

Clinical Video Telehealth for Gait and Balance

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A clinical video telehealth program increases veterans' access to specialty services and reduces travel time and related costs.

The VHA has about 700 community-based outpatient clinics (CBOCs). Often these remote clinics lack onsite specialty services. In 2014, about 3 million of the 9 million veterans in the VHA were enrolled in rural locations, according to the VHA Support Service Center Office of Rural Health. This rural cohort is a substantial veteran population for whom meeting specialty medical care needs can be challenging. Rural veterans often travel long distances to a hub medical center when accessing specialty care. This article describes the North Florida/South Georgia Veterans Health System (NF/SGVHS) telehealth solution to provide veteran-centric specialty care access for rural veterans. The program addresses falls, a major public health problem in the elderly.

The VA is a world leader in clinical video telehealth (CVT). Videoconferencing between clinic sites

allows clinicians to make diagnoses and provide and manage care without requiring long distance travel. Clinical video telehealth allows veterans to come to the CBOC, connect to a specialist in a remote VA hospital for consultation and treatment, and save transportation time and related costs. The VA has real-time CVT for polytrauma, mental health, rehabilitation, surgery, weight loss, and numerous other specialties.^{1,2} The CVT rehabilitation modalities have been successfully used both within the VA and in the community for about 15 years, although rigorous economic and functional outcome data are limited.³⁻⁶

GAIT AND BALANCE CLINIC

The NF/SGVHS spans 50 counties and is one of the VA's largest health systems for clinical workload and rural geography. In 2014, NF/SGVHS had about 160,000 enrolled veterans, and nearly 70,000 were rural, a

slightly higher percentage than the VA nationally.

The Gait and Balance Clinic of the Malcom Randall VAMC in Gainesville, Florida, focuses on evaluating and preventing falls and fall-related injuries in the aging veteran population for all enrolled veterans regardless of location. The NF/SGVHS has a robust CVT program, and in 2014, the physical therapist (PT) initiated a CVT Gait and Balance Clinic pilot. This program increased veteran access from remote clinics to these fall prevention services at NF/SGVHS and positively impacted travel time and related costs.

Clinicians refer veterans with falls, dizziness, and vestibular and gait disorders to the Malcom Randall VAMC Gait and Balance Clinic where specially trained PTs provide expert diagnosis and management. The Gait and Balance Clinic is staffed by 2 vestibular-trained PTs and a health technician. The assessments include sophisticated, specialized testing of balance function, determining biologic systems affecting balance. These include the vestibular, visual, sensory, and musculoskeletal systems (Table 1). Therapists provide customized veteran and caregiver education for in-home

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vestibular exercise programs, fall-reduction strategies, and as-needed adaptive equipment.

Veterans requiring in-depth evaluation attend a weekly Gainesville-based multidisciplinary clinic, staffed by a part-time neurologist, neurology resident trainees, a geriatric medicine fellow, and pharmacy residents and preceptor. Factors affecting gait and balance systems that potentially improve with exercise, such as muscle weakness or vestibular impairments, are mitigated by incorporating into the veteran's care plan personalized home fall-reduction strategies, exercise programs, and patient and caregiver education.

Specific exercises are designed for each patient's home environment. The home exercise programs typically include a combination of balance and strength training, vestibular maneuvers, and progressive walking for endurance. In addition to improving patients' functioning by addressing impairments found on examination, the PTs commonly prescribe assistive devices: rollator walkers, canes, and lower extremity orthoses that reduce fall risk by compensating for deficits in sensory motor systems.

The Gait and Balance Clinic receives more than 400 consults annually and experiences a yearly consult growth rate between 2% and 4%, commensurate with the increase in unique veterans due to new NF/SGVHS CBOC and outpatient clinic activations. Thus, there was an imperative to increase access to this focused consult service for an aging veteran population throughout this large health system. The NF/SGVHS improved timeliness and access to this specialty service within the VA by redesigning its Gait and Balance Clinic and initiating a CVT pilot that connected to selected affiliated remote CBOCs.

Table 1. Systems Assessed for Gait and Balance Disorders

Vestibular	Provides the brain and spinal cord with information on position, speed, and acceleration of the head; provides information about where the body is in relation to the ground
Visual	Helps orient the body in space by referencing the objects around it
Sensory	Pressure and position information to the brain and spinal cord to the joints, muscles, and tendons regarding the body motion
Muscular strength	Loss of muscle mass and strength affects balance, posture, mobility, and endurance

FALLS

Falls are a major public health problem in the aging U.S. population. Sixty-five percent of individuals aged ≥ 60 years experience dizziness or balance loss daily. About 12 million Americans aged ≥ 65 years have dizziness or balance problems that significantly interfere with their quality of life. Resulting falls are a major cause of both nonfatal and fatal injuries in older adults.⁷⁻¹¹ Dizziness also is a common experience among patients aged > 75 years.¹² During 2014, the VA saw about 140,000 veteran outpatients for the primary diagnoses of accidental falls, dizziness, and gait abnormality (VHA Support Service Center). The PTs at the Malcom Randall VAMC Gait and Balance Clinic address these important clinical problems in their aging patients.

