association of american medical colleges

March 8, 1985

MEMORANDUM

TO: Deans and OSR Members of U.S. and Canadian Medical Schools, and
          Interested Friends

FROM: Ricardo Sanchez, OSR Chairperson

SUBJECT: Enclosed Computer Compendium*

The Organization of Student Representatives (OSR) has long recognized the need
for a compendium of computer activity in medical schools. Our Fall 1983 OSR Report
article on "Computers and Medical Education" stimulated additional interest, and
a survey to learn how computers are being integrated into medical school curricula
was designed and sent to academic deans of all U.S. and Canadian medical schools
as listed in the AAMC Curriculum Directory. The survey requested information
about any electives or required courses which utilize computers for educational
purposes and about the availability of computer-assisted instruction (CAI)
programs. Of the 146 schools, 94 responded. Of these, 67 provided information
on the educational use of computers; the remaining 27 reported no such on-going
activity. At our 1984 annual meeting, we asked OSR members to check the accuracy
and completeness of the information received a year ago about their school; 19
updates were received including data from 2 additional schools. Our compendium
thus contains information on 69 schools and on NIH.

The information is divided into (a) courses utilizing computers and (b) CAI
programs available. Naturally, the dividing line between these two categories
is not always clear. There are other caveats. Because information about the
educational uses of computers is frequently not centralized and because of
new offerings being introduced all the time, important listings are missing
from the summaries provided. And, because of their length, we have not been
able to include all the descriptions provided by some schools of their CAI
programs.

However imperfect this compendium is, at least it is a start. We know that
many medical students, faculty and deans are curious about the range and
intensity of these activities; and we hope that our work encourages new
questions and more communications among these groups.

*The Dean is provided two copies with the request that one be forwarded to the
 head of any existing academic computing unit and/or shared with other faculty
 members most likely to be interested.

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association of american medical colleges

OSR COMPENDIUM OF COMPUTER ACTIVITY IN MEDICAL EDUCATION

Institutions Providing Information on Computer Activity

1. University of South Alabama
2. University of California (Davis)
3. University of California (San Diego)
4. University of California (San Francisco)
5. Stanford University
6. University of Colorado
7. University of Connecticut
8. George Washington University
9. Howard University
10. University of Florida
11. Medical College of Georgia
12. Morehouse School of Medicine
13. Chicago Medical School
14. Rush University
15. Southern Illinois University
16. Northwestern University
17. Indiana University
18. University of Kansas
19. University of Kentucky
20. University of Louisville
21. Tulane University
22. University of Maryland
23. Harvard University
24. University of Massachusetts
25. University of Michigan
26. Mayo Medical School
27. University of Minnesota (Twin Cities)
28. University of Missouri (Kansas City)
29. University of Missouri (Columbia)
30. Creighton University
31. University of Nebraska
32. Dartmouth College
33. New Jersey Medical (Newark)
34. University of New Mexico
35. Albert Einstein College of Medicine
36. Mount Sinai School of Medicine
37. New York Medical College
38. University of Rochester
39. S.U.N.Y. Upstate (Syracuse)
40. Bowman Gray School of Medicine
41. Duke University
42. University of North Carolina
43. Case Western Reserve University
44. University of Cincinnati
45. Ohio State University
46. Medical College of Ohio
47. Wright State University
48. University of Oregon
49. Hahnemann Medical College
50. Jefferson Medical College
51. University of Pennsylvania
52. University of Pittsburgh
53. University of Puerto Rico
54. Brown University
55. East Tennessee State University
56. University of Tennessee
57. Vanderbilt University
58. Texas A & M University
59. University of Texas (Galveston)
60. University of Texas (Houston)
61. University of Texas (San Antonio)
62. University of Utah
63. Medical College of Virginia
64. University of Washington
65. University of Wisconsin
66. University of Manitoba
67. Memorial University of Newfoundland
68. McMaster University
69. University of Toronto
70. National Institutes of Health

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INTRODUCTION

Information obtained from these schools about the uses of computers in medical education is shown in two categories: 1) courses using computers and 2) CAI (Computer Assisted Instruction). CAI is a learner-operated educational tool offering an individualized mode of study. The diagnostic capability and immediate feedback offered can create a tutorial atmosphere, and no special skills are required of the learner. CAI programs are available in several modes e.g., drill and practice, simulation, dialogue and may be written as primary or adjunct instruction, overviews or evaluation. A number of CAI programs are nationally available. Unfortunately, the compendium affords only a partial picture of the extent of their use and capabilities. The notes below, however, will help interested persons to obtain more information.

When using the compendium, keep in mind that the information appearing for each school is probably incomplete. Not all schools specified whether courses or portions of courses were required or elective or during which class year a medical student could enroll, e.g., MSIII. Also, many individual departments which are not listed probably make available some facilities and CAI programs to students.

OSR members providing updates on the information previously provided by their schools also completed a brief, informal survey about computer offerings and resources. All but one of the 19 stated that students have access to computers. Many mentioned the existence of a Learning Resource Center and an active, helpful health sciences library staff. A few even noted that terminals and printers are available in the student lounge. On the other hand, some students say that computer access is minimal and not well-publicized. An OSR member at one school notes that there is little emphasis on CAI, with students relying instead on old tests for review, and that faculty don't have the time or expertise to write programs relevant to their teaching. Unfortunately, results of the AAMC 1984 Graduation Questionnaire tend to corroborate this latter perspective; 83% of these seniors rated the use of computers in their medical school instruction "inadequate."

Clearly, the role of the computer in medical education is at a very formative stage of investigation and development. Some individual efforts to incorporate computers into the curriculum have been costly but unsuccessful, while others have taken hold immediately. It is the OSR's hope that the following pooling of basic descriptive information of activities will help prevent costly "wheel reinventing" and will stimulate medical educators and students to become more adept at using this wonderful learning tool.

While each dean, student and librarian who contributed information for this compendium deserves thanks, much credit goes to David Levy, M.D. (resident, Family Practice Center, University of Rochester and former OSR member, Temple University) who conceived and initially organized this project. Thanks also to Janet Bickel, Staff Associate, AAMC Division of Student Programs, for the editing and final compilation; inquiries and comments about the compendium should be addressed to her (202/828-0575).

> Organization of Student Representatives Administrative Board
> March 1985

Notes on CAI Programs

1. **Ohio State U. Library** (see page 23 of text). For information contact: Division of Computing Services, Ohio State University College of Medicine, 076 Health Sciences Library, 370 W. 10th Avenue, Columbus, OH 43210 (614)422-6192.

2. **Massachusetts General Hospital Library** (see page 15 of text under Harvard U.). For more information contact: G. Octo Barnett, M.D., Director, Laboratory of Computer Sciences, Massachusetts General Hospital, Boston, MA 02114 (617)726-3939.

3. MEDCAPS (Medical Computer Assisted Problem Solving) (see page 31 of text). For more information contact: Chris Herndel, Health Sciences Consortium, 103 Laurel Avenue, Carrboro, NC 27510 (919)942-8731.

4. PLATO Health Sciences Network (see page 31 of text). For more information contact: Sherry Walker-Linares, Coordinator, Department of Medical Information Sciences, College of Medicine, U. of Illinois – Urbana, 1408 W. University, Urbana, IL 61801 (217)333-0989.

5. MAC Family of Physiological Models (see page 31 of text). For more information contact: Khursh Ahmed, Computer Services Unit, McMaster University, 1200 Main Street, W., Hamilton, Ontario L8N 3Z5 (416)525-9140 ext. 2676.

6. National Library of Medicine. For information about the research and development activities in medical information systems, contact Mr. Earl Henderson, Acting Director, Lister Hill Center, NLM, 860 Rockville Pike, Bethesda, MD 20209 (301)496-4441.

I. UNIVERSITY OF SOUTH ALABAMA

<u>Courses Using Computers</u>
a) Course: Computers in Medicine (4 weeks; MSIV)
    Dept.: Family Practice
    Desc.: Using the Department's Apple II, the student will work under the supervision of the instructor to acquire: 1) A basic understanding of microcomputers and their components. 2) Applications of microcomputer technology to patient care problems. 3) Augmentation of the student's research skills using microcomputer technology: The elective is designed to allow students at any level of computer proficiency the opportunity to apply computer technology to a variety of clinical situations. The educational content will be flexible but will include medical problem solving, experimental design, and other material depending on the student's abilities and interests. The student will have instruction and discussions with the instructor concerning the use of microcomputers in practical aspects of their usage in medicine and have ample hands-on time with the Department's Apple II. There will be assigned readings commensurate with the student's level of computer proficiency. The student will be expected to complete a project to be agreed upon at the beginning of the rotation.

b) Course: Family Practice Preceptorship (6 weeks; MSIII)
    Dept.: Family Practice
    Desc.: During course of six-week Family Practice rotation students are loaned and use Apple IIE personal computers, which are used in genogram construction, report preparation, and several case study type CAI programs.

c) Course: Statistical Methods in Clinical Medicine (8 weeks; MSI)
    Dept.: Radiology
    Desc.: The objective of this elective is to acquaint the student with the use of statistical methodology in clinical medicine. The course offers a survey at an elementary level of classical statistical methods; probability, classification and measurement, sampling, description, estimation, hypothesis testing, analysis of variance, correlation, regression, prediction and decision. Examples are drawn from the medical literature.

d) Course: Biomathematics and Real Time Data Processing (4 weeks)
    Dept.: Pharmacology
    Desc.: The objective of this elective is to familiarize the student with methods and techniques of acquiring and processing data with minicomputer systems. The duties of the student will include learning to program in FORTRAN and evaluating experimental data and will write real-time routines to acquire and process data from a biological preparation. Documentation of programs will be expected.

2. UNIVERSITY OF CALIFORNIA – DAVIS

<u>Courses Using Computers</u>
a) Course: Community Health
    Desc.: One two-hour lecture covers computers in medicine in general. Terminals are "daisy chained" together in the lecture hall to allow students to observe, on their own terminal, how to log on and use the various programs available.

b) Course: Hematology
    Desc.: Undiagnosed cases are presented to the students to diagnose. The computer is used as a data base, providing information on laboratory results, case history, etc.

c) Course: Nutrition
    Desc.: This course requires all students to participate in a computer facilitated diet study. The program provides data on various nutritive values of specific foods and is used in planning patient diets.

The student facilities consist of six terminals housed in the computer resource room. These terminals are connected via telephone modems to 1) the Ohio State University and Massachusetts General Hospital teaching programs and 2) the University of California – Davis central campus computer center, accessing Burroughs, VAS and UNIX computers. The UNIX programs have been used by staff and faculty to create inventory files for teaching collections, such as gross pathology specimens, histology slides, and microbiological cultures. It is anticipated that these files will eventually be used by students as a data base for diagnostic projects.

3. UNIVERSITY OF CALIFORNIA - SAN DIEGO

<u>Courses Using Computers</u>
A 20 to 30 terminal computer classroom is proposed for medical student use. Presently, an Apple II and time-share terminals are available for Biostatistics. All first-year students must pass this course which includes lectures and hands-on experience on a time-share system (Burroughs 7800) to teach the use of statistical packages such as Minitab and SPSS.

