCAT Verbal Aptitude Test.

Recommendation 4.2. The MCAAP cognitive tests should include a quantitative test concerned with the abilities in data interpretation, reasoning, and problem solving. The test should replace the MCAT Quantitative Aptitude Test.

Recommendation 4.3. The MCAAP should include three separate science tests, one each in biology, chemistry, and physics. The three tests should assess the knowledge and application of concepts and principles and should replace the MCAT Science Test.

Recommendation 4.4. The MCAAP cognitive tests should not include a test like the MCAT General Information Test.

Recommendation 4.5. An experimental unit should be included on the MCAAP Applicant Assessment for the tryout of a problem solving test. The goal of such experimentation would be the eventual inclusion of a problem solving test in the MCAAP once a satisfactory and validated form is found.

Recommendation 4.6. Test panels with membership including undergraduate college and medical school teaching staff should be created to assist in the development of new MCAAP tests.

Recommendation 4.7. Two new forms of the MCAAP cognitive tests should be completed each year, one for use on each of the two annual national test dates.

Recommendation 4. 8. MCAAP should provide technical support for the new cognitive tests prior to their implementation.

Recommendation 4. 9. A uniform letter of evaluation should be developed for optional use by undergraduate advisors and medical colleges.

Recommendation 4. 10. An experimental unit should be included on the MCAAP Applicant Assessment along with the cognitive tests for the purpose of gathering personal survey data for study and eventual validation.

Recommendation 4. 11. A new MCAAP norm-referenced score scale should be developed which would minimize the misuse which might result from a false appearance of precision.

Recommendation 4. 12. MCAAP should provide a consolidated report of its Applicant Assessment to medical schools including cognitive tests results, college record, biographical and personal survey data, and results from letters of evaluation.

Recommendation 4. 13. MCAAP should provide for a continuing, extensive program of technical analysis and evaluation of the MCAAP Admissions Assessment (including cognitive tests and other data) resulting in the publication of updated technical handbooks at regular intervals.

Recommendation 4. 14. A publication about the MCAAP Applicant Assessment should be developed to assist medical school admissions committees in the proper and effective use of MCAAP data.

Recommendation 4. 15. MCAAP should sponsor a national registry of trained persons available to assist local admissions committtees on a consulting basis in the effective use of MCAAP data.

STAGE 2: ADMISSIONS DECISIONS BY STUDENTS

Recommendation 5.1. MCAAP should provide a pre-assessment booklet for students which include simulated MCAAP tests. The booklet would be designed to prepare students for the tests, to assist them in choosing medical schools to which to apply, and to inform them about all aspects of the application process.

Recommendation 5.2. The student report of scores on the MCAAP Applicant Assessment should be accompanied by an interpretive booklet which identifies decisions yet to be confronted by the student and provides information regarding possible options.

Recommendation 5.3. An MCAAP guide for undergraduate advisors should be developed to assist them at all levels of student advisement.

STAGE 2: ADMINISTRATIVE USES OF ADMISSIONS DATA

Recommendation 6.1. AAMC should establish a centralized Administrative Data System to facilitate student applications, to provide a coordinating data service to medical school admissions committees, to provide an administrative data service to medical schools, to provide a service for local medical school research and validation of all admissions data, and to provide for nationwide analysis and improvement of admissions data.

STAGE 3: EVALUATION OF OUTCOMES

Recommendation 7.1. MCAAP should sponsor and coordinate research on the evaluation of multiple outcomes of medical education for the purpose of evaluating present admission assessment variables and developing new ones.

APPENDIX A

REGULARLY-SCHEDULED SPRING MEETING
ATTENDED BY AAMC AND ACT STAFF
FOR CONSTITUENCY INPUT ON MCAAP

MEETING	DATE & PLACE	ACT Representative	AAMC Representative
Southern Regional Meeting of Council of Deans	March 7-10, 1973 San Antonio, Tx.	None	James Angel
Combined Western Regional Meeting of GSA, OSR, & AAHP	March 17-19, 1973 Asilomar, Calif.	None	James Angel Ayres D'Costa James Erdmann Dario Prieto Davis Johnson Robert Thompson
Western Regional Meeting of GME	March 25, 1973 San Francisco, Ca.	None	James Angel
Spring Meeting of Council of Academic Societies	March 28-31, 1973 Washington, D. C.	None	August Swanson
Midwest-Great Plains Regional Meeting of Council of Deans	April 2-3, 1973 Chicago, Ill.	Nancy S. Cole Richard Ferguson	James Angel
Southern Regional Meeting of GSA, OSR, & AAHP	April 5-7, 1973 Williamsburg, Va.	None	James Angel Ayres D'Costa
Northeast Regional Meeting of GME	May 3-4, 1973 Amherst, Mass.	None	James Angel James Erdmann
Combined Central Regional Meeting of GSA, OSR, & AAHP	May 10-12, 1973 Starved Rock	Nancy S. Cole Leo Munday Richard Ferguson	James Angel Ayres D'Costa James Erdmann Davis Johnson Robert Thompson
Southern Regional Meeting of GME	May 17-18, 1973 Savannah, Ga.	None	James Erdmann
Central Regional Meeting of GME	May 18-19, 1973 Cincinnati, Ohio	Richard Ferguson	James Angel L. Thompson Bowles
Northeastern Combined Meeting of GSA, OSR &AAHP	June 18-20, 1973 Lewisburg, Pa.	Nancy S. Cole Leo Munday Richard Ferguson	James Angel Davis Johnson Suzanne Dulcan

Note: GME = Group on Medical Education
GSA = Group on Student Affairs
OSR = Organization of Student Representatives
AAHP = Association of Advisors to the Health Professions

APPENDIX B

MCAAP REGIONAL CONFERENCES

SUMMER, 1973

MCAAP Central Regional Conference

Chicago, June 28-29, 1973

ORGANIZATIONS	REPRESENTATIVES
Council of Deans	Dr. Nat E. Smith
Group on Medical Education	Ms. Christine McGuire Dr. Agnes Rezler
Group on Student Affairs	Dr. John Herweg Dr. Woodrow Morris
Organization of Student Representatives	Dan Plautz Marc Cannon
Association of Advisors to the Health Professions	Dr. Charles Chantell Dr. Julian Frankenberg
Committee on Measurement of Personality	Dr. William Schofield
The American College Testing Program	Dr. Leo Munday Dr. Nancy S. Cole Dr. Richard Ferguson Ms. Patricia Gartland
Association of American Medical Colleges Staff	Mr. James Angel Dr. James Erdmann Dr. Ayres D'Costa Dr. Davis Johnson Ms. Marjorie Young
ADA Council of Dental Education	Dr. James Graham

MCAAP Southern Regional Conference

Atlanta, July 9-10, 1973

ORGANIZATIONS	REPRESENTATIVES
Council of Deans	Dr. Carl Cochrane
Group on Medical Education	Dr. Jack Hain Dr. Donald Bosshart
Group on Student Affairs	Thomas W. Johnson
Organization of Student Representatives	Stephen Keasler
Association of Advisors to the Health Professions	Dr. Frank Burtner Dr. Raymond Barreras
GSA Committee on Minority Affairs	Dr. Hector Farias
Committee on Measurement of Personality	Dr. Harold D. Haley Dr. William Schofield
The American College Testing Program	Dr. Leo Munday Dr. Nancy S. Cole Dr. Richard Ferguson Ms. Patricia Gartland
Association of American Medical Colleges Staff	Mr. James Angel Dr. James Erdmann Dr. Ayres D'Costa Mr. Dario Prieto Ms. Marjorie Young

MCAAP Northeastern Regional Conference

Washington D. C., July 12-13, 1973

ORGANIZATIONS	REPRESENTATIVES
Group on Medical Education	Dr. David Tormey Dr. Robert Blacklow
Group on Student Affairs	Dr. William Fleeson Dr. Thomas Meikle
Organization of Student Representatives	Robert L. Amrhein Dale Antanitus
Association of Advisors to the Health Professions	Lester Kieft Dr. Lawrence Bornstein
GSA Committee on Minority Affairs	Dr. Walter Leavell Dr. George Blue Spruce
Committee on Measurement of Personality	Dr. Betty Mawardi
The American College Testing Program	Dr. Leo Munday Dr. Nancy S. Cole Dr. Richard Ferguson Ms. Patricia Gartland
Association of American Medical Colleges Staff	Mr. James Angel Dr. James Erdmann Dr. Ayres D'Costa Ms. Sally McMullen Dr. Roy Jarecky Dr. Robert Boerner Mr. J. Michael McGraw Ms. Xenia Tonesk

MCAAP Western Regional Conference

Santa Monica, July 16-17, 1973

ORGANIZATIONS	REPRESENTATIVES
Council of Deans	Dr. Benjamin Belknap Dr. Daniel Ivler
Group of Medical Education	Dr. Bernard Revsin
Group on Student Affairs	Dr. John Steward Dr. Charles Spooner
Organization of Student Representatives	Patrick Connell
Association of Advisors to the Health Professions	Dr. John McAnally Mr. Val Christensen
GSA Committee on Minority Affairs	Dr. John Watson
Committee on Measurement of Personality	Dr. William Schofield
The American College Testing Program	Dr. Leo Munday Dr. Richard Ferguson Ms. Patricia Gartland
Association of American Medical Colleges Staff	Mr. James Angel Dr. James Erdmann Dr. Ayres D'Costa Ms. Marjorie Young Mr. Dario Prieto Ms. Ruth Johnson
American Academy of Family Physicians	Dr. Thomas Stern Dr. Robert Graham

APPENDIX C

MEMBERS OF THE MCAAP NATIONAL TASK FORCE

MCAAP NATIONAL TASK FORCE MEETING

Washington, D. C., September 26-28, 1973

NAME	REPRESENTATION
Angel, James (AAMC)	AAMC
Atencio, Alonzo (Univ. of New Mexico School of Medicine)	Ad Hoc Committee for Minority Concerns
Barreras, Raymond (Tuskegee Institute)	Southern AAHP
Blacklow, Robert (Harvard Medical School)	Northeastern GME
Bornstein, Lawrence (New York University)	Northeastern AAHP
Bosshart, Donald (Univ. of Texas, Medical Branch at Galveston)	Southern GME
Burg, Fredric (National Board of Medical Examiners)	NBME
Cannon, Marc (Medical College of Wisconsin-Milwaukee)	Central OSR
Christensen, Val (Pasadena College)	Western AAHP
Cole, Nancy (ACT)	ACT
D'Costa, Ayres (AAMC)	AAMC
Duff, Willard (Hartford Hospital, Hartford, Conn.)	COTH
Erdmann, James (AAMC)	AAMC
Ferguson, Richard (ACT)	ACT
Frankenberg, Julian (Univ. of Illinois-Champaign)	Central AAHP
Hain, Jack (Univ. of Alabama, School of Medicine-Birmingham)	Southern GME
Jolly, Paul (AAMC)	AAMC
Johnson, Davis (AAMC)	AAMC
Johnson, Thomas (Meharry Medical College School of Medicine-Nashville, Tenn.)	Southern GSA
Keasler, Stephen (Louisiana State-Shreveport)	Southern OSR
Leavell, Walter (SUNY College of Medicine-Syracuse)	Ad Hoc Committee for Minority Concerns
Meikle, Thomas (Cornell Univ. School of Medicine-New York)	Northeast GSA

MCAAP NATIONAL TASK FORCE MEETING
Continued - Page 2

NAME	REPRESENTATION
Morris, Woodrow (State Univ. of Iowa School of Medicine)	Central GSA
Munday, Leo (ACT)	ACT
Ortiz, Gilbert (New York Medical College)	Ad Hoc Committee for Minority Concerns
Prieto, Dorio (AAMC)	AAMC
Revsin, Bernard (Univ. of Arizona College of Medicine)	Western GME
Rezler, Agnes (Univ. of Illinois College of Medicine - Chicago)	Central GME
Scherr, Joanne (Univ. of Southern California)	Western OSR
Schmeiser, Cynthia (ACT)	ACT
Schofield, William (Univ. of Minnesota - Mayo Medical College)	COMP
Smith, Nat (University of Illinois College of Medicine-Chicago)	MW/GP-COD
Spooner, Charles (Univ. of California School of Medicine - San Diego)	Western GSA
Spruce, George Blue (National Institute of Health)	Ad Hoc Committee for Minority Concerns
Steward, John (Stanford Univ. School of Medicine)	GSA Committee on Financial Aid
Strelnick, Alvin (Yale University)	Northeastern OSR
Thompson, Robert (AAMC)	AAMC
Watson, John (Univ. of California-San Francisco)	GSA Committe on Minority Affairs

APPENDIX D

ANALYTICAL READING PASSAGES

1. Social Sciences
2. Social Sciences
3. Medical Topics
4. Medical Topics
5. Basic Sciences
6. Basic Sciences

ANALYTICAL READING

Social Sciences

Euthanasia, literally "good death," has been a controversial social topic and convention since before the early Greeks left their girl babies to die on mountaintops. At the time, this was a socially acceptable means of population control. But the same culture which condoned this custom produced the "Father of Medicine," whose 2400-year-old Hippocratic Oath is still administered at most medical school graduations. Part of this oath states that ". . . I will give no deadly drug to any, though it be asked of me, nor will I counsel such. . . ." which has been interpreted by physicians throughout the ages as a directive against mercy killing.