BALANCE

Balance is a complex skill based on the interaction of dynamic sensorimotor processes. Balance maintains postural control by keeping the body mass (center of gravity) centered on its support base during stance or voluntary dynamic movements and involves regaining stability quickly in response to destabilizing external perturbations. Balance is preserved by postural motor response adjustments to in-

ternal and external forces and environmental stimuli.

Balance is classified as either static, maintaining a base of support with minimal movement, or dynamic, maintaining a stable base of support while completing a purposeful movement. Visual, vestibular, and somatosensory signals are sent to the central nervous system, which in turn adjusts body sway and posture by integrating this information and by controlling skeletal muscles to perform appropriate responses for balance. The brain regions involved in gait control include the premotor cortex and parietal lobes.¹²

Sustaining postural control is critical for the successful and safe performance of most daily activities. Postural instability occurs particularly in elderly individuals due to any combination of decreased sensitivity in sensors, less effective sensory information input to the central nervous system, and reduced muscular capacity. Patients respond to the majority of postural perturbations through movement primarily at the ankles and hips, called the ankle and hip strategy.

The ankle strategy is most effective for countering slow, smaller perturbations. This requires sufficient ankle range of motion and strength to help maintain stability. The ankle

Table 2. Competencies for Telehealth Certified Technicians

- Articulates the unique challenges of conducting a telehealth visit in the elderly population at risk for falls
- Demonstrates proper guarding techniques to reduce risk for injury to staff and patient during transfers, balance, and gait testing
- Obtains orthostatic blood pressures accurately
- Tests for proprioception at the great toe accurately
- Screens for muscle strength in lower extremities accurately (quadriceps, hip abductors, hip flexors, ankle dorsiflexors, plantar flexors)
- Screens for dynamic visual acuity accurately
- Assists the physical therapist with Berg Balance Scale, Dynamic Gait Index, timed Up and Go, Clinical Test of Sensory Interaction and Balance (CTSIB), and postural reflexes
- Demonstrates ability to ambulate a patient with standard cane, rollator walker, and rolling walker
- Demonstrates the ability to safely guide/guard patients through the following exercises as deemed appropriate by the physical therapist: establishing the “safety zone” for home programs, maintaining balance with a reduced base of support, compliant surface training, functional strengthening exercise for lower extremities, gait activities, and vestibular adaptation exercises

muscles and joint receptors also provide proprioceptive information that assist in the correction of postural sway. When larger external forces are applied during stance, postural control of the body relies more on the hip muscles (hip strategy) as opposed to the ankle muscles. The hip flexor and extensor muscles act during the single-limb stance portion of gait and throughout dynamic turning. Thus, weakness in these muscles contributes to instability during gait and dynamic activities. Larger perturbations trigger a stepping strategy to regain postural control.

Stepping strategy involves an attempt to reestablish a new base of support by stepping forward or backward when the center of gravity has exceeded the original base of support. In the elderly, deficiencies of neural input, environmental feedback, central nervous system sensory integration, and motor output lead to impaired balance and falls. Rehabili-

tation efforts aim to improve the efficiency and integration of the sensory and motor systems.¹³⁻¹⁹

By addressing balance and postural instability and associated muscular weakness, vestibular-trained PTs are integral to mitigating fall risks and concomitant fall-related injuries in the aging elderly population.

IMPLEMENTATION

The Gait and Balance CVT pilot was approved as an exempt protocol by the NF/SGVHS VA Research and Development Committee and the affiliated University of Florida Institutional Review Board.

A technician at the Gainesville division scheduled a 1-hour appointment for both the outpatient clinic and main hospital clinic. The appointment duration for a face-to-face encounter was the same as the CVT appointment. At the remote site, medical support staff assisted veterans with appointment check-ins,

and a telehealth certified technician (TCT) escorted veterans to the examination room for the CVT visits.

The PT’s office had two 18-inch dual computer monitors. One monitor was for the Computerized Patient Record System (CPRS), and the other was for the CVT visit. The PTV’s computer had a speaker with a webcam that panned in or out at the remote site. The webcam’s software was preinstalled. The outpatient clinic examination room is 18 x 20 feet, accommodating various physical examination testing maneuvers.

In the examination room, the TCT accessed a telehealth mobile cart with a preinstalled webcam and speakers. This cart also connected peripheral devices, such as a stethoscope or otoscope (Figures 1A and 1B). The basic webcam cost about \$120. The remote site telehealth mobile cart cost ranged from \$30,000 to \$45,000 per unit, depending on the complexity. The mobile cart can be used for a variety of specialty CVT visits. The VA purchased a software license for the webcam and cart-attached computers.

