THE PREMEDICAL STUDENT'S HANDBOOK

AN HONORS THESIS (ID 499)

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PREFACE

Reflecting on my academic career at Ball State University as a premedical student, I remember the confusion, uncertainty, and mixed emotions with which I made the most important decision of my life. Fortunately, I have been successful in securing a place in the 1982-83 freshman class at Indiana University School of Medicine.

Dr. James List, premedical advisor, provides his students with valuable, sound advice concerning medical school. His role provided impetus for this thesis. I have attempted to provide a basic guide for premedical students to follow throughout their undergraduate educations, with particular application to Ball State's program. I hope that this paper serves as a valuable tool for others pursuing a medical education.
THE MEDICAL PROFESSION

The study and practice of medicine have occupied a special place in society from the earliest times. Ever since the ancient Greek, Hippocrates (460-370 B.C.), "the father of medicine," separated medicine from superstition and put it on a scientific basis, man has reaped the benefits of its ever-increasing discoveries and conquests. A physician has always held a position of honor and respect, because the true physician has traditionally had a genuine respect for the individual and his rights, a special regard for service to mankind, and a high sense of honor.

The challenges offered by a career in medicine today are both formidable and exciting. Spurred by scientific advances and increased social interest in the general health and well-being of man, medicine offers greater opportunities and rewards than ever before to those qualified men and women who choose it as their career and are willing to make the sacrifices demanded.

The purpose of this paper is to describe not only how to successfully prepare for medical school, but also to help make certain that medicine is the proper career choice.

The choice of medicine as a career goal is a decision that should be questioned and evaluated repeatedly as more is learned about one's self and one's values in relation to the demands and rewards of medicine. In other words, the possibilities should be explored objectively, not through rose-colored glasses. It is easy to glamorize medicine because of the deep sense of purpose, prestige, and the standard of living which many physicians enjoy; however, consideration of their intensive
education and the deep commitment of personal time and energies to other people reveals that medicine is truly a demanding profession. The following comments illustrate what it means to be a doctor:

--the devotion of one's time and effort both during medical school and residency and throughout one's professional lifetime;

--the daily functions of taking care of sick people: the challenge of the unusual, the monotony of the common complaint, the responsibility and availability for those dependent patients;

--the human rewards: satisfaction of being instrumental in helping sick people regain their health;

--the intellectual rewards of clinical and scientific problem solving.

In giving further consideration to whether medicine is the right career choice, honest self-analysis will enable one to determine how closely one's personal qualities match those ideally sought in a physician. Keep in mind, of course, that the traits listed below are ideals. Not even the best physician will possess all of these ideals in full measure.

**Intelligence.**

The medical student and physician must learn and retain vast amounts of information and interpret complex scientific material. This requires above-average intelligence. Desire, diligence, and hard work, in themselves cannot compensate for the inability to learn and organize information easily.

**Scientific Curiosity.**

Curiosity, the compulsion to ask "why" and "how", is an essential characteristic of those best suited to medicine. It takes an inquiring mind to find the cause and solution of individual medical problems and
to stimulate new discoveries. If the physician is to meet the challenges of research and keep pace with the rapid progress in medicine, he must constantly be stimulated to learn.

**Self-discipline.**

Daily, systematized study is imperative for the medical student. Unless one maintains rigid self-discipline and develops the powers of concentration to the fullest, the long road to becoming a practicing physician may never be completed. The ability to deny oneself immediate pleasures in pursuit of long range goals is not only a mark of maturity, it is essential to the would-be physician.

**Physical and Emotional Strength.**

Individuals who enter medicine are confronted with great pressures which begin in medical school and become increasingly severe throughout medical practice. The potential physician must be able to endure the long years of study and the personal sacrifices and hardships encountered during the training period. Mental agility and physical stamina to respond to the requirements of medical practice are essential.

**Interest in People.**

Throughout his life, the practicing physician will be working intimately with people. Therefore, a sincere understanding and enjoyment of people is necessary. Patients must be regarded with compassion, not as impersonal medical specimens.

**Objectivity.**

It is important that a physician keep an open mind. He must be capable of accepting and adapting to changes which afford better patient care. While the physician should be sympathetic to his patients, he must not become so personally involved with their problems that proper
care is not provided.

If at this point one's heart is still set on medicine, read on and keep working toward that goal.
PREPARING FOR MEDICAL SCHOOL

Certain basic ingredients must be present in an undergraduate pre-professional curriculum. This section presents general recommendations and information for the premedical student that will not only fulfill his academic requirements but will also enhance his personal growth.

Academic Requirements.

The medical profession seeks individuals from assorted educational backgrounds and with varied interests and talents. A strong foundation in basic sciences, proficient communication skills, and a practical knowledge in the social sciences and humanities provide a broad education that is advantageous to the prospective medical student.

A thorough knowledge of the principles and concepts of modern biology, chemistry, and physics is necessary since the study of medicine is based upon these fields. Mathematics, statistics, and computer theory are related disciplines in which some experience is frequently recommended.

Effective communication skills are essential in the understanding of medical information as well as for communication with patients. The foundation of the physician's relationship with patients, the public, and other professionals is communication.

The social sciences and humanities are concerned with the essence of the human experience—its history, achievements, attitudes, ambitions, values, motivations, and ideals. In addition, they can help one achieve an understanding of oneself and of others.

Next, the question of an undergraduate major arises. Should the student focus on the sciences or should he develop other interests in addition to the basic sciences? Currently, there are two schools of thought. The older school maintains that the student should major in
science since his career will be in science. The other school maintains that a medical education will provide the essential sciences and that a premedic student should investigate other interests while he still has a good opportunity.

Results reported in the June 27, 1980, *Journal of the American Medical Association*, indicated that with respect to grades in basic science courses and to Part I of the National Board's there was "no significant difference in performance between science and non-science majors."¹ Table 1 indicates acceptance rates by U.S. medical schools according to undergraduate major. From a practical point of view, as well, to spend four years in preparation for medical school with an approximately 50% chance of admission makes having an alternative goal important. Therefore, it appears that consideration of personal interests and aptitude should determine the undergraduate major.

