At-home aerobic exercise improves functional ability of patients with rheumatoid arthritis with limited exercise options

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At-home aerobic exercise improves functional ability of patients with rheumatoid arthritis with limited exercise options

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ABSTRACT

A clinical decision report using:


and its application for a patient with rheumatoid arthritis.

Keywords: rheumatoid arthritis, at-home aerobic exercise

Clinical-Social Context

Ms. Janet Williams [pseudonym] is a 52-year-old woman with a past medical history significant for rheumatoid arthritis who presents to an outpatient rheumatology clinic for medication refill. Ms. Williams has had rheumatoid arthritis for seven years and has been taking methotrexate and sulfasalazine. She has been out of her medications for 2 months due to difficulty attending appointments in the context of the COVID-19 pandemic, causing a flare-up in her symptoms including swelling and pain in her hands, wrist, elbow, and knee, and limited range of motion in her upper extremities. Her symptoms cause some functional impairment. She rates her pain as an 8/10 and states that she has tried relief with ibuprofen and a hot pad, but neither of these are sufficient to relieve the pain. She is disappointed with her worsening symptoms and is motivated to improve her health.

On review of systems, Ms. Williams endorses fatigue, shortness of breath, and weight gain, and believes these have occurred because she has not been exercising regularly. Upon further questioning, Ms. Williams states that her normal exercise routine consists of walking around her work campus during her lunch break. However, Ms. Williams has been working from home during the COVID-19 pandemic and does not feel safe walking around her neighborhood. As such, she has not been exercising lately.

Ms. Williams and the team developed a plan to ensure she does not run out of medication in the future. The treatment team also discussed exercise with her, explaining that regular exercise may help with her rheumatoid arthritis. The medical student and the patient worked together to devise an exercise plan; given the patient’s concern over neighborhood safety, the lack of available exercise gyms due to the COVID-19 pandemic, and the patient’s work-from-home constraints; the medical student recommended online at-home aerobic exercise videos. Aerobic exercise was recommended (as opposed to other forms of exercise) because it is similar to Ms. Williams’

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pre-existing exercise routine, requires minimal equipment, and would be easiest for Ms. Williams to incorporate. The patient agreed that this would work with her lifestyle and will look into this further.

Clinical Question
Can at-home aerobic exercise improve symptoms and complications of rheumatoid arthritis in patients with limited options for exercise?

Research Article

Description of Related Literature
As illustrated by the studies listed below, the recommendation of aerobic exercise for management and improvement of rheumatoid arthritis is a Grade A level of evidence because benefits are suggested by multiple randomized control trials. ⁴ To obtain relevant clinical research, the terms "rheumatoid arthritis home aerobic exercise" were searched in PubMed yielding 82 results. The search was refined to only include clinical trials since the year 2000, narrowing the search down to 21 results. Thirteen of these clinical trials were excluded because they were outside of the scope of recommendations given to the patient (aerobic exercise) and included recommendations such as strength training, hand and upper extremity exercises, physical therapy, disclosure of stress, and exercise using a videogame console. Two studies investigated hypotheses out of scope of the clinical question, and one study was not available in English.

The remaining five clinical trials were reviewed. The study by Kucharski et al. ¹¹ was a randomized controlled trial in adults older than 65 with rheumatoid arthritis. An experimental group participated in 20 weeks of a mixed gym- and at home- based exercise program consisting of aerobic and resistance exercise. The study found statistically significant improvements in fatigue, depression, and positive metabolic changes but no significant reduction in disease activity or inflammatory markers. Although the results were promising, this study was excluded because the patient population (adults age 65 and over) was not representative of Ms. Williams and the exercise program (both aerobic and resistance training) was out of scope of the recommendations given to Ms. Williams. The study also did not have a pure control group of patients exercising at their baseline, and the recommendations given to Ms. Williams were more similar to the GM group than the IM group.

The study by van den Berg et al. ²¹ was a randomized control trial comparing patients with rheumatoid arthritis enrolled in an internet-based exercise program (referred to as IM) with patients only given information about exercise (referred to as GM). The study found that members of the IM group were more likely to meet physical activity requirements than the GM group. IM members also showed improvement in functional ability, quality of life, and disease activity, but these differences were not statistically significant. This study was not chosen because the scope of the exercise training (involving strength training, a bicycle ergometer, and contact with others according to a formalized schedule) was beyond the scope of recommendations given to Ms. Williams. The study also did not have a pure control group of patients exercising at their baseline, and the recommendations given to Ms. Williams were more similar to the GM group than the IM group.

