

# ► Telemedicine for delivery of health care in Parkinson's disease

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## Summary

We have used telemedicine at the Seattle Veterans Administration Medical Center to deliver follow-up care to patients with Parkinson's disease (PD). Patients were located at eight facilities which were 67–2400 km from the medical centre. Each facility had videoconferencing equipment (connected by Internet Protocol at 384 kbit/s), and computer terminals that could access the patient's electronic medical record. Over a three-year period, we used telemedicine for 100 follow-up visits on 34 PD patients. Visits lasted 30–60 min. Patients and providers were satisfied with the use of the technology. Savings amounted to approximately 1500 attendant travel hours, 100,000 travel kilometres, and US\$37,000 in travel and lodging costs. For the first 82 telemedicine visits, the video quality was inadequate for scoring all components of the motor Unified Parkinson Disease Rating Scale (UPDRS). For the last 18 visits, a different videoconferencing unit produced better video quality, which was satisfactory for motor UPDRS measurements, except for components that required physical contact with the patient (rigidity and retropulsion testing). Our experience shows that telemedicine can be used effectively for follow-up visits with selected PD patients who are unable to travel.

## Introduction

The Veterans Health Administration (VHA) is one of the largest health-care organizations in the USA and cares for over 5 million veterans at 158 medical centres and other regional facilities. The VHA provides comprehensive care to veterans with chronic illnesses, including neurodegenerative disorders. Parkinson's disease (PD) is a progressive neurodegenerative disorder characterized by resting tremor, rigidity, bradykinesia and postural instability.<sup>1</sup> It affects approximately 1% of the general population over the age of 60 years, and in advanced stages it causes severe motor and cognitive disability. The disability of PD results in poor quality of life, carer burden, increased health resource use, and increasing direct and indirect costs of illness.<sup>2</sup> Many PD

patients are unable to travel long distances to tertiary medical centres. This problem is exacerbated in the VHA because veterans are older than the general population, have lower incomes than the general population and more than half of them live more than 40 km from Veterans Administration (VA) medical centres.<sup>3</sup>

Only one centre has previously reported the use of telemedicine in a small number of PD patients.<sup>4</sup> We have delivered follow-up care to PD patients using telemedicine for three years.

## Telemedicine for follow-up

Telemedicine visits were done instead of a follow-up clinic visit at the medical centre. These were patients for whom travelling to the medical centre for a clinic visit was either too difficult due to their illness, or the distance was too great. Often it was for both reasons. Ethics committee permission was not required for the work.

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Either a Vcon Armada Cruiser, Polycom ViewStation or a Tandberg Intern MXP videoconferencing unit was used. Transmission was by Internet Protocol at a data rate of 384 kbit/s. Patients were located at two Washington state veterans' homes (serving as assisted living facilities and nursing homes), five medical centres and one veterans' centre. The distances ranged from 67 to 2400 km. Almost all of the patients would have needed an attendant to be with them if they had travelled to the VA Puget Sound Health Care System (VAPSHCS).

The VAPSHCS health-care provider was a movement disorder neurologist who had access to the patient's electronic medical record simultaneously on the same monitor screen, or on a monitor screen adjacent to the audio-video equipment. He rated each visit for quality of technology and the degree to which the visit influenced the care plan (see Appendix). A health-care provider (primary-care physician or nurse) and/or a carer were present with the patient at each visit.

The duration of each visit was 30–60 min. We calculated the cost and time saved in travelling to the medical centre, as well as the cost for lodging and salary of staff/significant other accompanying the patients to the clinic. The cost of travel by car/van was estimated at US\$0.07 per km, ferry fare at US\$4.95, and taxi and airfare rate were calculated individually per visit. The cost of lodging for those who were required to stay overnight at the medical centre was US\$150 and the cost saved in staff/significant other accompanying a patient was estimated at US\$9 per hour.

## Experience

We used telemedicine for 100 follow-up visits on 34 PD patients. Most patients would have required a full-time attendant to travel with them. The patient's electronic medical records were available at all telemedicine visits. The audio quality was excellent for all visits. For the first 82 visits, the realtime imaging using the Vcon and Polycom cameras was adequate for gross motor observations, but inadequate for scoring all components of the motor Unified Parkinson Disease Rating Scale (UPDRS).<sup>5</sup>

For the last 18 visits, the enhanced video quality using the Tandberg camera was adequate for motor UPDRS measurements, except for rigidity and the retropulsion test (pulling the patient from behind to assess the patient's ability to recover). The health-care provider present at the patient's side would report rigidity and perform the retropulsion test. The ability to move the camera in all directions and zoom in and out using a remote control device allowed the

movement disorder neurologist to have a close-up view of the patients' movements and watch them walk across the examination room.