Table 1, U.S. Medical School Acceptance Rates by Undergraduate Major, 1978-79.²

<table>
<thead>
<tr>
<th>Major</th>
<th>Acceptance Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Sciences</td>
<td>45.7</td>
</tr>
<tr>
<td>Biology</td>
<td>42.6</td>
</tr>
<tr>
<td>Chemistry</td>
<td>52.9</td>
</tr>
<tr>
<td>Physics</td>
<td>45.7</td>
</tr>
<tr>
<td>Biochemistry</td>
<td>59.2</td>
</tr>
<tr>
<td>Microbiology</td>
<td>41.7</td>
</tr>
<tr>
<td>Zoology</td>
<td>43.5</td>
</tr>
<tr>
<td>Humanities</td>
<td>9.3</td>
</tr>
<tr>
<td>English</td>
<td>50.3</td>
</tr>
<tr>
<td>Philosophy</td>
<td>55.8</td>
</tr>
<tr>
<td>Foreign Language</td>
<td>47.5</td>
</tr>
<tr>
<td>Art</td>
<td>45.0</td>
</tr>
<tr>
<td>Music</td>
<td>58.1</td>
</tr>
<tr>
<td>Social Studies</td>
<td>42.3</td>
</tr>
<tr>
<td>Psychology</td>
<td>42.1</td>
</tr>
<tr>
<td>History</td>
<td>45.7</td>
</tr>
<tr>
<td>Economics</td>
<td>53.0</td>
</tr>
<tr>
<td>Political Science</td>
<td>45.7</td>
</tr>
</tbody>
</table>

Source: Applicant Files, Association of American Medical Colleges.
To be eligible for admission to the Indiana University School of Medicine, the applicant must complete a minimum of three years (145 quarter hours, excluding physical education and ROTC courses) of college coursework, including three quarters each of general chemistry, organic chemistry, physics, and biological science. It is strongly recommended that the applicant complete a B.A. or B.S. degree. Currently (1982), over 90% of the entering freshman have a bachelor's degree. Each of the required science courses must have both lecture and laboratory components. The equivalent academic courses provided at B.S.U. are listed in parentheses.

1. General Chemistry--one year--(CHEM 110,111,112 or CHEM 113,114,115)
2. Organic Chemistry--one year--(CHEM 230,231,232 or CHEM 233,234,235)
3. Physics--one year--(PHYCS 110,112,114)
4. Biological Science--one year--(BIO 111,112,211)

Electives recommended by the current (1981-82) class of first year medical students at the Muncie Center for Medical Education include: math, immunology, biochemistry, anatomy, physiology, genetics, histology, embryology, virology, microbiology, bacteriology, bioscientific terminology, and business. Obviously, not all of these courses must be taken, but any of them would be helpful.

A "major in premedical preparation" is offered at Ball State, as at some other institutions. It has been developed in consultation with the I.U. School of Medicine and includes all science courses required by I.U., plus others that have been suggested as appropriate. It does meet the Ball State requirement of a "major," and it can be completed easily in three years. Thus, it is of particular value to those students whose overall qualifications may be strong enough to gain them entrance into the I.U. School of Medicine after only three years of premedical work. For those students, Ball State grants 45
quarter hours of credit for the freshman year of medical school and awards a B.S. degree.

Ball State premedical students are advised to follow that major for the freshman year, taking biology and chemistry. At the end of the freshman year the student should evaluate his chances of admission to medical school after two more years and should consider the advisability of changing or adding a major in biology, chemistry, or any other field in which he has a strong interest. The premedical major prepares a student only for entering medical school, and in no case should a student graduate after four years of premed work with that major only.

Research.

Research provides the student with the atmosphere and the opportunity to develop an understanding of research methods and their significance. Since clinical medicine depends on the results of medical research, it is important for the student to appreciate this phase of science. Research often consists of long, hard hours of routine, repetitious work. However, the end result is information. Lists of faculty members and their research projects and interests are available from the Chemistry and Biology Departments here at Ball State, and undergraduate research is encourage. The Physiology and Health Science and the Physics and Astronomy Departments also promote student research. Interested students are urged to contact an appropriate faculty member.

Extracurricular Activities.

Extracurriculars consist of any activity outside regular academic coursework—research, volunteer work, employment, clubs, or whatever fills leisure time. Extracurriculars are an important indication of a student's personality and his capacity to do more than just study and
achieve good grades. It is important to note that the academic load of a freshman medical student is approximately double that of a full-time premed student.

Research work demonstrates dedication, the ability to work independently, and the ability for self-education, all important characteristics for a future medical student. Volunteer or paid hospital work confirms the ability to work with and around sick or dying people. It also indicates a sincere concern for people. A desire to serve and an interest in individual persons may be demonstrated by work in many non-medical settings, as well. Leisure activities are a strong indicator of motivation, interest, and self-fulfillment.

It is important to note, however, that it is better to be deeply involved with one or two projects than to be involved superficially with many activities.
THE ADMISSIONS PROCESS

The admissions process is a year-long and complex endeavor. Since there is much to learn about medical schools, admission policies, the application procedure, etc., it is important that every facet of this process be understood and followed precisely. This section will discuss the standard procedure for application.

Spring term of the junior year (approximately 18 months before expected medical school entrance) is the ideal time to begin the application process. At this time, the student should begin reading bulletins and information from selected medical schools. An excellent resource for this purpose is the Medical School Admission Requirements, published annually by the Association of American Medical Colleges (AAMC). Copies may be obtained from the AAMC, One Dupont Circle, N.W., Washington, D.C. 20036.

In addition, students should register to take the MCAT (Medical College Admission Test). Registration packets are available in late January from the premedical advisor or by writing to: MCAT Registration, American College Testing Program, P.O. Box 414, Iowa City, Iowa, 52243. This packet contains an announcement, registration card, and all up-to-date information about the MCAT (including test dates, testing locations, distribution of scores, and deadlines), and it is prepared annually.

Application deadlines are rigidly enforced.

The MCAT is given twice a year—in the spring (in April) and in the fall (in September) on a Saturday. Medical school admissions officers usually recommend the spring testing date in order to more quickly and efficiently process the application; however, if the premedical science
requirements have not been completed at this time, the fall testing date may be preferable. The risk of waiting until the fall, however, is serious. If illness, a death in the family, or other emergency prevents the student from taking the test, admission to medical school will be delayed an entire year.