4. UNIVERSITY OF CALIFORNIA - SAN FRANCISCO

<u>Courses Using Computers</u>
a) Course: Anatomy
   Desc.: Accelerated learning modules on anatomy vocabulary.

b) Course: Histology
   Dept.: Anatomy
   Desc.: The department uses approximately 20 self-instructional programs in the required histology course.

c) Course: Pharmacology
   Desc.: Five Apple computer programs were developed for student review of topics from the required pharmacology course. They are seen by the faculty as an alternative method of learning and reviewing course material.

d) Course: Programming Style
   Dept.: Medical Information Science
   Desc.: A systematic approach to the design and construction of computer programs. Development of clear, reliable, efficient, and easily modifiable programs; introduction and use of PASCAL; use of software tools; programming exercises involving advanced programming techniques.

e) Course: Information Structures
   Dept.: Medical Information Science
   Desc.: Elementary and high level information structures, data models, file organization techniques, searching and sorting. Special topics in non-numeric information handling are also included.

f) Course: Content and Format of Information
   Dept.: Medical Information Science
   Desc.: Consideration of the uses of medical information and its content, organization and format to serve these uses. Emphasis is on the medical record as a medium of medical information communication, and a review of medical information coding methodologies.

g) Course: Computer Systems I & II
   Dept.: Medical Information Science
   Desc.: Computer system architecture, organization, operating systems, programming languages, language processors, software engineering concepts, specification and design of software systems, and software reliability.

h) Course: Design of Systems
   Dept.: Medical Information Science
   Desc.: The design of previous medical information systems is examined. Successful components of the systems are studied in depth with respect to cost, performance, and acceptability.

i) Course: Data Base Management
   Dept.: Medical Information Science
   Desc.: Course covers techniques for logical and physical data base organization, data independence, models of data, approaches to large-scale data base management, security and privacy, data description languages, and query languages.

j) Course: Concepts of Information Science
   Dept.: Medical Information Science
   Desc.: Treatment of fundamental concepts which form the basis of information science: the nature of information and communication and the problem of knowledge representation.

5. STANFORD UNIVERSITY

<u>Courses Using Computers</u>
General Information: All of the following are elective courses available to medical students at . . .
level. All courses are 12 weeks (one quarter) in length.

All courses offered by the Department of Computer Science are also available to medical students. The department is a short walk from the medical school on the main campus. Here is a small sample of the courses available there: Fundamentals of Computer Science; Programming in PASCAL; File and Database Systems; Building Expert Systems; Computer Graphics, Digital Computer Organization; Fundamentals of Artificial Intelligence.

a) Course: Computer Applications in Medicine
   Dept.: Medicine
   Desc.: This one-quarter lecture provides an overview of medical computer science activities in both research and applied environments. Topics covered include office systems, hospital information systems, medical databases, pharmacy systems, laboratory systems, image analysis, EKG and EEG analysis, history taking, library systems, multiple health testing, medical computer-aided instruction. (Offered through the Medical Information Sciences Program.)

b) Course: Computer-Based Medical Decision Aids
   Dept.: Medicine
   Desc.: A study of representative examples from each of several major medical computing paradigms as they relate to computer-based clinical decision aids. Topics include 1) clinical algorithms, 2) clinical databanks, 3) mathematical models of physical processes, 4) pattern recognition, 5) Bayesian statistics, 6) decision analysis, and 7) artifical intelligence. Offered through the Medical Information Sciences Program.)

c) Course: Programming Project Course
   Dept.: Medicine
   Desc.: Intended for students who wish to implement ideas in a computer project. (Offered through the Medical Information Sciences Program.)

d) Course: Seminar on Computers in Biomedical Research
   Dept.: Medicine
   Desc.: This seminar surveys medical computing research at Stanford and nearby industries. Lectures are presented by local faculty and research staff. Typical topics include computers in the operating room, automated interpretation of medical data, and applications of artifical intelligence and databases to medical problems. (Offered through the Medical Information Sciences Program.)

e) Course: Computer-assisted Literature Searching
   Dept.: Medicine
   Desc.: This teaches the techniques involved in the use of several major online databases relevant to clinical medicine; MEDLINE, CANCERLIT, and TOXLINE are emphasized. The course meets the training requirements for access to the National Library of Medicine's system. Students will be eligible to apply for their own passwords upon successful completion.

f) Course: Computer-Based Research in Clinical Pharmacology
   Dept.: Medicine
   Desc.: Design and execution of clinical research projects involving computer-based drug interaction program at the Stanford Medical Center. Participation in development of systems for drug information retrieval and for the delivery of drug information to physicians of the community.

g) Course: Medical Information Sciences Colloquium
   Dept.: Medicine
   Desc.: Series of colloquia, offered by program faculty, students, and occasional guest lectures. Credit available only to students in the Medical Information Sciences degree program.

h) Course: Medical Information Sciences Journal Club
   Dept.: Medicine
   Desc.: Journal club for all students and several faculty. Participants report on recent relevant articles from the Medical Information Science literature. Credit available only to students in the Medical Information Sciences degree program.

Computer Assisted Instructional Programs

a) Program: Anatomy Quiz (medical students)
   Desc.:   Multiple choice and matching anatomy questions

b) Program: Hippocrates (medical students; residents)
   Desc.:   Surgical simulations

c) Program: Decision Maker (medical students, house staff, physicians)
   Desc.:   User constructs decision trees on a variety of clinical problems.

d) Program: Bill (medical students)
   Desc.:   Interactive program reviewing insulin, glucose metabolism and diabetes mellitus via a
             patient named "Bill".

e) Program: Sam (medical students)
   Desc.:   Interactive program reviewing purine metabolism via patient named "Sam".

6. UNIVERSITY OF COLORADO

Courses Using Computers
**It should be noted that the student-initiated COMPUTERS IN MEDICINE NETWORK, based
at University of Colorado, is now an AMSA Task Force which publishes a newsletter that those
reading this catalog may be interested in. Hats Off to Dan Cooper, Rob McClure, and the rest of
their "Mile High" group.

a) The following is a list of courses in the Department of Biometrics appropriate for medical
   students:

             Computer Oriented Statistical Methods
             Introductory Computing Literacy
             Applied Projects in Medical Computing
             Software Design and Structural Programming
             Design and Execution of Clinical Trials
             Mathematical Modeling in Medicine
             Computers in Medical Sciences

b) Course: Biochemistry 500 (12 Weeks; MSI)
   Dept.: Biochemistry and Genetics
   Desc.: This course utilizes some CAI programs produced elsewhere and in-house by faculty in
           order to help students study clinical aspects of biomedical syndromes.

c) Course: Genetics 502 (12 Weeks; MSI)
   Dept.: Biochemistry and Genetics
   Desc.: Small offering of interactive programs dealing with problems of Mendelian genetics.

d) Course: Biochemistry 600 (12 Weeks; MSI)
   Dept.: Biochemistry and Genetics
   Desc.: Course offers computer-assisted instruction with interactive features for study of
           kinetics.

e) Course: Introduction to Clinical Medicine
   Desc.: Allows students to utilize computer simulations for clinical case study. Utilizes CAMPS
           format to allow authors to program made-up clinical cases.

Curriculum-Related Software Programs

a) Program: Diarrhea 2 (1 diskette, Apple IIE)
   Desc.: A clinical case study with student interaction. Written using a format called CAMPS
           which allows the programmer to make up clinical cases. Will be used with ICM
           students.
b) Program: Kinetics (3 diskettes, Apple IIE, SuperPilot)
   Desc.: 13 lessons in kinetics for Biochemistry 600 students, with interactive feature.

c) Program: SCATCHARD (1 diskette, Apple IIE, SuperPilot)
   Desc.: A kinetics lesson for Biochemistry 600

a) Program: Basic Medical Pathology. Cell Injury and Cell Death. Cellular Alterations and Adaptations. (Lister Hill Natl. Center for Biomed. Comm.; 2 diskettes, 1 video laser disk, 1 documentation booklet; Apple IIE)
   Desc.: An interactive (computer-video disk) teaching system.

b) Program: Human - PC (Thomas Coleman, U. Miss. & James Randall, Indiana U.; on hard disk (IBM #2) note book, student's manual, instructor's manual; IBM PC)
   Desc.: Microcomputer version of a mathematical model of the human body in health and disease and during treatment. An interactive clinical simulation.

c) Program: Isolated Heart Lab. Learning Tools. (1 diskette, 1 booklet; IBM PC)
   Desc.: A simulated physiology lab with student interaction.

d) Program: Microbe: The Anatomical Adventure. Synergistic Software. (1 diskette, booklet; Apple II+ DOS 3.3)
   Desc.: A game based on the human body--can you get through the body to the brain in time to save the patient from bacteria, etc.?

e) Program: A Painful Foot in a 42 Year Old Male. (U. Washington School of Medicine; 1 diskette, IBM PC 128 K Ms DOS 2.0)
   Desc.: One of 12 clinical case studies for CME. Student interactive. Symptoms, diagnosis, treatment.

f) Program: Lower Abdominal Pain in a Young Girl. (U. Washington School of Medicine; 1 diskette, IBM PC)
   Desc.: One of 12 clinical case studies for CME. As above.

g) Program: Normal and Abnormal Lung Function. (Harold I. Modell, Ph.D. and Drs. Olszowka, Klocke, and Farhi, State U. of NY, Buffalo, Apple, 1982; 2 diskettes, 1 manual)
   Desc.: A program for independent study design to increase proficiency in respiratory physiology.

h) Program: Cardiology. Computer Medical Education. (1 diskette, info sheet, Apple IIE, ProDos 1.0.1)
   Desc.: A demo diskette of a cardiac clinical case. The history, multichoice lab tests, graphics, heart sounds, diagnosis, treatment, score of student, and summation of case. For medical students.

i) Program: Gross Anatomy by Computer. (Dr. David J. Moffatt, U. of Missouri, Kansas City; 1 diskette, Apple IIE, DOS 3.3 64K)
   Desc.: Anatomical simulation, description, questions for student interaction. The package includes 5 hours of computer instruction with manual, etc. for $4.95. To be enlarged, with new material available for addition to original package.

j) Program: Insearch. (Manlo Corp., 1983; 1 diskette, IBM PC)
   Desc.: A demo diskette of a database searching program for information retrieval in engineering, science, medicine, business, government, and law.

7. UNIVERSITY OF CONNECTICUT

Courses Using Computers
a) Course: Biostatistics
   Desc.: Optional use of statistical packages on the computer is utilized by approximately half of the class, others preferring non-computer "old ways." PLATO system with wide range of medical programs is available, though not presently utilized heavily.

8. GEORGE WASHINGTON UNIVERSITY

Courses Using Computers
a) Course: Introduction to Interactive Computing
   Dept.: Computer Medicine
   Desc.: Introduction to the Massachusetts General Hospital Utility Medicine Programming System (MUMPS) programming environment and data base management system, which allows nonprogrammers to design, establish, and operate interactive data bases that are useful for many research projects.

b) Course: Medical Computing
   Dept.: Computer Medicine
   Desc.: Aspects of computer use, including preparation and execution of programs that involve clinical or research applications such as ECG analysis, pulmonary function calculation, medical file management, mathematical modeling, data processing, and managerial computing. In most cases the instructor tutors a student in computation applied to a medical topic.

c) Course: Automated Medical Measurement Systems (4 weeks)
   Dept.: Computer Medicine
   Desc.: Students work under supervision in a multiphasic screening clinic and participate in the process of new implementations and in evaluation of the system. Seminar discussions related to clinical practice, preventive medicine, and occupational medicine.

