



# Postural orthostatic tachycardia syndrome treatment with physical therapy

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Policy contains: Postural orthostatic tachycardia syndrome; POTS.

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## Coverage policy

Physical therapy for postural orthostatic tachycardia syndrome is investigational/not clinically proven and, therefore, not medically necessary.

### Limitations

No limitations were identified during the writing of this policy.

### Alternative covered services

- Pharmaceutical interventions.
- Medical treatment for underlying contributing medical conditions.

## Background

Postural orthostatic tachycardia syndrome is a circulatory system disorder marked by insufficient blood return to the heart after standing up from a lying-down position, accompanied by lightheadedness or fainting (orthostatic intolerance), along with a rapidly increasing heart rate and hypovolemia (Fedorowski, 2019; Vernino, 2021).

The syndrome affects one million to three million Americans. Five of six persons with the condition are women, with the highest incidence occurring in ages 15 to 50 (Fedorowski, 2019).

Half of persons with the syndrome have a small fiber neuropathy which impacts the sudomotor nerves. Additional markers of the condition include physical deconditioning, reduced exercise capacity, headache, 'brain fog', dyspnea, gastrointestinal disorders, and musculoskeletal pain. Cause(s) remain unknown, but the syndromes often follow major surgery, trauma, a viral illness, vaccination, or pregnancy (Fedorowski, 2019).

Diagnosis is often based on a constellation of signs and symptoms that vary widely from person to person. Measurement of blood pressure, testing for heart rate (lying, sitting, and standing), and tilt table tests (the gold standard) can also be conducted (Fedorowski, 2019). Diagnostic criteria for postural orthostatic tachycardia syndrome include (Freeman, 2011; Vernino, 2021):

- Sustained heart rate of 30 beats per minute or more (40 beats per minute in persons ages 12 – 19) within 10 minutes of standing or head-up tilt in the **absence** of orthostatic hypotension.
- Standing heart rate often is 120 beats per minute or more within 10 minutes of standing or head-up tilt.
- Orthostatic tachycardia may be accompanied by symptoms of cerebral hypoperfusion and autonomic overactivity that is rapidly relieved by returning to a supine position.
- Criteria are not applicable for low resting heart rate.
- Symptoms occurring for at least three months, in the absence of other medical conditions or severe deconditioning associated with prolonged illness and bedrest.

Treatments for the symptoms vary and may include increasing salt and fluids in the diet and exercising. Caregivers may prescribe medicines, often those that regulate blood pressure, along with beta blockers. Most people affected by the syndrome eventually return to normal daily activities, although some have a poor prognosis. A survey, done two to ten years after diagnosis, of 502 patients ages 13 – 18 treated at the Mayo Clinic generated 172 responses: 19% reported complete resolution of symptoms; 51% reported persistent but improved symptoms; and 16% reported intermittent symptoms (Bhatia, 2016).

Physical therapy, typically on a graduated basis, is one means of treating the syndrome, as cardiovascular deconditioning (i.e., cardiac atrophy and hypovolemia) contributes significantly to the disorder and its symptoms (Fu, 2018). The Levine protocol, developed by Dallas cardiologist Benjamin Levine, incorporates behavioral changes and physical conditioning that can be done at home, starting in a safe sitting or lying down position and progressing to upright exercises. The supervised protocol may include weight training and semi-recumbent exercises such as rowing, swimming, and recumbent cycling over a period of three months or longer. Other interventions include physical counter maneuvers (muscle contraction, leg crossing, and forward bending) (Zhao, 2022).

## Findings

An expert consensus statement from the Heart Rhythm Society for treating postural orthostatic tachycardia syndrome gave a weak recommendation, based on randomized trials, for a regular, structured, and progressive exercise program for patients with the syndrome. Among other treatments, the Society classified one as “weak recommendation,” (acute intravenous infusion with saline), while the other six were “equivalent, benefits possibly exceed risks,” or “not recommended” (Sheldon, 2015).

The American College of Cardiology recommends exercise conditioning with a recumbent bike, rowing machine, or swimming, as a treatment for postural orthostatic tachycardia syndrome. The College notes that patients can exercise while avoiding the upright position to improve tolerance of the program. Dr. Levine is a study coauthor (Bryarly, 2019).