The MCAT is administered and scored by the American College Testing Program under the direction of the AAMC. The examination fee is currently (1982) $40 and AAMC policy does not permit a fee waiver for the MCAT. Upon payment, the candidate is entitled to have test scores sent to six medical schools, provided that they are designated at the time of the test on the appropriate forms and are not participating in AMCAS (American College Application Service). Official reports of MCAT scores will automatically be provided by AMCAS to any of its participating schools, which includes nearly all U. S. medical schools.

The MCAT is an objective measure of specified science knowledge and its application in solving related problems. The MCAT requires one day of testing and is administered in four sections. The Science Knowledge and Science Problems subtests are given during three hours in the morning session. Following a one-hour lunch break, the Skills Analysis: Reading and Skills Analysis: Quantitative subtests are given in the three-hour afternoon session. The Science Knowledge subtest is presented in consecutive subsections of biology, chemistry, and physics. The Science Problems subtest uses medical or science-related problems incorporating biology, chemistry, and physics. Test questions for both subtests are based on material ordinarily covered in the introductory courses in biology, general and organic chemistry, and physics. More general skills in reasoning and in the use of information are measured by the Skills
Analysis subtests. The reading subtest is presented in the form of medical journal and textbook material as well as case histories from which questions are drawn. The quantitative subtest's questions and problems are in reference to graphs, charts, tables, etc. High school math through trigonometry is important, but calculus is not required. Sample questions for each subtest, a 203-item, four-hour illustrative test, discussions of the types of skills to be assessed, and detailed outlines of the science areas to be covered are all included in an official publication of the AAMC: The New MCAT Student Manual. A copy may be obtained by writing the AAMC, address previously mentioned.

Six MCAT scores are reported, each presented on a scale ranging from 1 (lowest) to 15 (highest). Scores in biology, chemistry, and physics are determined by combining the Science Knowledge questions for each subject with the Science Problems questions for the respective disciplines. One score each is reported for Science Problems, Skills Analysis: Reading, and Skills Analysis: Quantitative. A score report in duplicate is sent to each examinee, and one copy should be forwarded to the premedical advisor.

The MCAT provides medical school admission committees with nationally standardized values to compare applicants with differing personal and academic backgrounds. MCAT scores alone do not determine whether an applicant is admitted to medical school. The MCAT cannot and does not measure motivation, sincerity, or personal characteristics. However, when interpreted in combination with college grades, it is of particular help to admissions committees in evaluating an applicant.

The next step in the admissions process is to register with AMCAS, a non-profit centralized application processing service organized by
the AAMC to facilitate the application process for students as well as for admissions committees. AMCAS does not make any admission decisions nor does it advise applicants. It serves only to expedite the initial stages of an application, to reduce the expense of the application procedure, and to assist those participating medical school admission offices by transmitting complete application materials for each applicant and providing useful rosters and statistical reports. A service fee is charged by AMCAS according to the number of participating schools to which the applicant wants to apply. The fee for application to one school is $30, and a $10 fee for each additional school is assessed.

All students applying to AMCAS-participating schools for admission must submit their application material through AMCAS. Applicants applying to medical schools not participating in AMCAS must contact those schools directly for application instruction. Applicants using AMCAS need to submit only one set of application materials and official transcripts. Application materials become available in March or April of each year and may be obtained from the premedical advisor or from AMCAS, Suite 301, 1776 Massachusetts Avenue, N.W., Washington, D.C., 20036.

An important section of the AMCAS application material is the essay portion. This space is provided so that the applicant can honestly describe himself and his motivations for entering medicine. In addition, reasons for discrepancies in grades, extracurricular activities, awards, research projects, previous employment, unique experiences, or anything that requires explanation or emphasis could be included in the biographical sketch. There is absolutely no excuse for spelling errors or grammatical faults, so reread the essay and make it as nearly perfect as possible. The same holds for the rest of the application as well---no errors.
Above all, follow the instructions to the letter, and do not provide more than specified or exceed the space provided. Use a typewriter whenever it is appropriate, and be sure that the ribbon is fresh.

The completed application materials are returned directly to AMCAS by the applicant no earlier than June 15. The latest date for filing AMCAS application materials depends on the individual medical schools. For the Indiana University School of Medicine, the latest date is December 15. It is strongly recommended to complete the application as soon as possible. Ideally, all materials (MCAT scores, AMCAS forms, letter of recommendations, etc.) should be in the hands of the admission committee in September, one year in advance of the student's expected entrance into medical school.

The processing of an applicant's file depends upon the receipt of both the application materials and all required transcripts from each U.S. or Canadian college, university, junior college, or graduate school attended. AMCAS verifies the applicant's academic record entered in the application against the official transcripts in order to assure accuracy. After verification, GPA and credit hour totals are computed, and other data are collected and forwarded to the schools, along with a reproduced copy of the application form.

The medical schools then will notify the applicant directly for additional fees, letters of evaluation, or various other items of information that are not processed by AMCAS. Ninety-seven medical schools participated in AMCAS for receiving applications to their 1982-83 entering class, including I.U. School of Medicine.

Once I.U. School of Medicine receives the AMCAS materials, a packet is sent to the applicant requesting three academic evaluations
(one each from a biology, chemistry, and physics professor), three personal evaluations, an evaluation from the Dean of Students, and an evaluation from a high school principal. In addition, a recent photograph (2"x3") and an application fee of $15 are required. Official transcripts must be sent to the medical school Admissions Office at the end of each subsequent grading period. The applicant is sent an I.U. School of Medicine Bulletin a few weeks after the initial correspondence. Most applicants who pass the initial screening at I.U. are invited for a personal interview with one or more members of the Medical School Admissions Committee.

The college recommendation and the medical school interview, because of their subjectivity, deserve special attention. How medical schools use these criteria and why they are important will now be examined.

The faculty recommendation is used to obtain information about the applicant's college career which cannot be found in the transcript. Another use for the recommendation is as a description of the character traits of the applicant, as viewed by an instructor. Finally, it can point out a student who is truly outstanding among those of equivalent GPA's and MCAT scores.

Applicants should approach professors who know them best as individuals and then to those who taught courses in which they did well. It is important to receive not just favorable comments but rather unique and outstanding ones. The same holds for personal recommendations as well. Letters from friends of the family, business associates of the applicant's parents, or holders of public office should not be solicited; instead, the first-year medical school students at the Muncie Center for
Medical Education suggested that letters from an employer, neighbor, family physician, minister, or other person who knows the applicant well be solicited.