One of the project’s implementation hurdles was adjusting from face-to-face patient encounters to virtual visits. The PT’s inability to use bodily presence for safety during various testing maneuvers customary during face-to-face encounters required adaptation to the telehealth visit environment. The solution was to have experienced licensed practical nurses (LPNs) serve as the TCTs, providing hands-on support for preventing patient falls during remote visits. At Malcom Randall VAMC, TCTs provide similar adjunctive services to other health professions, including physicians and mental health specialists during CVT visits.

The Malcom Randall VAMC TCTs acquired clinical staff competencies in transfers, balance, and gait testing to

prevent injury to both themselves and the patients. Extra safety measures were used when testing balance, such as using the corner of the room and having stable pieces of furniture proximate to the patient, creating a “safety zone” (Table 2). The TCTs were trained to obtain orthostatic blood pressure measurements, test first toe proprioception, screen for lower extremity muscle strength, and screen for dynamic visual acuity (ie, ability to perceive objects accurately while actively moving the head). The TCTs learned to ambulate patients using assistive devices: standard cane, rollator walker and rolling walker.

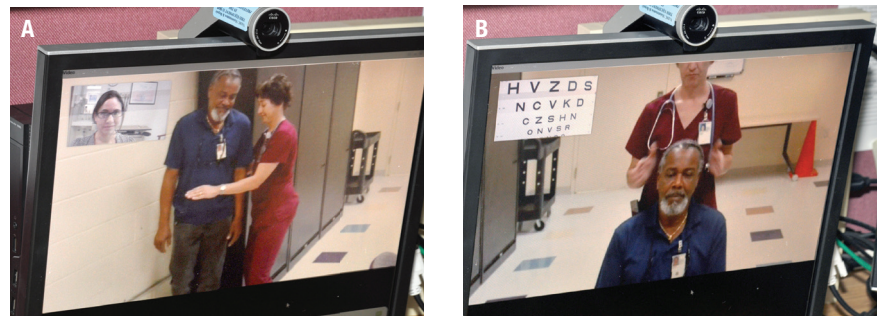
During the CVT encounter, the PT with the TCTs assistance, performed the following evaluations: Berg Balance Scale, Dynamic Gait Index, Timed Up and Go, Clinical Test of Sensory Interaction and Balance (CTSIB), and postural reflex testing. The Berg Balance Scale measures 14 balance-related tasks on a 5-point scale (0-4). The Dynamic Gait Index measures gait during usual steady-state walking, and walking during more challenging tasks. The Timed Up and Go uses the time that a person takes to rise from a chair, walk 3 meters, turn around, walk back to the chair, and sit down. The CTSIB measures how vision, vestibular and somatosensory function impacts balance against the forces of gravity.²⁰⁻²⁴

At the visit’s conclusion, using input the TCT PT educated patients and caregivers on home exercises, maintaining balance, compliant surface training, functional lower extremity exercise strengthening, gait activities, and vestibular adaptation exercises.

RESULTS

The Malcom Randall VAMC partnered with 5 remote clinic sites de-

Figure 1. Physical Therapist’s Computer Monitor



A, Telehealth certified technician simulating typical patient (VA employee) during balance evaluation. B, VA employee simulating the patient in the foreground, preparing to conduct the dynamic visual acuity test.

livering about 4 to 5 CVT visits weekly with 1 to 2 CVT visits per remote clinic monthly. Some of these sites serve primarily rural veteran enrollees. During the pilot project phase between April 2014 and August 2014, the PT performed 25 CVT encounters with veterans, evaluating gait and balance disorders. Anecdotal informal feedback on the CVT experience was positive for both clinicians and veterans. Moreover, the PT often ordered durable medical equipment during these initial CVT encounters to rapidly employ fall prevention environmental modalities.

The average round-trip mileage saved per veteran per visit was about 120 miles (Table 3). Reducing the drive time is an important consideration for elderly veterans and their caregivers.

DISCUSSION

The transition from face-to-face to CVT visit was seamless for the PT. Paramount to this success was the TCTs training and related competencies to expect common balance losses during testing. The experienced LPN was a good fit for the TCT role for this particular CVT clinic. Special emphasis in the TCT competency

training sessions was given to body and hand positioning to prevent falls in all directions. Placing the hands both in front and behind the patient simultaneously in anticipation of a fall was critical. Walking alongside a patient during gait testing with similar hand placement was also important. Special attention was given during and after the turn when most balance-impaired patients are prone to fall. This provided a feeling of security to both the patient and the remote PT.

CONCLUSION

Veterans expressed satisfaction to the PTs and TCTs about the reduced

Table 3. Mileage

Remote Clinic	Mileage to Gainesville Clinic
Palatka, Florida	44
Lecanto, Florida	62
The Villages, Florida	62
St. Augustine, Florida	73
Valdosta, Georgia	106

travel time and transportation costs. This pilot showed that employing a specialized gait and balance clinic is feasible using CVT technologies with positive results. ●

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