DIGITAL TECHNOLOGY An evaluation of automated, internet-based psychiatric history taking

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ABSTRACT

History taking using a web-based, automated software module (Historian) was compared with standard outpatient initial assessment on a community sample of 27 new psychiatric outpatients. The comprehensiveness and acceptability of the computer interview was evaluated. Historian was found to take psychiatric histories comparable with regard to content and comprehensiveness with those taken by clinicians. Historian was found to be highly acceptable to patients on a wide range of measures. History-taking software may help to prioritise referrals, focus the initial assessment and reduce consultation time in a psychiatric outpatient setting. The availability of a comprehensive history (Historian) is likely to lead to a shorter face-to-face consultation which could then be better focused on diagnosis and treatment. Service users with special needs such as hearing impairment, poor mobility or with no command of the English language (but literate in their native tongue) may benefit from improved access to psychiatric services.

KEYWORDS: Psychiatry, history taking, technology

Introduction

Primary care and mental health services are under increasing pressure despite a £450 million investment in reducing waiting times and increasing access to psychological therapies.[1] Access to rapid assessment and treatment is not helped by the government's £22 billion target for efficiency savings.[2] The government's mental health strategy, 'No health without mental health' recommends improving care and access to services through the greater use of information and communication technologies.[3]

Medical history taking lies at the centre of clinical diagnosis and decision making. Computer-assisted history-taking systems are tools that aim to aid clinicians in gathering data from patients to inform a diagnosis and/or treatment plan.[4]

Technological advances continue to develop at an exponential rate and offer the potential to enhance clinical care. Digital mental health has seen a rapid growth in the development of online and mobile device delivery of psychological interventions such as cognitive behaviour therapy, as well as e-mental health services allowing users for example, to record and monitor their symptoms over time, access professional advice and provide mutual support. 'ClinTouch' is one such service, both a platform technology and a stand-alone app; this tool aims to help people with psychosis start to manage their own symptoms.[5] ClinTouch provides real-time information to care coordinators and clinical teams on a client's progress. In addition, it gives real-time alerts if a client shows personalised early warning signs for relapse, allowing for very early intervention to avert this. It has been evaluated through a randomised controlled trial conducted with 80 service users.

Despite the increasing variety of available applications there is a paucity of evidence to support their wider use and there remains a significant challenge in how best to evaluate the acceptability, content, safety and clinical and cost effectiveness of digital solutions.[6] There may also be significant time constraints regarding completing such evaluations given the rapid advances in technology and the pressures facing some commercial developers in what is becoming an increasingly competitive environment.

The NHS has started to address these issues through new digital tools pages allowing developers to submit apps through the **https://developer.nhs.uk** website for assessment. In time, people will start to see more apps on the digital NHS apps library that are labelled 'being tested in the NHS' or 'NHS approved'.

Taking a psychiatric history offers special challenges in that it is a complex task, which can be time consuming and is subject to error. Information technology has been shown to aid clinical assessment by replicating part of the psychiatric interview. Computerised history taking can be used in various clinical settings and may be of benefit in eliciting potentially sensitive information, for example, on alcohol consumption,[7] sexual health[8] and substance misuse.[9] An evaluation of psychiatric history taking using a personal computer (PC) on an inpatient sample has been conducted.[9] No study, to our knowledge, has evaluated a package employing wider dissemination and access via internet delivery or on new outpatient referrals. This study aims to evaluate an automated web-based, computerised, psychiatric history module (Historian).

Historian presents an automated psychiatric history-taking system that allows patients to complete a statement based psychiatric history and mental state examination using the

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website **www.historian.uk.com.** Historian was developed using Microsoft® ASP.NET software. The software currently runs on a virtual server and all statement data presented to the patient is stored in a Microsoft MS SQL Server database. The program employs a 'pick and click' statement-based approach to history taking whereby the patient 'mouse-clicks', or uses a pen on a touch sensitive screen, to indicate any statements that he or she agrees with. Historian formats the responses and builds up a comprehensive history and mental state over around 30 web pages. Historian allocates a unique identifier to the patient but stores no identifying information to ensure anonymity of the history. The program enables histories to be taken in more than 15 languages including many that are common among refugees with an instant English output.

