

SESSION IX HEALTH APPLICATIONS

Enhancement of adherence to tricyclic antidepressants by computerized supervision

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An on-line computer program to enhance drug adherence is described for individuals receiving tricyclic antidepressant treatment for depression. Because supervision is important in increasing adherence, a computer program was designed to provide this service and to intervene in particular adherence problem areas, such as comprehending the prescription, managing side effects, and altering negative cognitions about medications. An evaluation study of the program is presented.

The use of on-line computer technology has become an increasingly important research area in mental health service delivery (Johnson, Giannetti, & Williams, 1976; Sidowski, Johnson, & Williams, 1980). Administrators of community mental health centers have implemented management information systems to monitor staff availability and client variables, such as progress through treatment, so that more effective decisions can be made regarding the delivery of mental health care to the community (Fishman, 1980; Laska, Siegel, & Bank, 1980). Klingler, Miller, Johnson, and Williams (1977) evaluated an on-line system for psychiatric assessment and found that this technology reduced program costs and time involved in report writing. Computer technology has been used clinically for psychiatric interviewing (Greist & Klein, 1980; Klein, Greist, & VanCura, 1975) and psychiatric diagnosis (Erdman, Greist, Klein, Jefferson, Salinger, & Olson, 1981), and computerized psychotherapy has been attempted (Colby, 1980; Slack & Slack, 1977). With these technological advances, mental health service delivery may be more effective and more widely distributed to individuals in need (Lanyon, 1971, 1972).

Since depression is a common and serious psychiatric disorder, investigations into ways that computer technology can help the depressed individual are needed.

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Schuyler and Katz (1973) reported that at least 12% of the adult population have had or will have depression serious enough to need treatment. A study by the National Institute of Mental Health (Secunda, Katz, Friedman, & Schuyler, 1973) found that 15% of adults, or 20,000,000 people, experienced significant depressive symptoms, and Gallant (1976) estimated that over 20,000 of these depressed individuals commit suicide every year. Using rigorous diagnostic criteria, Weissman, Myers, and Harding (1978) found depression in 6% of the population of an urban community.

One treatment for depression makes use of the group of medications known as tricyclic antidepressants. This class of drugs represents a powerful therapeutic agent. Morris and Beck (1974) reviewed 93 double-blind studies involving tricyclics, and in 61 studies, the tricyclic was significantly more effective than a placebo. In no study was a placebo more effective than a tricyclic. Cole (1964) and Klein and Davis (1969) reported similar findings. Despite the heterogeneity of depression, these drugs have proved valuable in reducing symptomatic severity in different types of depression (Akiskal, 1979; Amsterdam, Brunswick, & Mendels, 1980; Beck, Rush, Shaw, & Emery, 1979; Covi, Lipman, Derogatis, Smith, & Pattison, 1974; Haskell, DiMascio, & Prusoff, 1975; Klerman, DiMascio, Weissman, Prusoff, & Paykel, 1974; Peselow & Gershon, 1980).

Despite the efficacy of tricyclic antidepressant therapy, compliance or adherence to treatment programs is likely to be low. Blackwell (1976) concluded that between 25% and 50% of outpatients fail to take a significant part of their medication. With such low

adherence rates, some nonresponders to tricyclic antidepressants may in fact be nonadherers. Although a relatively safe and efficient method to treat depressed individuals exists, low adherence rates constitute a problem of considerable magnitude. Computer technology may assist in reducing this problem.

Adherence is a problem encountered by all medical and psychological practitioners and is defined by Haynes, Taylor, and Sackett (1979) as "the extent to which a person's behavior (in terms of taking medications, following diets, or executing lifestyle changes) coincides with medical or health advice" (p. XV). Haynes et al. (1979) reported more than 200 variables that have been studied in association with adherence, but conflicting results were sometimes reported with these variables. Blackwell (1976) reviewed 614 studies and found eight factors that consistently influenced adherence (see Table 1). Blackwell also concluded that many patients fail to comprehend the labeled instructions on the medication bottle and this lack of comprehension is correlated with poor adherence. Beck et al. (1979) and Burns (1980) identified negative cognitions and incorrect assumptions that patients often have regarding antidepressant medications and how these influence adherence. Negative side effects from the tricyclic antidepressants have also been associated with lower adherence (Greist & Greist, 1979).

Research on adherence (Blackwell, 1976; Hogue, 1979; McKenney, 1979) indicates that increased supervision regarding medications, whether by doctors, nurses, technicians, or pharmacists, increases adherence. Two studies (McKenney, Slining, Henderson, Devins, & Bart, 1973; Wilber & Barrow, 1969) have shown that when pharmacists and public health nurses provide information and monitoring to hypertensive patients, treatment adherence improves dramatically, whether the criterion is clinic attendance, medication ingested, or blood pressure control. Unfortunately, most of the improvement disappears after the intervention ceases. This extra supervision is often difficult, inconvenient, and expensive to provide to patients, even though it

has substantial therapeutic effect. Thus, computerized interventions may be helpful.