CAI Software Programs

a) Program: MGH Programs (practicing physicians and medical and allied health students) (also see page 15)
   Desc.: Current programs cover more than 20 different clinical management areas. The system provides individual self-paced learning based upon computer-simulated patient encounters. Cases are designed to convey the essentials of efficient diagnosis and effective patient management. The majority of programs are case oriented; examples include programs on abdominal pain, anemia, CPR, and hypertension.

b) Program: Ohio State University College of Medicine (medical, nursing, and allied health students and professionals) (see page 23)
   Desc.: A program library of 108 programs and approximately 480 hours of interactive CAI materials, these CAI programs are presented in several modes--drill and practice, tutorial self-evaluation, games, simulation, and dialogue. Examples include programs on medical terminology, the basics of CPR, and case encounters.

c) Program: MAC Family of Physiological Models (MACMAN, MACPUF, MACPEE, MACDOPE) (see page 31)
   Desc.: All programs are computer simulations of various organ and body functions.

9. HOWARD UNIVERSITY

There are Computer Assisted Programs available for self-assessment on Apple II computers.

10. UNIVERSITY OF FLORIDA

Courses Using Computers
a) Course: Computer Technology in Medicine (16 weeks)
   Dept.: Community Health and Family Medicine
   Desc.: Introduction to computer techniques and application in medicine.

11. MEDICAL COLLEGE OF GEORGIA

Courses Using Computers
a) Course: Anatomy (any time; MSI-IV)
   Dept.: Department of Health Systems & Computing Science in School of Graduate Studies
   Desc.: This course provides self-assessment software to students at the library and in the Research and Education Building on campus.

b) Course: Cardiology Elective (4 weeks; MSII-IV, housestaff)
   Dept.: Medicine
   Desc.: Dr. Abdulla of the Adult Cardiology Department has written programs to be used by medical students and housestaff and contributes to the Physical and Computer Journal. His computer lab is equipped with Apple IIE, IBM terminals, and staff to help users. His programs are patient simulation programs with emphasis on learning how to handle a situation and cost-effectiveness. He has one patient simulation program on the laser video disc on "Cardiac Emergencies." Other programs are on floppy diskettes on "Drugs", "Resuscitation", "Cardiac Disease in Children", and "Anemia." These programs are reviewed by other physicians.

c) Program: Computer Literacy (4 weeks; MSIV)
   Dept.: Research and Education Computing
   Desc.: Senior electives for "hands-on" experience on computers without having to go through detailed lessons on programming.

CAI Software Programs

a) Program: Pathology, Anatomy, Family Practice (medical and graduate students)
   Desc.: Patient simulations available in MCG library; accessible on microcomputers.

b) Program: Faculty-developed Programs
   Desc.: (1) Reserved software for teachers' education on computer; (2) computer lab for instaff training (drug delivery for patients and for nurses); and (3) programs to help prepare for certification examination.

c) Program: Self-instructional Programming
   Desc.: Teaches self-programming using BASIC; consists of twenty-two lessons.

12. MOREHOUSE SCHOOL OF MEDICINE

CAI Software Programs

a) Program: Board Review
   Desc.: A drill organized for the basic science courses. Also a question file in which students can target those areas they wish to concentrate on. Provides constant feedback as to progress and directs students to text reviews. Divided into areas of learning objectives, and students can study on one of three levels (timed factor: Quick, Moderate, and Intense). Program formatting was done at Uniform Services University for use on Apple computers.

b) Program: MEDCAPS (MSIII-IV) (see page 31)
   Desc.: Computerized branching program developed by Health Sciences Consortium; case format.

c) Program: Faculty Generated Question Data Bank (MSI-II)
   Desc.: Question bank of learning objectives written by basic science fauclty and organized along the lines of their courses.

13. UNIVERSITY OF HEALTH SCIENCES/CHICAGO MEDICAL SCHOOL

Courses Using Computers
a) Course: Elective training program in program development and operation of computers for storage and analysis of data. Bank of test questions under development.

14. RUSH MEDICAL COLLEGE

Courses Using Computers
A 20-hour mandatory course in Medical Computing has been recommended for the end of the second year. An eight-hour proficiency course may be required of all faculty and students.

CAI Library

This effort in computer education is one of the most massive in the country and is centered in the Office of Computer Based Education which has compiled an 82-page catalog of programs in their PLATO system, many of which were developed at Rush. Following is a partial listing:

a) Program: Behavior Item Bank (MSI)
   Desc.: 200 National Board format items under the following topics: illness and behavior, behavioral evaluation, approaches to the study of behavior, and psychophysiology.

b) Program: Cell Biology III (MSI)
   Desc.: A multiple choice quiz with feedback on specialized cell function. The quiz tests the student's knowledge of the distribution and function of organ cells in specific cell types.

c) Program: Introduction to Medical Computing
   Desc.: A self-contained introduction to computers for health professionals (management, physicians, nurses, and allied health fields) this lesson presents the basic structure of computer systems along with their primary functions. Examples are drawn from the health field, but the terminology and functions are common to all computing activities. A professional completing this lesson will be conversant in basic technology and writing a simple program.

d) Program: Medical Technology Association (MTA) Item Bank (medical technology students)
   Desc.: Topics covered include: Clinical Chemistry I & II, Toxicology, Urinalysis, Radioimmunoessay, Mycology, Mycobacteria, Hematology, Coagulation, Serology, Immunohematology, Immunology, Management, and Education. Questions include multiple choice, short answer, matching, and essay. All items have objectives and are referred to pages in current texts.

e) Program: The Genus Bacillus (MSI)
   Desc.: A tutorial lession that covers morphology, metabolism, antigenic structure and pathogenic properties of the genus bacillus. A short quiz is included.

f) Program: Medical Mycology: Systemic Mycoses (MSI)
   Desc.: A tutorial lesson that covers general properties of systemic mycoses, including pathogenesis, epidemiology and clinical cases. A short quiz is included.

g) Program: Opportunistic Fungi: Cutaneous and Subcutaneous Mycoses (MSI)
   Desc.: An introductory tutorial lesson in medical mycology. The lesson discusses opportunistic fungi, cutaneous fungi and subcutaneous fungi. Morphology, epidemiology, pathogenesis, clinical syndromes, diagnosis and therapy are presented.

h) Program: Virology Quiz Game (MSI)
   Desc.: A short answer/multiple choice quiz game covering various topics in virology. A total of 84 questions are presented. The student can choose topics in general virology, double-stranded DNA viruses, single-stranded RNA viruses, or miscellaneous viruses. Both correct answers and feedback are provided.

i) Program: Neurology Case Studies, Nos. 1-7 (extends through "20")
   Desc.: Case Studies developed for use with the Rush Medical College course in Neuroanatomy. A rudimentary knowledge of the anatomy of the spinal cord and its tracts is required; as one proceeds numerically through the case studies, the prerequisite knowledge necessary to answer the questions will progress upward through the various CNS structures:

   Case 1: "Jack Daniels" - Brown-Sequard Syndrome
   Case 2: "Milo Graham" - Syringomyelia
   Case 3: "Mary Sacip" - Wallenberg Syndrome
   Case 4: "Basil R. Terry" - Medial Pontine Infarct
   Case 5: "Anne N. Sefilli" - Weber's Syndrome
   Case 6: "I. P. Daily" - Ant. Spinal Art. Syndrome
   Case 7: "Olive Martini" - Medial Medullary Infarct

j) Program: The Use of Theory in Research
   Desc.: A tutorial lesson on the interrelationship of theory and research and the function of a theoretical framework for conducting research. Sections include a review of definitions, types and purposes of theory, the interrelationship of theory and research, and a short post-test. Developed for Masters level nursing students, useful introduction for any student.

k) Program: Gen. Pathology: Part I (MSII)
   Desc.: Gen Pathology Parts I and II deal with general pathologic processes; themes which result in variations covered in later lessons in the sequence. This lesson presents a slide review and discussion covering cell injury, cell death, intracellular accumulations and inflammation.

l) Program: Carcinoma of the Cervix: A Computer Based Video Disk Workshop
   Desc.: This lesson consists of three sections: basic background information for novices and review, consisting of natural history, anatomy, present extent, and summary of

available treatments; strengths and weaknesses of diagnostic and therapeutic tools (for self-assessment), covering history-taking, physical exam, exfoliative cytology, colposcopy and ablative treatment, radiologic therapy; and applied case studies to check mystery--"The College Co-ed", emphasizing cytology; "The Uncomfortable Homemaker", emphasizes treatment: "The Frightened Grandmother", handles differential diagnosis.

m) Program: Pediatrics Patient Management Problems
   Desc.: Six patient management problems simulate clinical encounters. History, physical, lab test, management, and treatment are tested and scored. Scoring gives both positive and negative weight to choices. Developed for students who have completed their Pediatrics clerkship.

n) Program: GASP! A Simulation of Human Ventilation, Pulmonary Gas Exchange, Gas Transport, Metabolism and Acid Base Regulation. (MSII)
   Desc.: This research-level simulation offers 300 alterable parameters and represents an accurate model of the human respiratory system. Because of its complexity, novice users may have difficulty selecting parameters and values even when they begin with one of seven preset problems. Instructional problems are therefore included to guide novices. The first, a drug overdose, demonstrates one of the "pure" phenomena commonly observed. The second, a balloonist, demonstrates one of the more subtle points of the alveolar air equation. The third, a smoker, demonstrates an all too typical patient and the results of a frequent error in management.

o) Heartsim: A Simulation of the Heart and Peripheral Circulation
   Desc.: A simulation of the heart and peripheral circulation, accounting for the heart inside the chest, systemic arteries and arterioles, a capillary bed and veins collecting blood from the capillary bed and returning it to the heart. The model can simulate most types of generalized heart disease, with the exception of valve lesions. Because of the distance between basic physiology and applied medicine, users frequently have difficulties manipulating the model. Therefore, guided instructional experiences have been provided for the novice. They include problems with arterial resistance, venous resistance, hemorrhaging, and intrathoracic pressure.

p) Program: The Normal Distribution and the Central Limit Theorem
   Desc.: This tutorial lesson introduces the student to the normal curve and its relationship to the central limit theorem in inferential statistics. Interactive graphic displays allow the student to create graphs in response to questions. Developed for graduate Health Systems Management students; useful introduction for any student.

q) Program: Medical Technology Association (MTA) Item Bank
   Desc.: The MTA PLATO based evaluation system provides a comprehensive, interactive, item banking system in conjunction with on-line student management, testing, and analysis. The instructor can give the student objectives, feedback and references associated with each question. Both essay and short answer questions can be accommodated, as well as multiple choice items and matching. The program allows generation of hard-copy screen prints of PLATO displays, using an Epson MX-100 printer connected to an IST-2 or IST-3 PLATO terminal.

