Computers in clinical practice: applying experience from child psychiatry

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Summary points

- This article explores the use of information technology in child psychiatry, a specialty that relies almost entirely on clinical skills, so many of the principles may therefore be applicable to other specialties
- Use of computers in clinical practice is at present largely limited to computerised versions of written tests or interviews
- Future developments may use technologies such as voice activated software, graphics, measuring response time, tailored testing, and virtual environments for tests that cannot be transcribed to written tests or performed during standard clinical interviews
- Outcome studies are needed to assess the impact of such technology
- Clinicians are best placed to identify specific potential developments and should be alert to the possibilities presented by the increasingly flexible and sophisticated technology available

Computers may be used to support information management, general administration, and clinical practice in a health service. I review the last use, drawing on examples in child psychiatry.

Advances have been made over the past 30 years in the use of computer aided assessment, diagnosis, and treatment in many clinical specialties. The place of computers in clinical practice depends on whether they confer an overall advantage, improving outcome, and whether they are acceptable to patients and clinicians. Child psychiatry is a clinical specialty: management rests very much on the skills of the clinician, with little use of automated investigation or instrumental intervention.[1] Thus, the principles governing the use of computers in this specialty may apply to many other clinical specialties. Coiera forecast the essential role of informatics in medicine in the coming century, describing it as fundamental to medicine as the study of anatomy.[2] However, the application of modern technology frequently fails because of inadequate dissemination, which I hope to overcome, at least in part, in this review.

Methods

I searched three databases (Medline, PsychLit, and BIDS) for references to computers or software used in medicine, psychology, and psychiatry published between 1991 and 1999 inclusive. In this review I have cited articles that described the clinical application of computerised assessments or treatments, their advantages and disadvantages, their acceptability to patients and clinicians, and ethical issues. Other relevant articles not included in this review are listed on the *BMJ*'s website at bmj.com.

Using computers in assessment: history taking, examination, and diagnosis

Computers can aid clinical assessment by replicating the clinical interview or written test or by assisting the diagnostic process. Taking a medical or psychiatric history is time consuming and open to errors. These may result from the interviewing technique, the interviewee's response to this, omissions, the interviewer's perception of the patient's speech and behaviour, or inferences drawn and decisions made on the basis of these. Physicians taking a medical history omitted up to 35% of the content of a computer gathered history.[3] Computers may substantially benefit clinical practice in overcoming some of these problems. For example, when provided with the results of a computer assisted interview to support their own assessment, child psychiatrists identified a different set of problems and prescribed different treatment.[4]

The characteristics of computerised versions of written tests have been studied. Computerised assessments of self reported self concept,[5] behaviour,[6] and personality[7] and a depression screening instrument[8] for children have been validated against paper versions. Not all computerised tests have written equivalents: one has been developed to assist the assessment of emotional, physical, and sexual abuse.[9] The availability of such tests in child psychiatry potentially enhances children's ability to describe their own perceptions of themselves and their behaviour in a way that might not otherwise be as acceptable to them. Computers can also assess children's performance. For examples, programs measuring children's visual vigilance[10] and impulsiveness and attention[11] show significant differences between children with mental health problems and normal controls, but they are disappointingly poor at discriminating between them.[12]

Computer assisted interviews for parents or families have also been developed and used successfully. The Achenbach child behaviour checklist has been computerised for completion by parents. This is reliable and acceptable to parents, who were prepared to give more spontaneous written answers than with the paper version.[13 14] Diagnostic interviews can also be acceptable to clinicians.[15]

Using computers in treatment

The use of computers in the treatment of childhood psychiatric disorder followed developments in adult mental health. Software that mimics the human-human therapeutic relationship was first developed in

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An extra reference list appears on the BMJ website

the 1960s.[16] Popular computer fantasy games have been used in child psychiatry to address issues of impulse control, long term planning, and peer relationships,[17] but with no evidence that any apparent gains during treatment are retained long term. More specialist programs have also been developed. Children and adolescents with attention deficit disorder can benefit from a computerised cognitive training system.[18 19] Measures of behaviour before and after training demonstrated that those children who performed well in the training showed improved behaviour.[18]

Children with emotional or behavioural problems seem to make appropriate use of a program designed to encourage expression through the use of "thought" and "speech" bubbles in a comic strip environment,[20] although no outcome studies are yet available. An uncontrolled study of a program designed to help families come to terms with divorce suggested that it encouraged parents and adolescents to show increased understanding and communication and decreased conflict related to the divorce.[21] A controlled study of this is needed. Another program is designed to help children with communication difficulties come to terms with traumatic experiences.[22] The program uses pictorial and metaphorical dialogue that facilitates both assessment and therapeutic work, but again controlled outcome studies are needed.