The study by Durcan et al. ²² was a randomized control trial investigating the effect of aerobic exercise, resistance training, and stretching on sleep and fatigue. The results showed such exercise had a statistically significant improvement in pain, stiffness, sleep quality, and fatigue. Although the results were promising, this study was rejected because the exercise program was out of scope of the recommendations given to Ms. Williams, and the study investigated the effect on only a narrow range of rheumatoid arthritis symptoms (as opposed to the chosen study).

To obtain additional articles, the words “rheumatoid arthritis home aerobic exercise” were searched in Google Scholar. Two review articles (by Baillet et al. ²³ and Rongan-van Darthel et al. ²⁴) were identified on the first page of the search, and the eight trials from these review articles that were published after 2000 and were not also found in the PubMed search were analyzed. Several studies were excluded because they were outside of the scope of recommendations given to Ms. Williams— including comparing supervised
exercise to physical therapy, group exercise, aquatic exercise, and cycling. One study was excluded because its selection criteria of hospitalized patients was not representative of Ms. Williams. The study by Melikoglu et al. presented interesting results about short-term dynamic exercise increasing IGF-1 levels and decreasing morning stiffness and pain. However, the duration of treatment (15 days) was shorter than the long-term changes recommended for Ms. Williams and the exercises in the treatment group were performed on a treadmill, which Ms. Williams does not have access to. The study by Westby et al. illustrates that aerobic exercise is associated with significant improvements in physical function and activity levels in women taking prednisone. However, Ms. Williams meets the study’s exclusion criteria of having taken methotrexate in the past six months, and she is not currently taking prednisone.

The study by Neuberger et al. obtained from both the PubMed and Google Scholar searches was ultimately chosen to answer the clinical question. This is a randomized-control study involving patients between the ages of 40 and 70 investigating whether aerobic exercise (delivered via either in-person classes or at-home video) would improve common symptoms of rheumatoid arthritis (fatigue, pain, and depression) and improve patients’ functional ability. This study was chosen because it was a randomized control trial investigating the efficacy of the specific recommendations given to Ms. Williams (at-home aerobic exercise) on improving a wide variety of symptoms, including some of the specific symptoms Ms. Williams was experiencing (such as fatigue and functional impairment). The patient age and overall health status were also similar to Ms. Williams, making this a reasonable paper to apply to Ms. Williams’ case.

Critical Appraisal

With 29.1% of participants withdrawing from the study before completion, Neuberger et al. can be described as a SORT level 2 according to SORT criteria. Participants for the study were recruited from “an arthritis clinic, private rheumatologists, media advertisements, and posted flyers.” Voluntarily recruiting individuals from treatment centers creates a selection bias, as individuals who are receiving treatment and volunteers for the study may have a higher motivation to manage and improve their rheumatoid arthritis. 404 individuals met inclusion criteria (aged 40-70 with RA, ambulatory, able to speak and understand English, and able to tolerate aerobic fitness testing) and exclusion criteria (history of fibromyalgia or COPD, currently receiving beta blocker or digitalis therapy, and currently doing aerobic exercise for more than 30 minutes a day 3 times weekly). These criteria do potentially bias for healthier patients but are appropriate to ensure that individuals could complete the necessary aerobic exercise and lack other comorbid conditions that could influence the results. Patients selected for the study were demographically similar to Ms. Williams in age, past medical history, and fitness level, further strengthening the choice of this paper to answer the clinical question.

310 individuals were then enrolled in the study and were randomized to one of three groups: a C-Tx group consisting of “12 weeks of low-impact aerobic exercises for 1 hour 3 times a week” via classes at a local fitness center, an H-Tx group consisting of the same exercise routine delivered via at-home videotape, and a control group instructed to continue their pre-existing exercise routines. The control group was thus not completely standardized (as individuals may have differing levels of baseline exercise), however instructing individuals not to exercise when it was hypothesized that exercising provides benefit for the patient would have been unethical. To control for exercise intensity, participants in both the H-Tx and C-Tx groups were given a target heart rate of 60-80% of maximum heart rate and were instructed to take and record their pulse at the end of each exercise session. The recommendations given to Ms. Williams were very similar to the H-Tx group, providing further justification for the selection of this study.

