based eclectic programmes of clinical experience with close contact and supervision from senior staff are the ingredients which the trainee sees as essential to a good training. A strong academic programme with promotion and facilitation of research is also important. Each of these items demands the close attention of senior staff, and it would seem appropriate that directives to juniors about the standards which they must meet in order to fully qualify as a psychiatrist should be accompanied by equally detailed objectives for trainers detailing their responsibilities.

## *Acknowledgement*

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# Computers in psychiatry

## Field data capture

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The process of psychiatric research, as distinct from its content, has been the subject of little comment. Central to present-day techniques are the use of questionnaires and more or less structured interviews. Pre-coded data are preferred, and even if there are few cases in any one study, the quantity of data collected for each usually compensates for this and justifies computer analysis, using statistical packages such as SPSS*. The days of punched cards have passed (only in the last eight years in one centre of excellence), so at least one of the error-prone steps (transfer of data from paper schedules by card-puncher) has been abolished, but the major chore is still this process, albeit direct to magnetic media (floppy or hard disk).

For many years, researchers in botanical and ecological research have used small, battery-powered data entry and storage devices (computers or even calculators) in field studies (e.g. Stephenson *et al*, 1976). Data are entered at the point of observation, and later transferred electronically to computer for permanent storage and analysis. The advantages

include simple verification of data entry at the point of observation, the possibility of the immediate genesis of summary scores, (allowing contingent data entry in a perfectly replicable way) and the avoidance of the error-prone process of transfer from paper to computer. However, until recently the data entered had to be heavily pre-coded and were limited in quantity by the memory size of the data capture device, and the process was not suitable for psychiatric research. Furthermore, there was little standardisation or compatibility of equipment, and electronic transfer was sometimes as costly to engineer as re-entering all the data.

'Computerised' psychiatric assessments are now familiar but, because of the size of the computers involved, these rely on bringing the subject to the computer for automatically-administered self-rating questionnaires like PROQSY (Lewis *et al*, 1988) or automated cognitive testing (e.g. Shahakian *et al*, 1988). The coming of light, battery-powered computers (so-called 'lap-tops') that can run standard software packages has opened up the possibility of 'field data capture' in psychiatric research, as storing large quantities of loosely-coded or non-coded information on a portable machine is now a practical reality, replacing the paper-and-pencil stage and data entry stage with a single step. This has the theoretical advantage of reducing error and analysis times, but the possible disadvantage of reduced acceptability to research interviewer and subject (for instance, due to restrictions on free-field note-jotting or the very presence of the technology in the interview setting). In order to explore these possibilities, we used a lap-top computer to gather pychiatric data in a research study, and we report here our impressions. This is not an evaluation of this method, (principally because the method is still evolving with our understanding of the pitfalls), but we feel that those thinking along these lines might find our account of interest.

## *The study*

This was a comparison of psychiatric morbidity in elderly patients after cataractectomy under either local or general anaesthetic. A new scale (the Delirium Rating Scale) was being piloted during the study, and the possibility of rapid changes to the schedule (avoiding the familiar agony of reprinting paper schedules) was an added attraction to using field data capture. The laptop was used to gather data at two of the four interviews with each subject in the study – both of these took place on open, busy wards.

### Technology

We used a Zenith 181 XT-compatible battery-powered laptop with twin 760k floppy diskette drives and 512k memory, which has a back-lit 6in by 8in blue LCD screen. Its CPU was running at 4 mHz; relatively slowly. We chose this for its substantial construction (it is not exactly light, but is robust), and for the back-lit screen (now a commonplace in lap-tops). We ran the data capture programs under MSDOS*, written in dBASE III PLUS* and also used MSBASIC* programs to prepare the format statements.

### Writing the programs

We decided to write programs that would allow any currently-available psychiatric interview already in electronic form (i.e. on a word-processor) to be converted into a series of screen images more or less identical with the original interview, into which data could be entered exactly as if pencil and paper were being used. We also wanted to allow free text 'doodling' on the entry screens – for instance, so that the interviewer could type in a response that posed coding difficulties for later attention. We chose dBASE because we were familiar with it, because data can be readily transferred to other programs like SPSS PC*, and because of its uncompiled coding: it was possible to write MSBASIC* programs that 'fooled' dBASE into accepting alien format statements.

### The system in theory

The psychiatric interview text is first modified to indicate where variables are to be read in, and if the interview is very long, it is divided into parts, with each part allowing the entry of up to 100 variables. There is no limitation on overall length of text or number of variables. A variable list is then constructed, with the legal range, type (numeric, character), size, etc, specified exactly as if using SPSS*. In addition, each variable can be part of up to four additional or logical summary scores, that can be calculated automatically after data entry or editing. The program then combines the interview text file and the variable list into one dBASE format statement and database file for each part. To each page of 20 text lines is added the page number, identification variable that links all parts for one subject, and a 'memo' field, into which 'doodles' can be entered. Then, under dBASE, the program gathers the data, using missing values as defaults, calculates the summary scores, and allows editing and export of the data to other programs.

### The system in practice

#### *Negative points*

The slow processing time of the Zenith when working with floppy disk files proved an intolerable impediment to the flow of the interview; programs had to be written so that the interviewing session (multiple

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patients) data were stored in a 'virtual' drive in memory, and this worked satisfactorily. However, this reduced the security of the system against failure.

Setting up the system for a new interview is very slow, and it is very sensitive to mistakes and omissions – it discovers fatal errors at a late stage (for instance, if you give two variables the same name – an easy thing to do with a long list). It creates dBASE format statements that are huge, and far too big to be edited under dBASE; so if you change your mind about the schedule, you have to use another text editor to edit them, or re-create the statements from scratch. It is possible to program in some branching (conditional jumps to another part of the schedule), but this must be done outside the system under dBASE.

The system's automatic calculation programs are in a primitive state, and failed consistently throughout the study.

Although direct export of data from the dBASE files to SPSS* on a desk-top computer was possible, a lot of the information (variable labels, missing values) is lost in this process, and a necessary development is greater control over passage of information from the system to SPSS*, including the passage of variables from different parts of the schedule (i.e. from different dBASE files).

Initial anxiety over battery levels meant that a heavy mains unit had to be carried around: the Zenith has no means of estimating how much charge is left. More recent laptops have this facility, or back-up packs.

### *Positive points*

Entering the data proved very easy, and acceptable to patients; no patient objected. (This was not because of delirium; the prevalence of any cognitive impairment was very low indeed in the survey.) The interviewer, with no previous knowledge of, or interest in, computers became rapidly accustomed to the new medium. It was relatively easy to change the schedule, although this required programming skills if one wanted to reduce the time taken to do this. The 'doodling' facility was used rarely, but was appreciated when necessary. The default 'missing' value system worked very well, and the ability to scroll forwards and back within any one part of the questionnaire was necessary to follow the patient's responses rather than the order of the questionnaire.

The amount of paper used in the project was reduced significantly.

## *Comment*

This tentative essay into paperless psychiatric research proved, inevitably, more complex than had been anticipated. More effort was expended than would have been the case with paper schedules alone, but valuable experience was gained. No intrinsic disadvantage of gathering data directly into lap-top computers was discovered, but a great deal of work on the programming and facilities is required if it is to become the norm rather than the exception. Developments in lap-top computer hardware have already obviated some of the niggles we discovered (e.g. slow speed), but the main challenge is in the software development. We conclude that specialist software engineers are needed for further development of this method.

*dBASE III Plus is a trademark of ASHTON-TATE. MSDOS and MSBASIC are trademarks of MICROSOFT CORPORATION. SPSS and SPSSPC are trademarks of SPSS Inc.

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