The Historian website stores anonymised data in a Microsoft MS SQL Server database. The Historian website does not store cookies. The Historian app stores data as anonymised text files on the individual user's mobile device. Neither will knowingly release any stored personal information to third parties. Historian does not collect any personal data from individuals that will uniquely identify them. Histories recorded are not identifiably linked with the user's personal identity and are stored anonymously through a coded identifier until a user wishes to delete their stored history.

Historian does date and time stamp records but does not currently upload data to any electronic health record system although this would be a desirable feature say for contemporaneity and for access by health professionals. The user has control over their own data and who they choose to send it to. They may, for example, print, fax, or email their histories as text files to an appropriate health professional. Users are advised that emailing their histories without using a secure email facility may lead to disclosure of sensitive personal information.

The Data Protection Act regulates the collection and use of personal data. The General Data Protection Regulation (GDPR) is the new legal framework that will come into effect on the 25 May 2018 within the EU. If data is not personal data, it is not caught by the Act, but it is not always obvious whether data is personal data or not. Historian, while recording Internet Protocol (IP) addresses in logs, does not profile users using IP addresses. An IP address is a unique address that identifies a device on the Internet or a local network. IP addresses are used for demographic purposes such as counting visitors, their countries of origin and their choice of internet service provider (ISP). An IP address in isolation is not personal data because it is focused on a computer and not an individual. The current view is that if dynamic or static IP addresses are collected simply to analyse aggregate patterns of website use they are not necessarily personal data. They will only become personal data if the website operator has some means of linking IP addresses to a particular individual, perhaps through other information held or from information that is publicly available on the internet. ISPs will of course be able to make this link but the information they keep will not normally be available to a website operator.

Method

The study sample derived from new case outpatient referrals made to each of the four general adult consultants, working in the Havering catchment area in adult psychiatry. A letter and information sheet, outlining the nature of the study and a request for consent to participate, was sent with the initial appointment letter for each appropriate referral. Patients who could be identified from the referral letter as having organic problems, such as probable younger onset dementia, were excluded. Inclusion criteria were:

> GP referral of new cases for psychiatric outpatients
> literacy in English because the computer program to be evaluated was the English version of Historian
> age group confined to 18–65.

Consenting patients were randomly allocated so that half would receive the face-to-face (clinician's) interview first, followed by the computer interview; the other half of the sample would conduct the computer interview, followed by the clinician's interview. In view of the potential fluctuation of symptoms, over relatively short periods of time, the computerised and clinician interviews were arranged within a two-week time frame of each other.

The computerised interview was conducted using a standard IBM-compatible personal computer with a touch screen monitor, standard keyboard, mouse and a broadband internet connection. The website was accessed by the researcher. The patient followed the instructions on the computer display and attempted to answer all of the questions without any assistance from the researcher. A printed copy of the computer interview was offered to the patient after the completion of both interviews. A sample history taken by Historian may be viewed at **www.historian.uk.com/sample1.aspx**

In addition to collection of demographic data a 'Computer experience' questionnaire assessed the frequency and duration of the patient's computer use including experience at work, home, and internet access. The time taken to complete the computer interview was recorded. The computerised psychiatric history was divided into 35 areas. The computer printouts and outpatient reports were compared as to the presence or absence of historical information recorded. An 'Acceptability questionnaire', to assess nine categories of user acceptability using a five-point scale, was completed by the patient at the end of the computer interview.

The study obtained ethics approval from the local Research and Development department and all participants gave informed consent.

Results

Demographic data

Of the 34 patients asked to participate in the study, 27 agreed to take part giving a response rate of 79%. Thirteen patients received the computer interview first, followed by the clinician's interview second. The other 14 patients took the computer interview after the clinician interview. The sample included 14 women (51.9%) and 13 men (48.1%). Mean age of the sample was 41 years and ranged from ages 19 to 63.

Computer experience

Table 1 illustrates the results of the computer experience questionnaire.

In addition, the mean value for years of computer experience was 4.2 years (standard deviation [SD] = 3.85) with a range of between 0 and 12 years.