Medical school admissions officers use recommendations to closely back up grade transcripts and MCAT scores. Most medical schools are reluctant to really specify their weighting of recommendations (possible because they really do not know themselves). However, recommendations are used in conjunction with grades, MCAT scores, and the interview to evaluate an applicant's overall potential. These four kinds of information must provide the basis for an admissions committee's decision.

The interview is another very important aspect of the admission process that creates much turmoil among premedical students. The purpose of the interview is three-fold: (1) it offers an admission committee the opportunity to clarify information about the applicant; (2) it allows the student to explain any unique or complicated aspect in the application and to learn more about the medical school; (3) it permits the medical school to acquire as much information as possible to determine who will profit most from that particular school's educational program. The interview should be a conversational, informative session; therefore, the applicant should approach the interview with an attitude of assurance, openness, and coolness of mind, and should answer all questions sincerely, spontaneously, and honestly. Also, the applicant should follow several basic rules of etiquette--being neatly groomed, polite, punctual, and above all honest.

Another aspect of the interview that causes concern is the topics for interview discussion. Some of the more popular questions include:
(1) why enter medicine? (2) what about current events (i.e., socialized medicine, euthanasia, abortion, high cost of medical care, etc.)? (3) what medical specialty, if any? (4) what if rejected? (5) how much time is spent studying? (6) what fills leisure time? (7) any direct exposure with sick or dying patients? This list is by no means inclusive of all possible interview topics, however, it does provide a general idea of what can be expected during the interview.

The final portion of this section will deal with the selection process. Admission decisions are made by committees composed of medical school faculty. Various procedures are used by committees, with the assistance of the admission office personnel, to select from all applicants those who will be seriously considered. Biographical information, state residency, college academic record, MCAT scores, the applicant’s personal comments, and faculty evaluations usually receive major attention in the screening process. Final admission decisions are made on the basis of the above factors and the personal interview.

Specifically, the Admissions Committee at I.U. School of Medicine is composed of approximately 30 members. About half are full-time faculty members and administrators, and half are practicing physicians who teach in the various clinical parts of the medical curriculum. The decision to accept or deny an application is always made by a vote of the entire committee. All committee members will have examined the application and will have had the opportunity to question the member(s) who interviewed the student.
THE MEDICAL SCHOOL YEARS

Entering medical school is certainly a very important event in a student's life. Yet, it is only the beginning. Medical education normally requires four years of medical school, which is often referred to as undergraduate medical education, plus one to seven years of internship and residency, which is referred to as graduate medical education. Legally, only one year of internship is required to become a practicing physician.

Curriculum

The curriculum varies from one medical school to another; however, typically, the student must first acquire a foundation of the "basic medical sciences" and understand the intricate functions and malfunctions of the human body. Later, clinical experience and patient contact are emphasized. Table 2 indicates the curriculum requirements for undergraduate medical education at Indiana University School of Medicine.

Table 2. Current Undergraduate Curriculum Requirements, I.U. School of Medicine.

<table>
<thead>
<tr>
<th>Freshman</th>
<th>Microbiology</th>
<th>Physiology</th>
<th>Neurobiology</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Biochemistry</td>
<td>Behavioral</td>
<td>Introduction to</td>
</tr>
<tr>
<td></td>
<td>Gross Anatomy</td>
<td>Science</td>
<td>Emergency Medicine</td>
</tr>
<tr>
<td></td>
<td>Histology</td>
<td>Electives</td>
<td>Electives</td>
</tr>
<tr>
<td>Sophomore</td>
<td>Pharmacology</td>
<td>Introduction to Medicine: History Taking</td>
<td></td>
</tr>
<tr>
<td></td>
<td>General Pathology</td>
<td>Introduction to Medicine: Physical Diagnosis</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Medical Genetics</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Systemic Pathology</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Junior Medicine</td>
<td>Surgical Specialities</td>
<td>OB/GYN</td>
<td>Surgery</td>
</tr>
<tr>
<td>Junior</td>
<td>3 Units</td>
<td>1½ Units</td>
<td>1½ Units</td>
</tr>
<tr>
<td>Senior</td>
<td>9 months</td>
<td>Electives</td>
<td></td>
</tr>
</tbody>
</table>

This curriculum schedule illustrates the discipline areas for each year.

The actual schedule of courses for the first two years varies at each of
the regional centers due to the fact that some centers follow a semester schedule while others are on a quarter schedule. In general, the basic medical sciences are presented in the first four terms. Entering students do have contact with patients beginning in the first academic year. Second year students have an intense 22 week multi-department course called an Introduction to Medicine. A 12 month core clinical clerkship program occupies the third year, and the fourth year is reserved exclusively for nine one-month electives. Qualified students may pursue the M.S. or Ph.D degrees, concurrently or sequentially, with a program leading also to the M.D. degree on either the Indianapolis or Bloomington campus.

Challenging opportunities are provided at Indiana University for each student. For example, most departments offer honors programs in which superior students have the option of independent study. Seminars, project laboratories, small-group discussions and guest speakers of special interest are extensively utilized to further the educational experience of the student.

In the clinical years, the student is completely integrated into the hospital setting, gaining knowledge as well as responsibility in all aspects of a patient's problem. During this time, the student is able to work with many different physicians and has the opportunity to observe their interaction with patients. In addition, the students are introduced to the range of medical specialities. Elective courses are offered to allow the student to investigate areas of special interest.

Cost

The cost of attending medical school is increasing steadily. Expenses depend on a number of factors: the school's tuition, the cost of living in that region of the country, the student's marital status,
and other factors such as transportation, insurance, books, etc. Table 3 suggests some expenses that a student might encounter. It should be noted that tuition and other expenses may change from year to year.

Table 4 estimates the expenses per year for the 1980-81 first-year class at Indiana University.