Computer programs have been developed to assist children with learning disability. Children with Down's syndrome and with severe language problems show significantly greater progress with computer based training than standard training in language and social communication.[23] Children with Down's syndrome and autism who fail tests of false belief can be taught false belief using a program specifically designed for this.[24]

There is evidence that some parents may benefit from computer assisted interventions. In one study 42 single mothers made appropriate use of a computer mediated social support network devised to address parenting issues.[25] The mothers reported less parenting stress using the network, and the "virtual group" developed a sense of community.

Virtual environments, often synonymous with virtual reality, have also been used in clinical practice. These are computer generated environments that provide continuous stimuli to one or more senses and usually include a visual three dimensional representation that responds in real time to the user. Virtual environments have been used to support the treatment of anorexia nervosa.[26] Controlled outcome studies have shown virtual environments designed for children with severe learning disability to be a safe and efficacious means of training in daily living skills and increasing self initiated activity.[27]

Advantages and disadvantages of using computers in clinical practice

The advantages of using a computer assisted interview over a written test are that the former can be less daunting than long lists, efficient, provide immediate feedback to patients, and overcome problems of illegibility and inefficient coding of data.[14 28] The quality of data obtained by computer based assessments is as high as that from clinical interview or written tests.[6–8 28] Computers are also tireless, giving the same response irrespective of time of day, and can be cost effective.[15] Furthermore, patients have greater control than in a standard interview.[29]

Adult psychiatric patients impart information to a computer that they do not impart to a fellow human—such as reporting higher daily alcohol intake[30] and suicidal ideation.[31] The question remains as to whether the answers to computer programs are more accurate, and, indeed, one study contradicts these findings.[32] Young people have also reported more experiences to computers than to interviewers on sensitive topics such as sexual experience[33 34] and substance misuse.[35]

Disadvantages of the use of computers include the initial capital outlay for hardware and software, with additional costs in updates. Further resources may be required, including administrative staff and rooms. Clinical staff may not be supportive and may not engage with training, patients may decline to use computers or may not have the requisite skills, and their use on home visits may be impractical.

The real test here is the impact of computers on outcome. For example, a diagnostic program on a surgical unit increased diagnostic accuracy from 81% to 91%, with a fall in the rate of perforated appendixes from 36% to 4% and unnecessary abdominal operations from 25% to 7%.[36] Similar outcome studies are needed in psychiatry, particularly given the underuse of investigations[1] and the effect of the use of computers on prescribed treatment.[4]

Acceptability of using computers in child mental health

Most adults enjoy, or even prefer, a computerised test or interview.[28 37] In psychology and psychiatry most resistance has come from clinicians.[15] I and colleagues have seen children make remarkable and sometimes unexpected observations and changes in their lives when using computers to describe personal issues in a structured way. Two aspects of the use of computers that may affect this process are the control children have over the interview[29] and the fact that they need not fear the immediate and potentially prejudicial response of a fellow human. Some studies report that young people find computerised testing equally or more acceptable than the clinical interview or written test.[34 35] In one study, although parents initially believed a computer assisted interview to be less friendly and personal, they were more positive about computerised testing after completing the interview.[13] No other studies have described patients withdrawing on the grounds of computerised assessments being impersonal.

Ethical issues

The ethical debate on the use of computers, irrespective of their efficacy and acceptability, is well rehearsed.[28–30 38] Computer assisted interviews may be inhumane, and, arguably, patients should not be subject to such a procedure at a time of psychological distress.[30] However, acutely ill adult patients report feeling better and more able to understand themselves after having taken a computerised test.[39] They prefer the privacy and lack of pressure of time afforded by the computer.

Concerns have been expressed about the displacement of professionals and the loss of the rapport that can be built up in a traditional clinical interview.[40] An additional danger is the wholesale use and interpretation of automated tests by people without training or skills in their use.[41] These concerns may be based on a misconception of the role of computers in clinical practice. They should not replace professionals but should be seen as a tool. Like a surgeon's scalpel, they may wreak damage in unskilled hands. Such tools should be administered only by professionals qualified to do so and who have an understanding of the specific test being used, including its limitations.[38]

The privacy of patients and their relatives should be protected. This involves a justification for using the proposed test, avoiding unwarranted intrusions, and obtaining informed consent.[38] The availability, ease of completion, or acceptability to patients do not in themselves justify the use of a test or intervention that may be an unwarranted intrusion. Tests should be designed to gather necessary information without being overintrusive. The nature, purpose, and risks and benefits of a proposed test or intervention need to be explained to the patient and, when necessary, to the person able to give consent on the patient's behalf. There is an ethical duty on both the developers of tests and on those administering them to meet these guidelines.

