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2020 Validation Report

Sword Health

SWORD HEALTH

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What does the program do?

SWORD Health is a digital MSK solution, offering virtual physical therapy for neck, shoulder, elbow, wrist, low back, hip, knee, and ankle pain.

This review covers: a) the results of two clinical trials involving patients recovering from total hip arthroplasties and total knee replacements; b) the results obtained in a cohort of patients treated with SWORD's low back pain program and c) the results obtained in a cohort of members from one of SWORD's clients.

Description of SWORD's approach

SWORD's approach to treating MSK conditions is based on therapeutic exercise, patient education and cognitive behavioral interventions.

Patients participating in SWORD's programs do their exercise sessions independently, at home, through an FDA-listed medical device that consists of motion sensors and a tablet that leverages artificial intelligence to synch and measure the patient's movements while wearing the sensors. A cloud-based portal allows the Physical Therapist to monitor and edit exercise programs remotely. A separate smartphone app allows two-way communication between the patient and the Physical Therapist. The educational and behavioral components are also delivered through the app.

Patients using the SWORD program can achieve outcomes comparable to conventional care and reduce the need for in-person visits. Because the program is virtual, patients can follow the treatment plan more easily than a conventional care plan, from the comfort of their home. Better adherence can lead to better results and lower costs.

How were results calculated?

Hip study: Sixty-six patients were split into two groups – one using Sword Health (35 participants) and one using conventional (in-person) care (31 participants), of which 58 ultimately completed the study protocol (30 vs 29 respectively). Everyone was measured before their surgery, at two points during the 8-week post-surgery recovery program (weeks 4 and 8), and then again 3 to 6 months after surgery. The Timed Up and Go test was used to measure how long a person takes to rise from a chair, walk three meters, turn around, walk back to the chair, and sit down; the Hip dysfunction and Osteoarthritis Outcome Scale (HOOS) was used by medical providers to ask patients about their ability to do various activities, quality of life, and perception of pain; and their hip range of motion (ROM). The two groups' improvement in these measures was compared to gauge whether one group performed differently than the other.

Knee study: Sixty-nine patients were allocated to two groups – one using Sword Health (38 participants) and one using conventional care (31 participants). Fifty-nine patients ultimately completed the study

protocol (30 vs 39 respectively). The primary outcome measured was the Timed Up and Go test (described above) at baseline, and at eight weeks, 12 weeks (three months), and 26 weeks (six months) after surgery. Another measure used was the Knee Injury and Osteoarthritis Outcome Score (KOOS), which is similar to the HOOS scale described above but for the knee. The two groups had similar starting scores.

Low back pain: Thirty-two patients diagnosed with low back pain and assessed to be high-risk for surgery were assigned to the SWORD Health program. Participants received wearable sensors and on average, had 42 AI-led exercise sessions during the 12-week period. A Physical Therapist monitored their progress. The analysis measured the participants adherence to the program (defined as completing the 12 weeks of treatment), as well as pain levels, interest in pursuing spine surgery, medication consumption (self-reported) and disability, measured through the Oswestry Disability Index (ODI).

Client case study: 598 members from one of SWORD's clients enrolled in the program. Members had a variety of MSK conditions, affecting neck, low back, shoulder, elbow, hip, knee and ankle. All members were assessed at baseline and then every four weeks during the program. This assessment included self-reported pain level, interest in pursuing surgery, medication consumption, anxiety - measured through the General Anxiety Disorder 7 questionnaire (GAD7)-, depression - measured through the Patient Health Questionnaire 9 (PHQ-9) -, and productivity, measured through the Work Productivity and Activity Impairment Index: General Health v2.0 (WPAI:GH). The report presents results at the 8 week mark.

What were the results?

Hip study: From the 66 participants that enrolled in the study (35 SWORD Health; 31 conventional), 59 completed it (30 vs 29). Considering the outcomes of the participants that completed the study (per-protocol analysis), the group assigned to the SWORD Health program had better improvement in all outcomes at 8 weeks and 6 months. Considering the outcomes of all 66 participants (intent-to-treat analysis), the group assigned to the Sword Health program had better improvement at each of the time points than the conventional care group on the Timed Up and Go test. On the HOOS test, Sword Health patients did better on the sports and Quality of Life components. They also did better on the range of motion tests, except for one component (standing flexion).

Knee study: The conventional care and the Sword Health groups improved on their TUG and KOOS scores enough to be considered clinically significant. The Sword Health group had significantly more improvement than the conventional care group on both tests at all of the post-surgery assessments with the exception of one component of the KOOS test (sports).

Low-back pain: Eighty-eight percent of participants completed the SWORD program, with 63% of participants completing at least three sessions per week. This compares favorably to adherence to traditional physical therapy programs for low back pain, for whom adherence can range from 30% to 86%, varying with how adherence is defined and how many weeks treatment lasts. Patients tend to drop out the longer that treatment lasts (see note below) (Jack & al, 2010). In terms of clinical

outcomes, participants reported an average reduction of 70% in pain levels, a 64% decrease in the intent of pursuing surgery, a 36% decrease in medication intent, as well as a 54% reduction in the ODI score.

Client case study: Eighty-nine percent of participants completed at least 8 weeks of the SWORD program. Those that completed the program reported a 50% decrease in pain levels and a 40% reduction in the intent of pursuing surgery. Regarding medication, 24% of those that were taking medication at baseline were no longer taking any at week 8; the ones that kept taking medication reported a 48% reduction in the number of days taking it. Of the members that scored at least 5 points in the GAD7 or PHQ9 scales at baseline, approximately one in three scored below 5 in the GAD7 at 8 weeks, and one in two scored below 5 in the PHQ9 scale. Participants also reported a 32% reduction in the percent overall work impairment caused by their MSK condition (from 12.0% to 8.1%).

Anything else?

For the hip and knee analyses, patients were assigned to the Sword Health program or to conventional care based upon the patient's geographical proximity to medical services. Those patients who were farther away from a conventional therapy provider were assigned to the SWORD program. This may make the two groups different in ways that cannot be measured and may skew the results.

In both knee and hip studies, a larger portion of patients in the SWORD Health group dropped out of care, compared to the conventional care group. 21% (knee) and 14% (hip) of the intervention group versus 7% and 6% in the conventional care group. This may make the results more favorable for the intervention group than they would be otherwise. In the hip study, results were analysed on an intent-to-treat approach, which circumvents this limitation.

In the low back pain and client case studies, the results were presented only for participants in SWORD Health programs, as there was no control group.

For all three analyses, participants voluntarily joined the program and may be different from the general population.

Works cited

Jack, K., & al, e. (2010). Barriers to treatment adherence in physiotherapy outpatient clinics: A systematic review. *Manual Therapy*, 220 - 228.

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