Patients appear to react favorably to computer interventions and tend to be open and honest (Carr & Ghosh, in press; Greist, Gustafson, Stauss, Rowse, Laughren, & Chiles, 1973; Klingler, Johnson, & Williams, 1976; Lucas, Card, Knill-Jones, Watkinson, & Crean, 1976; Lucas, Mullin, Luna, & McInroy, 1977). With apparent patient acceptability, developing computer programs for patient use seems reasonable.

PROGRAM DESCRIPTION

The program described here attempts to augment the clinician to improve medication compliance. The adherence interview (BARRY) provides six to eight 30-min sessions for a depressed patient. Because supervision enhances adherence, BARRY is designed to imitate human conversation regarding problem areas in medication adherence. BARRY monitors the level of depression by using the Beck Depression Inventory (Beck, Ward, Mendelson, Mock, & Erbaugh, 1961) and informs the patient of changes in symptomatology. Since patients often do not understand their medication regimen, instructions about the importance of regular intake of the drug in accordance with the prescription are emphasized, and, if necessary, suggestions are given to increase recall of the proper dose and the subsequent ingestion of it.

Side effects are common with the tricyclic antidepressants, and when the patient reports them, ways to decrease their severity are given. BARRY informs the patient about the probable side effects, their expected durations, and the possible therapeutic outcomes resulting from the medication. Attitudes and cognitions about medications that interfere with adherence are elicited, and cognitive change strategies are implemented (Beck et al., 1979; Burns, 1980). An example of an interaction with BARRY is shown in Figure 1.

Adherence to treatment can also be viewed in terms of "readiness for change." Davis (1971, 1973) developed the AVICTORY model for organizational readiness for change. Kiresuk (1979) has recommended that this model be adapted for individuals about to undergo a treatment to determine if the individual will adhere to it. The eight categories of AVICTORY are abilities, values, idea (adequate knowledge), circumstances, timing, obligation, resistances, and yield. Each category of the AVICTORY model is assessed with items from the Psychological Systems Questionnaire (PSQ) (Johnson, Giannetti, & Williams, 1979). The program makes use of this information to branch to appropriate sections in BARRY that have been designed to deal with readiness problem areas, such as information about depression and its treatment or suggested behavioral strategies to enhance adherence. Using the AVICTORY model insures that a patient with specific adherence difficulties

Table 1
Risk Factors Affecting Adherence to Medication

Increase Adherence	
Patient considers disease serious	
Family stability	
Compliance with other aspects	
Patient satisfaction	
Close supervision by physician	
Decrease Adherence	
Complexity	
Degree of behavior change required	
Clinic waiting time	

Note—From Blackwell (1976). Copyright 1976 by British Journal of Psychiatry. Reprinted by permission.

<p>Computer: Are you having any of the following side effects?</p> <ol style="list-style-type: none"> 1) Sleepiness 2) Dry mouth 3) Blurred vision 4) Trouble urinating 5) Constipation 6) Fast heartbeat 7) Sweating 8) Trembling 9) None of the above <p>Answer (more than one O.K.)</p>	<p>Patient: 1</p>
<p>Patient: 1, 2, 7</p>	<p>Computer: Perhaps you could reduce the sleepiness if you took most or all of your amitriptyline an hour or so before bedtime. Most of the "sleepiness" would then occur when you are asleep.</p>
<p>Computer: As you probably remember, we discussed each of these side effects last week. I'm not surprised that you've experienced sleepiness, dry mouth and sweating.</p>	<p>Computer: Do you think you would like to try taking your medicine all at once shortly before bedtime?</p> <ol style="list-style-type: none"> 1) Yes 2) No 3) Don't know (maybe) 4) Don't understand
<p>Computer: Almost everyone notices dry mouth, and even though it often decreases, you will probably notice some dryness as long as you take amitriptyline or any tricyclic antidepressant.</p>	<p>Patient: 1</p>
<p>Computer: Many people find frequent sips of water helpful, some chew gum and others try rock candy. It's not wise to take in high calorie drinks like soda pop to lessen your thirst, otherwise you may begin to gain weight.</p>	<p>Computer: Fine. It frequently works well to take it all at once before bedtime.</p>
<p>Computer: What have you been doing about dry mouth?</p> <ol style="list-style-type: none"> 1) Nothing—it doesn't bother me that much. 2) More water 3) Gum 4) Rock candy 5) High calorie beverages 6) Just suffering 7) Nothing—didn't know what to do 8) Something else 	<p>Computer: Sometimes people feel sleepy early in the morning if they take all their medication at bedtime. This can often be corrected by taking most of the amitriptyline at bedtime and a small part of it during the day.</p>
<p>Patient: 1</p>	<p>Computer: I'd suggest you try taking all six pills before bedtime and then if you feel sleepy in the morning, take five at night and one at noontime. We'll review the sleepiness problem again next week.</p>
<p>Computer: Glad to learn that.</p>	<p>Computer: Taking the medication mainly at night may also reduce the increased sweating you're experiencing. Is this side effect troublesome to you?</p> <ol style="list-style-type: none"> 1) Yes 2) No 3) Don't know (maybe) 4) Don't understand
<p>Computer: Is the sleepiness you are experiencing a problem for you?</p> <ol style="list-style-type: none"> 1) Yes 2) No 3) Don't know (maybe) 4) Don't understand 	<p>Patient: 2</p>
<p>Computer: The side effects that go along with taking amitriptyline can be annoying, but they usually diminish and some disappear in a few weeks. Dry mouth is an exception to this general rule.</p>	<p>Computer: Good</p>
<p>Computer: The important thing is to work out ways to reduce the side effects to a tolerable level so that you can continue taking amitriptyline until it relieves your depression.</p>	<p>Computer: The side effects that go along with taking amitriptyline can be annoying, but they usually diminish and some disappear in a few weeks. Dry mouth is an exception to this general rule.</p>