Table 3. Average expenses for first-year students at U.S. medical schools (in dollars). 4

<table>
<thead>
<tr>
<th>Expense Item</th>
<th>Private Range</th>
<th>Median</th>
<th>Average</th>
<th>Public Range</th>
<th>Median</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tuition &amp; fees</td>
<td>2863-14,855</td>
<td>7910</td>
<td>8183</td>
<td>487-5655</td>
<td>2079</td>
<td>2261</td>
</tr>
<tr>
<td>Resident</td>
<td></td>
<td></td>
<td></td>
<td>1087-26,321</td>
<td>4118</td>
<td>4527</td>
</tr>
<tr>
<td>Nonresident</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All other expenses</td>
<td>2400-9475</td>
<td>5550</td>
<td>5648</td>
<td>3000-8000</td>
<td>5322</td>
<td>5341</td>
</tr>
</tbody>
</table>

Table 4. Expenses per year for 1980-81 first-year class at I.U. (in dollars). 5

<table>
<thead>
<tr>
<th>Tuition</th>
<th></th>
<th>Microscope rental available: 60</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resident:</td>
<td>1520</td>
<td>Total average for all other expenses: 4500</td>
</tr>
<tr>
<td>Nonresident:</td>
<td>3680</td>
<td></td>
</tr>
</tbody>
</table>

Financial Aid

The best source of financial aid information will be the individual medical schools. Basically, there are two types of financial aid. Gift aid includes scholarships, grants, and tuition remission and does not require repayment; however, loan aid has to be repaid. There are also programs that provide funding for a medical education in return for service after receipt of the M.D. degree.

Previously, much of the financial assistance available to medical students was provided through the federal government. However, the pending decisions in Congress to reduce federal aid to graduate students may eliminate many potential sources. Nevertheless, a brief discussion of
the current sources of financial assistance will be provided in this section.

There are three major sources of financial aid: (1) loan and scholarship programs administered by financial aid offices at the medical school; (2) full federal scholarship programs which require service obligations; and (3) state loan/scholarship programs.

Loan and Scholarship Programs Administered by Financial Aid Offices.

Scholarships

The First-Year Scholarship Program for Students of Exceptional Financial Need (EFN) provides grants for students of economically disadvantaged families. Recipients receive full tuition, fees, book costs, and a monthly stipend of $480 for a 12-month period. These students are given priority consideration for the National Health Service Corps Scholarships for their second year of study.

Loans

The Health Professions Student Loan (HPL) program provides the cost of tuition plus $2500 per academic year. A ten-year repayment period of the principal and the interest at 7% are deferred until completion of the residency.

The National Direct Student Loan (NDSL) program has a $10,000 cumulative borrowing ceiling. The interest of 3% is subsidized until repayment, which begins nine months after graduation. Students are allowed ten years to repay this loan.

The Federally Insured (FISL) and State Guaranteed Student Loans (GSL) programs currently have a cumulative borrowing ceiling of $15,000. The interest is subsidized by the government while in school, and there is a ten-year repayment period beginning nine to twenty one months after
graduation, during which 7% interest is charged.

The Health Education Assistance Loan (HEAL) program is more expensive. The maximum amount that a student may borrow per academic year is $10,000 or a maximum aggregate of $50,000. The interest rate (at 12%) is not subsidized by the federal government, and it may be compounded semi-annually.

The Robert Wood Johnson Foundation (RWJF) provides up to $7500 per academic year. The total amount that can be borrowed is limited to $17,500. Interest on the loan is between 10 and 12%. Repayment of the loan may be made for a period of up to ten years.

The American Medical Association-Educational Research Foundation (AMA-ERF) loan offers up to $2500 per year at a current (1981) interest rate of 17%. The maximum interest charged is 3% above the current prevailing prime rate.

**Full Federal Scholarship Programs**

The Armed Forces Health Professions Scholarship Program provides contracts for financial assistance in exchange for active service in the Armed Forces (Air Force, Army, or Navy). Recipients receive tuition (tax-free), educational expenses (textbooks, lab fees, instruments, etc.), and a stipend of $400 per month. For each year of participation, students must serve one year in the appropriate branch of the Armed Forces. The minimum obligation is presently three years.

The National Health Service Corps Scholarship Program was established to bring health care to areas of the country which have severe health manpower shortages. Recipients receive full tuition, fees, educational costs, and a monthly stipend of $453 for twelve months. Scholarship recipients are obligated to serve one year of full-time
clinical practice in a federally designated shortage area for each year of support, with a minimum commitment of two years.

State Loan/Scholarship Programs.

Indiana residents in medical colleges are eligible for the Indiana Medical Distribution Loan Fund. Under this program, participants are obligated to serve one year in an Indiana area in need of primary care physicians for each year of support. The maximum limit of a loan is $5000 per annum. Thirty loans are awarded annually.

In order to be considered for assistance at I.U., financial need must be established by submitting a Financial Aid Form to the College Scholarship Service, a nationwide need-analysis service. The available funds are determined by budget allocation, alumni contributions, philanthropic foundations, memorials, and industry. The Indiana University School of Medicine Bulletin 1981-1983 provides a complete list of financial aids available to students from the University and the state of Indiana.

In summary, most medical students make use of multiple sources of income, including gifts and loans from their parents and relatives, their own earnings, their spouses' earnings, and bank loans. The determined student can find ways to finance his medical education.

Comparing Regional Centers of I.U. School of Medicine

In addition to the major campuses at Indianapolis and Bloomington, students may elect to be assigned to one of the seven other regional campuses throughout Indiana for the first two years of their medical education. The assignment cannot be guaranteed, however, since there are usually more requests than places at the regional centers. The purpose of this section is to provide a brief description of each
regional center.