Table 1. Results of the computer experience questionnaire

	Frequency in patient numbers (%)
Patients who have current use of a computer at home	10 (37.0)
Patients who have current use of a computer at work	14 (51.9)
Patients who have current access to the internet	20 (74.1)
Frequency of computer use	
> daily	10 (37)
> 1–2 times a week	6 (22.2)
> 1–2 times a month	3 (11.1)
> occasionally in the year	1 (3.7)
> never used	7 (26)

Time taken to complete computer interview

Figure 1 illustrates the time taken to complete the computer interview.

Mean time taken to complete the computer history and mental state examination was 62 minutes (SD=24.4) with a range between 30 and 120 minutes. There was a significant negative correlation between time taken to complete the computer interview and number years of computer experience (r [coefficient of variation] = −0.682, df [degrees of freedom] = 25, p<0.001). There was no significant relationship between the time for the computer interview and the total acceptability scores (r = −1.10, df = 25, p = 0.583).

Comprehensiveness

Paired samples t-test analyses showed that the difference between the number of items mentioned in the two types of interviews was highly significant (t = 4.359, p<0.01).

All 27 participants achieved a higher number of items mentioned in the computer interview (mean = 22.8, SD=4.83) than in the clinician's interview (mean = 15.5, SD=7.61). Separate paired t-test

analyses of participants receiving the computer interview before the clinician interview (t=20.5, p<0.01); those having the clinician interview before the computer interview (t=19.6, p<0.01) revealed similar results.

Comparison between the computer and clinician interviews, with respect to the 35 item categories, is shown in Table 2. In 24 categories the participants had greater items mentioned in the computer interview than the clinician's interview. Participants had more items mentioned in the clinician's interview in nine categories. In two categories an equal number of items were mentioned in each interview format.

Acceptability of computer interview

Table 3 illustrates the number of responses according to each category of acceptability. The mean acceptability score for each category of acceptability was greater than 3 out of a maximum of 5, in all areas apart from 'relevance of questions of computer interview' (mean = 2.85, SD=0.99). The mean acceptability score of the entire acceptability questionnaire was 4.07 (SD=0.78).

Figure 2 illustrates the user satisfaction on a scale of 1 (lowest) to 5 (highest).

Conclusion

Comprehensiveness of computer interview

The computer interview elicited significantly more items than the clinician interview. This reflects the nature of computerised interviewing in that systems can be systematic and more comprehensive than a clinician who may be restrained by time and workload pressures and who may omit questions. The Historian interview elicited a significantly more comprehensive psychiatric history in 20 out of 35 categories.

Acceptability of computer interview

In general, the acceptability of the Historian program was very good with a mean score of 4.07 out of 5. Patients may experience this computer interview as a novel experience. Perhaps this contributed to the high acceptability score. The acceptability findings are consistent with previous work. Other researchers have shown computer psychiatric interviewing to be efficient[11] and highly acceptable to patients.[12–16]
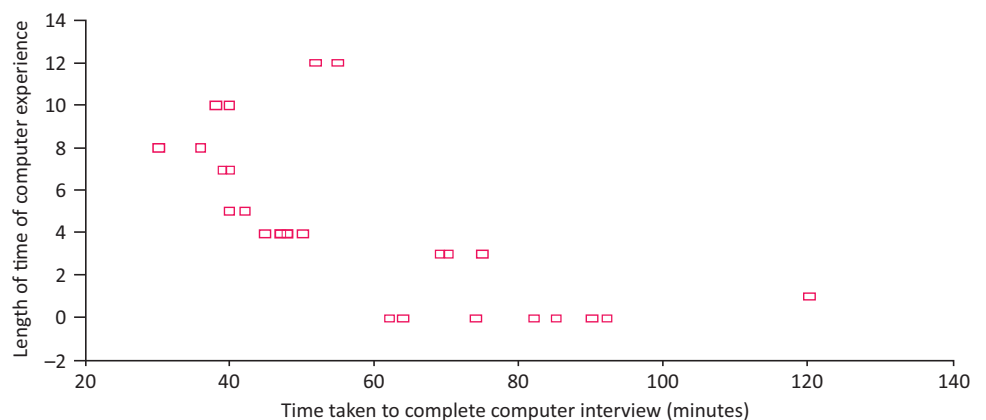

Fig 1. Time taken to complete computer interview.

