Sympmed I: computer program for primary health care

M W Uplekar, N H Antia, P S Dhumale

Abstract

Sympmed I is an experimental computer program that identifies and offers treatment to outpatients whose symptoms can be effectively and safely treated. To verify the safety of using such a package an evaluation of Sympmed I was carried out. The patients' symptoms were entered into the computer by a junior doctor and then by a non-medical person, an engineer. The prescriptions offered by the program were compared with those given by a general practitioner after examining the patient. It was found that 390 of 500 (78%) patients in the first group and 276 of 400 (69%) patients in the second group were offered prescriptions comparable to the ones given by the general practitioner, and the rest were advised to see a doctor. In no case was a patient offered treatment when he or she needed to see a doctor.

The results of the evaluation confirm that most problems seen by first level medical personnel in developing countries are simple, repetitive, and treatable at home or by a paramedical worker with a few safe, essential drugs, thus avoiding unnecessary visits to a doctor.

Introduction

In many community health projects in developing countries (including our own Mandwa experiment) it has been shown that with simple training, encouragement, and support even a semiliterate villager can effectively provide primary health care to the people.¹ This is possible because most day to day health problems encountered by the "first level" medical or paramedical personnel are simple, minor and usually self limiting or treatable with a few safe and effective drugs. Providing 'primary' care for such illnesses

requires neither great skill nor expensive investigations because the ailments are simple and treatment is mainly of the symptoms. The use of a stethoscope or other equipment is often merely a part of the ritual carried out chiefly for a patient's mental satisfaction. For a paramedical worker the important task is identifying the few patients who need further examination and investigation by a doctor or referral to a hospital.

The use of computers in medical diagnosis and treatment has been directed mainly at helping the doctor's memory and at widening the doctor's knowledge in helping to make a differential diagnosis and choose investigations and treatment.^{2,3} Some more advanced programs have been used for "applied symbolic reasoning" (artificial intelligence) to interpret clinical data and laboratory results.^{2,3}

As many of the patients seen by first level medical personnel have simple illnesses, we have tried to translate the real life approach of a general practitioner in the dispensary in a developing country into a computer program.

Method

An analysis of outpatients' case notes maintained by village health workers of the Mandwa Project and the records of outpatients attending some general practitioner's dispensaries in Bombay helped to identify the common symptoms seen by first level medical personnel that could and could not be treated (tables I and II). We found that in a vast majority of patients the symptoms could be treated safely and effectively using only the essential drugs in the World Health Organisation list of drugs that can be administered by a semiliterate community health worker without a doctor's supervision (table III). It was necessary only to prepare instructions to go with the prescriptions to include the use of home remedies wherever possible and also to mention the side effects of the drugs that the user needed to be aware of. It was then possible to construct a program of algorithms for each symptom to extract relevant information from users about their illness which was needed to decide on the prescription.

For each symptom entered the first step was to make the user aware of the symptoms or signs, which if associated with the presenting symptom require a doctor's attention or referral to hospital. This step helped to weed out cases that could not be handled by the computer. The remaining steps included probing deeper into the presenting symptom to make the user elaborate on the problem along the lines a doctor follows when taking a history.

SOFTWARE AND HARDWARE

The building block for Sympmed I is a single symptom. The program has a symptom file and a drug file. For each presenting symptom there are subdivisions as mentioned above. For each symptom or associated symptoms there are instructions and a list of

TABLE I—Symptoms included in the program and their frequency

Symptoms	No of cases
Fever	182
Cough	83
Running nose, blocked nose, or sneezing	33
Headache	49
Diarrhoea	45
Sore throat	24
Chest pain	24
Abdominal pain	37
Low backache	32
Burning or frequency on passing urine	7
Vomiting	17
Giddiness	3
Gas or indigestion	25
Constipation	6
Joint pains	18
Weakness	10
Itching	20
Miscellaneous:	
Passing worms	3
Ear pain or discharge	18
White discharge from vagina	20
Painful menstrual periods	5
Night blindness	0
Tingling of hands and feet	7
Hiccups	0

The Foundation for
Research in Community
Health, 84-A, R G Thadani
Marg, Sea face corner,
Worli, Bombay-400 018
M W Uplekar, MD, physician
N H Antia, FRCS, director

Computer Maintenance
Corporation Ltd, Bombay-
400 005
P S Dhumale, MSC, senior
systems engineer

Correspondence to:
Dr Uplekar.