Future developments

Computers have not yet been used to their full potential in clinical practice. For example, little use has been made of tailored, or adaptive, testing. This is sophisticated programming that ensures the selection of test items appropriate to the individual being tested.[42] Tailored testing is often abandoned in written tests and interviews because of its complexity. However, computers can calculate more precisely the necessity of each question as it arises and can detect inconsistencies and return to previous questions in order to clarify them further. This results in fewer non-responses and inconsistencies[35] and may reduce testing time by up to 50%.[43] A simulation study showed that accurate decisions are made on the basis of the administration of relatively few test items.[44]

Speech recognition software has also been used in personality testing[45] and the screening of depressive symptoms,[46] and it can potentially be used in most tests and interventions currently available. Measuring response times or differences in how hard keys are pressed may provide clinically important information.[47] There is further potential in many areas of medicine for the development of tests and interventions using virtual environments to assist patients and clinicians in developing new skills.

Conclusions

There is a wide range of uses for computers in clinical practice. However, their use at present is largely limited to computerised versions of written tests or interviews. Future developments may benefit from technologies such as voice activated software, graphics, measuring response time, tailored testing, and virtual environments. Outcome studies are needed to assess the impact of such technology.

This is true of child psychiatry, a specialty that relies almost entirely on clinical skills, and may, therefore, be applicable to other specialties. However, such technology is no panacea, and should be used discriminately. Clinicians are best placed to identify specific potential developments and should be alert to the possibilities presented by the increasingly flexible and sophisticated technology available.

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Endpiece

Marxian philosophy

You've got a goal. I've got a goal. Now all we need is a football team.

Groucho Marx

INFOPOINTS

CyberTranscriber—the virtual medical secretary on your desk

Clinic letters and discharge summaries provide the fundamental link between hospitals and primary care. In 1997-8 there were 41.635 million outpatient visits to NHS hospitals in England,[1] with each visit generating a typed letter. The widespread implementation of voice recognition systems should be considered as a response to the increasing typing load experienced by medical secretaries. However, currently available desktop systems require speech enrolment and considerable care to produce text with error rates of 3-5%.

CyberTranscriber[2] is a convergent technology, which exploits the internet, speech recognition, and email to generate letters and reports. Unlike conventional speech recognition software, it does not need speech enrolment, and the accuracy of the final report is equivalent to that achieved by an experienced medical typist. The user dictates down a telephone line, using the telephone keypad to control the record, pause, and "rewind" functions. The dictation is remotely processed into a rough draft by speech recognition software, and both the text and voice files are automatically routed via the internet to medical transcriptionists who correct the rough draft. Within 24 hours (range 4-24), all the text is returned by email as a Microsoft Word attachment.

We have explored the possible role for CyberTranscriber in NHS hospital practice by comparing the efficiency of generation of clinic letters by an experienced medical typist with letters generated by CyberTranscriber. A total of 441 consecutive outpatient clinic letters of similar length were generated, of which 215 were produced by conventional dictation and manual typing and 226 by telephone dictation and CyberTranscriber. The average time taken by the medical secretary to generate and print completed letters was 7.7 minutes per letter with manual typing and 2.2 minutes a letter with CyberTranscriber. There was no difference in the error rate between the two methods.

Thus, CyberTranscriber was three times more efficient in generating letters than an experienced typist. In practical terms CyberTranscriber allowed the medical secretary to complete the week's clinic letters in the equivalent of two days' work rather than the five to six days associated with manual typing. Further improvement in efficiency will be possible once NHSnet is operational, as the returned email could be forwarded to the relevant general practitioner without the need to print and post a letter.

CyberTranscriber could make a considerable impact on the efficiency of communication between primary and secondary care. The system costs about 1p per word but represents an irresistible technological response to the need to improve efficiency in the NHS.

For more information about the project see www.epsteingastro.demon.co.uk

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1 Government Statistical Service. Table B18 health care. Hospital outpatient activity: outpatient attendances, by sector; NHS trusts England. www.doh.gov.uk/HPSSS/TBL_B18.HTM (accessed 10 Aug 2000).
2 Speech Machines. www.cybertranscriber.com (accessed 4 Aug 2000).