Although euthanasia was never widely accepted (in fact, Switzerland is the only country that currently has a law which sanctions certain forms of euthanasia; it does, however, place restrictions on those who would perform it), in recent years it has become an increasingly controversial issue. This is due largely to the advances made in medical research and technology, which have complicated not only the processes whereby life may be maintained or extended, but also the very definitions of life and death. And while one can admire and defend these advances from a medical viewpoint, they have released a moral cloudburst. Society's reaction to this dilemma is typical: take the large complex issue, divide it into smaller complex issues, and try to resolve them separately. This approach has resulted in a tacit differentiation between active and passive forms of euthanasia.

Active euthanasia is that form of mercy killing in which an individual directly performs an act that will lead to the cessation of the patient's life. This act can be as overt as the injection of a fatal dosage of a drug or the injection or oral administration of a poison; it can be as covert as supplying the information, means, or encouragement which allows a patient to perform suicide. This form of euthanasia is almost everywhere considered a crime and is generally prosecuted under homicide laws. The tendency of courts has been to convict the perpetrators of such acts but then to give them only minimal sentences and probation, especially in those cases where the victim was clearly terminally ill or severely debilitated, with little, if any, hope to ever again live a "normal," happy life.

One of the more interesting aspects of many of these active euthanasia cases is the willingness of the "murderer" to admit his "crime" and explain his actions in terms of carefully thought-out justifications. He is usually intimately related to the victim, and at least part of the justification includes a plea from the victim for such an act of "mercy." He is also usually willing to accept the consequences of his actions, presumably because he gave the whole matter much agonizing thought before actually committing the act.

Passive euthanasia, on the other hand, is much more difficult to define, detect or prohibit. It entails allowing a terminally ill or seriously injured person to die who might, by means of advanced medical techniques or equipment, be kept alive. Here the definitions of life and death enter. Historically, death occurred when heart action and breathing ceased and neither could be reactivated. However, the introduction of sophisticated machinery has made it possible to maintain heart and lung activity (and thereby "life" functions) even after the brain has ceased to function. Conversely, the brain can be kept alive almost indefinitely without the somatic attachments of heart and lungs. Thus, the increasingly accepted criterion of death today is the absence of brain activity for 24 consecutive hours.

The controversy about passive euthanasia focuses on the following question: if and when treatment of any kind is withheld from someone for whom such treatment means the continuation of life (in whatever form), who should make such decisions and on what basis? The decision to unplug a machine or discontinue a palliative treatment is neither more nor less arbitrary and agonizing than the decision not to plug in the machine at all or ever begin treatment. Neither doctors nor relatives nor lawyers nor legislators feel confident about the who and how and when of such decisions. The doctor's agony centers around the fact that all his training emphasized the preservation and value of life; moreover, diagnoses and prognoses are not always accurate or clear cut. The relatives must be careful not to let selfish motives enter into the decision; they must also try to ascertain, when the victim pleads for mercy, whether the plea is based on medically sound reasons or whether it is based merely on psychological factors that are subject to change. Lawyers and legislators are acutely aware of the complexity of the legal and moral issues surrounding the legislation and clarification of particular ethical viewpoints.

There are currently no laws or methods which deal specifically with someone who has committed or encouraged another to commit passive euthanasia. Our legal system is based largely on protection from and prevention of overtly negative acts (such as injecting poison) rather than admonitions specifically to perform positive acts (such as turning on a dialysis machine).

The whole issue is further complicated by the fact that in the medical realm, the scientific means to indefinitely prolong individual "life" and at the same time to ease pain and suffering do exist, while in the familial realm, the financial and emotional means do not, or at least not necessarily. People are beginning to face and try to resolve, at least at the personal level, some of the moral and ethical problems raised by a relative's plea for euthanasia. Doctors, relatives of terminally ill patients, and people for whom the prospect of an existence dependent on a machine which does little more than maintain their biological life functions or a drug which eases suffering but promotes no cure is abhorrent morally or socially, are clamoring for legal guidelines which can be applied fairly and straightforwardly. They have a long wait.

Sample Questions

Comprehension Type B

1. The cited portion of the Hippocratic Oath is specifically applicable to

A. active euthanasia
B. passive euthanasia
C. both forms
D. neither form

Analysis Type D

2. Which of the following is consistent with the author's belief about society's reaction to complex problems?

A. When discussing capital punishment, the argument is that all cases should be judged by the same rules.
B. When considering the problems of birth control, no distinctions are drawn between temporary methods of control and permanent sterilization.
C. When discussing the issue of voluntary abortion, distinctions between healthy and unhealthy fetuses are disallowed.
D. When considering the problems of the handicapped, the problems of mentally handicapped and physically handicapped persons are considered separately.

Comprehension Type C

3. Which of the following most accurately represents the author's attitude toward euthanasia?

A. Euthanasia is a social evil which must be legislated against by every government.
B. Euthanasia is everyone's inalienable right to an honorable death.
C. Euthanasia is a complex issue that will not be resolved for a long time to come.
D. Active euthanasia is deplorable, but passive euthanasia is a legitimate, socially accepted form of mercy killing.

Analysis
Type E

4. Given the four cases recounted below, which of the following statements is true?

   I. John, a 3 year old mongoloid, is brought to the hospital with a very high fever. He dies because his father intentionally fails to mention that he is allergic to the penicillin with which they attempt to treat his fever.

   II. As a result of an auto accident, 23 year old Mrs. Jones has been in a coma for 5 months. Tests confirm that she has extensive brain damage and is paralyzed completely. When her husband refuses to pay any more hospital bills, the administrators are forced to shut down the machine which was maintaining her lung and heart functions.

   III. Susie is a tiny thalidomide baby born without upper limbs. Her mouth and throat are also inadequately formed, and an operation is necessary to assure proper functioning of her respiratory system. Her parents refuse to authorize the operation, and Susie dies.

   IV. Robert is a 75 year old diabetic who has several complications to his already troublesome disease. Within the past year, he has gone into diabetic coma three times. His wife, who can't bear to see him in agony any longer, replaces the insulin in the phial with eserine, an eye medication. The private nurse unwittingly administers the "insulin" to Robert at the appointed time. Robert dies.

   A. Case II is the only example of passive euthanasia.
   B. Case IV is the only example of active euthanasia.
   C. Cases I and III are the only examples of active euthanasia.
   D. All of the cases represent passive euthanasia.

Analysis
Type A

5. On which of the following assumptions does the author base much of his article?

   A. The question of euthanasia must ultimately be resolved by the medical profession.
   B. A resolution of the problems of euthanasia must ultimately include medical, moral and legal priorities.
   C. Since euthanasia has been practiced for over 2400 years, it is time that people began to accept it as a legitimate social convention.
   D. Since euthanasia is a form of homicide, it is inherently wrong.

Comprehension Type B

6. The current legal criteria for death focus on cessation of which of the following?

I. heart beat
II. breathing
III. brain activity
IV. renal and metabolic activity

A. I and II
B. I only
C. II, III, and IV
D. III only

Analysis Type D

7. The changes in the criteria for a legal definition of death resulted from

A. recognition that heart activity is less important to life than breathing.
B. invention of drugs that could sustain heart beat long after the rest of the body had ceased to function in any way.
C. recognition that the brain, the essential source of individuality, could be kept alive independent of the body.
D. invention of machines that could maintain life functions even in the absence of brain activity.

Analysis Type G

8. Given the development of a surgical technique whereby damaged brain cells could be restored to full capacity which of the following would probably result?

A. Euthanasia in cases of severe brain damage would no longer be allowed.
B. The question of euthanasia would cease to be a relevant social issue.
C. The legal definition of death would have to be altered.
D. The question of the quality of life would cease to be a relevant aspect of the euthanasia issue.

ANALYTICAL READING

Social Sciences

There are more than a quarter of a million persons diagnosed as schizophrenics in the U. S. hospitals today. Although most of these patients are classified under the category "paranoid schizophrenia," in reality there are important distinctions among the various types of this disease. The classification system which includes the category paranoid schizophrenia separates the disease on the basis of symptomatic differences into four types. These categories are simple, hebephrenic, catatonic, and paranoid schizophrenia. More recently (1953) Kantor, Wallner, and Winder proposed a two-type classification system based not on the symptoms of schizophrenia but on the causes; they suggested that all schizophrenics can be classified as either process or reactive schizophrenics. Although not all psychologists are willing to accept this newer system, research has shown that it can be an effective way to distinguish two different forms of schizophrenia. The cases of Paul and Robert, described below, are classic examples of these two types.

I. Paul is a 25 year old process schizophrenic. Although he was raised in a home with both parents, he seldom felt the presence of his father, a highly successful businessman whose work frequently kept him away from home for extended periods. In fact, the father resented Paul, an unwanted child, and regarded him as an unwelcome burden. Paul's mother was an unpleasant, carping, punitive, domineering woman who raised him in an aloof, impersonal way. She was the dominant element not only in their home, but in nearly every situation outside the home throughout Paul's childhood and adolescence.

At age three, when Paul entered nursery school, it became evident that he had trouble adjusting to social situations; at school he had temper tantrums and was a behavior problem because he preferred to play alone, had trouble speaking so that others could understand him, and had difficulty participating in games because of poor muscular coordination. Outside school he displayed similar social maladjustment, preferring to play alone rather than with other children. His mother's indifference and tacit refusal to control these impulses caused his behavior to become more abnormal, and by the time he entered kindergarten at age 5 he had to be referred for psychological examination. At the age of seven, apparently jealous of his parents' attention to and affection for his new sister, Paul attempted suicide by drinking furniture polish. Between the ages of 7 and 15 he had many homosexual experiences, and was once caught molesting a 7 year old girl. Characteristically, his social contacts and relationships continued to diminish, and he began to withdraw from all female figures.

At the age of 15 Paul was sent to a private day school where his homosexuality, seclusiveness and tantrums intensified. Soon he completely refused to attend school; he began to spend all of his time at home. After a psychiatric examination, Paul was hospitalized. Despite a variety of treatments, he remains seclusive and responds mostly to auditory hallucinations. Although he has now been in the hospital for several years, his condition remains largely unchanged and his prognosis is considered poor.

II. Robert is a 27 year old reactive schizophrenic. His family consists of both parents and three children (he is the middle child). Friends tend to describe his family as a "close-knit unit." Nevertheless, his father, a dominant, demanding man, devotes a great deal more of his time and attention to his business than to his family. His mother, with whom Robert maintained a close relationship throughout his early childhood, is completely submissive to the overpowering dominance of his father.

Like his father, Robert learned to attack his problems in a generally constructive way: forcefully and directly. His childhood and development revealed no aberrations. He learned to talk early, developed excellent muscular coordination, and became an active, hard-working, popular student Socially he was well-adjusted: he found it easy to establish friendships and to become a leader in many activities.