In all but one visit, new problems were identified and recommendations were made that would have been delayed if the patient had had to travel to the VAPSHCS. Educational and administrative information was shared with the patient's health-care provider, as well as with the patient during most telemedicine encounters. Resource savings amounted to approximately 100,000 travel kilometres, 1500 attendant travel hours, and US\$37,000 in travel costs. The cost figures do not consider the saving of not having a primary-care provider travel with the patient to a clinic visit.

The provider's ratings were 'strongly agree' or 'agree' for all questions in 99 of the 100 visits. For one visit, the answer to whether 'the telemedicine appointment resulted in identification of a problem or recommendations for future care, that may have been delayed if the patient had had to arrange to travel to clinic' was 'disagree'.

## Discussion

Telemedicine can be an effective approach for care delivery to PD patients living at long distances from or unable to travel to a medical centre. This technique has previously been shown to result in improved health status, increased efficiency and a decrease in resource utilization. We used telemedicine only to deliver follow-up care for patients already established to have PD. Therefore, all new referrals to our centre were seen in person for their first visit, but had the option of telemedicine for subsequent visits if they were close to a facility equipped with telemedicine apparatus. We also encouraged patients to travel in person to our clinic at least once annually, and only use telemedicine for interim visits every three to six months.

For the first 82 visits, the quality of the videoconferences was adequate for gross motor observations such as gait and balance, high-amplitude tremor, and moderate or severe levodopa-induced dyskinesia. The video quality did not allow detection of small-amplitude tremor, mild reduction in facial animation, subtle dyskinesia or adequate testing of limb bradykinesia as measured by finger tapping or alternating forearm supination/pronation. In addition, scoring rigidity and postural recovery from the retropulsion test require physical contact with the patient, which is not possible with telemedicine. The UPDRS, which was devised in 1987 to standardize detailed motor testing in PD, uses many of these observations to rate the severity of the motor disability

in PD.<sup>5</sup> However, for the last 18 visits, the enhanced video quality using the Tandberg equipment proved adequate for motor UPDRS measurements, except for rigidity and retropulsion testing.

At each telemedicine visit, a health-care provider (physician, nurse or physician assistant) was present at the patient's side. In some cases, spouses and/or family members were also present at the patient's side. During three telemedicine visits, a family member of the patient was seated at the movement disorder neurologist's side in Seattle. The presence of the primary-care provider and family members provided several advantages. First, the interim history and the medication list could be obtained simultaneously and efficiently from the patient, family members and health-care providers. Second, the presence of a primary-care physician and the nursing staff helped provide detailed information about the patient's overall motor and cognitive status at the assisted living or skilled nursing facility. This information included the occurrence of motor fluctuations, falls, cognitive impairment, hallucinations, sleep disturbance and dyskinesia. This information is extremely valuable in a dynamic disease such as PD, where the motor status can change from hour to hour depending on medication dosage and scheduling. Third, the direct interaction between primary-care providers and the movement disorder neurologist provided less room for miscommunication, immediate implementation of new recommendations, as well a learning experience for all parties. It also nurtured closer relationships between providers, who would otherwise communicate much less frequently.

In summary, telemedicine encounters proved to be a clinically acceptable and cost-effective means of following PD patients.

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Appendix. Telemedicine questionnaire

The telemedicine questionnaire was completed by the movement disorder neurologist at the end of each telemedicine visit. For each of the following statements the neurologist was asked to indicate 'strongly agree', 'agree', 'neutral', 'disagree' or 'strongly disagree':

- The telemedicine appointment resulted in recognition of problems or issues not apparent to the patient
- The telemedicine appointment influenced the care plan for the patient
- The telemedicine appointment resulted in identification of a problem or recommendations for future care that may have been delayed if the patient had had to arrange to travel to clinic
- The technology used for this appointment worked well
- I would rather use this technology than a telephone call
- The technology provided adequate quality of audio and video to accomplish the goals of the activity

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