

Appraisal and Diagnosis of Neurogenic Communication Disorders in Remote Settings

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Patients who suffer neurogenic communication disorders and reside in remote settings either do not receive services or they must travel long distances or become inpatients for extended periods. No services is unacceptable, because all patients merit appraisal and a diagnosis, and many respond to treatment with improvement in their communication. Traveling long distances for services is unacceptable, because it is expensive, inconvenient, may be contraindicated by the patient's medical condition, requires a means of transportation which often does not exist, and must be frequent and protracted. Hospitalization is also unacceptable, because the communication disorder does not necessitate hospitalization, it usurps a bed, carries a patient beyond DRG length-of-stay criteria, removes him or her from the home environment, and is expensive. There is a need to develop means for managing patients who live in remote settings.

Vaughn (1976, 1977, 1979) has developed methods (TEL-Communicology) to treat patients who reside in remote settings. These utilize the telephone to present auditory stimuli. Visual stimuli are limited to printed materials that are mailed to the patient. Responses are verbal, over the telephone; gestural, by using the telephone touch-tone keys; and graphic, by using "Telenote," a device that sends the patients' writing over the telephone to a receiver in the therapist's office. Vaughn's use of technology has provided some treatment for some patients who would not receive it, and it has reduced the expense of patient travel and hospitalization. However, TEL-Communicology is limited primarily, to the auditory modality, and it requires the patient to travel to the treatment center for initial and periodic appraisal and diagnosis. The purpose of this paper is to present our results in using video, computer, and telephonic technology to appraise and diagnose patients who suffer neurogenic communication disorders and who reside in remote settings.

METHOD

We have simulated a treatment center's ability to provide accurate appraisal and diagnosis for patients suffering a variety of neurogenic communication disorders and residing where services do not exist. Patients were appraised with a battery of measures in three conditions -- traditional face-to-face; closed circuit television; and computer controlled video laserdisc over the telephone. The appraisal measures included a motor speech evaluation (Wertz, LaPointe, and Rosenbek, 1984); The Western Aphasia Battery (Kertesz, 1982); Porch Index of Communicative Ability (Porch, 1967); the word definition, proverb explanation, and general information questions from the Mayo Clinic Procedures for Language Evaluation (Unpublished); the Token Test (Spreeen and Benton, 1969); and the Reading Comprehension Battery for Aphasia (LaPointe and Horner, 1979). The order of evaluation among conditions was randomized into blocks of 36 patients to control for practice effects and clinician bias.

Three clinicians participated in the study. Following administration of each measure, the evaluating clinician gave the patient a diagnosis -- aphasia, dementia, apraxia of speech, etc. After completing the entire battery of measures, the clinician gave each patient a final diagnosis. Thus, each patient received a diagnosis by a different clinician in each condition, and each patient's performance on each measure in each condition was collected for analysis.

In traditional, face-to-face evaluation, all measures were administered in a standardized manner in a quiet clinic room with only the patient and clinician present. All evaluations were videotaped for later reliability analysis.

The closed circuit television condition simulated appraisal in a remote setting, as shown in Figure 1, by designating one room as the treatment center and another room as a remote setting. In the patient's room, a video camera and monitor permitted the patient to see and hear the clinician, and in the clinician's room, similar equipment permitted the clinician to see and hear the patient. All measures were presented in a standardized manner. However a volunteer was present in the patient's setting to present and order stimuli following instructions from the clinician over the television monitor. All evaluations were videotaped for later reliability analysis.

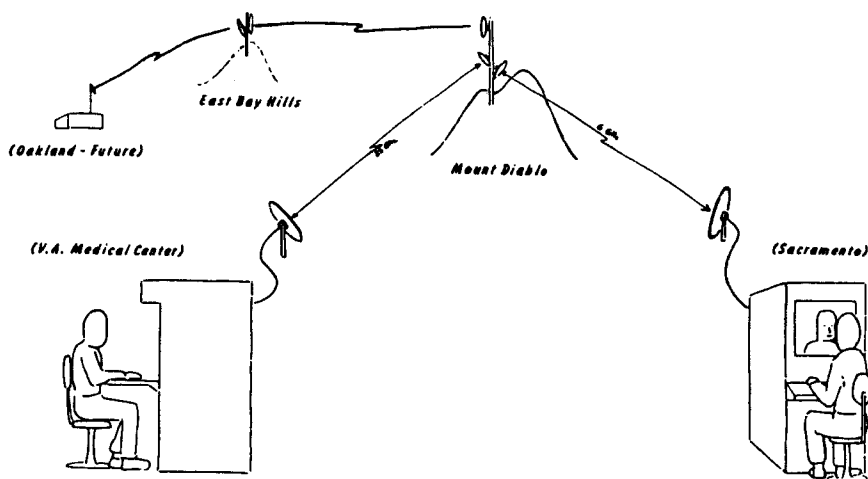
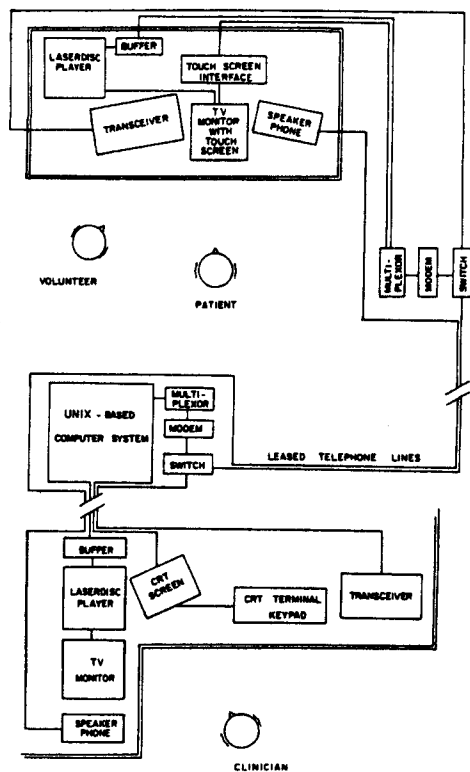