Figure 1. Example of BARRY's side effects supervision, showing an interaction taking place after the patient has signed on the computer and has given BARRY information such as the prescription.

receives the relevant interventions that BARRY can deliver.

PROGRAM OPERATION

The program is written using the CONVERSE interview driver system (Bloom, White, Beckley, & Slack, 1978). CONVERSE uses the MIIS programming language,

a dialect of MUMPS, and runs on a Data General ECLIPSE S-330 with 512 KB of core memory and 384 MB of disk memory. MIIS runs on other ECLIPSES, DEC PDP-11, or IBM Series 1 computers (Erdman et al., 1981).

CONVERSE is an interview system that is easily programmed and edited. This system is ideal for patient use because programs can be written to imitate human

conversation. Based on the responses a patient enters, CONVERSE is sophisticated enough to provide complex branching logic to subsequent sections. Information is presented on a cathode-ray tube (CRT) terminal, and responses are given via a keyboard. CONVERSE is designed for single-answer, multiple-choice, and free responses, and the patient may respond by touching a single key or by typing a more lengthy answer. A teaching section teaches patients to run the interview and to use the various response options and other control commands, such as GO, BACKUP, and CHANGE.

PROGRAM EVALUATION

Our program will be evaluated by using volunteer psychiatric outpatients in a clinical outcome study. Participants will be randomly assigned to one of three groups. The first group will be exposed to the computer program for approximately six weekly sessions. The second group will be monitored only for compliance behaviors. The last group will not be monitored or receive the computer program but will be retrospectively questioned about adherence behavior. All participants will receive normal clinical treatment by their physicians.

This design provides information about the effect of the program on adherence and also provides data on how monitoring influences adherence. Adherence criteria include pill counts, pharmacy records, and patient and physician ratings.

All participants will receive pre- and postexperimental measurements concerning their attitudes relating to belief systems about illness, health, and roles of patient and health care providers (PSQ). Several psychiatric and psychological inventories, such as the Beck Depression Inventory (Beck et al., 1961), Hopkins Symptom Checklist (Derogatis, Lipman, Rickels, Uhlenhuth, & Covi, 1974), and the Schedule for Affective Disorders and Schizophrenia (Endicott & Spitzer, 1978) will be administered at the preexperimental period to determine possible inclusion into the study. Subjects not suitable for tricyclic antidepressants will be excluded from the study. The same measures will be administered at postexperimental periods to assess symptomatological and diagnostic change.

Comparisons will be made regarding the effectiveness of the program over monitoring and normal clinical practice and whether different levels of adherence affect therapeutic outcome.

DISCUSSION

BARRY may be useful in settings in which tricyclic antidepressants are prescribed. The program is likely to be particularly applicable in primary care settings, in which the physician's time with a patient is limited and the patient needs supervision regarding the medication

regimen. By collecting patient data on adherence, the program is adaptable for another clinical use; the computer can provide feedback to clinicians so that non-adherers or possible nonadherers receive more appropriate management. For example, if a patient reports negative attitudes about medication or is experiencing severe side effects, these problems can be addressed by the clinician.

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