

Proposal for use of the SUMEX-AIM
Resource in a Hypertension
Control Project

1. Hypertension is a common pathologic disorder affecting 20% of the population. A programmed approach to its control will be of considerable benefit to clinics that have resources too restricted to deal with the volume of patients for which they find themselves responsible. There is a variety of approaches to the treatment of the disease, and the appearance of new drugs tends to extend this variety. Institution of a treatment regimen, monitoring its effect and making appropriate adjustments to the course of the disease as well as the appearance of drug induced side effects constitute problems which can be successfully dealt with by artificial intelligence systems. The problem is tricky but tightly constrained, and, while there are many variables, the complexity of their interaction generates a problem of programming difficulty about that of a two-mover puzzle in chess.

A study to assess the practical advantages of utilizing computers in the management of outpatient hypertension was initiated by the Clinical Investigation Center, Naval Regional Medical Center Oakland, California in the Fall of 1974. The software to support this project was envisioned as a combination of a history-taker and a therapy decision maker. The hardware to support the project would be the time/share computer system of the Lawrence Hall of Science at the University of California, Berkeley. Although the LHS computer system has very limited disc space, LHS advised the Center that LHS anticipated obtaining a very large disc resource in the near future, easily providing the space requirement for storing files which would accumulate during a year's test of the efficacy of computerized hypertension control.

2. The project is jointly funded by the Navy and the University of California School of Medicine, San Francisco. In fact, support by U.C. provided access to the LHS computer system.

3. Where computer systems can assist the physician or even substitute for him, just as they sometimes do for airplane pilots and space vehicle navigators, there is a benefit to the physician, to the patients, and--where fine tuning of procedures of therapy takes place through the enforced formality of programmed algorithms--medicine itself benefits. It is hoped that SUMEX-AIM can help in this service.

4. The programs being written for this project have some generality. The history-taker collection of routines was shaped from a similar collection written to explore how far such programs might be extended to permit interaction with the computer-naive patient so as to provide the least complicated problems of input, while constantly monitoring the input for possible error or misunderstanding and facilitating correction upon the detection of input error. These routines can be applied in any question/answer situation by simply replacing the text that represents the questions and answers.

The collection of routines which study the results of patients' question/answer input and physical data and laboratory readings has less generality. An initial general purpose algorithm that could deal with any symptoms/side effects/regime array proved to be too large for the amount of core available to users in the LHS system. However the original version remains available for possible use in larger systems.

5. We had hoped that some of the programming described in MEDICAL APPLICATIONS OF REMOTE ELECTRONIC BROWSING (Stanford Research Institute, January 1969) might be applicable in our project. However, the drug data base referred to in that study (cf. #4.2.5) is somewhat dated, with respect to those used in current hypertension therapy, the philosophy behind SRI's program ENGDRG is not appropriate to that of our program, and it seems that SRI carried that project no further. We are, of course, anxious to know of any efforts, comparable to ours, in this field, and to communicate whatever successes and failures might be useful to those with similar undertakings.

6. The hardware resources of LHS would be entirely adequate for this project, had they a much larger disc storage. The intended mode of operation at the Center involves use of four CRTs for displaying the questions of the history-taker to patients (and accepting their input), linked to the distant CPU by phone line interfaced by acoustic couplers; hard copy is obtained by use of ASR 33s used in the same way. Connect time: the 8-hour day.

7. All programs have been written in BASIC (the only language currently accepted by the LHS computer system), but a variant of BASIC which permits string-manipulation, RESTORE n, and IF...THEN--- where the --- may be a general instruction. (Were Boolean operations and bit-operations available, and if INTEGER type declarations were possible, this would be an extremely powerful language.) We have not yet studied the PDP-10 TENEX system but suspect that the only problem in conversion to that system might lie in the LHS convention of storing all file information in ASCII.

All program modules of our system require at most 3400 words of core (16-bit word length), and the generated files are expected to range in length from about 1000 words to 2000 words, with the mean toward the low end.

8. Connection to SUMEX-AIM would be through the San Francisco node of TYMNET.

9. Were this project to run on SUMEX-AIM, it could be transferred to LHS at any point after LHS has acquired a large disc storage.



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