Clinical Computing

Interactive Voice Response Systems in Clinical Research and Treatment

James C. Mundt, Ph.D.

From Bell's first cry to Watson for assistance to the many crisis help-lines currently available, telephones have been serving people in need. Interactive voice response (IVR) systems, a rapidly expanding technology for automated acquisition and dispersal of information, represent the convergence of computer-automated interviewing with touch-tone telephone service. IVR applications for routing telephone calls or accessing banking services are now commonplace.

Potential benefits of IVR systems for clinical research and treatment have recently begun to be explored and realized. As budgets for research and treatment delivery continue to require greater efficiency without sacrificing quality, use of IVR applications will continue to expand. This column describes the use of IVR technology in research and treatment of psychiatric and substance use disorders.

Use of IVR systems for data collection

IVR systems for obtaining and managing data are a major advance over previous methods. Touch-tone telephones permit 24-hour data collection, removing previous limitations related to distance or temporal availability of study staff. Automatic data collection by computers eliminates errors due to transcription or interviewer mistakes and facilitates optimal data management procedures.

Dr. Mundt is a research scientist at the Dean Foundation for Health, Research, and Education, 2711 Allen Boulevard, Middleton, Wisconsin 53562 (e-mail, Mundt_James_C@ssmhcs.com). John H. Greist, M.D., is editor of this column.

More detailed discussions of IVR applications in research have appeared elsewhere (1,2).

An IVR program for obtaining daily self-reports of alcohol consumption has been demonstrated to provide valid data, permitting analyses of alcohol use patterns that differentiate dependent from nondependent drinkers otherwise matched on quantity-frequency measures of use (3,4). Data collection using IVR systems is beginning to be used for investigating other conditions, such as eating disorders and impaired psychomotor and cognitive performance (5).

Assessment and diagnosis using IVR applications

Computers can reliably assess clinical symptoms and provide valid diagnoses (6). Several computerized assessments, including the Hamilton Anxiety Scale, the Hamilton Depression Scale, the Yale-Brown Obsessive Compulsive Scale, and the Liebowitz Social Anxiety Scale, have been reviewed recently (7) and are being incorporated into clinical drug trials (8). IVR implementations of these instruments are being used to monitor patients and provide feedback to clinicians (9).

Computerized interviews, such as PRIME-MD (10) and Symptom-Driven Diagnostic System for Primary Care (11), have been developed to diagnose *DSM-IV* axis I disorders commonly found in primary care patients and have been implemented as IVR applications. A study of 200 patients using PRIME-MD, implemented via IVR technology, found a high correspondence between the PRIME-MD diagnoses made with the IVR system and those obtained using the Structured Clinical Interview for DSM-IV

(kappa = .67, p < .001). These data contribute to other findings supporting the use of computers to assess psychiatric symptoms. Such computerized diagnostic interviews are now available for touch-tone telephone administration.

IVR applications for treatment

Accessible around the clock, IVR programs can provide patient-specific information, self-help treatment, encouragement, reinforcement, and support on request. With confidentiality protected by unique personal identification numbers and passwords, patients interacting with IVR systems provide information that is used to tailor current and future interactions. As goals are achieved or setbacks encountered, context-relevant messages are provided. This type of interaction may be most beneficial in treating frequently occurring behaviors that intrude on daily life, such as smoking, drinking, obsessive-compulsive behaviors, or depression.

A voluntary smoking cessation program using an IVR system advertised through work site health promotions, print media, and radio found that of 571 smokers, 35 percent quit smoking while using the program, and 14 percent remained abstinent six months after their initial call (12). For smokers who called the system five or more times, these percentages increased substantially (68 percent and 22 percent, respectively), suggesting that patients' willingness to use such systems is a strong predictor of IVR treatment effectiveness.

An IVR application for treating patients with obsessive-compulsive disorder allows patients to develop and implement a treatment plan by guid-

ing them through exposure and ritual-prevention procedures (13). Measures of obsessive-compulsive symptoms, work and social functioning, and symptoms of depression indicated improvement during a 12-week study of 40 patients. Patients making greater use of the system experienced the most improvement; 77 percent of those who completed two or more exposure and ritual-prevention sessions reported that their condition was "much" or "very much" improved at the end of the study.

Similar success has been obtained with an IVR program for treating mild to moderate depression (14). Again, a positive relationship was found between program use and treatment outcome. Of individuals voluntarily making ten or more calls to the IVR system over the 12-week study period, 72 percent showed a 50 percent reduction in their Hamilton Depression Scale scores, whereas only 30 percent of those making fewer than ten calls showed such improvement.

The future of IVR

Widespread access to touch-tone telephone service and growing familiarity with IVR systems in the population at large will contribute to continued and expanded use of IVR applications in research and treatment. Bringing subjects and study personnel together often constrains the selection of study sites to densely populated locations, which can limit the generalizability of results. Interrater reliability is a persistent concern for data obtained by human raters, particularly for multisite studies in which consistent training and feedback are difficult. Administration of validated research instruments using IVR programs addresses both of these issues.