By adolescence, however, Robert's close relationship with his mother was weakening; he began to feel unable to confide in either his parents or siblings. The figure with which he most strongly identified was his uncle, John. Uncle John was an unsuccessful, constantly out-of-work writer, whom the family regarded as a failure but whom Robert admired; he was the person Robert could most easily talk with and confide in. When Robert began to express the desire to major in the humanities in college, numerous family arguments ensued over the impracticality of such plans. His parents found his choice frivolous, and urged him to choose a more career-oriented major instead. Supported by his uncle, Robert ignored his parents' urgings and pursued the humanities not only in college, but also in graduate school. He earned a Ph. D. in literature and accepted a teaching position at a college 2800 miles from his home town. In college Robert's relationships with girls had tended to be largely intellectual, except for one brief, intense episode that ended is his junior year because of religious differences.

Four months before Robert was to leave for his new position, his uncle died suddenly. Robert began to feel guilty not only about having accepted a position so far from home, but also about neglecting his parents and ignoring their opinions. As his guilt intensified, he became more seclusive and preoccupied with sexual fantasies; he began compulsively hiding all his personal possessions and taking heavy doses of laxative daily. Robert's roommate, recognizing that his problems were becoming more severe, persuaded Robert to see the school psychiatrist, who recommended that Robert be hospitalized. In the hospital, Robert preferred seclusion. Soon he was having hostile and critical hallucinations. He was given tranquilizers regularly and underwent 10 months of intensive psychotherapy after which he was discharged. He subsequently accepted a teaching position not far from his parents' home.

Upon their admission to the hospitals, both Paul and Robert had been given several psychological tests. The results exemplify the differences between their types of schizophrenia. For instance, in a size estimation test, Paul tended to overestimate the size of the mother figure and Robert tended to underestimate her size. In a study of personal space (the distance a person consistently maintains between himself and others), Paul maintained a larger than normal space and Robert a smaller than normal space. In an ability-related exercise in which the subjects were intentionally criticized, Robert showed increased anxiety but little impairment in ability after criticism, while Paul showed more ability impairment but less anxiety.

REFERENCE

Higgins, Jerry. Based on article entitled "It Comes in Two Kinds," Psychology Today, October, 1972, Volume 6 No. 5, pages 103-105, 110111, 122, 124.

Sample Questions

Comprehension Type B

1. The dominant family pattern for a male reactive schizophrenic is:

   A. strong mother, weak father
   B. strong father, weak mother
   C. strong parents, weak siblings
   D. strong relatives, weak parents

Analysis Type C

2. The development of the reactive schizophrenic is UNLIKE that of the process-type in which of the following ways?

   A. Only the reactive develops from a lack of social relationships.
   B. Only the reactive usually has a long history of disturbed behavior.
   C. Only the reactive develops from the lack of attention from one parent or both.
   D. Only the reactive develops suddenly following a dramatic event or combination of events.

Analysis Type F

3. Psychologists who prefer the two-type categorization of schizophrenia to the four-type categorization probably do so because:

   A. the two-type system makes subgroups larger and allows closer comparison of symptoms
   B. the two-type system focuses on the presumed origins of the disease
   C. the four-type system has too much overlap in terms of symptoms
   D. the four-type system relies too heavily on environmental disease factors

Comprehension Type D

4. According to the article, which of the following are associated with reactive schizophrenia?

   A. guilt and anger
   B. jealousy
   C. guilt and seclusion
   D. anger and submissiveness

Analysis
Type E

5. Which of the following best explains why Paul tended to overestimate the size of the mother figure in the size estimation exercise?

A. His mother was the dominant, demanding figure in their home and in nearly every situation outside the home.
B. He wanted to undermine the demanding and punitive role his father played in his life.
C. He wanted to overcompensate for his parents' lack of love by exaggerating the size of the parent he loved most.
D. He wanted to give the impression that their relationship was strong and loving.

Comprehension
Type E

6. On the basis of these two classic case histories, it can be legitimately concluded that·

A. intellectuals suffer more often from reactive than from process schizophrenia
B. most process schizophrenics are homosexual
C. schizophrenia is based largely on environmental factors
D. seclusion and irrationality are symptomatic of both types of schizophrenia

Analysis
Type G

7. Before his divorce last month, Herbert acted fairly "normal." But since then he has been showing signs of withdrawal and irrationality and has been hearing strange noises. He was admitted to the hospital last week. On the basis of several tests doctors have classified him as a schizophrenic. What are his chances for recovery?

A. quite good because he is probably a reactive schizophrenic
B. poor because he is probably a reactive schizophrenic
C. quite good because he is probably a process schizophrenic
D. poor because he is probably a process schizophrenic

Analysis Type D

8. The type of schizophrenia exhibited by children from a one-parent home would depend on which of the following?

   I. the sex and forcefulness of the parent
   II. the sex and submissiveness of the child
   III. the presence or absence of specific traumatic experiences
   IV. the tendency of the child to withdraw

   A. I, II, and III
   B. I, III and IV
   C. II, III and IV
   D. All of the above

Analysis Type A

9. The process schizophrenic tends to display some antisocial behavior under which of the following conditions?

   I. in the presence of his mother
   II. in the absence of his mother
   III. in the presence of his father
   IV. in the absence of his father

   A. I and III only
   B. I and IV only
   C. II and IV only
   D. All of the above

Analysis Type F/G

10. In one psychological test, pictures of parents scolding children were shown to Paul and Robert. Their task was to find the one picture out of four in which the distance between the seated child and the upraised arm of the parent was the same as in the original picture. If their score was the number of mismatched pictures, which of the following would be expected considering their psychological history?

   A. Paul would make more errors on the father-scolding set.
   B. Paul would make the same number of errors on both the mother- and father-scolding sets.
   C. Robert would make more errors on the mother-scolding set.
   D. Robert would make more errors on the father-scolding set.

ANALYTICAL READING

Medical Topics

Some persons with allergic rhinitis (inflammation of the mucous membranes of the nose) have to suffer without antihistamines because this type of medication is frequently associated with drowsiness. In particular, those allergy sufferers whose work demands continuous activity and alertness have to endure the symptoms of their allergy(-ies) without relief while on the job, or sacrifice efficiency and productivity.

In recent years there has been increased interest in studying the effects of antihistamines on patients with nasal congestion due to allergic reactions. One study was initiated to investigate the effectiveness and possible side effects of a specific, timed-release combination of drugs used as a nasal decongestant. This combination of medications included two antihistamines (phenindamine tartrate and chlorpheniramine maleate) and a decongestant (phenylpropanolamine hydrochloride). The two antihistamines were carefully chosen: the first had demonstrated a stimulating effect on many patients, whereas the second had demonstrated excellent decongestant properties.

Thirty-four patients, most of whom worked in a local woolen mill, came voluntarily to the clinic seeking treatment for nasal congestion. There were 23 females and 11 males. On examination, 20 of these patients were diagnosed as having allergic rhinitis, 4 had allergic rhinitis with sinusitis, 2 had allergic rhinitis associated with conjunctivitis (eye infection) and 1 had allergic rhinitis associated with otitis (ear infection). Of those remaining, 5 had miscellaneous infections other than allergic rhinitis in their upper respiratory tracts, and 2 had acute common colds. The treatments lasted anywhere from two to fourteen days; the average treatment, however, lasted only from three to seven days. The results were evaluated in two ways: (1) the patients reported their individual reactions to the medication, and (2) the physician evaluated the treatment during return visits.

Twenty-two patients felt that the medication was very effective, 6 judged it moderately effective, and the remaining patients judged it poor. The physician's evaluations generally agreed with those of the patient: he found that 25 patients had good to excellent results, 4 had acceptable results and 4 were therapeutic failures. The physician was unable to see one of the subjects during his return visit; thus, he could not comment on this individual's results. The medication remained effective for about eight hours. The presence or absence of drowsiness was recorded in all cases. Excessive drowsiness occurred in five patients; mild drowsiness in two. One of the patients who complained about drowsiness also reported unpleasant dryness of mouth. No other side effects were observed.

Another doctor, on reading the results of this particular study, decided to see if he could duplicate the results by using the same drug combination on a similar group of people. The town in which he practiced contained a large clothing factory; thus, his patients included many cloth-cutters with respiratory allergies. He included in his sample the first 40 patients who came to him suffering from allergic rhinitis. His group included 25 males and 15 females. While a similar percentage of his group was diagnosed with allergic rhinitis alone (24), the complications for this group were slightly different: 7 had allergic rhinitis plus conjunctivitis, 3 had allergic rhinitis plus sinusitis.

He found that he treated patients anywhere from three to fifteen days; on the average, treatment lasted from three to six days. On conducting similar evaluations, he found that 26 of his patients judged the drug-combination good to excellent in terms of relieving their allergic symptoms, 7 judged it moderately effective, and the remainder judged it poor. The doctor's evaluations closely paralleled those of his patients: 29 good-to-excellent results, 6 acceptable results, and 5 with results poor enough to be considered total failures. The drug ceased to be effective after about 8 hours.

In terms of side effects, he had 9 patients who complained about drowsiness (6 severe, 3 mild) and 3 people who complained about dryness of mouth (2 of these were among the 9 with drowsiness; one was not).

Sample Questions

Comprehension
Type E

1. Which of the following conclusions follows directly from the results of these research studies?

   A. In the majority of cases, the formulation is useful in treating allergies without causing drowsiness.
   B. No conclusion can be reached until other side effects are more thoroughly investigated.
   C. Antihistamines do not cause drowsiness as formerly believed.
   D. This formulation should not be prescribed for patients who tend to exhibit side effects from antihistamines.

Analysis
Type A

2. Why was the first investigator unable to comment on the results for one patient?

   A. The patient was unable to make a return visit to the physician.
   B. The patient forgot to submit his evaluation of the treatment.
   C. When the patient made his return visit, the physician was unable to see him.
   D. The patient did not improve significantly enough over the course of the treatment.

Analysis
Type G

3. In light of the purpose of these studies, which of the following proposals should be considered as a subsequent research study?

   A. The identification of other side effects caused by this formulation.
   B. The incidence of drowsiness and effectiveness for different combinations of antihistamines and decongestants.
   C. The duration and effectiveness of treatment using different combinations of antihistamines and decongestants.
   D. The effectiveness of this formulation for a different sample.

Comprehension
Type C

4. Which of the following best states the hypothesis of the first experiment?

   A. This combination of drugs is effective for most people in reducing nasal congestion due to allergies.
   B. This combination of drugs does not cause side effects in the majority of persons with allergic rhinitis.
   C. The duration of treatment using this combination of drugs is relatively shorter than for other antihistamines.
   D. This combination of drugs is an effective treatment for allergic rhinitis and does not cause drowsiness in the majority of patients.

Analysis
Type C

5. Which of the following is a legitimate statement about bias in these experiments?

   A. Since the second group was only slightly larger than the first group, the problem of bias is equally irrelevant in both experiments.
   B. Since both groups of patients were chosen in the same way, there was no bias in either study.
   C. Knowing the results of the first experiment could have caused the second experimenter to anticipate and find the same results.
   D. The fact that the groups were so similar in terms of age, occupation, and sex distribution could have biased the results.

Analysis
Type F

6. Which of the following statements is the most valid inference based on the information in the article?

   A. Removing the phenindamine tartrate from the combination of drugs may greatly reduce the decongestant properties of this medication.
   B. Removing the phenindamine tartrate from the combination may change the incidence of drowsiness significantly.
   C. Replacing the phenylpropanolamine hydrochloride with a third antihistamine may greatly increase the effectiveness of this medication.
   D. Replacing the chlorpheniramine maleate may shorten the effective time for this combination.

Analysis Type F

7. Given the results of these experiments, which action would the two investigators be most likely to take?

   A. They would prescribe this drug combination for most persons with allergic rhinitis who need to keep alert at their jobs.
   B. They would prescribe this drug combination only to persons with allergic rhinitis who also suffer from otitis.
   C. They would prescribe this drug combination only in cases of extreme suffering and necessity until further studies are more conclusive.
   D. They would prescribe this drug combination to all allergy sufferers.