Table 2. Comparison of items mentioned between computer and clinician interview

Item category in psychiatric history	Number of participants (out of 27) in which item is mentioned in …	
	Computer interview (%)	Clinician interview (%
Demographic		
Gender	27 (100)	12 (44)[a]
Martial status	27 (100)	3 (11.1)[a]
Age	27 (100)	16 (59.3)[a]
Employment status	27 (100)	4 (14.8)[a]
Offspring	25 (92.6)	2 (7.4)[a]
Presenting complaints	27 (100)	21 (77.8)[b]
Duration of complaints	26 (96.3)	15 (55.6)[a]
Family history		
Parents	26 (96.3)	23 (85.2)
Siblings	25 (92.6)	20 (74.1)[b]
Relationships	25 (92.6)	11 (40.7)[a]
Bereavements	16 (59.3)	6 (22.2)[b]
Family history of psychiatric illness	23 (85.2)	21 (77.8)
Family history of physical illness	24 (88.9)	0 (0)[a]
Personal history		
Birth and development	8 (29.6)	24 (88.9)[a]
Childhood	19 (70.4)	19 (70.4)
Family life	25 (92.6)	6 (22.2)[a]
Schooling: problems (eg bullying, truancy)	12 (44.4)	18 (66.7)[b]
Schooling: friends	25 (92.6)	18 (66.7)[b]
Schooling: academic achievements	27 (100)	21 (77.8)[b]
Past employment	25 (92.6)	14 (51.9)[a]
Current employment	15 (55.6)	15 (55.6)
Past relationships	25 (92.6)	19 (70.4)[b]
Current relationships	16 (59.3)	20 (74.1)[b]
Children	14 (51.9)	16 (59.3)
Finances	25 (92.6)	16 (59.3)[b]
Housing	27 (100)	16 (59.3)[a]
Interests/hobbies	26 (96.3)	6 (22.2)[a]
Beliefs (eg religious)	23 (85.2)	2 (7.4)[a]
Alcohol history	25 (92.6)	23 (85.2)
Drug history (eg recreational drugs)	23 (85.2)	25 (92.6)
Forensic history	21 (77.8)	19 (70.4)
Psychosexual history	25 (92.6)	14 (51.9)[a]
Past medical history	23 (85.2)	25 (92.6)
Past psychiatric history	23 (85.2)	27 (100)[b]
Medication	20 (74.1)	25 (92.6)[b]

[a]p<0.01; [b]p<0.05

The acceptability of Historian was high in most areas of the computer interview. The availability of a touch-screen monitor for those who lack adequate keyboard or mouse skills may have contributed to this good user acceptability. The degree of *relevance* of the questions was the only area of acceptability that did not score greater than 3 on the 5-point scale. The comprehensiveness of the computer interview may result from Historian covering virtually all aspects of a psychiatric history irrespective of relevance to a particular case. The duration of the computer interview could also be difficult for some patients to endure; however, the software enables patients to exit at any stage and return to complete the interview at any time. The maximum time was 120 minutes although the mean was 62 minutes. Patients who had more years of experience in using computers spent less time completing the assessment. Around one-quarter of the sample had no previous experience of computer usage. Perhaps with the more widespread use of information technology the application of such programs could prove to be less time consuming in the future.

Limitations to the study

The study is limited by the small patient sample. Patients with moderate to severe learning disability, organic brain disorders and those too disturbed to participate in a computerised self-assessment were excluded (although no such patients were referred or participated during the study period). Patients who lack capacity to consent, say because of the severity of their psychotic symptoms or associated aggression, would not be able to complete a computerised psychiatric interview but may regain capacity at a later date. Relatives or next of kin might be able to complete a computerised assessment on their behalf following a best interest's decision. The 5-point Likert scale used in the study has not been validated but offers a survey of users' views on the acceptability and use of Historian. The assessment was undertaken in a busy inner-city psychiatric service with a heavy clinical workload. The study aimed to be as naturalistic as possible in that patients having been referred by GP's were initially assessed by experienced psychiatric trainees. Two experienced psychiatric trainees conducted the clinical interviews. One of the authors (JT) who developed the Historian software and assisted with the methodology remained independent of the evaluation.