The Canadian Cardiovascular Society made a strong recommendation, based on moderate-quality evidence, supporting exercise training for persons with postural orthostatic tachycardia syndrome. The Society's panel recommends exercise take place every other day for at least 30 minutes, in a non-upright position, focusing on aerobic reconditioning with additional leg resistance training. The panel added that some patients might not begin to experience positive results for four to six weeks (Raj, 2020).

A journal article by Mayo Clinic staff to guide clinicians treating adolescent postural orthostatic tachycardia syndrome asserts that exercise as a foundational treatment for the syndrome has "wide acceptance," but that "limited consensus" exists on specific exercise recommendations (Kizilbash, 2014).

A systematic review/meta-analysis of 25 case series ( $n = 755$ ) and three randomized controlled trials ( $n = 103$ ) that identifies exercise as a treatment for postural orthostatic tachycardia syndrome included just four references, only two of which published since 2005. Authors generalize evidence of efficacy as "extremely limited," due to lack of direct comparisons and heterogeneity in age, symptom severity, and efficacy measures (Wells, 2018).

No other systematic review or meta-analysis addresses exercise as a treatment for this syndrome. A review of exercise programs for postural orthostatic tachycardia syndrome states the treatment shows promise for patients whose condition otherwise does not resolve, especially those progressing from recumbent to upright activity in conjunction with core/joint stabilization and strength training. It also states that future research should better understand whether physical therapy improves exercise tolerance in these patients (Miranda, 2018).

A literature review recommends exercise and non-pharmacological interventions early in treating postural orthostatic tachycardia syndrome. Initial use of horizontal exercise is encouraged, along with supervised training to maximize functional capacity. The review lists volume expansion, reduction in venous pooling, and physical countermeasures as treatments and symptomatic relief, but their efficacy has yet to be investigated (Fu, 2018).

A group of 251 persons with postural orthostatic tachycardia syndrome began the Levine protocol, a mild-to-moderate intensity three-month endurance training program accompanied by increased salt and water intake. Only 103 subjects (41%) completed the program; another 24% reported problems in completing the program. Of those who completed three months, 71% reported significant reduction in symptoms (George, 2016).

Other studies in the medical literature address efficacy of exercise in treating postural orthostatic tachycardia syndrome. All are small (60 subjects or fewer), and most are not randomized. A randomized controlled trial ( $n = 62$ ) feasibility study, known as the PostUraL tachycardia Syndrome Exercise (PULSE) intervention, was being planned in late 2020 (McGregor, 2020).

In 2022, a nonrandomized retrospective trial ( $n = 77$  adult participants) examined the efficacy of a six-month unsupervised at-home training protocol for the treatment of postural orthostatic tachycardia syndrome in a tertiary care referral population (Gibbons, 2021). Forty-eight patients participated in a modified Levine exercise training protocol, and 29 nonparticipants served as controls. At the end of six months, compared to controls, fewer participants in the exercise group met heart rate criteria for postural orthostatic tachycardia syndrome (23% versus 93%,  $P < .0001$ ). In addition, the exercise group had a lower supine heart rate ( $P < .001$ ), a lower standing heart rate ( $P < .001$ ), and a lower frequency of syncope ( $P < .001$ ), with significant improvement detected in the EuroQol perceived quality of life scale score ( $P < .001$ ). No policy changes are warranted.

In 2023, we identified no new or relevant literature to add to the policy. No policy changes are warranted.

## References

On March 20, 2023, we searched PubMed and the databases of the Cochrane Library, the U.K. National Health Services Centre for Reviews and Dissemination, the Agency for Healthcare Research and Quality, and the Centers for Medicare & Medicaid Services. Search terms were “postural orthostatic tachycardia syndrome” (MeSH), “postural orthostatic tachycardia syndrome,” and “exercise.” We included the best available evidence according to established evidence hierarchies (typically systematic reviews, meta-analyses, and full economic analyses, where available) and professional guidelines based on such evidence and clinical expertise.

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## Policy updates

4/2021: initial review date and clinical policy effective date: 5/2021

4/2022: Policy references updated.

4/2023: Policy references updated.