Comprehension Type D

8. In the two studies combined, how many people experienced side effects?

   A. 20
   B. 19
   C. 17
   D. 16

Analysis Type D

9. Which of the following is a valid conclusion about the relationship of the two experiments?

   A. Since both experiments came to the same conclusions, the second was superfluous.
   B. Since the second experiment had the same results as the first, it served as verification.
   C. Since the experiments had significantly different results, they contradict each other.
   D. Since the experiments were performed on significantly different groups of people, the results are not comparable.

Analysis Type A

10. Which of the following assumptions is NOT essential to the outcomes of the two experiments?

   A. Both doctors must examine their patients in the same way using the same criteria of effectiveness.
   B. Both doctors must use the same questionnaire in order to determine the patients' evaluations.
   C. Both doctors must prescribe the same medicine to be taken in the same way for the same amount of time.
   D. Both doctors must explain the results in the same way to their patients.

ANALYTICAL READING

Medical Topics

Viral hepatitis is a necrotizing (cell-destroying) inflammatory disease of the liver. Two basic types of this disease, infectious hepatitis (hepatitis A) serum hepatitis (hepatitis B), can be distinguished in terms of cause and incubation period.

Hepatitis A, which is contagious, is the usual epidemic form. Since this form is normally transmitted orally by ingestion of fecally contaminated matter, it is most prevalent in areas where there is overcrowding or poor sanitation. It is more common among young people who have not previously been exposed. The fact that the virus is strong enough to resist normal water-purifying methods complicates the problems of control. Although hepatitis normally reaches the liver through the digestive system, it can also be transmitted parenterally (by injection) if the patient is accidently inoculated with a contaminated needle. The time between the infection and the first manifestations of the disease is 2 to 6 weeks.

Initial symptoms include vague gastrointestinal discomfort, muscle or joint pains, skin rash and fatigue. As the disease progresses the fatigue becomes more pronounced; nausea, vomiting, and anorexia (loss of appetite) gradually become more frequent, and the patient who normally smokes develops a curious distaste for tobacco. Fever is typical. The liver itself may be slightly firm and tender. Shortly after bile appears in the urine, jaundice develops and gradually intensifies. Most patients improve steadily and are free of signs and symptoms within six weeks after the onset of jaundice.

Hepatitis B, the second type, is generally transmitted by inoculation of contaminated blood, blood products, or materials mixed with or associated with blood (such as some vaccines); it can also be transmitted by any type of hypodermic injection with a poorly sterilized syringe or serum. Hence, the incidence of this type of hepatitis has vastly increased in large cities where the practice of needle-sharing among drug addicts is common. The unmonitored sale of blood to commercial blood banks has resulted in increased infections among those who receive blood products. This is particularly true in areas where drug addicts with hepatitis are unwittingly allowed to sell their blood in order to support their habit.

Hepatitis B, which has an incubation period of 2 to 6 months, is associated generally with the same outward symptoms as hepatitis A. In fact, for patients who already exhibit jaundice, a thorough examination, history of exposure, and lab tests are necessary to determine the particular type of hepatitis.

Fortunately fewer than 1% of patients hospitalized with either hepatitis A or B develop fulminant viral hepatitis, which is the clinical designation for massive hepatic necrosis. This is an abrupt and extensive destruction of the liver, which results in severe metabolic upsets and causes the patient to go into hepatic coma. In such cases, the liver weighs from 800 to 1,200 grams, which is much less than normal. Death in a hepatic coma occurs from 24 hours to a few days after the onset of such symptoms. Patients with submassive hepatic necrosis may survive somewhat longer (usually 2 to 3 weeks) if there are sufficient surviving liver cells to maintain [minimal] life functions. An autopsy following death from either massive or submassive necrosis of the

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There are several tests that a doctor can perform in order to help diagnose and determine the progress of hepatitis. A test for hepatitis-associated-antigen (HAA) is negative for hepatitis A and may be positive for hepatitis B. The SGOT test, which detects the presence of an enzyme Z released only by dying cells, indicates an above normal enzyme Z level as early as one week prior to the onset of symptoms. As the disease progresses, this level continues to rise; it usually goes above 1,000 units, occasionally above 3,000 units, and in very rare cases to 5,000 units.

CASE

Ms. D is a 33 year old motel employee who lives at home with her parents. She is 5' 7" and weighs 185 pounds. Her medical history includes an allergic skin disorder, varicose veins, and obesity. The first two were treated with ointments and injections, the last with diet pills. She has had both a tonsillectomy and an appendectomy, but no other operations.

In January 1969 she developed fever and bilateral swelling of the neck, which was treated with oral penicillin. The penicillin caused a skin rash and itching, and its use was discontinued. In February her varicose veins became problematic; her right leg swelled and developed an ulcer just above the ankle. She sought no medical treatment until May, when she was hospitalized immediately. In addition to her leg problems, she was found to be suffering from anemia and and a low grade fever. A treatment consisting of vitamin injections and multiple blood transfusions (a total of 9 between May 27 and June 22) brought some improvement. On June 15th, vein strippings were done on her right leg to relieve the varicose veins; seven days later, they were done on her left leg. While receiving her last unit of blood on the day of the second vein stripping, she had a temperature of 103^{o}. She complained about feeling chilled and nauseous and about not having any appetite; she also vomited repeatedly. Several anti-nausea drugs were administered, which appeared to bring relief. By June 24th, however, she appeared jaundiced; her high fever also continued. By early July the jaundice was more pronounced and she was quite sluggish. She reacted to pain and occasionally answered simple questions, but was disoriented as to time, place and person. Laboratory tests yielded an SGOT value of 2480 and a positive result for the presence of HAA in her blood. Treatment for acute hepatitis was initiated, but by July 7 Ms. D had slipped deeper into hepatic coma and was responding only to intense pain.

Sample Questions

Comprehension Type A

1. The term "parenterally" refers to transmission by:

   A. means other than through the intestines
   B. physical contact with an infected person
   C. inheritance
   D. a previous physical disorder

Analysis Type B

2. Ms. D's history and symptoms are similar to those of

   A. Hepatitis A
   B. Hepatitis B
   C. Fulminant hepatitis A
   D. Fulminant hepatitis B

Comprehension Type B

3. The author's use of the phrase "a curious distaste for tobacco" implies that

   A. he knows that this symptom is psychosomatic
   B. such a symptom is odd in the presence of anorexia, which usually stimulates smoking
   C. the reason for the link between the dislike and hepatitis has not yet been determined
   D. he is certain that there is no medical reason for the dislike

Analysis Type C

4. The primary difference between massive and submassive necrosis of the liver is

   A. the occurrence of hepatic coma
   B. the amount of damage to organs other than the liver
   C. the degree of cell necrosis
   D. whether hepatitis A or B preceded it

Analysis Type F

5. Given the details of Ms. D's case, what is the best estimate of her prognosis?

   A. She will not live more than another day.
   B. She will live about another $2\frac{1}{2}$ weeks.
   C. She may recover, but slowly.
   D. It cannot be determined without further information.

Analysis
Type C

6. Which of the following is a legitimate way to differentiate hepatitis A from hepatitis B?

A. the length of the incubation period
B. the occurrence of hepatic coma
C. the degree of cell necrosis
D. the presence of jaundice

Analysis
Type E

7. If you were a public health official in an area that had a sudden outbreak of hepatitis A, which of the following steps would you recommend to help control the spread of the disease?

I. urge people to boil their drinking and cooking water
II. order people to have a blood test to check for the presence of HAA and isolate all those with positive results
III. try to trace down all the known contacts of those who have the disease

A. III only
B. I and II only
C. II and III only
D. I, II, and III

Analysis
Type B

8. Jill is admitted to the hospital with nausea, high fever, and stomach distress. She complains about feeling very tired and not being hungry. In the process of taking a medical history, the intern discovers that four weeks ago she sold a pint of her blood to the local blood bank. He diagnoses her disease as hepatitis A. On the basis of the information contained in the article, is he justified in his diagnosis?

A Yes, because she is exhibiting all the classic symptoms of hepatitis A.
B. No, because the incubation period is not typical for that type of hepatitis A.
C. No, because only hepatitis B can be transmitted through contaminated needles.
D. No, because he does not have enough information to distinguish adequately between hepatitis A, B or some other disease.

Analysis
Type F

9. On the basis of the information in the article, which of the following are justifiable inferences?

   I. Ms. D contracted the hepatitis virus from a contaminated needle while she was receiving vitamin injections in May.
   II. One of the 9 blood transfusions Ms. D received was contaminated.
   III. Ms. D had been exposed to hepatitis before she was admitted to the hospital

   A. II only
   B. III only
   C. I and II only
   D. I and III only

Analysis
Type F

10. Which of the following patients is most likely to go into hepatic coma quite soon?

   A. John, whose liver weighs 1800 grams and whose blood is positive for HAA.
   B. Peter, whose SGOT value is 3,500 units and whose temperature is 104.5°.
   C. Susan, whose blood is negative for HAA and has an SGOT value of 900 units.
   D. Mary, whose blood is positive for HAA and has a temperature of 100°.

ANALYTICAL READING

Basic Sciences

Solutions are homogeneous mixtures of chemical species. Liquid solutions have certain properties that very with the number of particles of solute dissolved in the solvent. These properties, called colligative properties, include boiling point and freezing point.

For example, a volume of water boils at 100°C. But add a solute, such as the sugar fructose, and the boiling point rises slightly. For certain solutes in water the boiling point rises .51°C for each mole of solute per 1000 grams of solvent. A mole is equal to one gram-molecular weight of solute. The gram-molecular weight of fructose can be determined from its formula, $C_6H_{12}O_6$. Since the atomic weights of carbon, hydrogen, and oxygen are 12, 1 and 16 respectively, a mole of fructose is equal to (6 x 12) grams + (12 x 1) grams + (6 x 16) grams, or 180 grams. If 180 grams of fructose are dissolved in 1000 grams of water, the boiling point of this one-mole solution will be raised by .51°C to 100.51°C. A three-mole solution will be raised by (3 x .51)°C; so the boiling point of this solution will be 100°C + 1.53°C, or 101.53°C. A simple equation can be used to determine the rise in boiling point (RBP) of a solution:

$$RBP = K_bM,$$

where K_b is the boiling-point elevation constant, unique for each solvent (K_b = .51°C for water), and M is the number of moles of solute per 1000 grams of the solvent.

Similarly, the freezing point of a solution is lowered as solute is added. An equation for finding the lowering of freezing point (LFP) of a solution is

$$LFP = K_f M,$$

where K_f is the freezing-point depression constant for the solvent (K_f of water = 1.86°C).

Although all solutions have colligative properties, these equations are correct only when certain kinds of solutes such as hydrocarbons, sugar, and urea are used, since these solutes yield only one neutrally charged particle for every molecule added to the solution. Other kinds of solutes, such as common salt, dissolve in water to form several charged particles called ions for each molecule dissolved, and other calculations must be made to determine solution boiling points and freezing points.

Sample Questions

Analysis
Type G

1. If a sample of a homogeneous liquid mixture of two chemical species boils at a steady temperature, which of the following methods may be used to produce a higher boiling point using the same species in a second experiment?