Also, the Office of Computer Based Education has put together a Computer Communication Exchange Inventory, an extensive list of literature related to medical computing. The subgroups are:

   Introduction to Computing
   Computer Science Terminology
   Computer Science History and Philosophy
   Microcomputers
   Spreadsheets
   Word Processing
   Business Computing

Computer Science Programming
Computer Science Languages: Basic
Computer Science Languages: Fortran
Computer Science Systems Analysis
Computer Science Imaging
Artificial Intelligence
Computer Modeling and Simulation
Computer Based Education
Medical Information Systems
Computers in Nursing
Clinical Support: Data Acquisition and Analysis
Clinical Support: Neurology
Clinical Support: Computers in Pharmacology
Clinical Support: Computers in Cardiology
Clinical Support: Computers in Nuclear Medicine
Computer Networks and Electronic Communications
Information Data Bases and Retrieval
Library Information Systems
Introduction to Personal Computing: Hardware, Software, and Product Information

15. SOUTHERN ILLINOIS UNIVERSITY

Courses Using Computers
a) Course: Introduction to Computers (5 weeks; MSII)
   Dept.: Introduction to Clinical Medicine
   Desc.: This course utilizes IBM software to give students tools that help them with their
      learning activities. One software package (PROFS) has the following features:
      calendars and scheduling, electronic mail, and word processing (including spelling
      checks). STAIRS is a program that permits key work searches of text. After
      composing documents (such as journal article abstracts) using PROFS, students may
      store them on a STAIRS data base for subsequent retrieval. Students also learn some
      basic file commands; in addition to usual printer options, students can print multiple
      copies using a high speed laser printer.

b) Course: Introduction to Computers, Cont'd (MSIII)
   Desc.: In a course currently under design, students will be introduced to basic data base
      operations. They will be encouraged to create their own patient data base for use in
      evaluating their own additional learning needs. This course is to be offered for the
      first time in 1985-86.

c) Course: Computers in Medicine (1 week; MSIII or IV)
   Dept.: Medical Humanities and Medical Education
   Desc.: This elective course in computers is designed for students who wish to increase their
      ability to interact with computer applications. A major objective is to learn to
      evaluate both software and hardware in the light of a particular application. A second
      objective is to expose students to other uses of computers, including expert systems and
      artificial intelligence. This course will be offered for the first time in Spring, 1985.

16. NORTHWESTERN UNIVERSITY

Courses Using Computers
a) Course: Information Management and the Microcomputer
   Dept.: Medical Library
   Desc.: This course will serve as an introduction to the use of microcomputers to manage
      information. Topics will include data base construction and management, accessing
      remote research data bases, software to suppport clinical decision-making, etc. Each
      session will consist of a lecture and a lab session.

CAI Software Programs

a) Program: MEDCAPS (MSIII-IV; 3 simulations)
   Desc.: Microcomputer-based simulations of patient-physician encounters.

b) Program: Milliken (MSIII-IV; residents and physicians; 11 tutorials)
   Desc.: These are computer-based tutorials on a variety of medical topics.

c) Program: Medisim (medical students; allied health students)

Desc.: This is a series of simulations of encounters with patients with respiratory problems.

d) Program: Deltak Tutorials: Teach Yourself PC DOS, Teach Yourself Basic, Teach Yourself
   Visicalc; Teach Yourself Visicalc by Extended Features.
   Desc.: This is a series of tutorials on microcomputer skills.

e) Program: PLATO (medical students; faculty) (see page 31)
   Desc.: The Medical Library subscribes to PLATO which provides access to several hundred
   computer-based lessons.

17. INDIANA UNIVERSITY

Courses Using Computers
a) Course: Application of Computer Skills to Medical Problems (freshman elective)
   Dept.: Biochemistry
   Desc.: The student will be given the opportunity to gain experience in the use of a general
   purpose computer as applied to one or several problems of medical usefulness. The
   student may observe and participate in one or more of several on-going projects, design
   and pursue an independent project, or may learn and practice basic computer skills.

b) Course: Microcomputers in Physiology (freshman elective)
   Dept.: Physiology
   Desc.: An opportunity will be provided to use microcomputers for simulating biomedical
   systems. The models--cardiovascular, pharmacologic, nerve, human--will be
   manipulated, criticized, evaluated and modified. An Apple-II-Plus or SOL computer
   will be used.

c) Course: Research in Health Care Delivery
   Dept.: Community Health Sciences
   Desc.: The growing demand for health care coupled with increasing complexities in the
   provision and financing health care has produced significant problems in rationalizing
   health care delivery systems and medical decision-making. This elective is designed for
   those students having an analytical background who are interested in systematic
   examination of health care delivery and medical decision making issues. Computer
   simulation and mathematical modeling are used as the primary methodological
   approaches.

Principal topics include health systems planning, economic analysis of health policy, and cost
effectiveness of medical decision-making. A research project will reflect the student's personal
interest as well as the goals of the Health Systems Research Section within the Regenstrief
Institute for Health Care.

18. UNIVERSITY OF KANSAS

Courses Using Computers
a) Course: Pharmacology
   Desc.: This entire course is based around self-paced computer assisted instruction. The course
   lasts 19 weeks, but can be completed in as little as 14 weeks by the most industrious
   students. The three types of computer programs utilized are: (1) Self Instruction; (2)
   Review Questions; and (3) Case Histories.

   The self-instruction programs are similar to programmed texts in that the computer
   presents text or didactic information and then asks the students a series of questions.
   Each program is usually equivalent to a lecture on a single topic. The format of these
   programs may include simple to very complex branching decisions. Some of these
   programs include a pre-test and post-test that can be used to evaluate their
   effectiveness. The case history, or simulated patient encounter, consists primarily of
   problem-solving exercises. Although the general format is the same as in the
   self-instructional programs, the cases use more sophisticated logic and permit greater
   flexibility in response. For example, in one toxicology case the student can lose a
   patient in six ways but can save him in only one.

   The course is based on the "Keller Plan," a system in which a course is split into several
   units and the student must pass an exam on one unit before progressing to the next.
   The computer is a major component of the course although several other learning
   tools have important roles; e.g., laboratories, discussion groups, therapy conferences,
   and panel discussions.

b) Course: Computer Medicine - Research (elective)
   Dept.: Biometry
   Desc.: The course will present material emphasizing hardware devices and supporting software. Topics of interest concerning hardware devices include: primary memory elements, auxiliary memory devices, 1/10 devices, and CPU design. Discussions of software involve: memory addressing, operating systems, language converters, CAI, and various program packages.

19. UNIVERSITY OF KENTUCKY

Courses Using Computers
a) Course: Health and Society (elective, 10 hour seminar)
   Dept.: Behavioral Science
   Desc.: Microcomputers are used by students for practicing problem-solving, medical diagnosis and management.

Note: Ohio State (see page 23) and Massachusetts General Hospital (see page 15) programs are available along with MEDLINE, which includes library search, data analysis of medical problems and hospital management of patients, their records and accounts.

20. UNIVERSITY OF LOUISVILLE

A summer elective is offered to medical students to work with the faculty who are using computers.

21. TULANE UNIVERSITY

Computers with video tapes are used in the Anatomy Department along with a special program for educational reinforcement and enrichment, utilizing a multiple choice question format.

22. UNIVERSITY OF MARYLAND

The following electives are offered during January and June minisemesters:

Courses Using Computers
a) Course: Introduction to Basic Programming
   Dept.: Epidemiology and Preventive Medicine
   Desc.: Provide the student with a working knowledge of BASIC.

b) Course: Computer Fundamentals
   Dept.: School of Social Work and Community Planning
   Desc.: To present the fundamentals of computers so students can gain a greater appreciation of their capabilities and limitations as tools for enhancing the delivery of professional services.
c) Course: Basic Medical Electronics
   Dept.: Surgery
   Desc.: To enable physicians to use clinical laboratory and patient monitoring equipment more easily and effectively.

d) Course: FORTRAN Programming for the IBM 4341
   Dept.: School of Pharmacy
   Desc.: At the completion of this course the student should be able to: 1) write simple FORTRAN program utilizing the available data types, control structures, 1/0 procedures, subroutines and functions; and 2) read and interpret the IBM FORTRAN Reference Manual.

e) Course: Personal Computers
   Dept.: Academic Services Section
   Desc.: The student will be introduced to the basic concepts of personal (micro) computer use: the function of general and special computer 'peripherals', programming languages and programming, general purpose and scientific software, techniques of inter-computer communications. The goal is to promote intelligent selection and usage of microcomputers.

f) Course: Principles of Laboratory Computing
   Dept.: Academic Services Division
   Desc.: An introduction to computer applications to laboratory science. Intended for those with little computer background. It will cover the fundamental concepts of minicomputers and how they can be integrated into a variety of laboratory settings that require data acquisition, analysis and control of laboratory procedures.

CAI Library

a) Dept.: Anatomy
   Titles: The Thorax
            The Pelvic Girdle
            Bones of the Thigh and Leg
            Bones of the Foot
            The Shoulder Girdle
            The Arm and Forearm
            The Hand
            Cranial Parasympathetic Ganglia I
            Cranial Parasympathetic Ganglia II

b) Dept.: Biochemistry
   Titles: Interaction of Human Hemoglobin with Polyphosphates
            Oxygen Transport by Hemoglobin
            The Structure of Hemoglobin and Myoglobin
            Alosteric Modeling
            Introduction to Glycogen

c) Dept.: Epidemiology
   Titles: Biologic Variability
            Statistical Significance
            An Introduction to Principles of Screening for Disease
            Incidence and Prevalence

d) Dept.: Hematology
   Titles: Introduction – Red Cell Transfusion
            Platelets Plasma Components
            Thrombocytopenia
            Evaluation and Treatment (A)
            Thrombocytopenia
            Evaluation and Treatment (B)
            Plasma Coagulation Factors (A)
            Plasma Coagulation Factors (B)
            Scatchard Analysis

e) Dept.: Immunology
   Titles: Mounting Immune Responses
            Cytotoxic Hypersensitivity

f) Dept.: Neuroscience
   Titles: Dermatoms
            Nerve Plexuses
            Spinal Cord
            Spinal Nerves
            Spine – White Matter – Grey Matter
            Introduction to the Brain Stem (in progress)

g) Dept.: Pathology
   Titles: Organelle Changes in Acute Cell Injury
            An Introduction to Cell Injury and Death
            Alterations of Intracellular Digestion
            Chronic Cell Injury
            Hypertrophy (in progress)
            The Klett System
            The Use of the Coulter: A Hybridoma Cell Technique
            Disease Severity Staging: Accessing Medical Care

h) Dept.: Physiology
  Titles: Blood Flow Networks

i) Dept.: Pharmacology
  Titles: Endocrine Pharmacology

j) Dept.: Psychiatry
  Titles: Psychiatric Patient Workup
  Psychiatric Mental Status
  Psychiatric History Taking (in progress)

23. HARVARD UNIVERSITY

Courses Using Computers
a) Course: Use of Computers to Influence Medical Decisions
  Dept.: Biostatistics - Clinical Epidemiology
  Desc.: The course acquaints students with problems and accomplishments in the field of
    computer medicine and enables them to produce successful, useful computer programs.
    Students devise logic networks capable of solving selected clinical problems, translate
    each network into a high-level, interpretative computer language and use differences
    between decisions made by the resulting programs and those made by physicians as a
    basis for continually improving the programs.

b) Course: Digital Computer Applications in Patient Care
  Dept.: Medicine
  Desc.: The course is an apprenticeship experience. Students participate in a particular
    application of computers to patient care, working with a group involved in one of the
    following areas: Computer-Based Medical Record System for Ambulatory Practice;
    Automated Medication System; Computer-Based Medical Audit; Application of
    Computers to Clinical Teaching of Problem-Solving; Computer-Based Physician
    Consultation and Guidance Systems; Automated Interpretation of Laboratory Test
    Information; or Data Base Management and Statistical Analysis Support for Clinical
    Investigation. Students take responsibility for a limited area of activity and develop
    and carry through a project to completion.

c) Course: Computers and Patient Care
  Dept.: Health Sciences and Technology
  Desc.: The seminar is designed to give an overview of present and potential applications of
    computers to patient care. Topics include: hospital information systems, automated
    medical histories; input of physician progress notes and orders, ambulatory medical
    records, patient monitoring, automated medical consultation and diagnosis; medical
    education and clinical simulations; and data collection and analysis in clinical
    investigations.