TABLE II—Symptoms that cannot be handled by Sympmed I

Fever for more than one week
Convulsions
Abnormalities of behaviour
Abnormalities of consciousness
Loss or diminution of power or sensation in any part of the body
Disorders of eye and vision
Severe pain anywhere in the body
Anything more than mild breathlessness
Bleeding from any organ
Anything more than minor cuts and wounds
Appreciable recent weight loss
Signs presented as symptoms

TABLE III—List of 25 drugs included in the program

Acetylsalicylic acid
Alkaline mixture
Aluminium hydroxide
Aminophylline
Ampicillin
Benzyl benzoate
Chloroquine
Chlorpheniramine
Ferrous sulphate
Ispaghula husk
Mebendazole
Metronidazole
Noscapine
Nystatin
Oral rehydration salts
Oxyphenonium bromide
Paracetamol
Penicillin (oral)
Piperazine
Promethazine
Senna
Trimethoprim
Turpentine liniment
Vitamin A
Vitamin B complex

drugs to be prescribed and a list of drugs not to be prescribed.

The only hardware is an IBM compatible personal computer with standard configuration. A printer, if available, can print out symptoms entered and prescriptions offered. The software includes MS-DOS (micro soft disk operating system) and Dbase III.

USING SYMPMED I

Each new patient entering the general practitioner's dispensary where a personal computer was installed would first go to the computer. The general practitioner's medical assistant would enter the symptoms for the patient as they appear on the screen, without guiding or leading the patient. The printouts of symptoms entered and treatment advised for each patient were numbered serially and kept to the side. The patient would then go to the general practitioner, who would examine the patient and write up the patient's notes and treatment prescribed on his or her own paper which was numbered to match the computer printout for the same patient. The computer printouts and doctor's notes for each patient were attached together. This was a kind of blind study as the prescribing doctor was unaware of the contents of the computer printouts beforehand.

After the first 500 cases the medical assistant was replaced by a non-medical person, an engineer, who was asked to continue with the trial without making any changes in the method of evaluation. He was given some orientation about using the package. The important instructions included: (a) To begin history taking not by going through the list of symptoms as they appear on the screen but by asking "What bothers you most?" and enter the answer as the first symptom. (b) To enter other symptoms, if present, separately only if they are not taken note of in the subdivisions of the first symptom. (For instance, if a patient presents with fever and cough and fever is entered as the first symptom questions are included in the program in the subdivision of fever to find out whether the patient has cough and other details about it. Thus there is no need to enter cough again as a second symptom. The patient is then asked if he or she has "any more complaints?" If, however, the first symptom is associated with ones not covered in its subdivisions, such as fever with itching, for example, then itching is entered separately after searching through subdivisions of fever—the first symptom.)

Results

We completed a preliminary evaluation of Sympmed I by comparing the prescriptions given by the computer

with those given by the attending doctor after examining the patient. Only patients over 12 years of age were included, and 900 cases, 500 entered by a doctor and 400 by a non-medical person, were evaluated (figure). Table I gives the distribution of patients presenting with individual symptoms. The computer prescriptions for 390 (78%) of the first 500 cases entered by the assisting doctor generally matched those given by the examining doctor. We did not compare the drugs prescribed but the groups to which drugs belonged, such as analgesic-antipyretics, tranquillisers, antibiotics, and so on. Non-essential drugs prescribed by the doctor—vitamins and tonics in most instances—were not taken into account. Of the remaining patients, half were advised by the computer to consult a doctor, for 10 patients the symptoms were not in the program, and a tenth presented with signs only such as swollen glands in the neck, swellings, yellowness of the eyes, dental caries, puffiness of the face, and so on, where a doctor's confirmation after examination was essential before a prescription was offered.

Of the patients offered a prescription, nine out of 10 had more than one major or associated symptom. Among the patients who were advised to go to a doctor were a few who could safely have been given a prescription for symptoms, but in no case was a prescription offered by the computer where a patient needed a doctor's attention.

The figure (b) shows the outcome for the next 400 patients whose symptoms were entered by the non-medical person. Nearly three quarters got prescriptions comparable to those given by the examining doctor, a tenth were asked to go to a doctor, and for a fifth symptoms were not in the program. Of these last, about half (a tenth of the total) had minor problems whose symptoms could be added to the program: minor wounds, non-specific anorexia, sleeplessness, heartburn, palpitations, acne, painful neck, stye, conjunctivitis, and so on. No prescription was offered where a patient needed a doctor's attention.

Discussion

Experience with Sympmed I confirmed our impression that for most day to day health problems of the masses in the developing world a visit to a doctor can be avoided. A computer program such as this would not only reduce a doctor's workload but also allow the doctor to spend more time on cases needing a doctor's attention most.