   A. Use a smaller volume of the same solution
   B. Use less solute
   C. Use more solvent
   D. Use less solvent

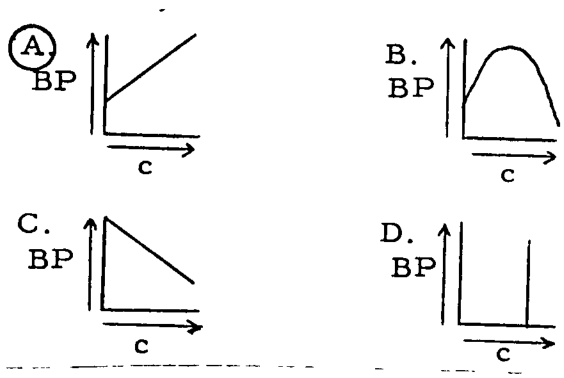
Comprehension
Type D

2. An insoluble substance added to water will yield a mixture that exhibits:

   A. a rise in freezing point
   B. a rise in boiling point
   C. a fall in the freezing point
   D. no change in boiling point or freezing point

Analysis
Type D

3. Which of the following graphs shows the relation between boiling point (BP) and concentration (c) of a solution?



Analysis
Type D

4. Which of the following practices makes use of a colligative property of solutions?

   A. removing oil-base paint with acetone
   B. scattering salt on icy pavement
   C. cooking foods in vegetable oil
   D. none of these

Analysis
Type D

5. Which of the following statements concerning the relationships expressed by the equation LFP = $K_f M$ is TRUE?

A. K_f has the same value in all calculations of LFP involving hydrocarbon in water solutions.
B. As temperature rises, more solute dissolves in a solution.
C. The LFP of solutions containing hydrocarbons of different gram molecular weights remains constant providing that the mass of solute used is constant in each case.
D. The K_f value will increase as the mass of water used to dissolve one mole of solute is decreased below 1000 grams.

Analysis
Type E

6. What information would have to be obtained to find the gram molecular weight of a substance using a boiling point experiment?

A. boiling point of the solution, mass of solvent, mass of solute
B. boiling point elevation constant, boiling point of the solution, mass of solution
C. mass of solute, boiling-point elevation constant, rise in boiling point of the solution
D. boiling point of the solution, mass of the solution, mass of solvent

Analysis
Type F

7. The LFP for a solution containing two moles of a solid chemical species and 1000 grams of a common solvent was found to be 7.20°C. One inference which may be drawn from this information is that:

A. the solution was cooled rapidly
B. the solute was ionic
C. the solute was not soluble
D. the solvent was not water

Comprehension
Type D

8. A colligative property of a solution is one that varies with:

A. volume
B. concentration
C. heat
D. temperature

Comprehension
Type B

9. A one mole solution of cane sugar (one mole of sugar = 342 grams) might contain

A. 342 grams of sugar in 342 grams of water
B. 684 grams of sugar in 2000 grams of water
C. one mole of sugar in one mole of water
D. one gram of sugar in 1000 grams of water

Analysis
Type D

10. If a gram molecular weight of cane sugar was added to 500 grams of water and the RBP of the solution was compared with the RBP of a half-mole fructose in water solution, which of the following ratios would be obtained?

A. $\frac{RBP_1}{RBP_2} = 0.5$

B. $RBP_1 = RBP_2$

C. $RBP_1 = 2(RBP_2)$

D. $\frac{RBP_1}{RBP_2} = 4$

ANALYTICAL READING

Basic Sciences

The metabolism of the body is the total of all chemical reactions and accompanying energy changes in its cells. The minimal amount of energy required per unit of time for all fundamental functions (such as breathing) is called the basal metabolic rate (BMR). The BMR is normally expressed in terms of the heat liberated per unit of time during these chemical reactions, since essentially all the energy expended by the body is converted into heat. This heat is measured in calories. A calorie is the quantity of heat required to raise the temperature of 1000 grams of water from 14.5^{o}C. to 15.5^{o}C.

A standard method of determining metabolic rate is called calorimetry. Direct calorimetry involves measuring the total quantity of heat in calories liberated in a given period of time. However, because the direct method is technically difficult to apply, it is rarely used. An alternative to direct calorimetry is indirect calorimetry, by which the oxygen used can be measured according to the following equation:

$$\underset{\text{(glucose)}}{C_6H_{12}O_6} + 6O_2 \longrightarrow 6CO_2 + 6H_2) + \text{heat}$$

Under standard conditions, when one liter of oxygen is metabolized with glucose, 5.01 calories are released; when metabolized with starches, 5.06 calories are released; with fat, 4.70 calories; and with protein, 4.60 calories. With a mixed diet the quantity of heat liberated per liter of oxygen used averages approximately 4.825 calories. Therefore, it is possible to calculate the amount of heat liberated in the body over a given time if the quantity of oxygen used in that time and the kind of food consumed are known. Usually, however, it will suffice to use the heat equivalence of the mixed diet. The indirect method of calorimetry is technically easy, gives good results, and has been used so much that when metabolic rate is mentioned it usually means the rate of oxygen consumption.

When measuring oxygen consumption in humans, the subject at rest breathes oxygen from a tank. The volume of oxygen he breathes in one hour can thus be directly measured. The carbon dioxide he exhales is removed from the system by sodium hydroxide. By dividing the number of liters of oxygen used in one hour by 4.825 (calories liberated per liter of oxygen used), the number of calories liberated per hour is determined. In order to standardize BMR measurements, the size of the individual must be considered: a small boy would not be expected to liberate the same number of calories per hour as a large man. To account for size differences, the calories liberated per hour is divided by the body surface area of the subject (in square meters). The calories liberated per square meter per hour can then be compared to a normal or standard value for the particular age of the subject. For example, the normal value for a 40 year old man is 38.0 calories. If the calculated value for a 40 year old male subject is 38.6, he liberates 0.6 calories above normal.

The BMR of a subject is sometimes expressed as a percentage above or below normal for his age or sex. Above normal readings are positive; below normal figures are negative. Variations of -10 to +10 from the normal value are considered insignificant. In the above sample, the subject's measure of 38.6 is 1.5% above the normal figure. His BMR of +1.5 on a percentage scale would be considered well within the normal range.

Other factors also affect the metabolic rate. The BMR increases with exercise, with an rise in body temperature, immediately after eating, and during excitement. It decreases during sleep. In addition to these physiological variations, a pathological increase (hyperthyroidism) occurs when the thyroid gland is overactive; a pathological decrease (hypothyroidism) occurs when the thyroid gland is underactive.

Sample Questions

Comprehension Type B

1. If a subject were to metabolize only carbohydrates (glucose and starches in equal quantities) during the period of the basal metabolism test, which of the following would be true?

   A. The quantity of heat liberated would be less than normal.
   B. Six liters of oxygen would be needed for the test.
   C. The BMR would be slightly higher than that calculated on a mixed diet.
   D. No change in the amount of oxygen normally used would be expected.

Analysis Type E

2. A three-year-old boy eats less food than his father, yet the boy's metabolic rate is higher. Which statement accounts for this apparent discrepancy?

   A. In proportion to his body weight, the boy burns up more food than his father.
   B. The boy burns up more food stored in the body as fats to compensate for his smaller food intake.
   C. The boy uses more oxygen than his father to metabolize a given amount of food.
   D. In proportion to his size, the boy uses less energy than his father.

Comprehension Type A

3. The calorimetry method described is termed "indirect" for which of the following reasons?

   A. Instead of expressing as calories the amount of heat produced, temperature is expressed as degress C.
   B. Volume of air used is measured rather than the volume of CO_2 produced.
   C. Volume of oxygen consumed is measured rather than the amount of heat produced.
   D. Instead of measuring volume of gas used in liters, pipette units are used.

Comprehension
Type B

4. A person with a BMR of -30 is MOST likely to

A. have hyperthyroidism
B. have hypothyroidism
C. be exercising
D. have a large body surface area

Analysis
Type E

5. Which of the following best explains why the subject of a basal metabolism test is instructed to eat no food for the twelve hours before the test?

A. The digestive process would elevate the BMR
B. Less oxygen is required for metabolism when the stomach is full.
C. The level of hemoglobin in the blood is elevated after eating.
D. Hunger contractions in the stomach lower the BMR.

Analysis
Type F

6. Two 30-year-old men of equal size use the same amount of oxygen in a BMR measurement, but the first takes twice as long to breathe it. If the first man has a BMR of zero, what would the BMR of the second man be?

A. negative
B. positive
C. zero
D. insignificant

Analysis
Type G

7. If for experimental reasons it was necessary to counteract the effect of having just eaten a large meal on the BMR, the best procedure would be to:

A. have the subject lie down
B. have the subject exercise
C. give the subject an injection of thyroid secretion
D. give the subject an injection of glucose solution

Analysis
Type F

8. An apparatus used to measure oxygen consumption malfunctions and reports only one half the actual amount of oxygen consumed in one hour. If the reported volume was used instead of the true volume in a BMR calculation the BMR would be:

A. above normal
B. below normal
C. zero
D. insignificant

Analysis
Type A

9. On a percentage scale, the normal BMR of a male subject as compared to the normal BMR of a female subject will usually be:

A. higher
B. lower
C. the same
D. positive, while the BMR of a female will be negative

Analysis
Type D

10. The normal number of calories liberated per square meter per hour for one man as compared to the number liberated for a smaller man will be:

A. greater
B. lesser
C. the same
D. positive, while that of a smaller man will be negative

APPENDIX E

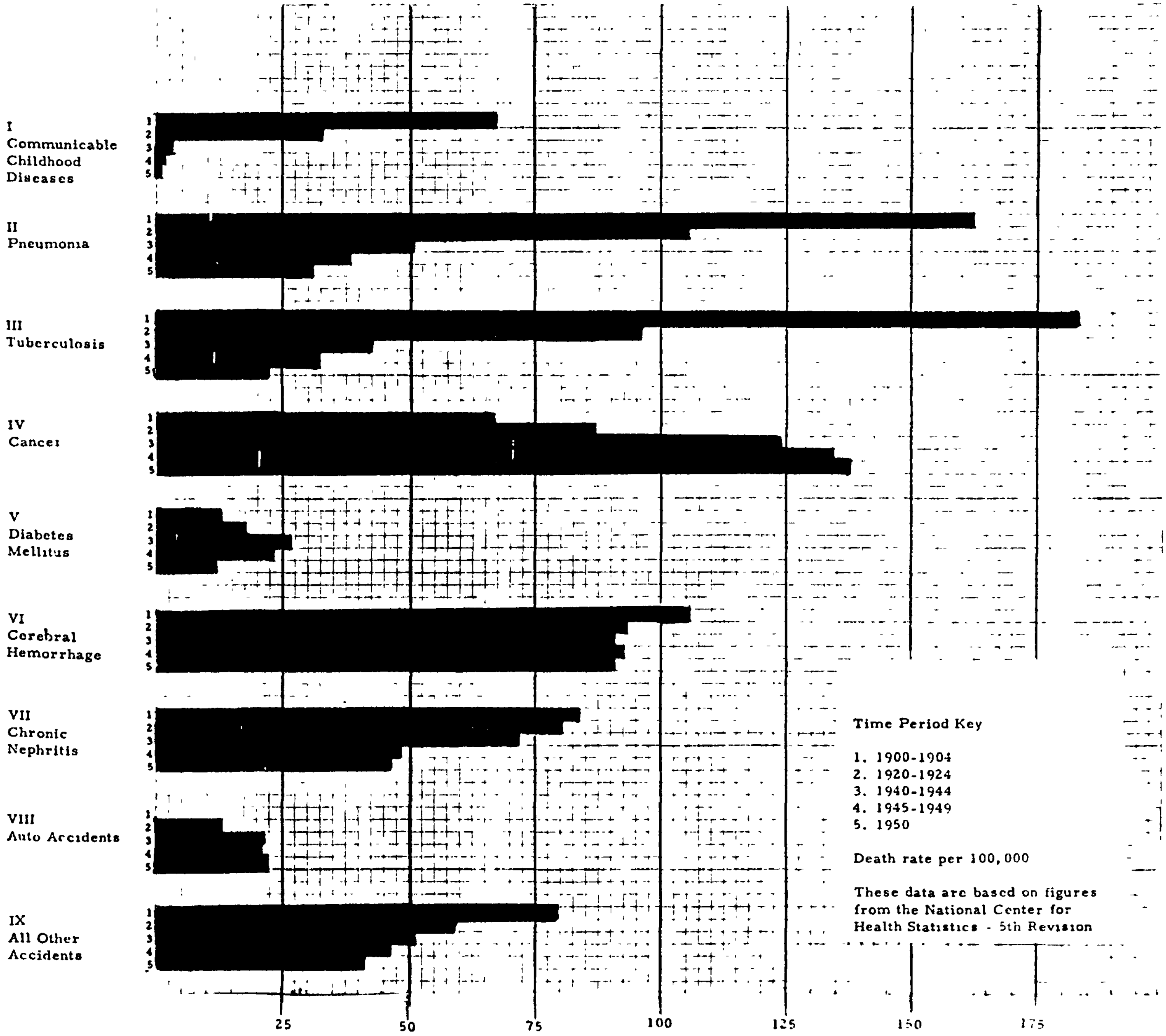
QUANTITATIVE ANALYSIS

1. Translation and Interpretation of Data
2. Translation and Interpretation of Data
3. Translation and Interpretation of Data
4. Reasoning and Problem Solving

QUANTITATIVE ANALYSIS

Translation and Interpretation of Data

Some Causes of Death 1900 - 1950



Sample Questions

1. Of the causes of death shown here, which disease shows the most stable pattern over the time span from 1900-1949?

   A. diabetes mellitus
   B. chronic nephritis
   C. pneumonia
   D. cancer

2. Which cause of death shows the most significant change between two consecutive reported time periods?

   A. communicable childhood diseases
   B. pneumonia
   C. tuberculosis
   D. all other accidents

3. Which of the following is consistent with the trends established in this graph?

   A. By 1955, the rate of death from cancer, pneumonia and auto accidents will probably increase sharply.
   B. Before 1900, the rate of death from auto accidents and diabetes mellitus was probably between 5 and 12 per 100,000.
   C. By 1955, the rate of death from communicable diseases, pneumonia, and tuberculosis will drop still lower.
   D. The rate of death from cerebral hemorrhage can be expected to change significantly in the early fifties.

