Computers in Medicine

Computerisation of diabetic clinic records

G B WATKINS, T SUTCLIFFE, D A PYKE, P J WATKINS

Summary and conclusions

A simple system for putting diabetic records on to a computer file is achieved by using stationery that combines the usual handwritten records (not computerised) with the minimum of essential data suitable for punching on to computer tape. The record may be brought up to date at a selected time interval. This simple, cheap system has been in use in a busy clinic for six years. The information on about 8000 diabetics now held in the computer file is used chiefly to help research by creating registers of patients with specified characteristics, such as treatment, heredity, complications, and pregnancy. A complete up-to-date index of the entire clinic population is always available, and routine clinic statistics are returned every six months.

Introduction

Diabetic and hypertension clinic records are particularly suitable for computer storage and analysis. Several systems have been described, not only for storing information but also for making recommendations in diagnosis and treatment¹⁻⁷ and even on prognosis.⁸ Some systems have "on line" access,^{1,8} while others are used for printing the patients' notes⁹ or emphasising potential risk factors.⁵ Most attempts to computerise clinical records have proved expensive, time consuming (up to 29 pages per patient⁴), and are, in the long term, poorly maintained.

We describe here a simple system for computerisation of diabetic clinic records that has been in operation at King's College Hospital since 1974. It has been developed as an index of diabetic patients, their treatment and complications, and as an efficient aid to research projects rather than as a research end in itself.

Method

The system has been designed for simplicity and acceptability; no additional staff are required, and only one to two hours of secretarial time a week are needed for its maintenance.

There are three forms (one of which is shown in the figure) containing 69 items of information in addition to name and registration number. The forms are designed to include handwritten notes (not computerised) side by side with simple factual information suitable for punching on to computer tape, and are completed by the clinic medical

KING'S COLLEGE HOSPITAL DIABETIC CLINIC
Physical Examination (Form 3)

66 DIAB R C N

Unit Number: 67 076542
Surname: 68 CASABON
Name: 69 DOROTHEA
Date of Birth: 70 6.10.92

Blood pressure: 71 130/75 N

General Appearance: Thin. Somewhat dry.
Teeth: ✓
General Examination: heart and chest normal.
liver edge 2" splan.
Feet - infected ulcer under L gt. toe

FEET
Neuropathic symptoms (e.g. significant pain, paraesthesiae, etc.)
Right Foot: 80 0 1 9 N
Left Foot: 81 0 1 9 N
Condition: 82 3 4 5 N
Amputation: 83 0 1 2 N
Operations on Feet (not including amputation): 84 0 1 N
Pulses Dorsalis pedis: 85 1 2 9 N
Post tibial: 86 1 2 9 N
Knee Jerks: 87 2 9 N
Ankle Jerks: 88 2 9 N

EYES
Vision (corrected): 72 2 3 N
Good Impaired Registered blind
Year retinopathy first seen: 73 73 N
Right Eye Examination: 74 2 N
Left Eye Examination: 75 2 N
If abnormal - (See note)
Severe Mild Severe
Cataract: 76 1 2 3 N
Microaneurysms/Dots: 77 1 2 3 N
Exudates: 78 1 2 3 N
Blot haemorrhages: 79 1 2 3 N
New vessels: 80 1 2 3 N
Retinitis proliferans: 81 1 2 3 N
Note: Cataract severe = Retina not clearly visible
Micros/dots Mild = < 3 seen
Blot haemorrhages Severe = > 3 seen

99 DIAB N

One of three forms completed for each patient at an initial clinic visit. Actual values are entered for some items (for instance, blood pressure)—some findings are ringed, and there is also space for handwritten information, which is not put into the computer record.

staff. The forms constitute the permanent records of the initial visit of every new patient to the diabetic clinic and never leave the patient's notes. Punching is performed in the computer department weekly, after letters have been written to the referring doctors. The records are brought up to date at a fixed time interval from the previous review, at present set at five years, but any convenient period could be selected, and lists of patients due for this review are printed weekly by the computer. Not every clinic attendance is recorded on the computer, in order to reduce the intolerable burden of form-filling that would otherwise fall on clinic staff. Reviews can, however, be undertaken at any time if required; at present this facility is used to document all women at their first attendance at the diabetic antenatal clinic.

The system is run on an ICL 2904 computer at King's College Hospital. There is one computer run a week lasting about 15 minutes.

Diabetic and Computer Departments, King's College Hospital, London SE5 9RS

G B WATKINS, MA, PHD, research assistant
T SUTCLIFFE, BSC, systems analyst
D A PYKE, MD, FRCP, consultant physician
P J WATKINS, MD, FRCP, consultant physician

About 5000 characters are punched and then verified each week. Running costs are therefore low, and the system has been adopted for routine use in the diabetic clinic.

After six years, 3400 new clinic patients have been recorded on the computer file. The records of 4600 patients who were actually attending the clinic when the system was started were added retrospectively, although inevitably the information on these patients was often incomplete.

Output

Information obtained from the computer file is of four types: (1) for compilation of registers, (2) for research, (3) for administration, and (4) for routine clinic statistics.

COMPILATION OF REGISTERS

The entire diabetic clinic population of nearly 8000 patients is now indexed according to specified characteristics, and the information is available in easily accessible registers in the clinic. The registers cover all aspects of diabetes.

(a) Those with vascular disease, including angina, myocardial infarction, and claudication.

(b) Diabetic complications including retinopathy, neuropathy, and proteinuria.

(c) All diabetic pregnancies.

(d) Women of child-bearing age, for "pre-conception" counselling.

