Use of microcomputer for histopathology: system using IBM PC and dBaseIII

W M SUEN, K W CHICK

From the *Department of Morbid Anatomy, Prince of Wales Hospital, Shatin, Hong Kong

SUMMARY A microcomputer program for use in the storage and retrieval of histopathology records is described. The program was written using dBaseIII, a commercially available data management system. The program provides for efficient storage and rapid retrieval of pathology reports and facilitates clinical research. Downloading of data on to a mainframe computer is possible.

The Prince of Wales Hospital, the teaching hospital of the Chinese University of Hong Kong, has 1400 acute beds. The department of morbid anatomy receives about 10 000 surgical pathology specimens every year. The manual storage of histopathology reports and their subsequent retrieval is tedious and time consuming. To facilitate filing and retrieval a program based on a desk top microcomputer was designed. We report here our first two years' experience with the system.

Material and methods

HARDWARE

An IBM PCXT with 512KB RAM and 10MB hard discs was linked to an EPSON FX-100+ printer. A 32MB external hard disc subsystem (Sigma Designs) was added last year. A streaming tape backup unit with a capacity of 45MB (Sigma Designs) was used to copy data from the hard disc subsystem.

SOFTWARE

A general database management software, dBaseIII (Ashton-Tate), was used as a basis from which our program—"pathology record system"—was written.

P.W.H. PATHOLOGY RECORD SYSTEM

1. Input data/Access temporary file.
 2. Scan record—by patient's name.
 3. Scan record—by hospital number.
 4. Scan record—by laboratory number.
 5. To PRINT menu.
 6. To SEARCH option.
 7. Leave this programme, and return to dBASE—III.
 8. Leave this programme, and return to SYSTEM.
- Please list choice.

Fig 1 Main menu of "pathology record system".

Accepted for publication 26 August 1987

PATHOLOGY—NEW RECORD

Name:
Sex:
Age: ◇
HKID:
Date:YY.MM.DD
Lab. no:

Tissue:

Please enter laboratory number, otherwise it will not be stored. When you have finished, enter BLANKS for lab. no.

Fig 2 Screen for registration of new specimen (logging in).

PATHOLOGY SIGN-OUT/EDIT

Name: LEE YIN KWAN
Sex: F
Age: 70
HKID: NA
Date: 86.04.07
Lab. no: S8602637
Tissue: URETHRAL MEATUS

Diagnosis:

T code:
M/E/F code:
Comment:
Is this report ready for transfer? N

Enter N for next record, P for previous record,
S for signing-out, E for editing temporary file.
Press RETURN when DONE

Fig 3 Screen for signing out for editing of temporary record.