4. Which of the following is NOT relevant to a careful analysis of these data?

   A. The figures for periods 3 and 4 may be somewhat distorted because deaths for soldiers serving overseas were not included in the data base at all.
   B. The figure for all other accidents may be distorted because deaths once classified as accidents can now be identified as disease-caused.
   C. The figures for period 5 cannot be directly compared to the figures for the other 4 periods because the time span is different.
   D. The figures do not present conclusive data on the relationship of all causes of death.

5. Which of the given causes was probably responsible for most deaths in 1943?

   A. pneumonia
   B. chronic nephritis
   C. all other accidents
   D. cancer

6. For the given causes of death, for which is an individual's probability the highest and the lowest in 1955?

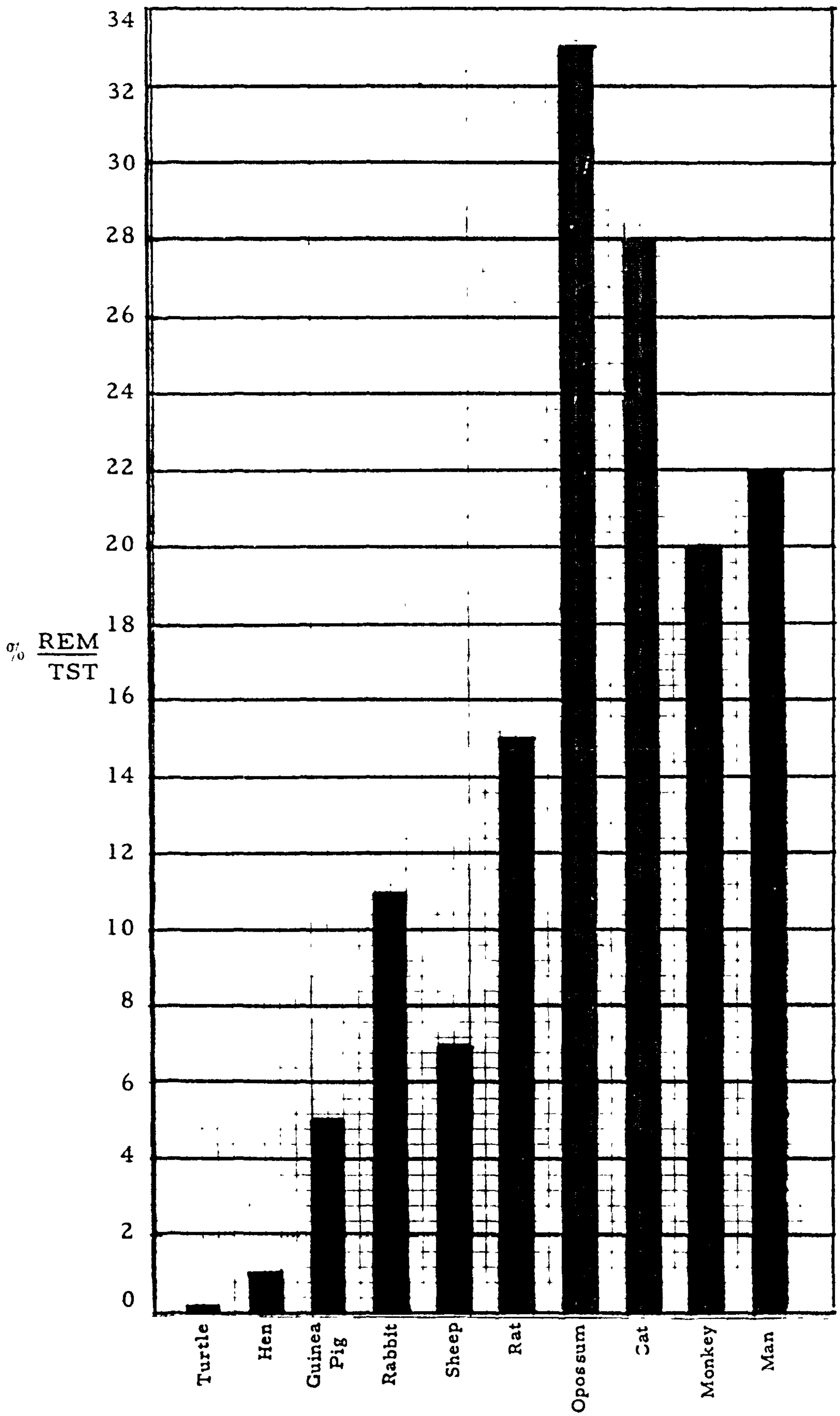
   A. Highest, cancer; lowest, communicable childhood diseases
   B. Highest, cerebral hemorrhage; lowest, auto accidents
   C. Highest, communicable childhood diseases; lowest, cerebral hemorrhage
   D. Highest, cancer; lowest, auto accidents

7. Which of the following statements is true?

   A. The pattern for cancer deaths is directly opposite to the pattern for tuberculosis deaths.
   B. The pattern for chronic nephritis is almost parallel to the pattern for all other accidents.
   C. The pattern for communicable childhood diseases is atypical of those in the graph.
   D. The pattern for cerebral hemorrhage is quite erratic.

QUANTITATIVE ANALYSIS

Translation and Interpretation of Data

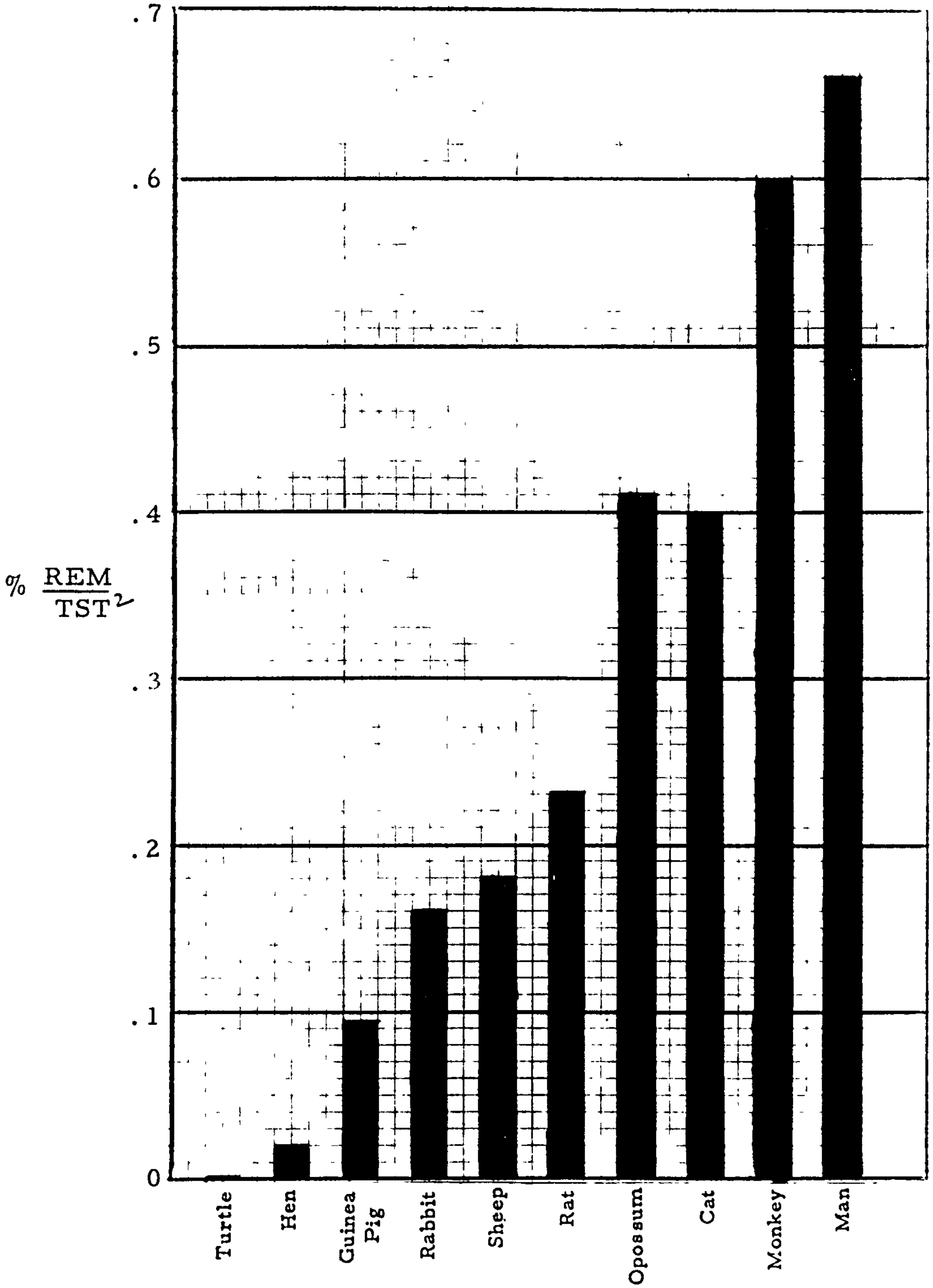


Graph I

Percentage of time spent asleep in 24 hours

Turtle	80%
Hen	50%
Guinea Pig	53%
Rabbit	67%
Sheep	40%
Rat	66%
Opossum	80%
Cat	70%
Monkey	33%
Man	33%

Graph II


% REM/TST
.7
.6
.5
.4
.3
.2
.1
0
Turtle
Hen
Guinea Pig
Rabbit
Sheep
Rat
Opossum
Cat
Monkey
Man

Of the several stages of sleep, rapid eye movement (REM) is the period of deep sleep during which dreaming takes place. One biologist investigated the percent of total sleeping time (TST) spent by several species in REM. The results are shown in Graph I. To compensate for the differences in daily sleeping time for each species, the investigator divided the results shown in Graph I by the percentage of the day spent asleep. These results are shown in Graph II. The following questions are based upon his results.

1. What percent of a 24-hour period does the guinea pig spend awake?

   A. 10
   B. 47
   C. 50
   D. 53

2. Approximately what percent of total sleeping time does the rat spend in REM?

   A. 15
   B. 20
   C. 34
   D. 66

3. What species has the highest percentage of REM during its total sleeping time?

   A. turtle
   B. opossum
   C. monkey
   D. man

4. For which species is the percentage of total sleeping time spent in REM relative to the percentage of the day spent asleep the greatest?