**EVANSVILLE CENTER FOR MEDICAL EDUCATION**

The Evansville Center is located in Evansville, Indiana. Students are concurrently enrolled as special graduate students in both the University of Evansville and Indiana State University—Evansville. Classes are held in the Medical Education building on the I.S.U. campus and in the Health Sciences building on the U.Of E. campus. However, student assignments are limited to only one campus on any given day to avoid unnecessary travel between campuses. Three community hospitals with a total of more than 1500 beds and 350 physicians are associated with the Center. In addition to the Center's own medical library, the libraries of both universities, Mead Johnson Research Center, and three hospitals are fully available to students. All of the student areas on both campuses are available for 24-hour use. The teaching programs are scheduled on a semester basis. For additional information concerning the Evansville Center, write: Director Evansville Center for Medical Education P.O.Box 3287 Evansville, In. 47732

**FORT WAYNE CENTER FOR MEDICAL EDUCATION**

The Fort Wayne Center is located in Fort Wayne, Indiana and is on the Indiana University—Purdue University campus on the city's north side. The Center occupies 14,500 square feet in the new classroom-office-laboratory building, and all classes and labs are contained on the third floor. In addition to the Center's own medical library, the campus library is available for students use. Students have 24-hour access to the Center's study areas and library. Three hospitals offer a combined total of 1600 beds and 350 medical staff, with about 1300
patients daily. The Center is on the semester system and the course content is consistent with that of the other Centers. For further information, write: Director Fort Wayne Center for Medical Education 2101 Coliseum Blvd., East Fort Wayne, In. 46805

LAFAYETTE CENTER FOR MEDICAL EDUCATION

The Lafayette Center is located on the campus of Purdue University in West Lafayette, Indiana. The medical students are registered as special graduate students with the University. Classes are conducted in Lynn Hall, Smith Hall, and Lilly Hall, with libraries located in Lynn Hall, Lilly Hall, the Stewart Center, and the various hospitals. The Lafayette Center calendar follows a semester system. For further information on the Lafayette Center, write: Director Lafayette Center for Medical Education Lynn Hall, Room B-12 West Lafayette, In. 47906

MUNCIE CENTER FOR MEDICAL EDUCATION

The Muncie Center is located on the periphery of the Ball State University campus in Muncie, Indiana. Library facilities of the hospital and of B.S.U. are available to students. All classes and labs are held in Maria Bingham Hall, which is immediately adjacent to the hospital. Ball Memorial Hospital is associated with the Center and is a 650-bed community hospital with a full range of specialties. The curriculum follows a quarter system. For further information about the Muncie Center, write: Director Muncie Center for Medical Education Ball State University Maria Bingham Hall Muncie, In. 47306
NORTHWEST CENTER FOR MEDICAL EDUCATION

The Northwest Center is located on the Indiana University Northwest campus in the Glen Park area of Gary, Indiana. The medical students have access to the Steven C. Beering Medical Library and Medical Resource Center. Seven large hospitals are associated with the Center. The Center occupies 26,500 square feet of a recently renovated building on the southwest corner of campus. The first year program is offered in two semesters, whereas, the second year program is offered on a trimester basis. For additional information concerning the Northwest Center, write: Director
Northwest Center for Medical Education
3400 Broadway
Gary, In. 46408

SOUTH BEND CENTER FOR MEDICAL EDUCATION

The South Bend Center is located on the campus of the University Notre Dame in Notre Dame, Indiana. Students are considered special graduate students and are eligible for all privileges of University of Notre Dame students. Numerous facilities are available to the medical students, such as the South Bend Medical Foundation, with its extensive library services. Classes are taught by U.N.D. and I.U. faculty on a semester basis. For further information concerning the South Bend Center, write: Director
South Bend Center for Medical Education
Haggar Hall
Notre Dame University
Notre Dame, In. 46556

TERRE HAUTE CENTER FOR MEDICAL EDUCATION

The Terre Haute Center is located in Holmstedt Hall on the campus of Indiana State University in Terre Haute, Indiana. Two hospitals, with 600 beds and 130 physicians, and the Katherine Hamilton Mental
Health Center are associated with the School of Medicine. All students are registered as special graduate students at I.S.U. The basic medical library and library consortium office are housed in the Cunningham Memorial Library. For further information concerning the Terre Haute Center, write: Director
Terre Haute Center for Medical Education
135 Holmstedt Hall
Terre Haute, In. 47809
REJECTION--OPTIONS AND ALTERNATIVES

Failure to gain admission to medical school can bestow a shattering blow to a student's confidence, especially since most medical school applicants have experienced continued success up to this point--among the best graduates in high school, accepted by and successful in the college of their choice, and admired by family and friends. A rejected medical school applicant has three options: the person may reapply to medical school the following year, apply to a foreign medical school, or pursue an alternative career.

Reaplication

Applicants who fail to gain admission to medical school should reassess their credentials in order to determine if reaplication is a viable alternative. This reassessment should perhaps begin with a discussion of the original application with an admissions officer of the medical school. In most cases, a simple reaplication with identical credentials is pointless since the present credentials already failed to secure an acceptance. Therefore, the student should improve his academic and non-academic credentials to become more competitive in the applicant pool. Four possible fields of improvement include grades, MCAT scores, recommendations, and subjective evaluations.

Although most medical schools profess not to be obsessed with grades, they are undoubtedly a very important facet of the selection process. Grades represent academic commitment, day by day, over the past three or four years. They tell something about responsibility, motivation, study habits, and potential capabilities. A sound record of academic performance at college is interpreted as a reasonable
predictor of equally good performance in professional school. If, on
the other hand, the cumulative GPA—representing three or four years
of college work—is not respectable, the chance of improving this overall
record is doubtful. However, it is possible to improve the science
GPA since it is computed only for biology, chemistry, physics, and math.
Therefore, grades can be an effective means of enhancing one's credentials.

In contrast to grades, scores on the MCAT (Medical College Admissions
Test) can be controlled more easily by the prospective reapplicant.
The MCAT can be taken more than once, and only the three most recent
scores are forwarded to medical schools for consideration. Recall that
the MCAT measures acquired knowledge at a given point in time and basic
skills related to native intelligence. The MCAT is not a reliable indicator
of overall past performance; however, it serves a very useful purpose in
the selection process simply because it is a standardized test that is
not influenced by grading policies, difficulty of courses, academic
load carried, etc. The MCAT provides a relative base for comparison
within the national pool of applicants of that year.

If the MCAT is to be retaken, how much improvement can be expected?
If the test was taken before full training in biology, chemistry, or
physics, then a poor score there can be expected to improve following
adequate preparation. Performance on the problem solving section may
improve slightly, since knowledge of basic material is necessary; however,
reading and numerical comprehension are unlikely to change. Also, training
in the art of test-taking may benefit overall test performance.

So, an individual can, in most cases, improve an MCAT score by
further study of biology, chemistry, and physics and by obtaining instruct-
ion in effective test-taking.
Several different commercial courses for MCAT preparation are available. The Kaplan Course is the most renowned. Opinions of the Kaplan Course range from enthusiastic endorsement to absolute condemnation. The variety of courses offered range in cost from $300 to $1000. It should be noted that no guarantees exist for improvement in MCAT scores; however, most people improve their scores. But the gains vary among individuals. One point must be stressed: the results obtained depend on the effort the individual exerts.

