Bateman Horne Center
RESEARCH | CLINICAL CARE | EDUCATION

10-Minute NASA Lean Test

(a standardized passive stand test)

Clinician Instructions

Orthostatic intolerance (OI) is an umbrella term used to describe the development of symptoms induced by upright posture that are relieved by reclining or supine posture. Orthostatic hypotension (OH), neurally mediated hypotension (NMH) [or neurogenic orthostatic hypotension/NOH] and postural orthostatic tachycardia syndrome (POTS) are terms used to describe several subtypes of OI.

The 2015 National Academy of Medicine (NAM) clinical diagnostic criteria for myalgic encephalomyelitis/chronic fatigue syndrome (ME/CFS) establishes that orthostatic intolerance is a common and often overlooked feature of illness that is objectively measurable.

OI may contribute to dizziness, fatigue, headache, cognitive dysfunction, chest discomfort (palpitations, shortness of breath), abdominal discomfort (nausea), tremor, anxiety, various pain manifestations, and even non-epileptic seizure activity. We recommend that all ME/CFS and fibromyalgia syndrome (FMS) patients undergo the standardized 10-Minute NASA Lean Test***** to assess for orthostatic intolerance.

A baseline diagnostic test will be most revealing if therapeutic measures that reduce orthostatic intolerance are withheld upon the day of testing. For example, patients are encouraged to limit extra fluid and sodium intake, remove compression socks, and adjust medications that might influence the test (see examples below). These treatments can be **resumed immediately** after the test.

Tools needed:

- Bed, wall, blood pressure cuff, and finger or ear pulse oximeter.
- The test is most safely done with two observers: one to obtain blood pressure (BP) and heart rate (HR) values, and one to scribe, observe, and instruct.

General baseline pre-test preparation instructions *(directed by a medical provider, as appropriate for each patient):*

- Ideally, taper, stop or hold medications, supplements, or substances (including extra fluids and sodium), that might affect BP or HR, with timing based on the drug half-life and patient safety. Patient should be normally hydrated, and not dehydrated.
- **Examples of medications to consider withholding or modifying**:
  - Midodrine or Northera
  - Fludrocortisone
  - Beta blockers: propranolol, metoprolol, bisoprolol or atenolol
  - Stimulants: methylphenidate, dexadrine, or caffeine
  - Tricyclic antidepressants (TCA): amitriptyline, doxepin, or cyclobenzaprine
  - Serotonin-norepinephrine reuptake inhibitors (SNRI): duloxetine (Cymbalta) or venlafaxine (Effexor)
  - Tizanidine

Conducting the 10-Minute NASA Lean Test:

- Ask the patient to remove shoes and socks and lie supine (comfortably) on a bed or full exam table in a quiet room for 15-20 minutes to reach circulatory equilibrium[1].
- After the 15-20 minutes, record the patient's BP and HR.
- Repeat a minute later. If repeat vital signs are not similar, retake until two consecutive readings are relatively consistent. The goal is to determine the average resting supine BP and HR.

Next:

- Ask the patient to sit on the edge of the table/bed, then stand straight up, and lean against a nearby wall with only their shoulder blades touching the wall.
- Heels should be approximately 6" from the wall.
- Coach the patient to relax as much as possible.

Once the patient is leaning against the wall:

- Start a timer and record the first standing BP and HR.
- Repeat BP and HR measurements every minute for the next 10 minutes.
- Instruct patient not to shift, move, talk/chat, except to report symptoms of discomfort.
- Observe patient for lightheadedness or signs of pre-syncope. **Stop the test and have the patient lie down if about to faint.**
- Observe skin and extremities for changes in color and temperature.
- Assess cognition.
- Document any comments/patient symptoms as applicable.
    - See page 2 for a sample template that can be used to record blood pressure and pulse.

The 10-Minute NASA Lean Test can also be repeated while <u>on all OI treatments and interventions</u> to assess efficacy and determine next steps of treatment.

Orthostatic Vital Signs/The 10-Minute NASA Lean Test

	Blood Pressure (BP)		Heart Rate	
	Systolic	Diastolic	bpm	Comments/Symptoms
Supine 1 minute				
Supine 2 minute				
Standing 0 minute				
Standing 1 minute				
Standing 2 minute				
Standing 3 minute				
Standing 4 minute				
Standing 5 minute				
Standing 6 minute				
Standing 7 minute				
Standing 8 minute				
Standing 9 minute				
Standing 10 minute				

Notes and References

*The 10-Minute NASA Lean Test (a passive stand/lean test) is a variant of a test used decades ago by NASA researchers to test for orthostatic intolerance.[2] "Leaning" reduces muscular influences on venous return, a major cause of variability in orthostatic testing. Passive stand testing has been validated as an equivalent or superior measure of orthostatic intolerance as compared to Head-Up Tilt Table tests[3,4].

[1] Stewart, JM. (2013). Common Syndromes of Orthostatic Intolerance. Pediatrics. 2013 May;131(5):968-80. doi: 10.1542/peds.2012-2610. Epub 2013 Apr 8. Review. PMID: 23569093 Free PMC Article

[2] Bungo, M. W., Charles, J. B., & Johnson Jr, P. C. (1985). Cardiovascular deconditioning during space flight and the use of saline as a countermeasure to orthostatic intolerance. *Aviation, space, and environmental medicine,* 56(10), 985-990.

[3] Shvartz, E., Meroz, A., Magazanik, A., Shoenfeld, Y., & Shapiro, Y. (1977). Exercise and heat orthostatism and the effect of heat acclimation and physical fitness. *Aviation, Space, and Environmental Medicine*, 48(9), 836-842.

[4] Hyatt, K. H., Jacobson, L. B., & Schneider, V. S. (1975). Comparison of 70 degrees tilt, LBNP, and passive standing as measures of orthostatic tolerance. *Aviation, Space, and Environmental Medicine*, 46(6), 801-808.

[5] Roma, M., Marden, C., Rowe, PC (2018). Passive standing tests for the office diagnosis of postural tachycardia syndrome: New methodological considerations. Fatigue: Biomedicine, Health & Behavior, 6:4, 179-192. https://www.tandfonline.com/doi/full/10.1080/21641846.2018.1512836

[6] Natelson, BH., Lin, JMS., Blate, M., Kahn, S., Chen,Y., Unger, ER. Physiological assessment of orthostatic intolerance in chronic fatigue syndrome. J Transl Med. 2022 Feb 16;20(1):95. doi: 10.1186/s12967-022-03289-8. PMID: 35172863. PMCID: PMC8849016