

# A COMPUTER PROGRAM FOR OESOPHAGO-GASTRO-DUODENOSCOPY RECORDS

S Paramarajah

## SYNOPSIS

The feasibility of using a computer database management system based on an 8-bit microcomputer for storing, retrieving and analysing patient data in a limited setting (oesophago-gastro-duodenoscopy records from a peripheral general surgical department over a 1 year period) is presented. A program developed by the author was used to enter the relevant records of 208 patients undergoing the above examination, and to retrieve and analyse any desired data. Compatible statistical and graphics software packages can be used to access and analyse the data and display or print out the results.

The limitations and scope for further expansion of the system are discussed.

## INTRODUCTION

While some of the potential uses of computers in medicine, such as clinical diagnostic systems, have had only slow impact (1, 2), other applications have been more readily accepted. Among the latter are database management systems for the storage, retrieval and analysis of patient data. Databases of various sizes can be designed to cater for differing requirements. Whereas a mainframe computer would be necessary for keeping all the patient records of a large general hospital, a 16-bit or an 8-bit microcomputer (3) will be able to command enough random access and storage memory as well as processing power and speed to cope with a smaller database involving some hundreds or a few thousands of patients.

A simple program written by the author for the entry, storage, retrieval and analysis of data on patients undergoing flexible fiberoptic oesophago-gastro-duodenoscopy is described.

Surgical Unit I  
Hospital Sultanah Aminah  
Johor Bahru  
Malaysia

S Paramarajah, MBBS (S'pore), FRCS (Edin)  
Consultant Surgeon

## MATERIALS AND METHODS

The program is written in the Applications Development Language (ADL) of dBase II. dBase II is a popular and powerful relational database management system (4) for microcomputers and contains the built-in programming language ADL. The program uses 31 of the 32 available fields of the 'primary use' database.

The program was written on the 8-bit Apple II+ microcomputer incorporating a Z-80 microprocessor on an expansion card, and running the operating system CP/M.

The endoscope used was the Olympus GIF-P3 forward-viewing oesophago-gastro-duodenoscope. The examinations were done at the Department of Surgery, Hospital Sultanah Aminah, Johor Bahru on patients with presenting clinical features pointing to pathology in the upper gastro-intestinal tract, both out-patients and ward cases. The data were obtained from the case notes and entered into the database via the program in batches. A total of 208 patients were examined during the 1 year period from January to December, 1984.

### The Program

The program is menu-driven. The opening menu displays the following choices:

- (1) NEW REGISTRATION
- (2) ENTER OR VIEW DATA
- (3) DISPLAY STATISTICS
- (4) FILE MANAGEMENT
- (5) EXIT

Selection of (1) NEW REGISTRATION, will lead to the registration data entry format screen as shown in Fig. 1. Some of the non-numeric registration data (as also subsequent clinical data) have to be abbreviated into code, as indicated to the left of the respective data entries. Error-checking facilities have been included, so that only numbers will be accepted for the I.C. or REGISTRATION numbers; < 100 for AGEM; C, I or O for RACE; M or F for SEX. Similarly duplicate entries for the

same I.C. or REGISTRATION numbers will not be accepted. The errors will be flagged. At the completion of registration the program will return to the opening menu.

On selecting (2) ENTER OR VIEW DATA, one will be prompted to enter the I.C. number, REGISTRATION number or OUT-PATIENT number (one of which must have been previously entered at registration) before reaching the menu shown in Fig. 2. Picking the desired item on this menu will present the appropriate data entry format: REGISTRATION DATA; INITIAL MEDICAL DATA; FIRST ENDOSCOPY; LAST ENDOSCOPY; FOLLOW-UP. Any previously entered data will be displayed (some in coded form) at the top of each respective screen, e.g. as in Figs. 3 and 4. To alter a previous entry one has only to enter the new data at the correct data entry prompt.

The 3rd item on the opening menu is (3) DISPLAY STATISTICS. This will lead to a secondary menu, through which various displays of the data such as cross-tabulations (Fig. 5) and listings can be shown. These displays will reflect the current data in the database, automatically taking into account any additions and changes. There is an option to print out the displays on a printer (Fig. 6).

Finally, the 4th choice on the opening menu is (4) FILE MANAGEMENT. Using this one can search through the patients' names alphabetically and extract certain registration data, or do house-keeping chores like making a back-up of the database, checking for invalid data or ascertaining remaining space on the floppy diskettes. There is also a facility to enter dBASE II directly from the program so that one who is conversant with the query language of dBASE II can access the database and manipulate the data outwith the confines of the program, and according to any particular interest (e.g. Table I).