Potential benefits

It is envisaged that, in practice, patients could complete the computer history (perhaps in stages) from home, or from a 'health internet café' or a community base, prior to their initial consultation. Such an approach would potentially help in screening and prioritisation, in saving consultant time and costs, and enable a better focus on the patient's diagnosis and management rather than the time consuming but necessary task of history taking. Historian may benefit non-specialist services that are required to take a history from a user with severe hearing impairment or where there is a need to take a history in another language and interpreters are not readily available. Historian may also potentially be of value to younger users (possibly those presenting with first episode psychosis) some of whom might be suspicious of contact with mental health services and may be more accepting of the technology.

Table 3. Historian computer interview – user satisfaction (score 1 = low acceptability, score 5 = high acceptability)

Acceptability question	Number (%) responding with score 1	Number (%) responding with score 2	Number (%) responding with score 3	Number (%) responding with score 4	Number (%) responding with score 5	Mean response (SD)
I found that most questions were relevant to my problem	2 (7.4)	9 (33.3)	7 (25.9)	9 (33.3)	0 (0)	2.85 (0.99)
I found it difficult to answer questions from the computer	0 (0)	3 (11.1)	4 (14.8)	14 (51.9)	6 (22.2)	3.85 (0.91)
The computer interview helped me to express my problems	0 (0)	2 (7.4)	8 (29.6)	12 (44.4)	5 (18.5)	3.74 (0.86)
I had difficulty using the mouse or touchscreen	0 (0)	0 (0)	3 (11.1)	10 (37.0)	14 (51.9)	4.41 (0.69)
I felt better at the end of the computer interview	2 (7.4)	4 (14.8)	7 (25.9)	12 (44.4)	2 (7.4)	3.30 (1.07)
I felt uncomfortable answering questions from a computer	0 (0)	0 (0)	5 (18.5)	6 (22.2)	16	4.41 (0.80)
I feel that others would benefit from the computer interview	0 (0)	0 (0)	2 (7.4)	16 (59.3)	9 (33.3)	4.26 (0.59)
I found it was a stressful experience	0 (0)	0 (0)	3 (11.1)	12 (44.4)	12 (44.4)	4.33 (0.59)
I would do this interview again if required	0 (0)	1 (3.7)	4 (14.8)	14 (51.9)	8 (29.6)	4.33 (0.68)

Social desirability distortion refers to the tendency by respondents, under some conditions and modes of administration, to answer questions in a more socially desirable direction than they would under other conditions or modes of administration. Meta-analysis of social desirability distortion compared computer questionnaires with traditional paper-and-pencil questionnaires and with face-to-face interviews in 61 studies.[17] The authors found that there was less distortion on computerised versions of interviews than on face-to-face interviews. The authors recommend further research is needed on the effects of context and interface on privacy perceptions and on responses to sensitive questions but patients reporting on highly sensitive areas of their lives may feel free of social pressure and may be less prone to give socially desirable answers in a computer-based assessment. History-taking software can also be of value as a research tool, since output is generally routinely recorded.