P.W.H.DEPT. OF MORBID ANATOMY—SURGICAL PATHOLOGY SUMMARY REPORT

DATE	LAB NO.	NAME	SEX	AGE	HKID	TISSUE	DIAGNOSIS	T CODE	M CODE	COMMENT
86.05.14	S8603641	CHOI	F	41	B939402	VABRA ASPIRATION	ENDOMETRIUM-PROLIFERATIVE PHASE	T28000	M79310	
86.05.14	S8603642	LEUNG	F	53	B254939	VABRA ASPIRATION	ENDOMETRIUM, PROLIFERATIVE PHASE	T28000	M79310	
86.05.14	S8603643	LAU	F	42	A201557	VABRA ASPIRATION	EARLY SECRETORY ENDOMETRIUM 9 (PLEASE SEE ABOVE)	T82000	M79320	
86.05.14	S8603644	CHOW	M	55	16221	SUPRACLAVICULAR LN	METASTATIC ADENOCARCINOMA, POORLY DIFFERENTIATED	T08220	M81406	PROBABLE PRIMARY: LUNG
86.05.14	S8603645	HO	M	32	E592356	R PREAURICULAR SINUS	SINUS TRACT	TXY100	M46340	
86.05.14	S8603646	CHAN	M	23	16954	APPENDIX	NO HISTOPATHOLOGY	T66000	M00100	
86.05.14	S8603647	KWONG	F	27	G154493	NAEVUS OF NECK	SEBORRHOEIC KERATOSIS	T02300	M72750	
86.05.14	S8603648	LEUNG	F	33	E471103	UTERUS	CHRONIC CERVICITIS, LEIOMYOMA WITH RED REG-ERATION	T82900	M88900	
86.05.14	S8603649	IP	F	31	E240544	NEVUS OF FACE	INTRADERMAL NEVUS,EXTENDING TO RESECTION MARGIN	T02120	M87500	
86.05.14	S8603650	LI	F	41	B383584	UT CURETTINGS	ENDOMETRIUM OF PROLIFERATIVE PHASE	T28000	M79310	T83000 M76800 T08710 M00100
86.05.14	S8603651	LAU	M	20	C423619	RT BREAST LUMP	SYNAECOMASTIA	T04020	M71000	
86.05.14	S8603652	TO	M	43	2576	BUTTOCK CYST	EPIDERMAL CYST	T02471	M33410	
86.05.14	S8603653	LEE	F	36	C280282	R BREAST SKIN NODULE	DERMATOFIBROMA	T02400	M88320	
86.05.14	S8603654	MOK	F	46	C015745	CERVICAL 3'CLOCK BX	CERVICITIS, ACUTE ON CHRONIC	T83000	M42100	
86.05.14	S8603655	TSE	F	50	C134985	VABRA ASPIRATION	ENDOMETRIUM OF PROLIFERATIVE PHASE	T28000	M79310	
86.05.14	S8603656	AU	F	41	A628848	CERVICAL, 4 O'CLOCK	MICROSCOPIC CLUMP OF CELLS SHOWING SEVERE DYSPLASIA (CIN III)	T83000	M74003	
86.05.14	S8603657	KWOK	F	34	E440827	CERVICAL BX	CERVICAL BX AT 1, 7 AND 11 O'CLOCK—SEVERE DYSPLASIA (CIN III)	T83000	M74008	
86.05.15	S8603658	TAM	M	68	16978	LT FRONTAL LOBE	METASTATIC ADENOCARCINOMA	TX2200	M81406	
86.05.15	S8603659	YU	M	27	NA	NP BX	MALIGNANT LYMPHOMA, DIFFUSE, SMALL CLEAVED CELL TYPE	TY0100	M96303	
86.05.15	S8603660	YIP	F	69	C077539	LT PARIETAL LOBE	GLIOBLASTOMA MULTIFORME	TX2300	M94403	

Fig 4 Worksheet copy of permanent file.

PROGRAM

The data file includes the patient's name, hospital number (identity card number), sex, age, date of receiving of the specimen in the laboratory, laboratory number, tissue, diagnosis, topography code, morphology code and comment. The data are stored in two separate files—a temporary file for the logging in of specimens and a permanent file for the final diagnoses. Both topography and morphology codes are manually coded by pathologists with SNOMED (*Systematised Nomenclature of Medicine*, edited by the College of American Pathologists). Ward and bed number were deliberately omitted due to limited storage capacity. Full reports which include the above data plus detailed descriptions are kept separately.

After several trials we arrived at a menu-driven data entry program (fig 1) which allows secretarial staff with no computing knowledge to key in data. The data are entered in two phases. New specimens are entered into the temporary file which contains the patient's demographic data, date of receipt of specimen, laboratory number, and tissue (fig 2). When the final histopathological diagnosis is available, the diagnosis, SNOMED codes, and comment are added. A flag is

then assigned to the record to indicate that the record is ready to be transferred to the permanent file (fig 3). Worksheet hardcopies are printed out periodically from both files in chronological order (fig 4). Transferring records from the temporary to the permanent file is done daily together with the updating of the index files by menu-driven program (fig 5). It takes about 10 to 15 minutes to update 50 records. The updating process is done during off-peak hours.

P.W.H. PATHOLOGY RECORD SYSTEM
DATA ENTRY FUNCTION

1. Log-in new specimen (new record).
2. Sign-out specimen/Edit log-in record.
3. Search record from temporary file—by name.
4. Search record from temporary file—by ID no.
5. Transfer records after sign-out (temporary to permanent). (Warning: This is a time-consuming process).
6. To return to main menu.