MGH Program Library

The Massachusetts General Hospital (MGH) Library consists of interactive user-controlled
computer-based programs for the medical education of physicians, medical students and other
health professionals. They are designed to teach clinical problem-solving skills as well as to
provide factual information. There are currently two arrangements for network access: MGH
distributes the programs through GTE TELENET communications network, and the programs are
also offered as the Continuing Medical Education component of the AMA/NET. MGH
computer-based simulations are also now becoming available for microcomputer or personal
computer users; these are being distributed by Williams and Wilkins in Baltimore (800)638-0672.

The following alphabetical listing describes some of the programs available to users of the MGH
system:

a) Program: Abdominal Pain
  Desc.: Simulates patient with chief complaint of abdominal pain. Challenges the user's clinical
    judgement and diagnostic skills by modeling a sequential approach to information
    collection. The model is based on statistical prediction of the potential information
    content of each possible question in a vocabulary at each point in the diagnostic
    work-up.

b) Program: Arterial Blood Gas
   Desc.: Leads user through an analysis of ABGs of simulated patients or values supplied by user. Task is to gain clinical information and make therapeutic decisions on the basis of ABG values.

c) Program: Anticoagulant Simulator
   Desc.: Simulates patient taking anticoagulants. Program uses a mathematical model to represent patient drug interaction. Presents a simulated patient's PT on a daily basis and requests Warfarin dose for that day.

d) Program: Cardiac Arrhythmias
   Desc.: User must diagnose and manage disturbances of heart rate and rhythm. Patient's condition changes based on user intervention with feedback on each decision and patient's status.

e) Program Digitalis Teaching Program
   Desc.: Presents information on digitalis and questions user's retention and understanding of this information.

f) Program: Cardiopulmonary Resuscitation
   Desc.: The CPR program is an interactive multiple-choice program to teach the cognitive skills that the health professional must have in order to handle the problem of acute cardiac arrest.

g) Program: COMA
   Desc.: This program is intended to present a model for evaluating a comatose patient as such patients present to the emergency department. The user's goal within the program is to arrive quickly and efficiently at a differential diagnosis and to begin appropriate therapy. Upon request the computer can guide the user to an appropriate diagnosis and/or present large amounts of relevant factual material.

h) Program: Hypertension Diagnosis
   Desc.: User's goal is to define the etiology of the hypertension in a 'practical' manner taking into account the patient's age and general medical condition.

i) Program: Hypertensive Emergencies
   Desc.: The multiple-choice program is designed to familiarize the user with the nature of acute hypertension, and to teach the clinical pharmacology of many of the drugs available for treatment of malignant hypertension.

j) Program: Hypertension Management
   Desc.: Simulates patient with hypertension; task is to manage patient.

k) Program: Idiopathic Respiratory Distress in the Newborn
   Desc.: The cases within the program are organized into two sections: 1) general neonatology and respiratory distress (RDS); and 2) pulmonary physiology and pathology. The first section deals with simple concepts of respiratory physiology, more difficult cases of RDS and pulmonary syndromes peculiar to the neonate.

l) Program: Joint Pain
   Desc.: Simulates patient with acute joint pain; task is to diagnose cause of the joint pain and begin treatment. Uses vocabulary of PE, HX, LAB, RX and DX. Can advise user on how to proceed with his "work-up" and supply factual data if desired.

Additional MGH Programs Available

Arrhythmias
Tutorial
Basic Life Support
Bleeding
Urology
Self-Assessment
   Exam

Dyspnea
Hepatitis
Prophylaxis
Meningitis

<u>Programs to be Added Soon</u>

Anemia	Emergency Room Treatment of Asthma
Thyroid	Coronary Artery Disease

24. UNIVERSITY OF MASSACHUSETTS

BASIC programming and statistical packages are offered. Also CAI program at Massachusetts General Hospital is available in the library.

25. UNIVERSITY OF MICHIGAN

<u>Courses Using Computers</u>
a) Course: Computers in Medicine (8 weeks, elective)
  Dept.: Biochemistry
  Desc.: Analyze and program a solution to an appropriate clinical research problem.

<u>CAI Software Programs</u>

a) Program: MACPUF (see page 31)

b) Program: OSU Library (see page 23)

26. MAYO MEDICAL SCHOOL

Computer Assisted Instruction is used in the following courses: Anatomic Pathology, sophomore Pediatrics, and the freshman Body Systems course.

27. UNIVERSITY OF MINNESOTA, MINNEAPOLIS

<u>Courses Using Computers</u>
a) Course: Computer Applications in Medicine (3 weeks, elective)
  Dept.: Lab Medicine and Pathology
  Desc.: Introduce student to use of computers in medical eduation, tomography, pharmacy,
      clinical labs, intensive care, and medical records.

b) Course: Computer Applications in Medical Research
  Dept.: Lab Medicine and Pathology
  Desc.: Introduce student to current and anticipated future uses of computers in health care
      delivery system.

c) Course: Pathophysiology I - Renal
  Desc.: Fluid and electrolyte computer case studies

<u>CAI Software Programs</u>

a) Program: Pathophysiology I - Renal
  Desc.: Management of Renal Failure (CAI for Apple computer) Milliken Corp., 1979.

28. UNIVERSITY OF MISSOURI - COLUMBIA

The University of Missouri at Columbia has a long history of computer use in medicine. Computers are used extensively in conjunction with diagnostic instrumentation, patient recordkeeping, and accounting. For the past ten years the University has also conducted a post-doctoral training program on the subject of indexing various aspects of rheumatic disease. The University of Missouri is one of five U.S. schools to maintain such a program, which is supported by the National Library of Medicine.

The most rapidly progressing program in medical computer science at Missouri is designed to institute routine use of computers by medical students. The developing elements include the establishment of computer terminals that are accessible to students around-the-clock, the placement of microcomputers in the new medical sciences building, and the development of formalized coursework in medical computer sciences. Currently, computer terminals are available to students from across the campus, around-the-clock, at many locations. In a few months programs designed to allow medical students to review coursework and prepare for the National

Board examinations may be available at these two locations. In addition, thirty to forty microcomputers will be placed in the new health sciences library.

By June 1985, an interdisciplinary elective course on the subject of medical computer science will be available to third- and fourth-year medical students. The coursework will include an intensive study of the use of computers in medicine with an emphasis on the pragmatic aspects of such use and a de-emphasis on computer design. A series of short courses will also be available to provide students with the basic skills necessary to use the microcomputers, or the computer terminals in adjacent buildings, without enrolling in the elective course described above.

29. UNIVERSITY OF MISSOURI - KANSAS CITY

CAI Software Programs
Offered for the last ten years is a Quarterly Profile Examination system with non-punitive comprehensive tests in basic and clinical sciences. The 400 question exams are culled from their computerized data-bank of 13,000 multiple choice questions which are all referenced to standard textbooks. The QPE is not meant to be "an in-house National Board" although students have found this to be a great means of study and preparation. Scores reported to test-takers include a breakdown of strengths and weaknesses along with a list of references in areas associated with a performance well below average. These results are used by faculty for advising but not for grade assessment. In addition: 1) microcomputer (Apple II) packages are being developed in basic science (seven disks of 100 questions each) in six traditional areas of clinical sciences and in patient management problems (8 cases) related to alcohol abuse; 2) microcomputers are used in teaching biostatistics and epidemiology; and 3) microcomputers have also been used for testing during the surgery rotation.

30. CREIGHTON UNIVERSITY

Courses Using Computers
a) Course: Medicine and Surgery Rotations (12 weeks; MSIII)
   Desc.: Makes use of Milliken Seminar (a pre-package CME seminar) on an elective basis.

31. UNIVERSITY OF NEBRASKA

Courses Using Computers
a) Course: Microcomputers in Medicine
   Desc.: An introduction to medical computing and information. Emphasis on medical applications of microcomputers; computer diagnosis, decision theory, patient records, data management, telecommunications, statistics, word processing, and computer-assisted medical education. Introduction to the BASIC language and to MUMPS.

CAI Library

Management of Cardiac Arrythmias
  (Parts I-III)
Chronic Renal Failure
Understanding Nutrition
Respiratory Failure
Diabetic Ketoacidosis
Myocardial Infarction
Rheumatoid Arthritis
Acute Renal Failure
Surgical Infection
Gastroesophageal Reflux
Clinical Management of Advanced
  Breast Disease
Peripheral Arterial Disease (Parts I-II)
Colorectal Polynosis
Colorectal Cancer
Surgical Nutrition
Cancer of the Tyroid
Shock
Sleep Disorders
GI Inflammatory Diseases (Parts I-II)
Convulsive Therapies
Non-surgical Management of the

Diabetes
Cardiac Examination
Mitral Valve Prolapse
Bacterial Endocarditis
A Sociological View of Selected
  Clinical Topics
Evaluation of Anemia
Hodgkins Disease - Diagnosis
Hodgkins Disease - Treatment
Immunology for Surgeons
Surgical Treatment of Peptic
  Ulcer Disease
Acute and Chronic Pancreatitis
Surgical Parathyroid Disease
Multiple Endocrine Neophasis
Malignant Medanoma
Cutaneous Thermal Burns
Trauma
Extrahepatic Biliary Surgery
Alcoholism
Diagnosis of Organic Mental Disorders
Interviewing Patients with Emotional
  Complaints

Recurrent Stone Former
Management of Bladder Cancer
Visical
The Data Factory
Clinical Approach to Patients
   with COPD
Asthma
Gonorrhea
Thyroid Dysfunction

Suicide
Clinical and Familial Aspects
   of Depression
Portal Hypertension
Med Caps
EKG Lesson
Baby Blue
GI Bleeding
Diagnosis and Treatment of
   Abdominal Injuries

CAI Software Programs

IBM BASIC
BASE II
WORD PERFECT
LOTUS 1-2-3

DISK OPERATING
SYSTEM (DOS)
CHART MASTER
BASE II ON DISK
TUTORIAL
ABSTAT - DOS

32. DARTMOUTH MEDICAL SCHOOL

Courses Using Computers
a) Course: Computers and Medical Decision-Making (elective, 10 weeks, MSIV-V)
   Dept.: Interdisciplinary
   Desc.: Introduces student to microcomputer technology for medical decision-making, computer
      programming, data base management, computerized statistics, decision analyses and
      word processing.

