

NASA 10 Minute Lean Test | Instructions for Providers

Orthostatic intolerance (OI) is an umbrella term used to describe the development of symptoms when standing upright that are relieved when reclining. Orthostatic hypotension (OH), neurally mediated hypotension (NMH) [or neurogenic orthostatic hypotension] and postural orthostatic tachycardia syndrome (PoTS) are terms used to describe variants of this response.

The new evidence-based IOM clinical criteria for ME/CFS establish that orthostatic intolerance is a common and often overlooked feature of illness that is objectively measurable. OI may contribute to dizziness, fatigue, cognitive dysfunction, chest and abdominal discomfort, and pain manifestations.

We recommend that all ME/CFS and Fibromyalgia patients have a NASA 10-minute Lean Test to assess for orthostatic intolerance.

The test will be most revealing if interventions that treat orthostatic intolerance are withheld before testing. For example: limit extra fluid and sodium intake, do not wear compression socks, and withhold medications that might influence the test (see below). These treatments can be resumed after the test. Use continuous monitoring devices when possible.

This can also be used to assess the efficacy of treatment. In this case, have the patient come in on current treatment and lifestyle interventions.

Ask the patient to remove their shoes and socks. Then, lie down on a bed or exam table in supine position for 15 minutes to achieve resting equilibrium. Make sure that the patient can lie FLAT comfortably. If they have issues lying flat, place a pillow underneath their knees to ensure there is no need to raise legs while resting. This prevents blood pooling in the lower extremities. After 15 minutes, record blood pressure (BP) and heart rate (HR) while supine. Repeat one minute later. If vitals are not similar, retake until two consecutive readings are relatively close. The goal is to determine the true resting BP and HR.

Next, ask the patient to sit up and walk to a designated wall where they will lean against. ONLY their shoulder blades should contact the wall. Their heels should be approximately 6" from the wall. This can be further to prevent touching of buttocks and wall. Coach the patient to relax and avoid arching of the lower back. Once patient is leaning against the wall comfortably begin the timer. After one minute, measure the standing BP and HR. Repeat every minute for the next 9 minutes. Instruct the patient not to talk, except to report symptoms. Ask them to avoid moving, tensing or shifting their weight. Observe patient for lightheadedness or signs of pre-syncope. Observe extremities for engorgement or alterations in color and temperature. Assess for changes in cognition. Include patient's comments and/or observations as applicable. See template on page 3.

Instructions When Withholding Pharmacological and Behavioral Treatments

All should be confirmed per provider and adjusted as appropriate

- Limit water/fluid intake to 1000 mL for 24 hours prior to test. The patient should not be dehydrated or overhydrated. If thirsty, they can drink water PRN.
- Limit ADDITIONAL sodium intake for 48 hours before.
- Do not wear compression socks or clothing.
- Wear a short-sleeved shirt or tank top.
- Withhold medications, supplements, and substances that might affect blood pressure or heart rate. Adjust timing according to drug half-life and patient safety.
 - Examples:
 - midodrine or Northera
 - fludrocortisone
 - beta blockers such as propranolol, metoprolol or atenolol
 - stimulants such as methylphenidate, dexadrine or caffeine
 - tricyclic antidepressants (TCA)-- amitriptyline, doxepin or cyclobenzaprine
 - Serotonin Norepinephrine Reuptake Inhibitors (SNRI) e.g. Cymbalta or duloxetine
 - tizanidine



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Orthostatic Vital Signs: The NASA 10-minute Lean Test

	Blood Pressure (B/P)		Heart Rate	Pulse Pressure (SBP-DBP)	Comments
	Systolic	Diastolic			
Supine 1 minute					
Supine 2 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					
Additional Comments:					

*The NASA 10-minute Lean Test is a variant of a test used by NASA researchers to test for orthostatic intolerance¹; it 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^{2,3}.

[1] 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.

[2] 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.

[3] 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.

About the Bateman Horne Center

Empowering Patients, Advancing Research, and Improving Clinical Care for all those impacted by ME/CFS and Fibromyalgia

Formerly the Fatigue Consultation Clinic (FCC) and the Organization for Fatigue & Fibromyalgia Education & Research (OFFER), the Bateman Horne Center of Excellence (BHC), was formed in 2015 as a 501(c)3 nonprofit organization.

We envision a world where patients with ME/CFS and Fibromyalgia are readily diagnosed, effectively treated, and widely met with empathy and understanding. BHC is led by Dr. Lucinda Bateman and Suzanne D. Vernon, Ph.D., who bring more than 40 years of combined experience and leadership to treating patients and advancing research in the areas of ME/CFS and Fibromyalgia.

Lucinda Bateman, MD | Founder & Medical Director

Dr. Lucinda Bateman completed her BS and MS at Brigham Young University (BYU), attended the Johns Hopkins School of Medicine, returned to the University of Utah for Internal Medicine residency, and became certified by the American Board of Internal Medicine in 1991. She started a small private group practice in 1991 and practiced General Internal Medicine until 2000.

During this time, she proctored many students as Adjunct Volunteer Clinical Faculty for the University of Utah, including nurse practitioners, physician assistants (PA), medical students and residents, and was active on the staff at LDS Hospital. She was awarded Teacher of the Year four times while teaching in the Utah PA (Physician's Assistant) program. In 2000, she was one of three Utah internists chosen by her peers in Top Doctors, a national publication.

Throughout her career, Dr. Bateman's interest has become more focused on the diagnosis and management of unexplained chronic fatigue, ME/CFS and FM, inspired by the silent suffering of her sister, Shauna Bateman Horne.

Since starting the Fatigue Consultation Clinic in 2000, Dr. Bateman has evaluated and followed more than a thousand patients with chronic fatigue conditions. She has lectured extensively on issues relating to chronic fatigue syndrome and fibromyalgia. She has served on the boards of the Easter Seals of Utah, The International Association of Chronic Fatigue Syndrome (IACFS/ME) and The CFIDS Association of America. She co-founded the non-profit, OFFER (The Organization for Fatigue and Fibromyalgia Education and Research) to encourage the sharing of information with patients and medical providers and foster cooperative research efforts aimed at understanding the cause(s) of and developing treatments for ME/CFS and FM. This goal led to the recent merge of OFFER Utah and the Fatigue Consultation Clinic to the Bateman Horne Center.

To see Dr. Bateman's bibliography of published journal articles, visit:

<http://www.ncbi.nlm.nih.gov/myncbi/collections/bibliography/46470176/?reload=publicURL>