Furthermore the database can also be accessed by certain other compatible software such as ABSTAT, which is a limited statistical package for microcomputers. Through this descriptive statistics can be worked out (e.g. Table II) or displayed as bar charts (Fig. 7). ABSTAT also has facilities for the computation of a

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NEW REGISTRATION
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=====
TYPE IN EACH ENTRY AND PRESS <RETURN> KEY,
OR JUST PRESS <RETURN> IF DATA NOT AVAILABLE
=====
PATIENT'S NAME :
(Enter digits only) I.C. NUMBER :
(No./yr, eg 2345/84) LAST ADMISSION NUMBER :
OUT-PATIENT NUMBER :
(M=Malay, C=Chinese, I=Indian, O=Other) RACE :
(M=Male, F=Female) SEX :
(Age in years) AGE :
(Enter all 4 digits) YEAR OF BIRTH :
(I or II) UNIT :

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Fig. 1 NEW REGISTRATION data entry screen. Note that the non-numeric data (except PATIENT'S NAME) have to be entered in coded form.

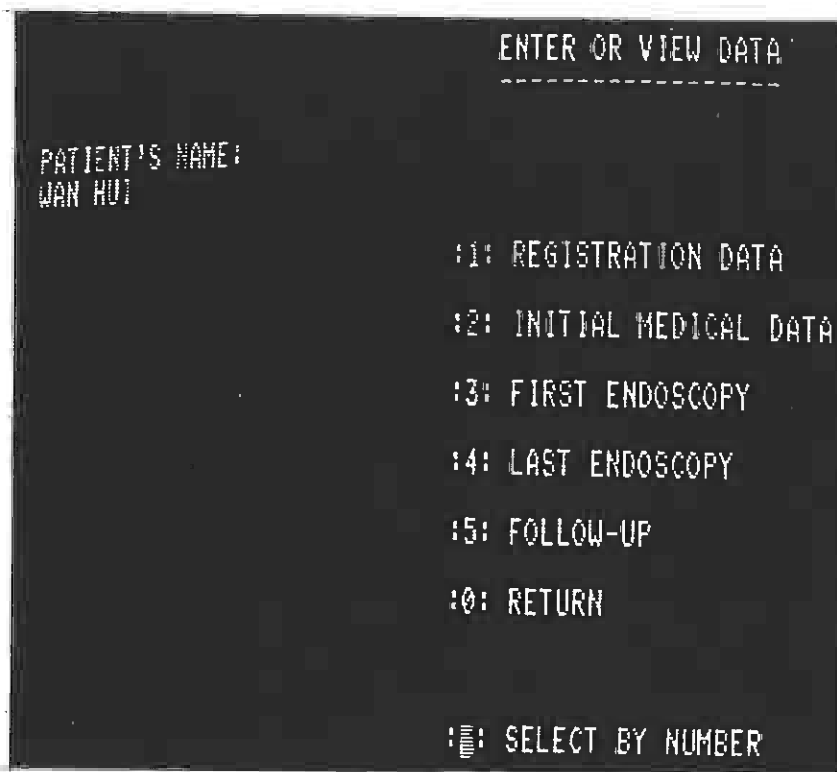


Fig. 2 The Menu for the various ENTER OR VIEW DATA choices.