   A. opossum
   B. monkey
   C. turtle
   D. man

5. If a cow spends about 28 percent of its total sleeping time in REM and sleeps about 33 percent of the day, approximately what would be the value of REM/TST^2?

   A. .80
   B. .84
   C. .91
   D. .93

6. Why is the percentage of total sleeping time spent in REM lower for sheep than for rabbits yet the value of REM/TST^2 is higher for sheep than it is for rabbits?

   A. Sheep spend a greater length of time asleep than awake.
   B. Rabbits spend a greater length of time awake than asleep.
   C. Sheep spend a greater length of time awake than rabbits do.
   D. Rabbits spend a greater length of time awake than sheep do.

7. If the total sleeping time spent in REM for the dog is 30 and the value of REM/TST^2 is .50, what percent of a 24-hour period does the dog spend asleep?

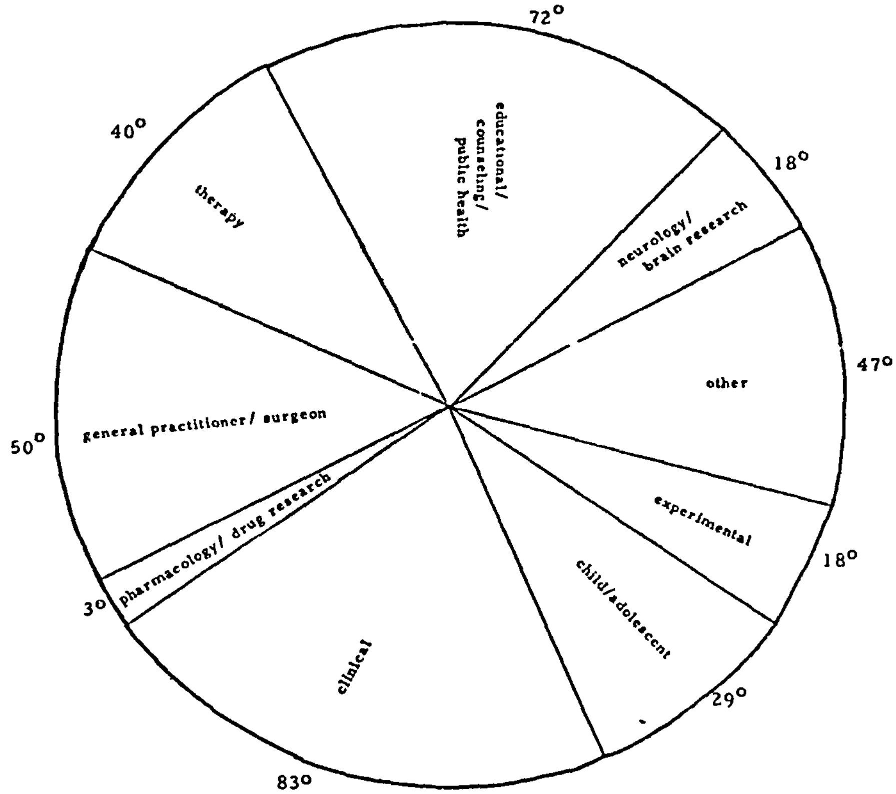
   A. 15
   B. 60
   C. 70
   D. 80

QUANTITATIVE ANALYSIS

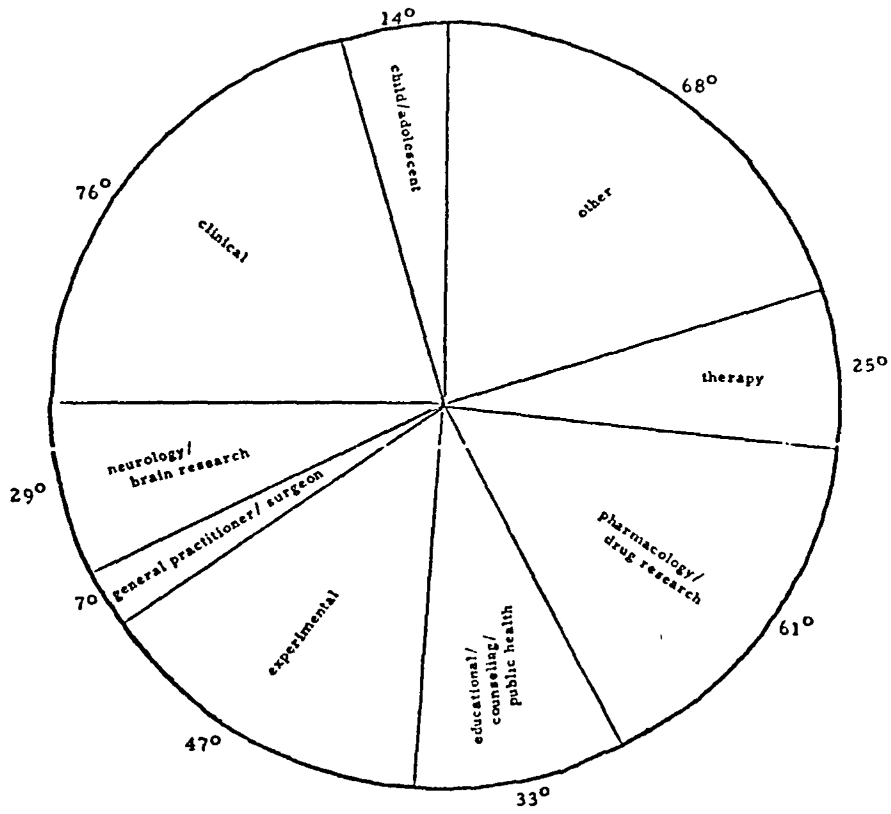
Translation and Interpretation of Data

The survey whose results are presented here was conducted by a graduate student in pharmacology who wanted to determine whether and to what extent differences of opinion on psychedelic drugs exist between professionals who have first hand knowledge of psychedelic drug research (researchers) and practicing professionals who do not have such first hand knowledge (professionals). Both groups included professionals with various specialties as shown in the circle graphs.

		Taken With Supervision		Taken Without Supervision	
		% Professionals	% Researchers	% Professionals	% Researchers
MARIJUANA	very dangerous	2.0	4.0	10.0	4.0
	somewhat dangerous	18.0	8.0	36.0	20.0
	hard to say	29.5	19.5	33.0	35.0
	somewhat safe	9.5	9.5	11.0	22.0
	very safe	41.0	59.0	10.0	19.0
		100.0%	100.0%	100.0%	100.0%
LSD	very dangerous	19.5	7.0	64.0	38.5
	somewhat dangerous	25.5	16.0	23.0	27.5
	hard to say	28.0	19.0	8.0	24.0
	somewhat safe	18.5	29.5	2.5	8.5
	very safe	8.5	28.5	2.5	1.5
		100.0%	100.0%	100.0%	100.0%



~~(Professionals)~~
N = 490



(Researchers)
N = 127

1. Which, if any, of the professional specialties listed below were proportionately equal in representation in both groups?

   A. neurology/brain research
   B. experimental
   C. child/adolescent
   D. None of the above

2. Which group of professional specialists returned the largest number of questionnaires and which group returned the smallest number?

   A. (largest) clinical researchers; (smallest) general practitioner/surgeon researchers
   B. (largest) clinical professionals; (smallest) pharmacology/drug research
   C. (largest) clinical professionals; (smallest) general practitioner/surgeon researchers
   D. (largest) clinical researchers; (smallest) pharmacology/drug researchers

3. Which group was represented by fewer therapists?

   A. Researchers
   B. Professionals
   C. Equally represented
   D. Cannot be determined

4. Which group was represented by a larger number of experimenters?

   A. Researchers
   B. Professionals
   C. About equal
   D. Cannot be determined

5. What percent of the professionals were involved in neurology/brain research?

   A. 18
   B. 29
   C. 25
   D. 88

6. For which category did the largest percent of professionals use the hard-to-say response?

   A. Marijuana with supervision
   B. Marijuana without supervision
   C. LSD with supervision
   D. LSD without supervision

7. How many researchers felt that it was somewhat dangerous to take LSD without supervision?

   A. 20
   B. 25
   C. 27
   D. 35

8. About which drug under which conditions was there least agreement between researchers and professionals?

   A. Marijuana with supervision
   B. Marijuana without supervision
   C. LSD with supervision
   D. LSD without supervision

9. How many clinical researchers felt that LSD was very dangerous without supervision?

   A. 48
   B. 37
   C. 10
   D. Cannot be determined from given data

10. Which drug did researchers tend to consider safest?

A. Marijuana with supervision
B. Marijuana without supervision
C. LSD with supervision
D. LSD without supervision

11. Which of the following statements is true?

A. Researchers and professionals disagreed most about the safety of LSD when used with supervision.
B. The opinions held by both groups showed less variance for these drugs when used without supervision
C. Both groups tend to think either drug is more safely used under supervision.
D. Researchers that used the category "hard to say" tended to be less consistent from one drug to another rather than from one method to another

QUANTITATIVE ANALYSIS

Reasoning and Problem Solving

1. Mercury is 13.5 times as dense as water. If a full pail contains 3375 grams of mercury, what is the greatest weight of water in grams it could hold?

   A. 45,562.5
   B. 25,000
   C. 2,500
   D. 425.62
   E. 250

2. If an object is thrust upward with a velocity of 100 feet per second, then at the end of "t" seconds it will have reached a height of $(100t-16t^2)$ feet. Approximately how many seconds would it take for an object to reach 156 feet?

   A. 1
   B. 2
   C. 3
   D. 5
   E. 6

3. Which of the following is a formula for the distance in miles travelled by a car in "t" hours ($t > 2$) if the average speed was 45 mph for the first two hours and 65 mph after that?

   A. $\frac{45t}{2} + 65(t - 2)$
   B. $55t$
   C. $90 + 65(t-2)$
   D. $\frac{45}{2} + \frac{65t}{2}$
   E. $90 + 65t$

4. A biologist needs a soil that is 6% sand in order to do an experiment in plant growth. He has two mixtures of soil available to him: one is 8% sand, the other is 5% sand. How much of the second mixture would he need to add to 30 pounds of the first mixture in order to get the type of soil he needs?

A. 13
B. 38
C. 57
D. 60
E. 68

5. If a chemist has 90 pints of a 30% salt solution, how much pure salt must be added to produce a solution which is 40% pure salt?

A. 9
B. 15
C. 60
D. 67.5
E. 120

6. Given the formula: Foot Candles = $\frac{C.P.}{d^2}$ where C.P. = candlepower and d = distance, how will the illumination be affected if a 100 candlepower lamp is replaced by a 200 candlepower lamp and the distance from the illuminated subject is doubled?

A. Eight times the original value
B. Four times the original value
C. Two times the original value
D. Same as the original value
E. One-half the original value

7. If sulfuric acid contains, by weight, 2 parts hydrogen, 32 parts sulfur and 64 parts oxygen, what part of sulfuric acid is oxygen?

A. 1/49
B. 16/49
C. 1/2
D. 2/3
E. 32/49

APPENDIX F

BASIC SCIENCES

1. Discrete Items
2. Statements and Principles
3. Laboratory Experiments
4. Laboratory Experiments

BASIC SCIENCES

Format 1: Discrete Items

Classification

Analysis
Type A

1. If the sea kelp Laminaria is immersed in a sodium chloride solution isotonic with sea water, the electrical resistance of its cells will probably:

   A. increase indicating increased permeability
   B. increase indicating decreased permeability
   C. decrease indicating increased permeability
   D. decrease indicating decreased permeability

Analysis
Type A

2. In a particular experiment two types of wild rabbits (white and gray) were exposed to the attacks of an eagle. On alternate days the ground was covered either with a powder similar to snow or with a gray-colored soil. If the number of each type of rabbit captured by the eagle was recorded daily, which of the following results most likely occurred?

   A. More white rabbits were captured on the days with white ground covering.
   B. More white rabbits were captured on the days with gray soil.
   C. Equal numbers of each type of rabbit were captured on the days with white ground covering.
   D. Equal numbers of each type of rabbit were captured on the days with gray soil.