Please list choice.

Fig 5 Screen for data entry, editing, and transfer.

The records are indexed according to the patient's name, hospital number, laboratory number and SNOMED codes. This allows searches to be done quickly: retrieval takes less than five seconds for a file size of 20 000 records.

Backup of data is done with streaming tape on a regular basis by the authors.

Discussion

We discovered that the introduction of computerisation in our laboratory posed many problems, the least of which was the programming. Resistance from secretarial staff was intense initially, but was quickly overcome as the system proved its value in record retrieval, which greatly assisted the office staff in answering requests from histopathology reports over the phone.

We chose to use the IBM PC because of its popularity. Most of our colleagues possess their own IBM compatible personal computers at home and regularly take data home to work on in floppy discs. Our application program is written in dBaseIII, a very popular and powerful management program. It can handle up to one billion records in up to 128 fields (items); and each field may contain up to 254 characters. Indexing on one or more fields can be done easily. For more advanced programs, one may manipulate up to 15 files at one time. The capacity of this software is obviously more than adequate for a histopathology laboratory. One outstanding feature of dBaseIII is its rapid index search, facilitating almost instantaneous retrieval of data from a very large database. Commands in the program are written in simple English phrases. These are easily mastered with a little practice, even for persons with little or no previous computing knowledge.¹ Search can also be done on specified variables in any of the fields. Application programs can easily be written. One important feature of the software is that data may be converted into ASCII (American Standard Code for Information Interchange) files, and hence may be downloaded to any standard mainframe computer for data storage or upgrading. This means that record keeping can be started early before planning for a more advanced system, which is known to be time consuming.

To develop our own package on a microcomputer was a challenge. Clinical research and monthly statistics were facilitated by SNOMED coding of the diagnoses. In some centres SNOP was preferred.¹ Our system required the pathologist to code numerically the diagnosis in SNOMED as this gives a specific morphological and aetiological description of the diagnosis. This was time consuming for pathologists,

especially in the early phases before they familiarised themselves with the coding. There are packages available for histopathology laboratories,^{2,3} some even permit autocoding of SNOMED from the topography and morphology phases. One such package is the SNOMED system from the College of American Pathologists (CAP). We were, however, unhappy with the limits such a system imposed on our file structure.

Specimens with more than one histopathological diagnosis pose certain problems. Our system only allows for the principal diagnosis to be indexed. Additional diagnoses are coded and stored in the "comment" field. Only about 10% of our specimens have secondary diagnoses, and retrieval of secondary diagnoses is seldom needed in our daily routine work. Although retrieval of those codes is possible by sequential search, it is more time consuming than the index search. Analysis entailing secondary diagnosis codes, usually for research purposes, can be carried out by running batch files. This can be done at night when the terminal is not needed for data entry or enquiries.

The use of mainframe computers to link up clinical laboratories and even the whole hospital is becoming increasingly popular. The installation of a minicomputer for all the clinical laboratories was in the planning stage when we designed our microcomputer system. The ability of our program to download the existing data into the minicomputer was therefore a major consideration. After the minicomputer (Burroughs Computer System) was installed in August 1986 data transfer was successfully accomplished by first transcribing the data into ACSII files, with minor modifications in file structure. Data can also be downloaded from the minicomputer to the personal computer for processing.

We acknowledge the advice and help of Professor J C K Lee.

References

- 1 Swettenham KV, Nickols C, Berry CL. Computer programs in histopathology record keeping. *J Clin Pathol* 1982;35:40-4.
- 2 Briggs JC, Ibrahim NBN, Mackintosh I, Norris D. Practical use of a word processor in a histopathology laboratory. *J Clin Pathol* 1982;35:151-8.
- 3 Subbuswamy SG, McCormick A, Peters EE. Computerisation of histopathology/cytology records—use of a commercial data storage system. *J Clin Pathol* 1984;37:157-62.

Requests for reprints to: Dr W M Suen, Department of Morbid Anatomy, Prince of Wales Hospital, Shatin, Hong Kong.