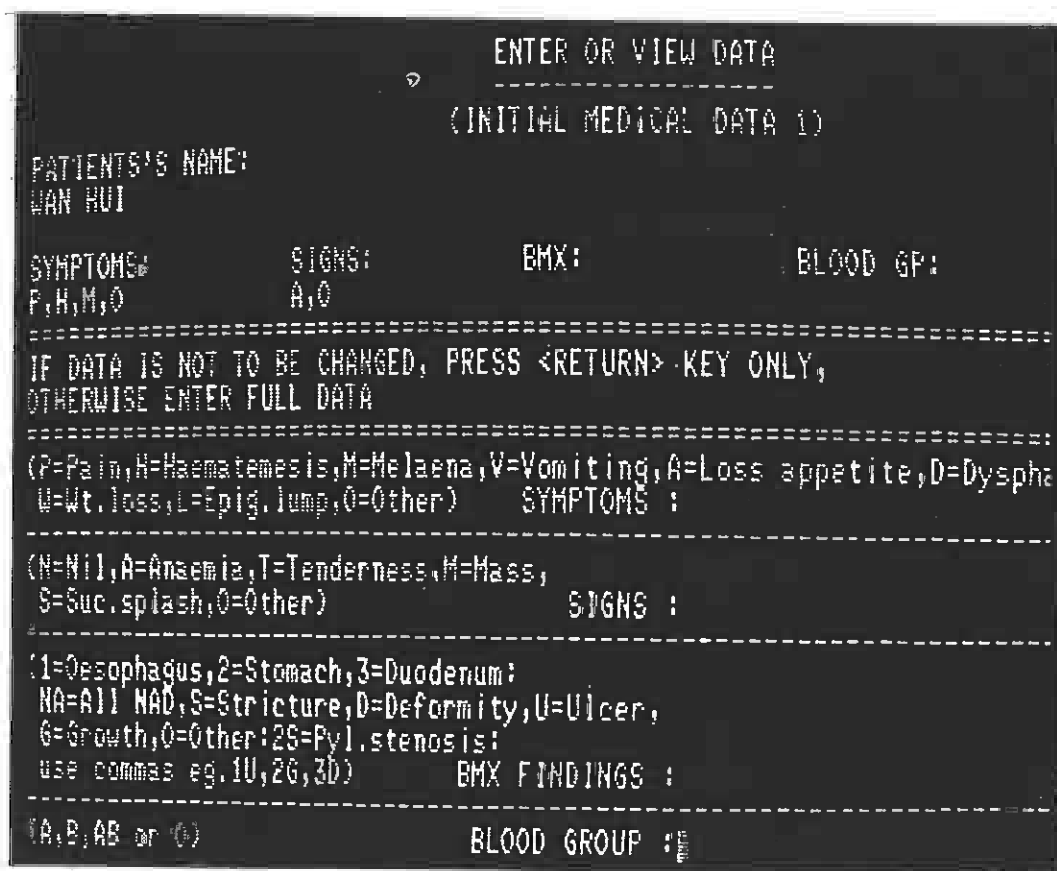


Fig. 3 First of two screens for entering or viewing INITIAL MEDICAL DATA. Previously entered data are shown in code at upper part of screen display.

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ENTER OR VIEW DATA
-----
(FIRST ENDOSCOPY)

PATIENT'S NAME:
WAN HUI

DATE:
10/12

DOCTOR: ANAESTH: INSTR: FINDINGS: BIOPSY:
PAR L E 2E

-----
IF DATA IS NOT TO BE CHANGED, PRESS <RETURN> KEY ONLY,
OTHERWISE ENTER FULL DATA
-----
(DAY/MONth/YEAR, eg. 29/04/84) DATE :
(Initials up to 3) DOCTOR :
(L=Local spray, G=G.A., V=Valium) ANAESTHESIA :
(E=Endview, S=Sideview) ENDOSCOPE :

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(1=Oesophagus, 2=Stomach, 3=Duodenum, 4=G-J anast: NA=All NAD,
A=Atrophic, I=Inflammation, E=Erosion, V=Varices, U=Ulcer, F=Fibrosis,
S=Stenosis, G=Growth, O=Other) FINDINGS :

-----
(1or2or3or4: N=Necrotic, A=Atrophic, I=Inflamm, F=Fibrosis,
B=Benign, C=AdenoCa, S=SqCa, U=UndiffCa,
O=Other: W=Waiting) BIOPSY :

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Fig. 4 Screen for entering or viewing FIRST ENDOSCOPY data. Figs. 3 & 4 also indicate the coding of various clinical data.

OVERALL FIGURES  
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(AGE GROUPS)

DATE: 31.12.1984

RACE	AGE <25	AGE 25-49	AGE 50-74	AGE 75+	TOTAL
Malays	10	24	29	3	66
Chinese	4	37	42	13	96
Indians	5	10	28	2	45
Others	0	0	1	0	1
TOTAL	19	71	100	18	208

WAITING :

Fig. 5 Display screen showing race and age-group cross-tabulation of the 208 examinations.

ALL FINDINGS

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-----
OESOPHAGUS:      OESOPHAGITIS =      22
                  EROSION =      1
                  VARICES =      3
                  GROWTH =      7

STOMACH:          GASTRITIS =      21
                  ATROPHIC GASTRITIS =      6
                  EROSIONS =      22
                  ULCERS =      41
                  PYLORIC STENOSIS =      6
                  GROWTH =      12
                  OTHERS =      13

DUODENUM:         DUODENITIS =      21
                  ULCER =      18
                  SCARRING =      12
                  OTHERS =      2

STOMA:           ULCERS =      4

N.A.D.:          =      52
    
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Fig. 6 Print-out (using the program's print option) of the screen display showing a listing of all endoscopic findings.