33. NEW JERSEY MEDICAL SCHOOL

Courses Using Computers
a) Course: Computer-Based Tutorial in Gross Anatomy
   Desc.: The Anatomy Department has developed a series of interactive programs for use as an
      adjunct in studying the gross anatomy of the head and neck. They consist of objective
      questions like those that appear on examinations, with explanations of the right and
      wrong answers. There are seven programs in the series:

      Neck (Criterion File)
      Neck (Survey File)
      Skull and Face (Criterion File)
      Skull and Face (Survey File)
      Eye and Ear (Criterion File)
      Oral and Nasal Cavities, Pharynx and Larynx (Criterion FileZ)
      Embryology of the Head and Neck

b) Course: Computers in Medicine (non-credit elective; MSI & II)
   Dept.: Biomedical Engineering and Laboratory Computer Systems
   Desc.: This is a seminar series covering: microcomputers; hospital information systems; medical
      record keeping and billing systems; biomedical signal processing; computers in nuclear
      medicine; artificial intelligence; and searching the medical literature with computers.

c) Course: Computers in Medicine (elective with credit; MSIV)
   Dept.: Preventive Medicine and Community Health
   Desc.: Students are given an overview of the current and future role of computers in the
      medical sciences. Areas of application covered include computer-assisted diagnosis,
      hospital computing systems, laboratory computing, statistical computing, and
      computerized patient billing. By means of seminars, group discussions, literature
      review, programmed instruction, hands-on computation, and site-visits, students gain a
      basic understanding of the fundamentals of computers and computer processing and of
      the potential application of computers in medicine. Evaluation is based on class
      discussion, assignments, and a summary paper focusing on a specific application of
      computers in medicine.

The school also provides access to PLATO programs at the University of Illinois and the Massachusetts General Hospital programs.

34. UNIVERSITY OF NEW MEXICO

CAI Software Programs

a) Program: Patient Management Problems (PMP) from Medical College of Virginia (all health sciences students)
   Desc.: This menu-drive software simulates management of "real" patients. Each of the five cases in this series provides feedback as data is entered; a "final mark' displays optimum management score and cost, individual score and costs, errors of omission and commission and unforgiveables.

b) Program: Medical Computer-Assisted Problem Solving (MEDCAPS) from Health Sciences Consortium (all health sciences students)
   Desc.: This software is "smarter" than PMP because it understands a variety of possible answers concerning patient management. MEDCAPS also supports various degrees of difficulty by providing help, such as flagging abnormal variables. The series currently include nineteen patients, each a separate diskette.

c) Program: Sensitivity Analysis Models from Biomatrix (all health sciences students)
   Desc.: A limited program introducing sensitivity analysis in decision theory. Users should be familiar with manipulating a decision tree. This is "what if" software which changes values in the tree to see how this affects a final decision.

d) Program: Human-80 Physiological Simulations by J. E. Randall (all health sciences students)
   Desc.: Over 200 variables may be manipulated to give realistic feedback on treatments provided to a patient. Software includes thirteen patient simulations.

e) Program: Cardiac Arrest Simulation Program, Aspen Systems Corporation (and health care workers who may be involved in a "code" situation).
   Desc.: Includes an EKG review (5 minutes) and attempts to simulate a cardiac arrest with a running time clock and a series of choices of treatments. It provides instant feedback on choices, and can print out an evaluation at the end of the session.

35. ALBERT EINSTEIN COLLEGE OF MEDICINE

Courses Using Computers

a) Program: Renal Physiology (3 weeks; MSI)
   Desc.: Course leader has developed a program which is meant to teach problems in fluid/electrolyte balance.

CAI Software Programs

a) Program: CAI in Renal Physiology
   Desc.: For use in conjunction with renal physiology course in the first year; developed by Einstein faculty member.

b) Program: Applewriter
   Desc.: For use with Apple personal computer in library. Printer available.

c) Program: Clinical Problem-solving in Surgery (MSIII-IV)
   Desc.: Program presents surgical patient and Boards-type management problems.

36. MOUNT SINAI MEDICAL CENTER

Courses Using Computers

a) Course: Computers in Medical Education and Medicine (elective for MSII & MSIV, 7 week sessions)
   Desc.: Describes ways in which computers can be used for medical education and can facilitate medical practice, office practice, and medical research.

b) Course: Special Studies in Clinical Cardiology
   Desc.: Computer applications in cardiology and electrophysiology.

c) Course: Introduction to Clinical Radiation Therapy and Oncology (4-12 weeks; MSII-IV)

Dept.: Radiology/Oncology

d) Course: Computer Applications to Pulmonary Function (12 weeks minimum; MSII-IV)
   Dept.: Pulmonary Medicine
   Desc.: Computer and programming analysis for algorithms and pulmonary function instrumentation.

37. NEW YORK MEDICAL COLLEGE

Courses Using Computers
a) Course: Computers in Medicine (4 weeks; MSIV, elective)
   Dept.: Community and Preventive Medicine
   Desc.: Gives each student an appreciation of the present and future importance of computers in the practice and teaching of medicine. Topics include: application of personal computers and microprocessors in diagnostics, office practice, automated patient management, treatment and medical records systems.

38. UNIVERSITY OF ROCHESTER

CAI Software Programs

a) Program: MEDCAPS
   Desc.: This computer-assisted problem-solving from the Health Science Consortium includes 17 cases, 10 in pediatrics and 7 in internal medicine. MEDCAPS is an "author friendly" system in which software can be written in a relatively short period. The system can be run on Apple II series and will soon be available for IBM PC's.

39. SUNY - UPSTATE MEDICAL CENTER

a) Course: Subsection of Introduction to Clinical Medicine
   Dept.: Medicine
   Desc.: In 1983-84, ten hours of this year-long course were set aside for presentations and exercises related to computer technology. The purpose is to introduce students to both current and potential applications of computers in medicine, to basic terminology and concepts involved in computers and to the range of software available and how it is created. Particular attention is paid to: a) computer applications in decision-analysis through the structure of artificial intelligence; b) applications within diagnosis itself through interaction with a simplified version of the PROMIS Knowledge Coupler; and c) epidemiologic analysis of a computer stored patient data base. As currently conceived, a unique body of patient data will be gathered by 2nd year students as they conduct their history and physical exam training during the year. Each student will see from five to seven patients during this course. For each patient they will complete a machine-scorable health-risk appraisal questionnaire. Data from these questionnaires will be read into a patient data base which in effect forms the panel of patients seen by the class. This panel, numbering from five to seven hundred patients, will then be available for various analyses in the latter portions of the course. Students will simultaneously be dealing with these concepts in the epidemiology course. The availability of the patient database will enable them to conduct such analyses as disease frequency, assessment of personal health habits and risks by sex and age groups and comparisons of the characteristics of their own panel with regional and national statistics.

b) Course: Pediatric Clerkship
   Desc.: Students have been involved with the solution of diagnostic games in Pediatrics for more than ten years. Currently, there are eight diagnostic games in such areas as abdominal pain, anemia, coma, edema and jaundice. All of these programs present students with simulated patient cases which they must solve by suggesting laboratory tests and making subsequent decisions based upon their results. These simulations utilize a text recognition program which requires students to recall relevant laboratory exams. This system is superior to a coded recognition program utilizing a previously distributed list of laboratory tests which cue students. A patient database-record keeping system called Roster is currently in use by Pediatric faculty. A second generation of Roster which is easier to operate and more transparent in its functioning will be installed later this year making this program more readily accessible to students.

c) Course: Elective on Computers in Medicine (MSIV)

Desc.: The fundamental goal of this course is to enhance students' literacy. Topics include terminology, mechanical aspects (or hardware) and logical aspects (or software) of computers and computer systems. We examine how computers are used in medical settings and at UMC in particular, and see and use various software packages including word processors, data managers, programming languages and operating systems. Students learn how to write programs in at least two different computer languages. The pros and cons of personal versus large computers, of owning versus sharing services, and of applying alternate technologies or methods are considered.

40. BOWMAN GRAY SCHOOL OF MEDICINE

The school has the capacity to parallel a substantial portion of the second-year curriculum in a computer-assisted form; 175 hours are on the students' second-year schedule that they may utilize for this purpose as they see fit. All this instruction is in question and answer format and it is intended to highlight the most significant portions of instruction in pathophysiology of disease and clinical applications. A smaller part of third-year Medicine, dealing with organ-system related clinical pathology and mechanisms of disease, is also available for self-study.

The library is connected with the Ohio State Network and offers their selection of other materials which students may use.

41. DUKE UNIVERSITY MEDICAL CENTER

Courses Using Computers
a) Course: The Computer Textbook of Medicine
   Dept.: Community and Family Medicine
   Desc.: Students participate in the writing and updating of the computer textbook of medicine. Information contained in the initial chapter of ischemic heart disease is used to assist in the management of patients in the Cardiology Service.

b) Course: Digital Computers and Their Application in the Health Sciences
   Dept.: Community and Family Medicine
   Desc.: For students desiring an intensive exposure to medical computer application, the flexible format of the course permits a variety of projects in computer medicine. Examples include projects in interactive patient interviewing; computer-aided instruction; patient/MD education/data collection; organization, retrieval, display and analyses; and MD-assistant programs.

c) Course: Biostatistics in the Medical Sciences
   Dept.: Community and Family Medicine
   Desc.: A practical approach to statistical methods and their use in medicine and the related health sciences. Particular emphasis is placed on issues in the design, conduct and interpretation of clinical and epidemiological studies. Topics covered include data collection and management, as well as tests of statistical significance for rates and ratios as measures of disease risks.

d) Course: Medical Use of Computers
   Dept.: Community and Family Medicine
   Desc.: An introductory course on applications of computers in clinical medicine with special emphasis given to various methods of collecting data from patients and making such data available for computer analysis. Computer applications in several medical environments will be considered as examples, including visits to these units. Experiences include the writing of simple computer programs and hands-on experience with computers and computer input and output devices.

CAI Software Programs

a) Program: Clinical Neurology
   Desc.: The computer program simulates the patient-physician encounter in the practice of general medicine in which patients with common neurologic illnesses are seen. The purpose of the program is to teach the student the efficient and economic utilization of lab procedures and the branching logic necessary in accurate neurologic diagnosis.

42. UNIVERSITY OF NORTH CAROLINA - CHAPEL HILL

Courses Using Computers
a) Course: Introduction to Biomedical Computing (elective)
   Dept.: Pathology, in conjunction with Biomedical Engineering and Mathematics
   Desc.: Laboratory computerization; applications of microcomputers in medical office, use and
          development of medical databases, statistical interpretation of data, and elementary
          real-time data acquisition techniques in patient monitoring.

