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Clinical Experience

## Telemedicine and the Evaluation of Cognitive Impairment: The Additive Value of Neuropsychological Assessment

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### A B S T R A C T

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**Introduction:** The number of people in the United States living with dementia is projected to rise to over 7.1 million in the next 12 years, representing a 40% increase from current levels. This anticipated “dementia tsunami” has led to a recent state and national policy emphasis on early detection, improved care quality, reduced caregiver burden, and increased access to care. The ability to achieve these objectives is limited by few dementia specialists in rural and small communities and the challenges of travel to and within congested urban regions for dementia patients and their caregivers. Telemedicine is one such means for responding to this lack of access to subspecialty assessment and care. We describe our early experiences with this technology applied to neuropsychological assessments, with data from 31 patients.

**Methods:** As part of an interdisciplinary dementia care demonstration project, clinical video teleconferencing provides real-time high resolution video interactions between dementia subspecialists in a major metropolitan medical center and patients in 3 outlying clinics located 180, 150, and 100 miles away. Comprehensive neuropsychological assessments, designed to address referral questions related to neurocognitive disorders via clinical video teleconferencing, are conducted as one component of interdisciplinary care.

**Outcomes:** Eighty-seven percent of patients referred for neuropsychological assessment had an inaccurate neurocognitive diagnosis at the time of referral. Unmet and unrecognized mental health treatment needs were identified in over 77% of patients. In addition, acceptance was good for patients, caregivers, and clinicians.

**Discussion:** Teleneuropsychology is proving to be an excellent resource for clarifying cognitive and psychiatric diagnoses, and integrating individual strengths, weaknesses, and preferences into treatment and care plans used by other health care providers, patients, and caregivers.

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The number of people in the United States living with dementia is projected to rise to over 7.1 million in the next 12 years, representing a 40% increase from current levels.<sup>1</sup> This anticipated “dementia tsunami” has led to a recent state and national policy emphasis on early detection, improved care quality, reduced caregiver burden and increased access to care.<sup>2</sup> However, the ability to achieve these objectives is limited by infrequent and inaccurate dementia diagnoses by general practitioners,<sup>3,4</sup> few dementia specialists in rural and small

communities, and difficulties associated with travel to and within congested urban regions for dementia patients and their caregivers. This lack of access to specialty care is of particular concern given the consequences of delayed or missed diagnoses, which include missed opportunities to manage symptoms, remove potentially harmful medications, recognize coexisting medical conditions, provide caregiver assistance, plan for future care, address legal and financial issues, and participate in clinical trials.<sup>5</sup>

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### Telemedicine

Telemedicine is one such means for responding to this lack of access to subspecialty assessment and care. Within the US Veterans Health Administration (VHA), telemedicine has become a focus of cost-effective, accessible health service delivery to Veterans, many

of whom are of advanced age, carry multiple medical diagnoses, and live in remote regions where travel to tertiary medical centers is difficult.<sup>6</sup> Internationally, programs utilizing clinical video teleconferencing (CVT) capabilities have been developed for the treatment and management of conditions such as stroke,<sup>7</sup> diabetes mellitus, frailty, chronic illness, cancer, major depressive disorder, post-traumatic stress disorder, and patients with home bound status.<sup>6</sup> Telemental health services within the VHA have been demonstrated to be cost-effective and acceptable to patients<sup>8</sup> and a viable means for providing medication management, psychotherapy, and diagnostic assessment to those living in rural areas.<sup>9</sup>

### *Telemedicine and Dementia Care*

The role of telemedicine is expected to expand, providing increased access to clinical care for geographically isolated geriatric patients in rural settings.<sup>10</sup> Telemedicine-based programs using CVT for dementia care have been favorably received by both nursing home and community dwelling patients and their caregivers, achieving high physician satisfaction, adequate reliability with face-to-face assessment, and favorable clinical outcomes.<sup>11,12</sup> Interdisciplinary models for the care of elders with cognitive impairment have also been applied via CVT, to replicate best practices from the traditional memory clinic setting.<sup>13</sup> Specific clinical components involved in the assessment of dementia, including physician clinical interviewing<sup>11,14,15</sup> and objective cognitive testing with screening instruments,<sup>16–22</sup> have been found to be feasible and reliable over telemedicine.