Participants from each group were assessed for RA symptoms (fatigue, pain, and depression) and functional ability (grip strength and walk time) at baseline (T1), after 6 weeks (T2), and after 12 weeks (T3) by trained assessors who were blinded to enrollees’ group assignments. Conducting the study as a single-blinded study was appropriate—because the study involves deliberate lifestyle changes on the part of the participant it is not possible to create a double-blinded trial.

62 participants dropped out of the study before baseline data were collected (T1), and 28 dropped out after T1. These 28 individuals had a longer history of RA (16.4 years vs 11.2 years) and had a longer time taken to walk 50 feet (11.6 seconds vs 9.7 seconds). Thus, attrition bias may be present toward healthier individuals, although Ms. Williams’ 8-year history of RA is similar to that of the remaining participants.
The results of the study revealed the paper’s first hypothesis—that aerobic exercise would improve symptoms of fatigue, pain, and depression—was validated for the C-Tx group (P<0.04) but not for the H-Tx group. One possible explanation the paper gave for this was differences in exercise intensity—participants in the H-Tx group self-reported lower maximum heart rates than the C-Tx group (with a NNT of 3.7 for achieving 60% of maximum heart rate and 8.3 for achieving 80% of maximum heart rate between the two groups). The second hypothesis—that exercise would improve patients’ functional ability and aerobic fitness level—was partially validated for both the C-Tx and H-Tx groups. Both groups reported statistically significant improvements in left grip strength (P<0.005) and walk time (P<0.005) which serve as measures of functional ability, but neither group reported statistically significant improvements in aerobic fitness (although both groups did show improvement). Over the 12-week trial, the H-Tx group increased their left grip strength increased by 4.8%, and walk time decreased by 5.7%.

Results of this study could be strengthened by lengthening the time of the intervention—12 weeks may not be enough to see the full effect of exercise, and these promising results warrant additional research on a longer time scale. To further investigate the effects of at-home aerobic exercise, further studies should be done with stricter control over exercise intensity between the two groups such as more frequent review of patient heart rates with frequent feedback provided for participants.

### Clinical Application

This study illustrated that at-home aerobic exercise provides less improvement in RA symptoms than in-person aerobic exercise, but still significantly improves patients’ functional ability (P<0.005)—indeed, left grip strength for the H-Tx group increased by 4.8% and walk time decreased by 5.7%, sizable changes that may produce noticeable differences in Ms. Williams’ daily life. Although this study suggests at-home aerobic exercise may not improve all of Ms. Williams’ complaints (such as fatigue and pain), the benefits provided for functional ability—combined with Ms. Williams’ exercise preferences and limitations due to the COVID-19 pandemic—warrant the recommendation of at-home aerobic exercise. Ms. Williams’ similarities to the patients in this study—such as age, disease duration, and medical history—suggest that she will likely experience the benefits in functional ability seen in this study. Because the study suggested that difference between C-Tx and H-Tx may be due to lower exercise intensity in the H-Tx group, Ms. Williams should be given specific heart rate goals and counseled that benefits are more likely to be seen if she adheres to them, giving her higher intrinsic motivation to exercise at optimal intensity. To increase adherence to the program, Ms. Williams could share her plans with other members of her household and even ask them to exercise with her. Potential harms from such exercise include injury, which could be prevented by giving Ms. Williams specific exercise plans/recommendations for her level of fitness and instruction to avoid over-exercising.

### New Knowledge Related to Clinical Decision Science

Using specific information about Ms. Williams’ previous exercise experience and preferences, social situation, and limitations due to the COVID-19 pandemic, our team was able to make an at-home aerobic exercise recommendation that will fit her current lifestyle and that she was eager to begin. Research in the literature suggests that at-home aerobic exercise will improve her functional ability and also disproves previous myths that exercise can be harmful for patients’ joints. Clinical decision science thus ensures that efficacious recommendations are made that are also comfortable and feasible for the patient’s social circumstances, providing greater chance of adherence and benefit for the patient.

This case also illustrates the interdependence of multiple modalities to treat chronic problems. Ensuring uninterrupted medication supply would enhance adherence to exercise programs. Giving recommendations that are “do-able” for the patient would increase adherence, which is the specific point of this clinical decision report. Too often, doctors recommend treatment plans that are impractical for patients and not recognizing this disjunction creates frustration for patients and providers. This case illustrates how the time spent understanding the patient’s social circumstances can lead to better treatments.

### Conflict Of Interest Statement

The author declares no conflicts of interest.
References