Automated assessment and diagnostic information, such as that obtained by the IVR PRIME-MD, could be obtained routinely from patients before their scheduled appointments and used for directing further inquiry and assessment when patients are seen face to face. Computerized instructions for medication use, which have been shown to be as effective as personal instruction (15), could be implemented as an IVR ap-

plication and made available 24 hours a day. Such programs can reduce demands on staff time and facilitate more efficient use of limited resources.

Although the treatment examples above illustrate the potential for stand-alone IVR-administered therapy, the greatest potential for this technology may be as an adjunct to clinical interaction. The process of recovery and health maintenance requires daily efforts by patients. IVR applications allow patients to self-report progress and establish computerized records of achievement. Reports of setbacks could be used for facilitating patient-practitioner discussion during face-to-face sessions. Applications are currently being developed to permit practitioners to design customized scripts, recorded in their own voice, addressing the individual needs and therapeutic goals of specific patients.

Many individuals will disclose sensitive information to a computer that they would be reluctant to discuss with another person (6). Because an IVR program permits such interaction from the safety of one's own home, some of the most socially stigmatizing issues, such as sexual abuse, HIV risk-related behaviors, and alcohol and drug abuse, might be most amenable to IVR-mediated screening, assessment, and therapy. Permitting anonymous access to IVR applications addressing highly sensitive issues might bridge current barriers that prevent patients from seeking help. Callers could be reassured, educated about sources of support in the community, and helped to make initial steps toward recovery.

Conclusions

What does all this mean? This column does not advocate replacing current patient services with IVR applications. Rather, services could be enhanced—cost-effectively—by appropriate use of this technology. Consistent information and feedback provided by computers to patients via telephone affords an efficient means of extending staff resources. Experiences with IVR research and treatment programs indicate that the willingness of individuals to use these

programs will be the primary determinant of their success.

IVR technology can provide clinicians, researchers, and administrators with a new method of gathering data and presenting information to patients any time and any place a touch-tone telephone is available. This interaction allows outcome assessments and development of therapeutic approaches that have not previously been feasible. The technology can strengthen clinical practice, extend research methods, and enhance administrative support of service quality and value, which should be goals of all health care innovations. ◆

References

1. Mundt JC, Perrine MW, Searles JS, et al: An application of interactive voice response (IVR) technology to longitudinal studies of daily behavior. Behavior Research Methods, Instruments, and Computers 27:351–357, 1995

2. Mundt JC, Searles JS, Perrine MW, et al: Conducting longitudinal studies of behavior using interactive voice response. International Journal of Speech Technology, in press

3. Perrine MW, Mundt JC, Searles JS, et al: Validation of daily self-reported alcohol consumption using interactive voice response (IVR) technology. Journal of Studies on Alcohol 56:487–490, 1995

4. Mundt JC, Searles JS, Perrine MW, et al: Cycles of alcohol dependence: frequency-domain analyses of daily drinking logs or matched alcohol-dependent and nondependent subjects. Journal of Studies on Alcohol 56:491–499, 1995

5. Mundt JC, Kelleher PK, Perrine MW, et al: Psychological performance assessment via interactive voice response systems. Behavior Research Methods, Instruments, and Computers, in press

6. Greist JH, Klein MH, Erdman HP, et al: Comparison of computer- and interview-administered versions of the Diagnostic Interview Schedule. Hospital and Community Psychiatry 38:1304–1311, 1987

7. Kobak KA, Greist JH, Jefferson JW, et al: Computer-administered clinical rating scales. Psychopharmacology 127:291–301, 1996

8. Kobak KA, Greist JH, Jefferson JW, et al: Computerized assessment in clinical drug trials (New Clinical Drug Evaluation Unit abstr). Psychopharmacology Bulletin 32:464, 1996

9. Greist JH, Jefferson JW, Wenzel K, et al: Telephone assessment program: patient monitoring and clinician feedback (New Clinical Drug Evaluation Unit abstr). Psychopharmacology Bulletin 32:455, 1996

for frequent service users decrease. The major difference in our mental health system during that time was the introduction of the triggers system. These results suggest that implementation of this system for early intervention produced a reduction of inpatient utilization among the population of frequent service users.

Discussion and conclusions

One explanation for the effectiveness of the triggers system in reducing inpatient admissions and length of stay may be that the tracking system and clinical reviews led to improvements in the overall functioning of the mental health system. Local managers reported increased involvement by private providers in team reviews, more effective communication among providers in cases where many agencies serve a single consumer, and more intensive and focused treatment planning for frequent service users, which led to more effective interventions and better outcomes.