Figure 1. Appraisal with closed circuit television of patients with neurogenic communication disorders residing in remote settings.

Appraisal with computer controlled video laserdisc over the telephone was simulated, as shown in Figure 2, by designating one room as an existing treatment center and another room as a remote setting. All appraisal measures were mastered on video laserdiscs. These were played on a video laserdisc player that contains a microprocessor permitting access of approximately 50,000 frames of audio and video material on the disc. Visual stimuli were presented on a TV monitor that contained a touch screen in the patient's setting. Thus, the patient responded by touching the stimuli displayed on the screen. The responses were recorded by a UNIX based computer system and also appeared on the clinician's CRT screen for "on line" scoring. Auditory and verbal stimuli and responses were transmitted between clinician and patient by a speaker phone in each setting. A telenote transceiver in each setting permitted sending and receiving written stimuli and responses. The clinician selected appraisal measures and tasks within each measure by using a CRT terminal

keypad interfaced with the UNIX based computer system and the laserdisc player in the patient's setting. Appraisal measures were presented in a standardized manner. However, some modifications were necessary. For example, photographs of the ten PICA objects were displayed on the patient's TV monitor and replaced the standard real-object stimuli. Further, PICA Subtest II and III could not be presented, because the clinician could not see the patient's pantomimic responses. Thus, the DiSimoni *et al.* (1980) short version of the PICA was used to compute an Overall score. Finally, a volunteer was present in the patient's setting to assist in orienting the patient to the equipment and tasks following clinician instructions and to send some scores -- for example, praxis subtests on the WAB -- with the telenote transceiver to the clinician. Laserdisc appraisal was audiotape recorded and combined with computer-scored gestural responses and telenote graphic responses for later reliability analysis.

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Figure 2. Appraisal with computer controlled video laserdisc over the telephone of patients with neurogenic communication disorders residing in remote settings.

Appraisal and diagnosis was compared among the three conditions by an analysis of variance on test performance, percent agreement for diagnosis, and a kappa analysis of agreement in diagnosis.

RESULTS

Thirty-six patients displaying a variety of neurogenic communication disorders have been appraised and diagnosed in each of the three conditions. Table 1 shows that percent agreement in diagnosis of specific neurogenic communication disorders ranged from 83 to 100 percent among conditions. Agreement in diagnosis by closed circuit television and traditional, face-to-face diagnosis ranged from 86 to 100 percent among disorders, and overall

agreement was 93 percent. Agreement in diagnosis by computer controlled video laserdisc over the telephone and traditional, face-to-face diagnosis ranged from 84 to 98 percent among disorders, and overall agreement was 91 percent. Agreement in diagnosis between the television and laserdisc conditions ranged from 83 to 100 percent among disorders, and overall agreement was 91 percent.

Table 1. Percent agreement in diagnosis among three appraisal conditions -- face-to-face (FTF), television (T), and laserdisc (L).

DIAGNOSIS	PERCENT AGREEMENT		
	FTF - T	FTF - L	T - L
Aphasia	94	94	100
Apraxia of Speech	94	92	92
Dysarthria	86	89	86
Dementia	89	84	83
Confusion	100	98	97
Traumatic Brain Injury	94	98	97
Right Hemisphere	92	89	86
Overall	93	91	91

Table 2 shows the results of a kappa analysis of diagnoses for the 36 patients in the three conditions. The kappa statistic yields k , a chance corrected percent agreement measure with a statistical base. All but one of 21 comparisons reached significance, indicating strong agreement in diagnosis among conditions.

Table 2. Kappa statistic for diagnosis in three conditions -- face-to-face (FTF), television (T), and laserdisc (L).