Further information about the Kaplan Course can be obtained from their central office, 535 Madison Avenue, New York, N.Y., 10022 or their toll-free number, 1-800-223-1782.

Numbers do not tell the complete story about an individual; therefore, medical schools give considerable weight to recommendations. As mentioned in an earlier section, Indiana University requires one academic recommendation each from a biology, chemistry, and physics professor. Usually, very little can be done to reverse an inadequate or noncommittal recommendation, thus, it is important that these professors know the applicant well in order to insure a meaningful recommendation.

Subjective evaluations include all the other things besides grades, MCAT's, and recommendations. Medical schools make these evaluations from information contained in the application and from the interview. Obvious mistakes include illegible handwriting, misspelling, grammatical errors, and poor typing on the application. The purpose of the application is to present a positive image of the applicant to the admissions committee, most members of which never meet the applicant directly. Therefore, great care should be taken when completing the application. All directions should be followed exactly and all questions should be answered fully and truth-
fully. Always type unless longhand is specifically called for. State things in one's own words, but have someone check a rough draft for errors.

An interview should be a pleasant conversation; however, it can be disastrous for the applicant if he arrives late, is improperly attired, is argumentative, is discourteous, or is otherwise objectionable.

Now, with better credentials reapplication is a practical alternative. But the question arises of what to do in the intervening year while a reapplication is processed. A person could acquire considerable information about medicine by working with physicians or by working at a hospital. As a non-skilled worker, the job may consist of clerical duties or duties along the lines of a nurse's aid. The Emergency Room provides an excellent locale for patient exposure. While firsthand exposure is important, formal education should not be neglected. Most medical schools encourage a student to stay in the habit of studying and in an academic atmosphere at least part time in the year between applications. This year could be used to broaden one's education in special fields of interest. This one year might allow some applicants to become more mature and independent. Whereas some applicants may devote this year to one of the altruistic enterprises such as VISTA, The Peace Corps, Volunteers in Appalachia, or medical missions in Central America, others may spend this year earning and saving money.

Foreign Medical School

Every year a large number of rejected American medical school applicants leave the United States, learn a new language, invest a large amount of money, and join the many other Americans seeking a medical education abroad. Any consideration of attending a foreign medical school
must begin with an understanding of the admission requirements, the
cost, the language difference, the potential schools, and the re-entry
procedure.

In general, if a student is qualified to attend an American
medical school, he's qualified for a foreign medical school, too.
Admission to a foreign medical school entails up to seven years of
concentrated study. The curriculum of a foreign medical school may
take longer than American schools because native-born applicants
usually have not studied the biology, chemistry, and physics courses
given in premed schools here. Unfortunately, American students may
not be given advance standing for those completed science courses and
may have to repeat them in the foreign medical school. Therefore, the
student enrolled abroad must be prepared to devote up to seven years to
the venture.

In addition, he must be willing to spend a considerable amount of
money. There are almost as many tuition schedules as there are foreign
medical schools. Private schools in other countries have steep tuitions;
whereas, government supported schools are practically free. For example,
in Mexico, tuition runs about $5000 a year for a privately funded school.
On the other hand, in Italy it runs only about $100 per year.

As with tuition, living costs are quite variable. Living expenses
are reasonable in the underdeveloped countries, but almost unaffordable
in Western Europe. On top of all this, scholarships are non-existent,
but loans may be obtained on a limited basis.

Next, the student must be prepared to learn and become fluent in
a foreign language. Most likely, the student will be learning medicine
in a language other than English, since those schools in countries
where English is the spoken language—Australia, Canada, England, India, Ireland, New Zealand, Scotland, and South Africa—are restricting their intake of U.S. citizens. An exception to this trend is the medical schools in the Philippines, where many U.S. students are accepted each year. Language undeniably poses learning problems for foreigners in many countries.

Prior to selecting a school, students who are determined to apply to foreign medical schools should be aware of the following considerations:

(1) Personal Qualifications. The student should be intelligent, well-prepared, well-motivated, mature, not easily discouraged, very efficient, and adaptable, since in most cases there is a lower standard of living abroad, and the curriculum is self-taught to a considerable degree.

(2) Language Skills. As mentioned earlier, the ability to communicate well enough in another language to ensure adequate comprehension and notetaking is very important, since English answers and replies to exam questions are not permitted.

(3) Financial Resources. A student must have adequate financial reserves to cover tuition, books, and living expenses. Outside employment is usually not allowed to foreign students.

(4) WHO Listing. Medical schools that are recognized by the government of that country are listed in the World Directory of Medical Schools, published by the World Health Organization. A survey of this listing is important because students who attend unlisted schools are neither eligible for COTRANS (Coordinated Transfer Application System) nor for the ECFMG (Educational Council for Foreign Medical Graduates) exam for re-entry. Recognition by a government and listing in the
World Directory, however, is not equivalent to accreditation and indicates nothing about the quality of education at the school.

(5) Method of Instruction. At foreign medical schools the student is more or less on his own. Emphasis is on lecture material rather than laboratory or clinical work. Students have minimal contact with professors.

The following comments about various medical schools have been grouped by the language of instruction:

Dutch:

In the Netherlands, applications from the industrialized nations are not accepted. Therefore, students should not attempt application to these schools.

English:

Applications to medical schools in the United Kingdom are administered by the Universities' Central Council on Admissions, but only one or two highly qualified U.S. students are accepted each year.

In Ireland, about 43 spaces are open for foreign students. Instruction is based on American textbooks, and the curriculum could be completed in five years.

In New Zealand and Australia, U.S. applications are discouraged. Philippine medical schools have admitted a number of U.S. students. The National Medical Board and ECFMG tests are administered at these schools.

French:

In France, about 5% of each entering class is allotted to foreign applicants. There are no textbooks, therefore, students must rely solely on lecture material.
German:

Admission of U.S. students is not likely because preference is given to students from Austria, Germany, and non-industrialized countries.