CAI System Information

a) Self-assessment Courses:
   Central Nervous System
   Randomized Item Bank
   Muscular and Peripheral Nervous System
   Pharmacology Review for Second Year Medical Students
   Advanced Kinesiology and Biomechanics, Unit Assessments
   25 Part Self-assessment on Radiographic Accessories
   Basic Medical Sciences Item Bank

b) Tutorials on:
   Acid-Base Balance
   Alimentary Tract Obstruction in the Newborn
   Anatomic Classification of Autonomic Neurons
   Closed Drainage Systems for the Thoracic Cavity
   Boston Classifications of Aphasia
   Cranial Nerves Used in Speech and Hearing
   Acoustic Speech Parameters of Dysarthia
   Enzyme: Identification, Classification and Significance
   Foot Item Nutrient File
   Ophthalmoscopic Interpretation
   Histology Review of Basic Tissues and Organ Systems (UNC)
   Histology (OSU)
   Juvenile Diabetes for Health Professionals
   Lower Extremity Anatomy
   Orthopedic Lesions
   Physiologic Chemistry of Nutrition
   Obstetrical Terminology
   Examination of the Funds
   Principles of Orthopedic Traction
   Short Topics for Patient Usage
   A Bird's Eye View of Pediatrics
   Diseases of the Appendix
   PICA Test for Aphasia
   Psychotropic Medications
   Clinical Organ Scanning
   Septic Shock Care
   Cardiac Arrhythmias
   Basics of Electrocardiography
   Normal and Abnormal Dentition for Speech Pathologists
   Medical Terminology
   Physiology and Disorders of Body Temperature Resulation
   Anticoagulant Medication
   Communications
   Ventricular Arrhythmias
   Neuromuscular Morphology

43. CASE WESTERN RESERVE UNIVERSITY

Courses Using Computers
a) Course: Model Experiments in Physiology
   Desc.: Solving problems in cardiovascular, pulmonary, and renal systems. Students can
          simulate physiological responses and manage cases of several weeks duration. Fatal
          management of the patient is readily reversible with this approach, thus permitting
          considerable flexibility in regimen experimentation. Three teaching programs are
          available: MacMars, MacPuf, MacPee.

b) Course: Research Elective (8 weeks; MSI-II)
   Dept.: Biometry
   Desc.: Medical applications of computers, including analysis, design, and implementation.

c) Course: Computer Applications in Medicine (4 weeks; research elective; MSIII-IV)
   Dept.: Developmental Genetics and Anatomy
   Desc.: This elective provides hands-on experience in developing interactive programs on
          microcomputers with interfacing to intelligent video cassettes or video disk players.
          Student time involvement determines the extent of courseware development possible.

44. UNIVERSITY OF CINCINNATI

CAI Software Programs

a) Program: Pathology
   Desc.: Self-assessment exams used to help students prepare for real exams.

45. OHIO STATE UNIVERSITY

CAI Program Library

This school has been actively involved in using computer-based educational progams in medicine, nursing, and allied medical professions for 14 years. The university has an extensive CAI library which is accessible nationally. The program library is listed below. Within the medical school curriculum approximately one-third of the medical students who are independent study students use 100 hours of CAI materials during the first two years. Most of these programs are basic science tutorial in nature, but also included are some clinical simulations.

The following is an alphabetical listing of the CAI programs available from the Ohio State University College of Medicine (see Introduction). Because of field-testing and revision, some programs are not available for general release. For more complete program information, write for a CAI User's Guide.

Abdominal Arteriographic Anatomy (abang)
Commonly-Used Health Care Abbreviations (abbrev)
Electrolytes and Acid-Base Balance (abel)
Acid-Base Balance (aciba)
Assessment of Fluid, Energy, and Protein Intake in Infants
Anesthetic Agents and Adjunct Drugs for Nurses (agent)
Alimentary Tract Obstruction in the Newborn (altrac)
Modular Simulations (askme)
Assessment of the Patient With Respiratory Pathophysiology (assess)
Closed Drainage Systems for the Thoracic Cavity (bottle)
Computer Assisted Instruction in Breech Delivery (breech)
Infection Control (bugout)
An Introduction to CAI (cai)
Computer Aided Studies of Computer Concepts (cascc)
Computer Aided Simulation of the Clinical Encounter (case)
A Basic Review of Nursing in Coronary Care (ccnur)
Introduction to the Interactive Instructional System (coding)
Content Review (core)
Cardiovascular Terminology (cvterm)
Nutritional Anatomy for Medical Dietetics (dietan)
Musculature of the Elbow Joint (elbow)
Enzyme: Identification, Classification and Signature (enzics)
Case Studies in Family Medicine (fammed)
Food Item Nutrient File (foods)
Ophthalmoscopic Interpretation (fundus)
CAI Demonstration - Simulation Programs (games)
Gross Anatomy Self-Evaluation Exercise (ganatl)
Oxygen Therapy Equipment (gasem)
Developmental Task Groups (group)
Hand Anatomy (hanat)
Biomedical Electrical Safety (hazard)
Viral Hepatitis (hepvir)
Hi Baby (hibaby)

Histology (histl)
Medical Longitudinal Fasciculus Syndrome (inerve)
Endotracheal Intubation (intube)
For Juvenile Diabetic Patients (judi)
Lower Extremity Anatomy (lowex)
Orthopedic Lesions (lumbum)
Use of Measurement Systems and Equivalents (math)
Neuroanatomy Self-Evaluation (neuro)
Clinical Nursing Simulations (nursim)
Physiologic Chemistry of Nutrition (nutro)
Obstetrical Terminology (obtern)
Oral Cancer Recognition (oralca)
Instruction in the Use of Oral Contraceptives (orcon)
An Approach to the Diagnosis of Orofacial Pain (orpain)
Principles of Orthopedic Traction (ortrac)
Short Topics for Patient Use (pacare)
Patient Management of Diabetes (pamadi)
Physiological Chemistry (pcheml)
A Bird's Eye View of Pediatrics (peds)
Basic Perceptual Terminology and Concepts (percep)
Peritoneal Structures of the Abdomen and Pelvis (perit)
Diseases of the Appendix (phase4)
Physiology Self-Evaluation Units (physeu)
Independent Study Program (pilot)
Physics in Physiology (pips)
Computer Simulated Case Studies in Clinical Dietetics (plan)
Syndromes: Postural and Bilateral Integration (poblit)
Principles of Orthopedic Surgery for the Hip and Knee (proshk)
Psychotropic Medications (psymed)
Healthwork Puzzles (puzzle)
Questions about Ileostomy Surgery (quails)
Statistics for Quality Control (qucost)
Clinical Organ Scanning (radio)
Radiographic Quality Control Simulation (radsim)
Review in Radiologic Technology (radtec)
Radiotherapy-Basic Principles, Processes and Procedures (rather)
Recipe Calculations (recipe)
Diagnosis of Redeye (redeye)
Sensorimotor Procedures for Inhibition of Hyperactivity (relax)
Basic Techniques of Cardiopulmonary Resuscitation (rescue)
You've Got to Have Heart (restup)
Review Topics for Medical Personnel (review)
Human Sexuality Education (sexed)
Septic Shock Care (shock)
The Shoulder Joint (shojt)
Vital Signs (signs)
Sensory Intergrative Therapy (sitin)
Anatomy of the Skull (skull)
Problem Solving Skills in Medical Technology (solve)
Review of Selected Motor and Sensory Tracts of the Spinal Cord (spicor)
Basics of Electrocardiography (stripl)
Cardiac Arrhythmias (strips)
Stroke Rehabilitation (stroka)
History Taking (takehx)
Medical Terminology (terms)
Developing and Using Test Taking Ability on Multiple Choice Tests (testqu)
Physiology and Disorders of Body Temperature Regulation (therm)
Technique, Observation and Discussion of Stains (toads)
Differential Diagnosis of Toothache (tootha)
Child Development Between Ages Two and Five (tots)
Treatment Planning for the Relief of Regional ZPain (tretpa)
Anticoagulant Medications (trumai)
Communication (uandme)
Review in Urinalysis (ural)
Measurement and Recording of Urinary Output (ureme)
Basic Aspects of Intravenous Theraphy (veins)

Ventricular Arrhythmias (ventar)
Neuromuscular Morphology (vesali)
Ordering OSU College of Medicine CAI Visuals (visual)
Terms Used in Medical Science (vocab)
Physical Theraphy and Effective Patient Management (whatpt)

46. MEDICAL COLLEGE OF OHIO

Courses Using Computers
a) Course: Self-Study of Electrophysiology (2 weeks)
   Dept.: Physiology
   Desc.: Interactive program to renew the basics of membrane physiology

b) Course: Pathology/Physiology/Pharmacology
   Desc.: Test questions/study questions

47. WRIGHT STATE UNIVERSITY SCHOOL OF MEDICINE

This school provides a half-day session for students entering their fourth year. The first hour is devoted to basic literacy and terminology, with the emphasis on state-of-the-art applications in office management and clinical medicine. For the remainder of the afternoon students rotate through six stations offering a demonstration/sampler in one particular area.

48. UNIVERSITY OF OREGON HEALTH SCIENCE CENTER

Courses Using Computers
a) Course: Physiology (MSI-II)
   Desc.: A microcomputer-based model of the loop of Henle is used as a supplement to lecture and reading material.

b) Course: Patient Evaluation (MSI-II)
   Dept.: Public Health
   Desc.: Ohio State Case Series: patient encounter simulation to improve history-taking skills.

c) Course: Community Medicine Elective
   Dept.: Public Health
   Desc.: Students use the computer to prepare case summaries for seminar discussion.

d) Course: Biostatistics
   Desc.: Freshmen have access to self-study review. Incorrect answers trigger directions to text where material is explained.

e) Course: Medicine Clerkship
   Desc.: Students receive patients' bill analyses.

49. HAHNEMANN MEDICAL COLLEGE

Computer Assisted Learning

The library has 8 terminals and programs are available in most subjects.

50. JEFFERSON MEDICAL COLLEGE

Courses Using Computers
a) Course: Medical Microbiology Laboratory
   Desc.: Computer-based patient simulations are used on seven Apple III's.

b) Course: Family Medicine Clerkship
   Desc.: Students may use IBM computers at the Jefferson Family Practice Unit in their required clerkships.

c) Course: Pediatrics Clerkship
   Desc.: Patient simulations/tutorials are being developed for junior students.

d) Course: All Basic Sciences
   Desc.: A self-assessment review program in the basic sciences is offered to sophomore medical students.

51. UNIVERSITY OF PENNSYLVANIA

Courses Using Computers
a) Course: Pediatric Clerkship
Desc.: Computer-based instruction (PILOT) and problem-solving in diagnosis and management (CAMPS & CADI systems).

b) Course: Clinical Decision Making
Dept.: Medicine
Desc.: Clinical decision theory, diagnosis and therapeutic applications. Clinical data acquisition, integration, interpretation, psychology of medicine problen-solving, use of decision algorithms and cost/benefit analyses.

c) Course: Introduction to Microprocessors
Desc.: One sesson on medical application for the PC - Visi Calc applications in anesthesiology.

52. UNIVERSITY OF PITTSBURGH

Courses Using Computers
a) Course: Internist/CADUCEUS
Dept.: Decision Systems Laboratory
Desc.: Still in research stage but is being used for some cases as well as for teaching purposes. Series of programs in LISP that will accept symptoms which are run through a data-base, resulting in a diagnosis. As an elective, students can work on CADUCEUS data base with staff.

b) Course: Human Physiologic Simulator
Dept.: Physiology
Desc.: Pathophysiology aspects to observe, examine, and treat.

c) Course: MED LINK
Desc.: MED LINK is a data base management system authored by Steve Hasley, M.D. (5920 Walnut Street, #302). MED LINK is designed to cross reference and organize medical information. The program is written for an IBM Personal Computer with two disk drives or a hard disk. Information is entered into the computer as associations between medical terms, e.g., congestive heart failure is linked to bibasilar rales. Each of these two terms can, of course, be linked to many other terms as well. The information is retrieved by entering one term into the computer, and the program will list all of the other terms that are associated with the first term.