DIAGNOSIS	KAPPA STATISTIC		
	FTF - T	FTF - L	T - L
Aphasia	.88***	.88***	1.00***
Apraxia of Speech	.86***	.77***	.65***
Dysarthria	.70***	.66***	.83***
Dementia	.55***	.52**	.43*
Confusion	1.00***	NA	NA
Traumatic Brain Injury	.47 ns	.65*	.65*
Right Hemisphere	.68***	.60***	.53**

* = Significant at $p < .05$
 ** = Significant at $p < .01$
 *** = Significant at $p < .001$
 ns = Not significant at $p < .05$

NA = k could not be computed because of equal margins. Percent agreement was 98%

A comparison of patient performance on two of the appraisal measures, PICA and WAB, in the three conditions is shown in Table 3. Separate analyses of variance for the PICA Overall score, WAB Aphasia Quotient, and WAB Cortical Quotient showed no significant difference in patient performance on any measure among conditions.

Table 3. Mean patient performance on three standardized measures in each appraisal condition.

MEASURE	APPRAISAL CONDITION					
	Face-To-Face		Television		Laserdisc	
	\bar{X}	S.D.	\bar{X}	S.D.	\bar{X}	S.D.
Porch Index of Communicative Ability Overall Score	11.97	1.79	11.95	1.69	11.57	2.05
Western Aphasia Battery Aphasia Quotient	79.67	20.48	79.07	21.91	80.11	20.03
Western Aphasia Battery Cortical Quotient	78.73	17.32	79.37	17.86	78.78	16.49

DISCUSSION

Our results indicate that diagnosis based on appraisal by television or laserdisc is essentially the same as diagnosis based on traditional, face-to-face appraisal. Moreover, patient performance on standardized measures in the television and laserdisc conditions is essentially the same as performance in traditional, face-to-face administration. The agreement among conditions suggests that either closed circuit television or computer controlled video laserdisc could be substituted for traditional, face-to-face appraisal and provide an accurate diagnosis for patients who reside in remote settings. Prior to accepting this suggestion, we would be comforted by the same results with a larger sample containing more patients in some of the diagnostic categories and a field test of the equipment, materials, and methods developed in our simulation study. Completion of our second block of 36 patients will meet the former need, and renewal of this project by Veterans Administration Health Systems Research and Development will meet the latter.

Certainly, the answer to every question is not technology. Our use of it needs to be guided by the same rigor we have employed traditionally, and its efficacy must be tested, just as the efficacy of all patient management must be tested. Thus, we do not seek high tech or low tech. We seek just the right tech.

ACKNOWLEDGMENTS

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DISCUSSION

- Q: What was the basis for your percent agreement calculations among the three modes of assessment?
- A: We looked at agreement in the final diagnosis given by the clinician who saw the patient face-to-face compared with the diagnosis given by the clinician in the laserdisc condition and the diagnosis given by the clinician in the television condition.
- Q: How many categories could have been assigned? How many different judgments could have been made? What would chance agreement be?
- A: Up to eight diagnoses were possible -- aphasia, apraxia of speech, dementia, confusion, traumatic head injury, right hemisphere involvement, dysarthria, and no communication impairment. Agreement was based on the diagnoses of three clinicians, one in each condition. So, chance agreement among three clinicians with eight possible choices would be rather low. In addition, we used a kappa analysis which is corrected for chance and has a statistical base.
- Q: Did you have a medical history and background information on your patients? Some patients need to have other kinds of assessment besides language assessment. For example, they need to have their visual abilities checked and other things that might influence language test results. When you have them in front of you, you can get them to the other personnel to be evaluated and do a more comprehensive workup. It may be cheaper in the long run to have people come into the hospital than to evaluate their language with your techniques in a remote setting.

- A: That's a good question. Our techniques are designed for centers that have services except speech and language evaluations. For example, in the Veterans Administration, most of the outpatient clinics, residential facilities, and medical centers have a neurologist either on staff or by consultation. They have ophthalmology available. Even in the private sector, many patients have access to these services through private physicians. The thing that doesn't exist in many areas is speech and language evaluations.
- Q: Did you use the DiSimoni SPICA in all three conditions?
- A: No we didn't only in the laserdisc condition. In fact, we administered all PICA subtests except II and III in the laserdisc condition. The score in our analysis of variance that compared PICA overall performance among conditions was the DiSimoni short form overall in the laserdisc condition compared with the complete overall in the television and face-to-face conditions.
- C: We have found that PICAs and SPICAs administered within one week of each other may differ by 15 percentile units.
- A: That's worth knowing. DiSimoni and his colleagues reported no significant differences between PICA and SPICA overall scores. If we are going to use the SPICA for comparison with the PICA or to measure change in patients, we want it to be reliable. Perhaps we need a replication of the DiSimoni effort.
- Q: I'm very impressed with the amount of agreement in your results. How difficult was it to set up the equipment and keep it maintained? Also, how did the patients like each condition?
- A: We have not analyzed how patients like the various conditions. We know that the clinicians are not wild about the laserdisc condition. The equipment, except for the tele-note transceiver, which is constantly malfunctioning, works quite well. We have good technical assistance, and this is essential to set things up. Other than for the tele-note transceiver, we have had few equipment problems.
- Q: How long does an evaluation take, and does the time differ among conditions?
- A: Depending upon a patient's severity, our battery of six measures can take from three to ten hours in each condition. We have not compared time among conditions, but we have not noted marked differences.