Although a small body of literature supports the feasibility, validity, and acceptability of neuropsychological assessment delivered via telehealth,<sup>23–27</sup> there has only been a single small scale study, which discusses the feasibility of neuropsychological assessment as part of a telemedicine delivered comprehensive dementia care program for hard to reach patients.<sup>13</sup>

To further address the feasibility and value of telemedicine for increasing access to high-quality cognitive assessment and care, we describe our early experiences with this technology applied to neuropsychological assessments, with data from the first 31 cases seen in the Veterans' Cognitive Assessment and Management Program (V-CAMP). We provide diagnostic assessment details, including impact on clinical care and resulting psychosocial interventions. Finally, we propose recommendations for the future study and practice of teleneuropsychology.

## **Methods**

### *Setting*

As part of V-CAMP, an interdisciplinary VHA telemedicine dementia care demonstration project, CVT provides real-time high resolution video interactions between dementia subspecialists in a major metropolitan medical center and patients in three outlying VA Community Based Outpatient Clinics (CBOC)s located 180, 150, and 100 miles away. All 3 CBOC locations provide primary care and mental health services. Other services offered (physical therapy, audiology, social work) vary among the participating sites.

As of June 2013, V-CAMP had served over 100 patients and their family caregivers. Comprehensive neuropsychological assessments are conducted as one component of interdisciplinary care.

### *Participants*

Primary care providers and other clinicians refer patients to V-CAMP for diagnostic clarification, medication management,

behavioral disturbance, care management, functional assessment, and other cognitive impairment-related problems. Patients are offered CVT-based services as an alternative to traveling to a tertiary medical center for consultation.

Most patients who accept a consultation to this program are first engaged in care management provided by clinical social workers, however, direct referral for neuropsychological assessment is also possible. Care managers screen for high frequency dementia-related problems, which includes the assessment of a wide variety of geriatric syndromes, behavioral and cognitive concerns, psychosocial and resource needs, and caregiver functioning (as appropriate). The majority of patients are seen via CVT by a geriatrician or geriatric nurse practitioner for an initial medical evaluation, which includes assessment of current complaints, pertinent history and physical examination, medication review, and brief objective cognitive testing. Consultation with neuropsychology is requested according to the clinical impression of the geriatric provider. Most commonly, referrals for neuropsychological assessment are made for differential diagnosis among neurocognitive disorders and between neurocognitive and psychiatric conditions contributing to clinical presentation.

### *Neuropsychologists*

A clinical neuropsychologist and a neuropsychology fellow under the supervision of a board-certified clinical neuropsychologist conducted assessments of the patients described below. Clinical neuropsychologists are specialized clinical psychologists concerned with the behavioral manifestations of brain function and dysfunction. Comprehensive neuropsychological assessment relies heavily on formal validated and reliable measures of cognitive function. Tests are scored and interpreted in light of both quantitative and qualitative results. Interpretation of these results require the integration of behavioral observations, medical and psychiatric history, education, culture, motivation, attitudes, sensory and motor functioning, and overall emotional functioning into the conceptualization of the patient, their clinical presentation, and the treatment plan subsequently generated.<sup>28</sup> Findings of such assessments can identify areas of functional strength and weakness, which are essential components in the diagnosis, treatment planning, and care of patient with congenital or acquired brain dysfunction.

### *Telehealth Clinical Technicians*

Telehealth clinical technicians (TCT)s at the CBOC provide assistance in accompanying patients to the evaluation room, coordinating teleconferencing, preparing stimuli in accordance with an ordered folder system described below, and transmitting stimuli via fax to the clinician following test completion. The TCTs who collaborate in this program represent a variety of educational and occupational backgrounds including nursing and public administration. Only one TCT had experience with geriatrics, and none had experience with telemedicine prior to starting their current position.

### *Procedures*

#### *Folders*

Testing materials at the CBOC are organized by TCTs into a series of numbered folders with the order of administration predetermined by the neuropsychologist. During the course of the assessment, as a measure requires visual or tactile testing materials (for the purposes of reading, writing, drawing, etc.), the patient is instructed to remove and return materials from the corresponding folder. The patient or a TCT manipulate the camera angle to correspond with the nature of different tests, allowing the administrator to observe and provide

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