Potential risks

It is important that developments in computerised assessments are properly evaluated. Highly sensitive personal data are necessarily collected during the history-taking process and there
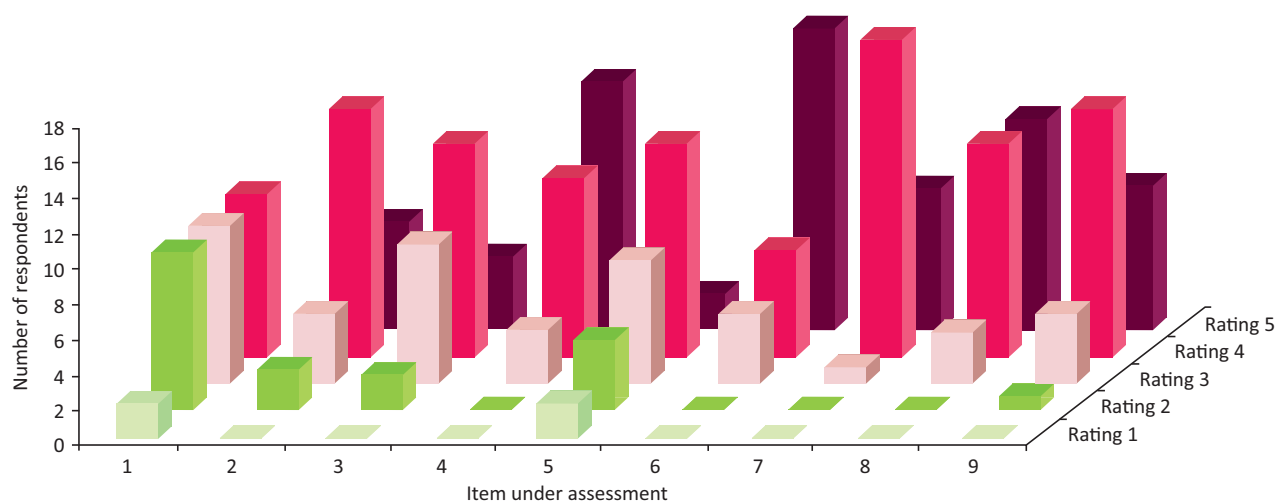

Fig 2. User satisfaction. Items under assessment: 1 = perceived relevance of questions; 2 = ease of answering questions; 3 = ease of expression of problems; 4 = ease of use of computer devices (eg mouse, touch pen, keyboard); 5 = degree of satisfaction after interview; 6 = degree of comfort during interview; 7 = view of likely benefit to others; 8 = stressfulness of interview; 9 = perceived likelihood of future use.

is a clear need to ensure that data are adequately safeguarded through a combination of approaches which may include for example the use of anonymity and appropriate encryption techniques.

Systems will need to be adaptable as psychiatric histories have evolved and have become more complex over time in response to social changes. These changes include increased ethnic diversity, more complex family relationships, developments in how sexual identity is perceived and recorded and the usage of a wider range of psychoactive substances. Other aspects of the history can alter for example changes in the benefit or educational system.

Although software can simulate empathic responses, computerised assessments may possibly impact on the relationship between the doctor and patient. User satisfaction of some computerised history-taking systems suggests that computerised interviewing can be broadly therapeutic, but some psychiatrists may continue to question this with the argument that technology may dehumanise psychiatry. With many mental health and primary care services facing shortages of staff and increasing demands, consideration may need to be given as to whether it is acceptable to disengage the information-gathering component of history taking from the therapeutic element.

There is a need to determine what aspects of care suffer if they lack face-to-face contact and what can be responsibly and safely managed through distance care. Non-verbal communication such as a patient's level of distress or mood is readily accessible in a face-to-face interview and through tele-mental health assessment, but such cues are not generally readily accessible in computerised assessments. The difficulties in accurately assessing the mental state through self-report is also a challenge that psychiatrists face in using computer programs in routine care.

The Historian website does not currently highlight clinical risks say of suicide or self-harm or undertake any diagnostic evaluation or offer clinical management advice but software that offers such approaches either through clinically based algorithms or machine learning, carries potential medicolegal risks.

Future developments

Comprehensive English psychiatric history and self-report mental state software has been made available as freely downloadable apps (Historian v1.0) for use on mobile (iOS and Android) devices. Historian does not incorporate any translation capability but offers 1st and 3rd person histories and an automated analysis of the completed history, highlighting key features and possible risks and offering likely psychiatric diagnoses based on the selections made. Information can be emailed, faxed or printed from the app. Historian carries appropriate legal disclaimers and does not offer clinical management advice. The diagnoses it generates have yet to be evaluated against those of clinicians. ∎

Conflicts of interest

One of the authors (JT) developed the Historian software and assisted with the methodology but remained independent of the evaluation. Historian has had no external funding for its development, translations or evaluation.

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