When data are entered into the program, MED LINK can store a reference to each association as the data are entered. This feature is useful when a group of students is working on a single data base, or when two individuals want to merge their data bases. MED LINK could provide an invaluable study guide and reference source and an active learning experience for students as they create the data base. It can also give students an appreciation of how data bases are produced.

53. UNIVERSITY OF PUERTO RICO

Courses Using Computers
a) Course: Physiology
Desc.: Questions and answer quiz program.

b) Course: Pharmacology (MSII)
Desc.: Evaluation of drug actions in the cardiovascular system.

NOTE: There are future plans in the clinical departments to introduce MED-LINE.

54. BROWN UNIVERSITY

Courses Using Computers
a) Course: Cell Physiology and Biophysics
Desc.: Simulations of biological systems and quantitative aproaches to biological problems (FORTRAN).

b) Course: Community Health Clerkship

Dept.: Community Health/Family Medicine
Desc.: Data collection and problem identification with five ambulatory scenarios to teach clinical reasoning and increase cost consciousness.

55. EAST TENNESSEE STATE UNIVERSITY

Courses Using Computers
a) Course: Introduction to Microprocessors (elective, 2 weeks; MSIV)
   Desc.: Self-instruction, hands-on elective for introduction to uses of microcomputers in medicine and practice management (Apple II).

56. UNIVERSITY OF TENNESSEE

No formal courses offered, however, students have use of PLATO for locally developed computer-assisted instruction programs.

57. VANDERBILT UNIVERSITY

Courses Using Computers
a) Course: Computer Applications in Medicine (elective, 1 semester)
   Dept.: Radiology
   Desc.: Medical data acquisition, image processing, resource management and research applications.

b) Course: Computer Applications in Medicine II (elective, 1 semester)
   Dept.: Radiology
   Desc.: Digital imaging systems with nuclear medicine, nuclear magnetic resonance, computed tomography, ultrasound and digital substruction systems. Display, storage and manipulation of clinically important digital images and implications of an all digital imaging department.

   NOTE: Students have access to several CAI programs such as that from Ohio State University.

58. TEXAS A & M UNIVERSITY

Courses Using Computers
a) Course: Biomeasurements (MSI)
   Desc.: Uses of computers in medicine are introduced.

59. UNIVERSITY OF TEXAS – GALVESTON

Courses Using Computers
a) Course: Digital Computer Application in Medical Care (4 weeks; elective)
   Dept.: Physiology
   Desc.: Basic vocabulary of computer science, computer architecture, binary, octal, and hexadecimal systems, mathematical logic, set theory, graph theory as applied to information processes and structures, problem reduction and analysis, primitive control structures and flow-charting. Students work on large mainframe as well as microcomputer systems.

b) Course: Interdisciplinary Functional Lab
   Dept.: Physiology
   Desc.: Computer simulations are is use in place of some animal experiments.

60. UNIVERSITY OF TEXAS – HOUSTON

Courses Using Computers
a) Course: Using Computers to Search Bibliographic Databases (2 weeks; MSIII)
   Dept.: Pediatrics/Learning Resource Center
   Desc.: Teaches essentials of data base searching (MEDLINE) including system commands, search strategies, use of indexing terms and subject headings.

b) Course: Using Word Processing Software (ongoing; all levels)
   Dept.: Learning Resource Center
   Desc.: As needed, teaches essentials of using word processing software, e.g., Wordstar.

c) Course: Using Data Base Software (ongoing; all levels)

Dept.: Learning Resource Center
Desc.: As needed, teaches essentials of using data base software, e.g., dBase II.

CAI Software Programs

a) Program: HIPPOCRATES I & II (MSIII)
Desc.: Case-diagnostic simulation exercises pertaining to surgical case simulations.

b) Program: MEDCAPS (MSIII)
Desc.: Case diagnostic simulation exercises pertaining to medicine and pediatric case simulations.

61. UNIVERSITY OF TEXAS – SAN ANTONIO

Courses Using Computers
a) Course: Introduction to Computers for the Health Science Professionals
Dept.: Biomedical Sciences
Desc.: Big Minicomputers offer broad fimiliarity with computers (DEC 20, APPLE, RAINBOW-100, IBM PC, DEC).

b) Course: Neuroscience Software Project
Dept.: Physiology and Biomedical Sciences
Desc.: Reinforces teaching concepts with a variety of locally created programs of graphic applications. Apple II is linked to Betamax SLO323 video recorder/player for use in study of the neuroanatomical materials in the medical neuroscience course. Frame accurate control is accomplished by RAVE.

62. UNIVERSITY OF UTAH

Courses Using Computers
a) Course: Introduction to Small Computers (elective, 3 hr./wk.; MSI-II)
Desc.: Word processing, spread sheets, data base management, data analysis.

b) Course: Rational Basis of Medical Decision Making (elective, 3 hr./wk.; MSI-IV)
Desc.: Computer assisted medical decision making.

63. MEDICAL COLLEGE OF VIRGINIA

Courses Using Computers
a) Course: Network Models of Transport in Epithelial Membranes (elective; MS I-II)
Desc.: Pharmacokinetics, biochemical, and physiologic processes are modeled on an analog computer.

b) Course: Clinical Case Simulations (required, MSIII)
Dept.: Surgery
Desc.: Apple II, surgical simulated cases, with proficiency grade, and cost score generated. Cases are repeated until proficient grade is achieved.

64. UNIVERSITY OF WASHINGTON

Courses Using Computers
a) Course: Physiology
Desc.: Use of computer simulations for teaching respiratory physiology.

65. UNIVERSITY OF WISCONSIN

Courses Using Computers
a) Course: Computer Utilization in the Clinical Laboratory (elective; senior level)
Dept.: Preventive Medicine
Desc.: Provides student with techniques of data processing and related problems in laboratory on small and large computers.

66. UNIVERSITY OF MANITOBA

Courses Using Computers
a) Course: Biochemistry Tutorials (elective; MSI)

Desc.: Six clinical cases on Apple II to challenge clinical skills with interactive tutorials.

67. MEMORIAL UNIVERSITY OF NEWFOUNDLAND

a) Course: Computerized Self-Evaluations
   Dept.: Histology, Molecular Genetics, Infectious Diseases, Neuroscience, Community Medicine,
      Internal Medicine, Pediatrics
   Desc.: Self-evaluations based on National Board questions.

b) Course: Computerized Patient Management Problems
   Dept.: Pediatrics & Internal Medicine
   Desc.: VAX computer utilizing DEC.

c) Course: Interactive Video Disc Project
   Dept.: Molecular Biology and Pathology
   Desc.: Being developed to use for teaching pathology in collaboration with Lister Hill National
      Center for Biomedical Communication.

68. MCMASTER UNIVERSITY

Courses Using Computers
a) Course: Surgery (clinical students)
   Desc.: Use of computers for multiple-choice questions and answers.

   NOTE: MAC MAN series on HP 3000 is available for use throughout basic science and clinical
      periods.

69. UNIVERSITY OF TORONTO

Courses Using Computers
a) Course: Use of Computer Terminals (graduate students)
   Dept.: Biostatistics
   Desc.: Remote job entry of SAS jobs. In addition: traditional courses in FORTRAN and Data
      Processing as elective. In progress: program in "Computers in Medicine."

70. NATIONAL INSTITUTES OF HEALTH

Courses Using Computers
a) Course: Computers in Clinical Medicine
   Desc.: o To provide a review of fundamentals of computer and information sciences and
      engineering as applicable to information processing and scientific decision-making in
      clinical medicine.

      o To examine in-depth and evaluate the design and operation of representative
      applications of computers in clinical medicine in order to develop a sense of what is
      functional and useful.

      o To provide an opportunity for independent study or work on a project in conjunction
      with senior professional staff.

      o To acquaint the students with information sources about new developments in the
      broad field of computers in medicine, and to provide some insight into the
      professional opportunities for physicians specializing in computer applications in
      medicine.

      Selection of Applicants: This course is designed for medical students who are already
      familiar with computers, are already competent in programming (at least one language
      on one machine), and have demonstrated initiative and accomplishment. Previous
      education and experience in mathematics or engineering is helpful but not esssential.
      Selection is also based on evidence of motivation to explore the clinical applicability of
      computers in greater depth and on references indicating that the applicant can be a
      mature, responsible participant in seminars and projects.

      Students will also be considered on an individual basis for work involving computers in
      the clinic or laboratory while the formal elective course is not in session. The student
      would work under a preceptor on a full-time research project without the formal
      lectures which accompany the fall elective course. Interested students should write Dr.

Rodbard, Building 10, Room 8C312, National Institutes of Health, Bethesda, MD 20205.

CAI PROGRAMS (See Introduction for Information on Who to Contact)

MEDCAPS (developed by Health Sciences Consortium)

This CAI software is a series of simulated patient work-ups. A chief complaint is presented and the user may order medical history, physical exam and laboratory findings. The goal is to arrive at the correct diagnosis with the least time and cost. A great deal of instructional feedback is offered and, at the end, a final case discussion occurs. Presently, three sets of diagnostic problems are available: Pediatric Cardiology, Pediatric Pulmonary, and Adult Problems in Dyspnea. Soon to be released is a fourth set on Common Family Practice Problems. Programs are written for Apple computers and soon to be available for IBM-PC and IBM-XT. MEDCAPS has authoring capability. Also avaliable is MEDCAPS-Manager, a student usage and performance report package.

PLATO Health Sciences Network (Developed at U. of Illinois College of Medicine at Urbana-Campaign)

The PLATO catalogue includes 450 medical lessions written in a variety of formats, e.g., drill and practice, dialogue, simulation, problem-solving lessons. Students work at their own pace, and graphics are extensively used. PLATO lessons are programmed in the TUTOR language and meet a variety of teaching demands, allowing for graphing, computing and branching commands. PLATO also has natural language answer-judging capability.

MAC Family Physiological Models (Developed at McMaster U. Medical School)

The interactive digital computer program MACMAN, MACPUF, MACPEE, and MACDOPE are simulation models for use in clinical, physiological and pharmacological teaching and research. The student can monitor important physiological variables and study the effects of altering the values of one or more factor, e.g., myocardial performance on the physiological system being simulated, over a period of time. The progress of the simulated patient is displayed graphically at the computer terminal (visual display unit, local printer or lineprinter), and symptoms and selected computed values are printed at regular intervals of time. MACMAN models elementary haemodynamics; MACPUF, lungs and blood gas exchange; MACPEE, circulation, body fluids and electrolytes; MACDOPEX, drug kinetics and metabolism; and MACBABE, lungs and blood gas exchange in the premature. These are written in the programming language of FORTRAN.

The MACAID program is a master driver which allows any of the simulation models to be placed in the context of an instructional text. It can be used in its own right as a general purpose system for mounting teaching texts and self-assessment exercises.