Application
Type B

3. In the reaction $2C_2H_6(g) + 7O_2(g) \rightarrow 4CO_2(g) + 6H_2O(g)$, how many liters of oxygen are required for the complete combustion of 16 liters of ethane?

   A. 7
   B. 16
   C. 49
   D. 56

Application
Type B

4. A series circuit contains a 4-Ω and a 2-Ω resistor connected to a 110-volt source. The energy dissipated in the 4-Ω resistor as compared to the energy dissipated in the 2-Ω resistor during the same time is:

A. one-fourth as great
B. one-half as great
C. the same
D. twice as great

Analysis
Type A

5. If two virus particles of different genetic constitution infect a bacterium, the virus particles liberated will consist of:

A. one kind which is a mixture of the two parental types
B. two kinds representing each of the two parental types
C. two kinds, one of which is a mixture of the two parental types and the other representing the dominant virus particle.
D. three kinds, one of which is a mixture of the two parental types and the other two representing each of the parental types.

BASIC SCIENCES

Format 2: Statements and Principles

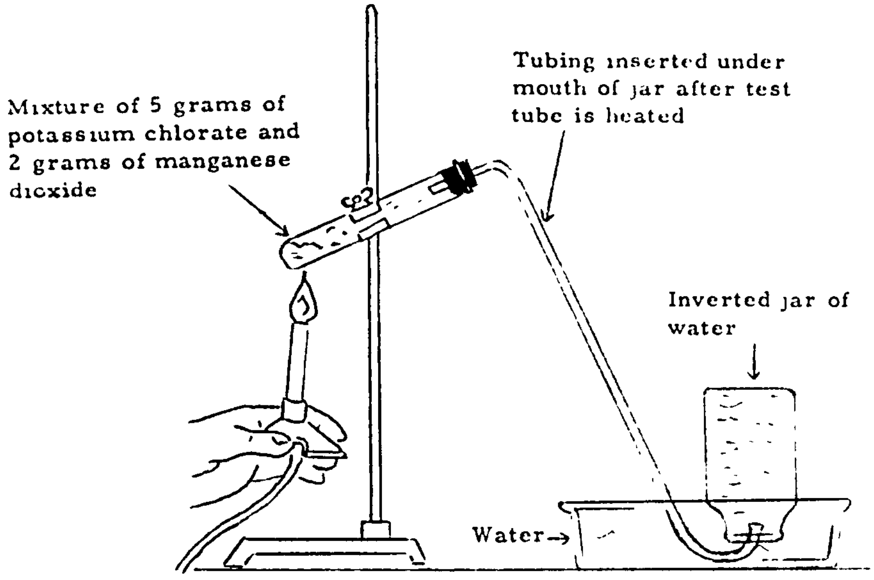
A. Acceleration
B. Diffraction
C. Entropy
D. Inductance
E. Ionization
F. Kinetic Energy
G. Period of a Pendulum
H. Polarization
I. Power
J. Refraction

Listed above are ten principles of physics. For each of the statements below, select the principle which is referred to by the statement. A principle may be applicable to more than one statement.

Classification	Key	
Application Type C	C	1. Only if the transformation is reversible will the system undergo no change.
Application Type A	D	2. The unit is $\frac{\text{Volt-sec.}}{\text{amp}}$
Application Type B	G	3. It will increase if it is measured on the top of a high mountain.
Application Type A	F	4. For a rotating body, it equals $\frac{1}{2} I\omega^2$.
Application Type C	J	5. When the speed of light in a diamond is three-fifths of the speed in air, it is equal to 1.667.
Application Type B	F	6. A bullet in flight is an example.

BASIC SCIENCES

Format 3: Laboratory Experiments



<u>Classification</u>

Analysis
Type A

1. Which of the following reactions is occurring in this experiment?

   A. $2KCl + MnO_2 \xrightarrow{\Delta} 2K + Mn + Cl_2 + O_2$
   B. $MnO_2 + 2KClO_3 \xrightarrow{\Delta} 2KCl + Mn + 4O_2$
   C. $2KCl \xrightarrow{\Delta} 2K + Cl_2$
   D. $2KClO_3 \xrightarrow{\Delta} 2KCl + 3O_2$

Analysis
Type B

2. The potassium chlorate and manganese dioxide are mixed mainly to:

   A. allow for the uniform transfer of energy through the mixture
   B. increase the efficiency and uniformity of the reaction
   C. prevent the accumulation of oxygen gas in the mixture
   D. increase the amount of oxygen that can be obtained from the mixture

Analysis
Type A

3. If the mixture is heated too strongly, the most noticeable effect will be:

A. sparking of the mixture
B. increased pressure inside the test tube
C. vapor cloud production in the glass tubing
D. a rapid rate of bubble production

Application
Type B

4. The manganese dioxide acts as a catalyst by:

A. giving up its oxygen atoms
B. providing a lower energy path for the decomposition of potassium chlorate
C. increasing the pressure inside the test tube
D. increasing the energy of the potassium chlorate molecules

Analysis
Type B

5. The test tube is heated for one minute and the gas allowed to escape before the actual collection is begun because the:

A. test tube and the water are at different temperatures
B. pressure is greater in the test tube than in the jar
C. gas initially coming through the tubing will be a mixture
D. reaction will be easier to stop in the event of a malfunction

Analysis
Type A

6. A by-product that is present after the reaction is:

A. chlorine gas
B. oxygen gas
C. potassium chlorate
D. manganese dioxide

Synthesis
Type B

7. If the glass tubing became blocked with solid matter while the reaction was proceeding, what could be expected?

A. The reaction would stop.
B. The temperature of the test tube would increase.
C. The tubing would melt.
D. The stopper would be blown out of the test tube.

BASIC SCIENCES

Format 3: Laboratory Experiments

An experimenter was interested in the properties of an unknown liquid which was clear and pale blue. He found that after he poured the liquid into an open flask and left it in a dark room for one day, the volume of the liquid decreased and turned a darker blue. He discovered that the liquid boiled at 101.4°C, and when all of the liquid was boiled off, a hard blue residue remained. When placed in a stoppered flask and heated, the liquid decreased in volume and the stopper flew off. He also found that after attempting to freeze the liquid in a filled and tightly stoppered flask, the flask broke after the temperature had remained at -3.72°C for four minutes.

Classification

Analysis
Type A

1. The experimenter's conclusion that the substance is a solution is:

   A. valid because the liquid boiled at 101.4°C.
   B. valid because the liquid is clear and colored and darkens on evaporating.
   C. invalid because no test for solutions was performed.
   D. invalid because the solvent did not contribute to the color of the substance.

Application
Type C

2. The fact that the stopper flew off when the flask containing the liquid was heated is an example of the:

   A. expansion of a liquid when heated.
   B. expansion of the flask when heated.
   C. reduction of pressure of hot air.
   D. increased volume of a heated gas.

Analysis
Type A

3. When the stoppered flask was heated, the volume of the liquid decreased. If the experimenter had not heated the flask, the liquid would have:

   A. taken longer to force the stopper off.
   B. immediately stopped reducing its volume.
   C. reached an equilibrium.
   D. continued to decrease its volume.

Application Type B

4. The tightly sealed flask broke after the experimenter tried to freeze the liquid because the:

   A. liquid decreased in density as it cooled.
   B. gases formed in cooling the liquid forced the flask to break.
   C. flask contracted on cooling.
   D. liquid increased in density as it cooled.

Application Type A

5. The rate at which this solution evaporates depends upon the:

   A. concentration of the molecules at the surface.
   B. variations in pressure.
   C. heat evolved when the gas condenses to a liquid.
   D. rate of condensation.

APPENDIX C

MCAAP CONCERN FOR THE CONFIDENTIALITY OF DATA

MCAAP CONCERN FOR THE CONFIDENTIALITY OF DATA

With the growing sophistication of computer systems which have greatly expanded capabilities for storage and retrieval of information, there is increasing concern about the rights of citizens as related to data files which are maintained about them. In response to this growing concern, former Secretary of Health, Education and Welfare, Elliot L. Richardson established the Secretary's Advisory Committee on Automated Personal Data Systems, (Report of the Committee, 1973). The formation of the committee rested upon a public interest determination made by Secretary Richardson which provides in part as follows:

> "The use of automated data systems containing information about individuals is growing in both the public and private sectors... The Department itself uses many such systems, and in addition, a substantial number...are used by other organizations, both public and private, with financial or other support...from the Department...at the same time, there is a growing concern that automated personal data systems present a serious potential for harmful consequences, including infringement of basic liberties. This has led to the belief that special safeguards should be developed to protect against potentially harmful consequences for privacy and due process." (p. viii)

The Committee analyzed and made recommendations about:

- Harmful consequences that may result from using automated personal data systems;
- Safeguards that might protect against potentially harmful consequences;
- Measures that might afford redress for any harmful consequences;
- Policy and practice relating the issuance and use of Social Security numbers. (p. ix)

As a result of the Secretary's Advisory Committee, an extensive report was submitted and published in July, 1973. The thorough investigation of the problem has led to recommendations in the areas specified above. The rights of privacy of the individual have been defined. Additionally, the types of data systems and their uses were outlined and clarified by the Secretary's Committee.

It was noted by the Committee that under current law, a person's privacy is poorly protected against arbitrary or abusive record-keeping practices. For this reason, and also to establish standards of record-keeping practices which are appropriate to the computer age, the report recommends enactment of a Federal "Code of Fair Information Practice" for all automated personal data systems. The code rests on five basic principles that would be given legal effect as "safeguard requirements" for such systems:

(1) There must be no personal data record-keeping systems whose very existence is secret.

(2) There must be a way for an individual to find out what information about him is in a record and how it is used.

(3) There must be a way for an individual to prevent information about him that was obtained for one purpose from being used or made available for other purposes without his consent.

(4) There must be a way for an individual to correct or amend a record of identifiable information about him.

(5) Any organization creating, maintaining, using, or disseminating records of identifiable personal data must assure the reliability of the data for their intended use and must take precautions to prevent misuse of the data (p. xx).

Recognizing and appreciating the seriousness and scope of the problem of the confidentiality of such records as could be developed through the implementation of the proposed MCAAP Administrative Data System, or any other system, it is essential that steps be taken from the outset to protect the individual applicant about whom data will be gathered. Not only must the applicant be protected, but provision must be made to assure the appropriate confidentiality and use of data about the applicant pools and selected candidates of participating institutions of medical education.

The question of how and by whom such guidelines for the maintenance of confidentiality should be developed would appear at this point in time to be directly related to the work and recommendations of the Secretary's Advisory Committee. In view of the legislation being proposed by the Committee, it would seem appropriate at this point in time to withhold the development of extensive guidelines for confidentiality and utilization of records until such legislation is enacted. Once legislation has been provided, the regulations and applicability to the type of system which is developed as a part of the MCAAP plan should be reviewed. It was noted by the Committee that legislation would provide minimum standards for the protection of the privacy of the individual, however, it would appear from the suggested safeguards and recommendations that such legislation will still be quite strict in its provisions as well as quite extensive. A strict adherence to all legislative guidelines would be enforced in the implementation and utilization of MCAAP Applicant Assessment data. The provisions could also be reviewed and determination made as to whether or not additional provisions for confidentiality would be warranted beyond those provided by the Code for Fair Information Practice. Whether or not additional provisions would be necessary, of course, must await the pending legislation.

In the event that the recommended legislation has not been enacted and enforced by the time the MCAAP plan would be implemented, it would seem appropriate now to recommend that guidelines could be established at that time perhaps based upon the recommendations and safeguards which have been pointed out by the Secretary's Advisory Committee.

While the final development of guidelines for confidentiality must await an assessment of circumstances nearer the time of the implementation of MCAAP, it is mandatory at this point in time that due regard be given to the serious nature of the issue of confidentiality. Respect for the rights of the individual and the appropriate utilization of data must be a matter of ethical and professional concern of all agencies and individuals involved with MCAAP, and an appropriate policy to govern the regulation of confidentiality must be developed. In order for many research efforts to be started, it may become necessary for a preliminary and tentative policy to be developed prior to final resolution of the problem of confidentiality.