ABSTAT 2.23

FILE: GAST

REV# 0

PAGE 1

COMMAND: BARG

VARIABLE: 1 AGE

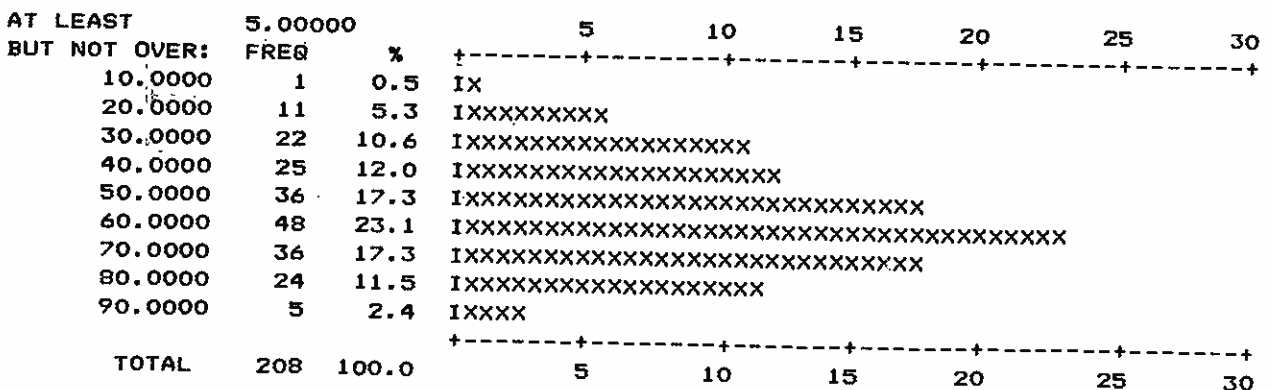


Fig. 7 Print-out of a bar chart for age as displayed by statistical package ABSTAT. The ages have been divided into intervals of 10 (other intervals can be selected). The frequencies and relative frequencies of the ages within the intervals are also shown.

**TABLE I:  
FREQUENCIES OF PRESENTING SYMPTOMS IN  
GASTRIC ULCER AND GASTRIC CANCER**

	Gastric ulcer (38)	Gastric cancer (7)
Epigastric pain	31	6
Haematemesis	16	0
Melaena	19	1
Vomiting	10	7
Anorexia	11	3
Dysphagia	2	0
Weight loss	7	5
Lump epigastrium	1	1
Other	2	1

**TABLE II  
MEANS, MEDIANS AND RANGE OF AGE (YRS)**

	Mean	Median	Range
All patients (208)	50.7	53	5-85
Benign gastric ulcer (38)	56.4	56.5	29-80
Gastric cancer (7)	59.1	61	44-73

number of the more esoteric functions of inferential statistics (such as the chi-square and the Student's t statistic, correlation, regression and analysis of variance, and the Mann-Whitney test). Another package, dGRAPH, can be used to display graphics from the database such as pie diagrams and line graphs.

## DISCUSSION

The program was written for an 8-bit microcomputer with 64K RAM, using 35 tracks on single-sided five-and-a-quarter inch floppy diskettes (128K). As such a program diskette with its full complement of files can contain records of about 180 patients. By removing the data entry files about 30 more records can be appended for analysis of data. Cross-tabulations as in Fig. 5, or alphabetically listing of names of 20 records will take approximately 2 to 3 minutes.

The above limitations can be overcome to a certain extent by using a hard disk (5), which has a faster access time and larger storage memory. Several thousand records can be easily accommodated, but with such numbers the processing time on an 8-bit microcomputer will be stretched; a 16-bit machine will be considerably faster. The latter can also use dBASE III, an augmented version of dBASE II. This has 128 fields per record as compared to the previous 32 fields, and can be used to enter more details of the patients.

The entry of non-numeric patient data in coded form

allows for faster and more accurate search, retrieval and analysis of such data, as well as economising on computer storage (6). But this is at the expense of losing the various nuances of meaning and qualifications of detail often contained in textual data.

The program is in menu-driven form so as to make it easy to be used by someone not familiar with operating computers or with computerese; in other words it is aimed to be "user-friendly".

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