The idea that increased contact with consumers through intensive case management may reduce recidivism is well documented (12–15). The triggers system may have provided a systematic, quantifiable way to focus the attention and resources of the managed care system on a selected group of patients in the early stages of decompensation. The triggers system has also provided an easy way for staff to prioritize the needs of various consumers when competing demands on staff time and energy are made.

A major positive result of the triggers system was the increased involvement by private providers in treatment planning and clinical reviews. In the past, the public mental health system has had difficulty gaining access to the time and resources of private providers who are not under contract for the provision of services.

The triggers system meets the criteria for best practices in the nine dimensions of care outlined by the Joint Commission. It meets the criteria for efficacy because it produces increased scrutiny and treatment planning for consumers who may be experiencing a psychiatric deterioration. The process is also appropriate because it allows treatment planning directed to the consumer's immediate needs. The system meets the criteria for availability, timeliness, effectiveness, and efficiency because clinical reviews are provided for screened trigger events soon after the event, and the plan that results from the review reduces unnecessary hospitalizations and crisis stays. Because the process is a cooperative venture among service providers, reduces the risk of hospitalization, and includes the consumer in treatment planning, the goals of continuity, safety, and respect and caring are met. We hope that continued study will further define the advantages of the triggers system and that the results reported here may be replicated. ◆

References

1. Carpenter MD, Mulligan JC, Bader IA, et al: Multiple admissions to an urban psychiatric center: a comparative study. Hospital and Community Psychiatry 36:1305–1308, 1985

2. Casper ES, Romo JM, Fasnacht RC: Readmission patterns of frequent users of inpatient psychiatric services. Hospital and Community Psychiatry 42:1166–1167, 1991

3. Casper ES, Donaldson B: Subgroups in the population of frequent users of inpatient services. Hospital and Community Psychiatry 41:189–191, 1990

4. Casper ES, Pastva G: Admission histories, patterns, and subgroups of the heavy users of a state psychiatric hospital. Psychiatric Quarterly 61:121–134, 1990

5. Casper ES: Identifying multiple recidivists in a state hospital population. Psychiatric Services 46:1074–1075, 1995

6. Geller JL: A historical perspective on the role of state hospitals viewed from the era of the "revolving door." American Journal of Psychiatry 149:1526–1533, 1992

7. Geller JL: In again, out again: preliminary evaluation of a state hospital's worst recidivists. Hospital and Community Psychiatry 37:386–390, 1986

8. Geller JL: Treating revolving-door patients who have "hospitalphilia": compassion, coercion, and common sense. Hospital and Community Psychiatry 44:141–146, 1993

9. Performance Improvement in Plant, Technology, and Safety Management: Enhancing the Environment of Care. Oakbrook Terrace, Ill, Joint Commission on Accreditation of Healthcare Organizations, 1994

10. The Framework for Improving Performance: From Principles to Practice. Oakbrook Terrace, Ill, Joint Commission on Accreditation of Healthcare Organizations, 1994

11. Klegon DA: JCAHO mental health care network accreditation as a performance improvement project. Psychiatric Services 48:359–363, 1997

12. Dincin J, Wasmer D, Witheridge TF, et al: Impact of assertive community treatment on the use of state hospital inpatient bed-days. Hospital and Community Psychiatry 44:833–838, 1993

13. Dietzen LL, Bond GR: Relationship between case manager contact and outcome for frequently hospitalized psychiatric clients. Hospital and Community Psychiatry 44:839–843, 1993

14. Green JH: Frequent rehospitalization and noncompliance with treatment. Hospital and Community Psychiatry 39:963–966, 1988

15. Bond GR, McGrew JH, Fekete DM: Assertive outreach for frequent users of psychiatric hospitals: a meta-analysis. Journal of Mental Health Administration 22:14–16, 1995.

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10. Spitzer RL, Williams JB, Kroenke K, et al: Utility of a new procedure for diagnosing mental disorders in primary care: the PRIME-MD 1000 study. JAMA 272:1749–1756, 1994

11. Broadhead WE, Leon AC, Weissman MM, et al: Development and validation of the SDDS-PC screen for multiple mental disorders in primary care. Archives of Family Medicine 4:211–219, 1995

12. Schneider SJ, Schwartz MD, Fast J: Computerized, telephone-based health promotion, I: smoking cessation program. Computers in Human Behavior 11:135–148, 1995

13. Baer L: Behavior therapy: endogenous serotonin therapy? Journal of Clinical Psychiatry 57(suppl 6):33–35, 1996

14. Osgood-Haynes D, Baer L, Greist JH, et al: Use of advanced technology in the assessment and treatment of depression. Poster presented at the annual meeting of the Association for the Advancement of Behavior Therapy, New York, Nov 21–24, 1996

15. Madoff SA, Pristach CA, Smith CM, et al: Computerized medication instruction for psychiatric inpatients admitted for acute care. MD Computing 13:427–441, 1996