French (or Flemish) and German

Belgian admission standards are quite selective and include review of pre-medical work, MCAT scores (sometimes), a language exam, and an interview. Five percent of the enrollment is allotted to foreign students.

Swiss schools consider only a very few highly qualified applicants who are fluent in French or German. U.S. applications are discouraged.

Italian

All U.S. applications are administered by the Italian Consulate Office in New York. Acceptances are restricted to applicants with "B" or better averages. A language exam is required for official acceptance.

Spanish

Mexican state funded medical schools accept only a few U.S. applicants; whereas, private Mexican schools accept many U.S. students, but the admission standards vary.

About 65 U.S. students are accepted at the University of Monterrey (UDEM) Institute of Health Sciences, Nuevo Leon. Admission standards are selective with both language and entrance examinations administered. Holders of B.S. degrees could complete the UDEM curriculum in 3½ years.

The medical schools in Spain restrict admission to U.S. applicants. Some Spanish medical schools are in the process of curriculum reformation due to the existing political unrest.

In most cases, all the years of medical education will have to be completed abroad, because the chances for a transfer to a U.S. medical
school with advanced standing are remote.

COTRANS helps U.S. students accomplish the transition from foreign to domestic medical schools. Part I of the National Medical Board examination is administered to re-entering students. "Less than 3% of the estimated 6000 Americans studying abroad successfully transfer to U.S. medical schools." 7

In order to become licensed for practice of medicine in the U.S., students must take the ECFMG tests for certification and FLEX (Federated Licensing Examination) for state licensing in most states.

In conclusion, anyone attempting a medical education abroad should carefully examine current admission standards and past test performance data for U.S. students and graduates abroad and realistically appraise personal aptitudes and qualifications before investing several years and extensive sums of money in a project that offers no guarantees for the eventual practice of medicine in the U.S.

Alternative Careers

There are three paths by which a person may end up with a license to practice medicine in the United States. So far, American Medical Schools and Foreign Medical Schools have been discussed above. The third path is represented by American Osteopathic Medical Schools. A method of therapy involving manipulation of the dislocated spine emerged in 1874 as the osteopathic doctrine. Today, osteopathic medicine incorporates all the other disciplines of medicine and accepts all of the standard medical knowledge and therapy--from antibiotics and surgery to psychiatry--but with a different emphasis. Osteopaths promote holistic medicine and their schools encourage students to become general practitioners. Thus, if one's goal is to become a general practitioner, then pursuit of the
D.O. degree is a viable alternative in the event of a medical school rejection. Preprofessional requirements and undergraduate medical education are basically the same as for allopathic (M.D.) medicine. For further information about osteopathic medical schools, write: American Osteopathic Association, 212 E. Ohio Street, Chicago, Illinois 60611.

Another "healing profession" that survives and prospers despite its defiance of all logic and common sense is chiropractic medicine. Chiropractic theory holds that all diseases are caused by pinched nerves from misaligned vertebrae and that appropriate manipulation would correct the problem. There are sixteen chiropractic colleges in the U.S., and none of them are affiliated with universities or hospitals. All fifty states license individuals to practice a profession that has no scientific basis. However, it is possible that in the 1980's chiropractic medicine will expand and acquire further strength, so it could become a possible consideration for rejected medical school applicants.

Dentistry is probably the second choice of most rejected medical school applicants who have given up the idea of medicine. The traditional dental school curriculum requires four academic years of study for completion. The first two years are concerned with the biological sciences and the basic principles of oral diagnosis and treatment. In the final two years, the curriculum concentrates on clinical study. Dentistry is a widely respected profession and certainly warrants consideration, but in many ways it differs from the practice of medicine and calls for thoughtful examination by a potential applicant. Further information can be obtained from the: Council on Dental Education, American Dental Association, 211 East Chicago Ave. Chicago, Illinois 60611.
Podiatry and optometry are also health-related careers. These practitioners have a body of knowledge about certain human ailments, and patients consult them for relief. Podiatry looks after feet—diagnosis of diseases and administration of medical or surgical treatment for them. Podiatrists are not physicians who have specialized in feet. There are no university affiliated schools of podiatry in the U.S. All five presently functioning schools are private institutions. The professional curriculum is a four-year program, and preprofessional requirements are basically the same as for allopathic medicine. Podiatry is a viable alternative.

Optometry is a health care profession that examines, diagnoses and treats conditions of the eyes using lenses. There are 13 optometry schools in the U.S. and two in Canada, with nine of these affiliated with a university. Optometry provides yet another alternative. Like podiatry, the professional curriculum requires four years for completion, and preprofessional requirements are similar.

Veterinary medicine is the science and art of caring for all species of animals. The average veterinary student has had four years of undergraduate preprofessional work. The typical graduate curriculum requires four years of concentrated study. Admission to veterinary schools is sometimes more competitive than admission to medical schools, but for some premedic students this could be another alternative.

Public health is committed to safeguarding the public by preventing and controlling disease and to educating the public in the techniques of disease and accident prevention. The perspective and skills of public health are essentially those of group consciousness and care.

The health services administrator contributes to public health by
effectively planning, organizing, and financing the many components of the personal health care delivery system.

Pharmacists are responsible for the distribution of drugs and must have a comprehensive knowledge of drugs including their composition, chemical and physical properties, and pharmacologic activities. They serve as a prime source of drug and health information to patients and other health professionals.

Nursing is a helping profession whose major focus is the health and illness needs of patients. Nursing is practiced in hospitals, schools, industry, the home and other health care institutions.

The allied health occupations are focused primarily on the support of physicians, dentists, or other health professionals in the health care delivery system. Rehabilitation, occupational therapy, medical social work, physical therapy, medical technology, dental hygiene, radiological technology, dietetics, nutrition, respiratory therapy, operating room technician, and medical office work are examples of these careers allied to medicine. Programs vary in length from two to four years and vary in the ratio of preprofessional academic work to clinical work.

Perhaps the best single source of information on medically related vocations is Indiana Health Careers, Inc., 1835 North Meridian St., Indianapolis, Indiana. 46223
NOTES


2Ibid., pp. 2506-2509.


5Ibid., p. 137.


7W.F. Dube, "Are Foreign Medical Schools Desirable Alternatives?," The Advisor, April, 1974, p. 6.
REFERENCES*


*These and other career related materials are located in the Career Reference section of Bracken Library.