(e) Treatment groups.

(f) Patients by race.

Each register includes selected information on the patients listed. Other lists are in preparation.

RESEARCH

Registers and lists for specific research projects are easily prepared at any time, and several studies, based on appropriate lists of patients prepared from the computer file, have been undertaken and published. They include studies on genetics,¹⁰ nephropathy, weight changes, and extensive lists for selecting patients for the WHO Multinational Study of Vascular Disease.¹¹ A magnetic tape copy of our records was sent to Professor J J Jones in the West Indies for comparison with the results in his clinic.¹²

ADMINISTRATION

A complete and up-to-date alphabetical list of all clinic patients is invaluable to the clerical and medical staff, and greatly superior to a card index. It includes simple details of age, sex, and dates of diagnosis and of the most recent review. Weekly lists of patients for review are prepared by the computer. Prints of individual records may be obtained at any time.

CLINIC STATISTICS

Routine clinic statistics include an analysis produced every six months of all new clinic attenders by age, sex, and race.

Discussion

This system of computerised diabetic records was designed for routine use in a busy diabetic clinic. Its main purpose is to serve as an easily accessible and up-to-date register of the thousands of diabetics attending a clinic, and as an index of their treatment and complications. Its concept is simple, and there has been no attempt to record every detail on every patient. The design of the forms to accommodate handwritten records alongside data suitable for computerisation is one of the most important features which keeps the tedium of form-filling to a minimum. They are completed entirely during the consultation, making the system simple to use and cheap to maintain.

Information obtained from the computer file of nearly 8000 patients is now available as a series of registers listing patients with specific features. Our aim has always been to aid research, and, although this system has potential value as a research tool in its own right, this was never the main objective. The administrative role is also important, if limited: the up-to-date alphabetical clinic list is invaluable, and weekly lists indicating which patients are due for review are essential. Long-term defaulters could also be identified by the absence of a current review.

There is at present considerable interest in developing systems for computerising diabetic clinic records in other centres. We hope that as they evolve there will be some uniformity in the collection of basic information on diabetic patients. The data recorded in our system have been agreed with colleagues at St Thomas's Hospital as a basic "core" of information, and are included by them in a more extensive computerised system. Uniformity is essential for future epidemiological work, especially relating to the onset and mortality of diabetes.

We are grateful for the close co-operation of the medical records department in King's College Hospital. The computer system was developed with a grant from the British Diabetic Association, and GBW is at present supported by a grant from them. The information for the "core" data was agreed with Professor P H Sönksen and Dr Clara Lowy at St Thomas's Hospital. Further details may be obtained from GBW in the diabetic department, King's College Hospital.

References

- Bolinger RE, Price S, Kyner JL. Computerised management of the out-patient diabetic. *JAMA* 1971;216:1779-82.
- Bolinger RE, Price S, Kyner JL. Experience with automation as an aid in the management of diabetes. *Diabetes* 1973;22:480-4.
- Rosati RA, McNeer JF, Starmer CF, Mittler BS, Morris JJ, Wallace AG. A new information system for medical practice. *Arch Intern Med* 1975;135:1017-24.
- Beilin LJ, Bulpitt CJ, Coles EC, et al. Computer-based hypertension clinic records: a co-operative study. *Br Med J* 1974;ii:212-6.
- Bulpitt CJ, Beilin LJ, Coles EC, et al. Randomised controlled trial of computer-held medical records in hypertensive patients. *Br Med J* 1976;i:677-9.
- Komaroff AL, Black WL, Flatley M, Knopp RH, Reiffen B, Sherman H. Protocols for physician assistants—management of diabetes and hypertension. *N Engl J Med* 1974;290:307-12.
- Komaroff AL, Flatley M, Browne C, Sherman H, Fineberg SE, Knopp RH. Quality, efficiency and cost of a physician-assistant-protocol system for management of diabetes and hypertension. *Diabetes* 1976;25:297-306.
- Greenes RA, Barnett GO, Klein SW, Robbins A, Prior RE. Recording, retrieval and review of medical data by physician-computer interaction. *N Engl J Med* 1970;282:307-15.
- Schmitt JK, Poole JR, Schultz TA, Lewis SB. Use of the computer in the management and study of diabetes mellitus. *Present Concepts, Endocrinology Research Symposium* 1980;13:129-37.
- Leslie RDG, Pyke DA. Chlorpropamide-alcohol flushing: a dominantly inherited trait associated with diabetes. *Br Med J* 1978;ii:1519-21.
- Jarrett RJ, Keen H, Grabauskas V. The WHO multinational study of vascular disease in diabetes. 1 General description. *Diabetes Care* 1979;2:175-86.
- Jones JJ, Watkins PJ, Owyong LY, Loh PP, Kutty MK, Jogie B. Diabetes and its vascular complications in Malaysia. *Trop Geogr Med* 1978;30:439-49.

(Accepted 30 September 1980)

A woman with heavy menstrual flow notices that she develops varicose veins and painful legs during her menstrual periods. Is this common, and what treatment is advised?

The heavy menstrual flow needs investigation. There may be a local uterine cause for it that can be treated. Progesterone has a well-known series of effects on smooth muscle, mainly causing relaxation, and this is what probably happens to the walls of the veins. So, worsening of varicose veins and the symptoms they cause are often observed, both in pregnancy and during the menstrual cycle. The varicose veins should be treated in the way deemed most appropriate for them. If a contraceptive method is being used an attempt must be made to decide if it is contributing to the problem of the legs. This may require some therapeutic trial.