There are some important shortcomings of Sympmed I. It is agreed that this approach defies certain principles of medicine as no clinical examination or investigation is carried out and no diagnosis is made before a prescription is handed out. A step giving a list of probable diagnoses based on history alone could have been incorporated in the present program. Computer programs are being developed as an aid to decision making for rural health workers.^{4,5} But under circumstances such as this diagnosis could be a pointless diversion in the therapeutic process, which is after all what interests the patient.⁶ The different expressions used by patients for a common symptom need to be considered when making the symptom file. Most importantly, the possibility of translating the program into local languages needs further investigation or the presence of a paramedical worker-interpreter is always required. The limitations of a busy general practitioner are the limitations of Sympmed I as well. Just as a general practitioner may miss a diagnosis of pulmonary tuberculosis if a patient presents with cough and fever of less than a week's duration and no physical signs, our program may also send the patient off with a prescription for a simple respiratory infection—with a warning, of course, to report to a doctor if symptoms

Outcome for (a) 500 patients whose symptoms were entered into computer by a doctor and (b) 400 patients for whom a non-medical person entered symptoms. 1: Prescription was comparable to that given by general practitioner; 2: patient advised to go to a doctor; 3: patient presented with a sign (for example, a swollen gland) rather than a symptom; 4: symptom not in program

persist despite treatment—as the general practitioner would do.

Would simple flow charts be just as useful and cost effective? If our own experience with village health workers of Mandwa Project is any indication the diagnostic flow charts^{7,8} will never be popular among the workers despite efforts to promote their use. The reasons generally were that health workers had always to refer and cross refer to more than one flow chart for each patient and that most charts gave the probable diagnoses when it was suggestions about treatment they were most interested in. Since computers are coming in a big way, even to the remote areas of the developing world, and are being used for administration and for collecting epidemiological data we thought it desirable to develop programs for a paramedical worker that could also be used by a lay person. Eventually it may be possible to devise portable hardware so the package would be more useful in rural areas.

After the knowledge base is refined and a larger field trial carried out Sympmed I may be useful in broadening a paramedical worker's or even a lay person's knowledge and awareness of the treatment of illness. It may be used primarily for screening patients in crowded outpatients departments at rural health centres and urban dispensaries with the help of a paramedical worker directing only those patients to a doctor who

need a doctor's attention most. Sympmed I is expected to help in promoting safe, informed, primary, curative care with the use of home remedies and a few essential drugs, in limiting dangerous self medication, and in reducing expenditure on trivial health problems.

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Molecular genetics in clinical practice: evolution of a DNA diagnostic service

A L Meredith, M Upadhyaya, P S Harper

Abstract

The development of a molecular genetics diagnostic service over a three year period was studied in a National Health Service region with a population of three million. Starting from a time when few diagnostic applications were possible, the number of disorders and the overall demand had grown rapidly. Conditions for which molecular genetic diagnosis had been provided included Duchenne and Becker muscular dystrophy, myotonic dystrophy, Huntington's disease, and cystic fibrosis. Of 405 requests for diagnosis, 151 (37%) related to determination of carrier state, 187 (46%) to determining the feasibility of future prenatal diagnosis, and 67 (17%) were prenatal diagnostic biopsy samples, almost exclusively of first trimester chorion. DNA samples for future diagnostic use with a wide range of genetic disorders had also been banked.

The study showed a need for close integration with clinical genetics services to allow satisfactory genetic counselling and interpretation of risks.

Introduction

It is 10 years since the first human gene was cloned (β globin)¹ and only six since a DNA restriction fragment length polymorphism was first linked to a genetic disease (Duchenne muscular dystrophy).² There has been dramatic progress since in both cloning and mapping disease genes. At the time of the ninth human gene mapping workshop in Paris in September 1987 a total of 600 human genes had been cloned, while 350 anonymous polymorphic DNA sequences had been isolated.³

With the increase in knowledge has come an

increased possibility for the diagnosis and prediction of genetic disorders for which the gene has been cloned or where closely linked markers exist. This development, though not its extent, was foreseen by some workers in molecular genetics, and three centres in the United Kingdom were funded for three years to evaluate applying the new advances by means of a diagnostic service.

We present a preliminary analysis of data collected during this pilot study in Cardiff, one of the three centres. Though the project has not yet been concluded, and there will be an independent evaluation of its acceptability and economic value, an assessment now is of value because the discipline is changing rapidly and there is pressure on many regions to develop their own services.

The service

Recombinant DNA techniques were established in our department in 1982 for research principally in relation to muscular dystrophies and other neuro-genetic disorders. Diagnostic requests in relation to this research started to arise as early as 1983,⁴ emphasising the need for a specific DNA diagnostic group. This was established in mid-1985 as a result of funding by the Welsh Office and Department of Health in connection with the "three centres" project.

A total of £50 000 a year was provided, allowing the appointment of a senior scientist, a technician, and a part time data analyst. Running expenses were £18 000 a year, and a similar initial sum was allocated for equipment costs. No funding was allocated for clinical or clerical aspects of the work nor for family tracing or sampling by genetic fieldworkers.

Institute of Medical Genetics, University of Wales College of Medicine, Heath Park, Cardiff CF4 4XN

A L Meredith, PHD,
M Upadhyaya, PHD,
P S Harper, FRCP, professor

Correspondence and requests for reprints to: Dr Meredith.