Patients With Advanced-Stage Cancer May Benefit From Telerehabilitation

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—Andrea L. Cheville, MD, MSCE

A new study finds that for patients with advanced-stage cancer who reside in remote locations, collaborative telerehabilitation can improve physical functioning, pain relief, and quality of life while lowering the costs associated with long-term cancer care, including lengths of hospital stays. The study was led by researchers from the Mayo Clinic in Rochester, Minnesota, and appears in *JAMA Oncology* (doi:10.1001/jamaoncol.2019.0011).

Lead study author Andrea L. Cheville, MD, MSCE, a professor and chair of physical medicine and rehabilitation research and director of the Cancer Rehabilitation Program at the Mayo Clinic, says a big part of her team’s motivation for conducting the study was to alleviate stress and pain for patients with hematological cancers or late-stage solid tumors who already are starting to become disabled. “One-on-one clinic-based encounters for these patients aren’t always necessary,” Dr. Cheville says. “Plus, the appointments are often inconvenient, the patients don’t feel well, and they’re stressed over treatment and financial burdens along with other hardships. Also, most patients with late-stage disease don’t want to spend their time in institutions, so staying out of nursing homes and hospitals is a critical goal for them.”

In this vein, Dr. Cheville says her team wanted to find an effective means of delivering validated exercise interventions in a way that was patient-centric and easily accessible. “Those were big drivers for our interest in telerehab and the study’s design, and we believe it’s the first time a study like this, focused on such a vulnerable population, has ever been completed.”

**Study Design**

More than 500 patients (257 women and 259 men) with confirmed stage IIIC or stage IV solid cancers or hematologic malignancies with moderate functional impairment randomly were assigned to 1 of 3 study arms. The participants were identified through review of the Mayo Clinic’s electronic health records for its campuses in Rochester, Minnesota; Jacksonville, Florida; and Scottsdale, Arizona. They all underwent automated assessment of physical function (mobility) and pain using telephone interviews, with data reporting to their care teams, at baseline, 3 months, and 6 months.

The first study arm served as the control group; patients received remote monitoring only. These patients received automated monitoring for pain based on 3 survey items: 1) average pain intensity; 2) interference with enjoyment of life; and 3) interference with general activity. They received automated monitoring of mobility using 5 items from the Activity Measure for Post-Acute Care (AM-PAC) basic mobility bank.

Participants in the second study arm received an individualized physical conditioning program via telephone from 2 physical therapist fitness care managers specializing in cancer rehabilitation. They directed patients in a pedometer-based walking and resistive exercise program. The fitness care managers informed each patient’s oncologic, hematologic, and primary care teams about the patient’s progress and concerns. Participants randomized to the third study arm also received the same telerehabilitation regimen plus pharmacological pain management administered by a nurse.

**KEY POINTS**

- Telerehabilitation improved mobility and quality of life.
- The total number of hospital days among control arm participants was significantly higher than among telerehabilitation participants due to shorter hospital stays, not fewer hospitalizations.
Dr. Cheville says they kept the telerehabilitation low-tech partially because many of the remote locations did not have the bandwidth to support tools such as interactive video. Her team pilot-tested some video conferencing approaches, but the connections were not reliable enough and were found to be jarring and disruptive. “It’s easy to get dazzled by technology, but we found it was better to keep it simple using things like IVR (interactive voice response) via the telephone, or web and smart phone interfaces to gage their pain and function.”

All participants were evaluated by a research assistant using the AM-PAC basic mobility computer adaptive test to follow changes in mobility, the 5-item EQ-5D-3L for health-related quality of life, and the Brief Pain Inventory average and total interference instruments. Dr. Chevelle said that a computer algorithm selects the next most informative item given a respondent’s prior answers. “The idea is to customize the ‘test’ to the test taker’s level, to increase precision and efficiency of trait estimation.” She says the approach first was developed in the military to assess the mathematical and verbal aptitude of new recruits.

### Study Results

Patients who participated in the telerehabilitation intervention (study arm 2) had significantly improved mobility function ($P = .03$) and quality of life ($P = .01$) compared with the control group. Those patients in study arm 2 and those in study arm 3 (telerehabilitation as well as nurse-led pain management) had significantly reduced pain interference and average pain intensity. The magnitude of difference for groups 2 and 3 compared with the control group was nearly identical for pain interference, and was slightly greater in group 3 for average pain intensity.

Another important result was that the total number of days of hospitalization among participants in control arm 1 was 57% higher than in study arm 2 participants and 18% higher than in participants in study arm 3; however, this finding was due to shorter hospital stays, not fewer hospitalizations.

Although the researchers note that the telerehabilitation intervention was beneficial, they concede that the improvements were modest. “Of course I would have liked better results,” says Dr. Cheville.

Julie Silver, MD, an associate professor and associate chair in the physical medicine and rehabilitation department at Harvard Medical School in Boston, Massachusetts, agrees that the study is important. “In advanced cancer, studying the delivery of interventions via a telemedicine model is particularly interesting for several reasons. One is that these are patients who are often older and have preexisting comorbidities as well as a cancer diagnosis that results in chronic and progressive debilitating disease. The physical impairments and functional disability caused by the cancer itself is further compounded by oncologic-directed therapies.” Dr. Silver says this combination of factors makes these patients particularly vulnerable, and small shifts, either up or down, in functional status may have a larger than anticipated effect on considerations such as cost. “For example, a small improvement in functional status that results in someone being able to continue to live independently in their own home instead of living in a nursing home may result in a large reduction in financial burden.”

One result surprised Dr. Cheville the most. “We thought improvement in arm 3 was going to be a slam dunk, that it would be the Cadillac model. We expected to hit the ball out of the park, by simultaneously addressing function and pain, and we didn’t!”

In an accompanying commentary to the study, Manali Patel, MD, MPH, an assistant professor of medicine and oncology at Stanford University and the Palo Alto Veterans Affairs Health Care System in Palo Alto, California, stated that she might have an explanation for this surprise outcome. “Although these results initially seem unexpected, it is possible that, similar to the nurse’s role in the telerehabilitation with pharmacological pain management arm, the fitness care managers also proactively identified and communicated participants’ pain to the primary clinical teams. This could have resulted in complementary symptom–directed pharmacologic interventions in addition to pain-focused rehabilitation for participants in the telerehabilitation-alone arm.”

Dr. Cheville says one of the most gratifying results of the study was how many of the patients completed it. “Retention has been a persistent issue with similar studies. Patients may drop out because the interventions are too structured, rigorous, and challenging for vulnerable populations.” She reported that only 7 participants in the control arm (4.1%) and 5 participants in each of the telerehabilitation arms (2.9%) withdrew consent. In addition, 11 participants (6.4%), 13 participants (7.6%), and 15 participants (8.7%), respectively, died during the study in arms 1, 2, and 3.

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