UNIVERSITY OF DELAWARE.

6 Minute Walk Test for Adults with Lower-Limb Amputations

Description: The 6 Minute Walk Test (6MWT) is used to assess aerobic capacity[1] and walking function[2] in various populations. In patients with lower-limb amputations it can be used to assist with functional level classification[3] and prediction of prosthesis nonuse at 1 year follow-up.[4]

Equipment: Stopwatch, rolling tape measure, long hallway (≥30m) or loop walkway, vital sign equipment

Patient Instructions: "This test assesses your walking capacity. Cover as much ground as possible in 6 minutes. You may rest at any point and sit if absolutely necessary, but the clock will not stop, so please start walking again as soon as you are able. To avoid limiting your speed, we will refrain from conversation. I will give you time updates. [I will walk with you (if loop walkway or safety concerns)]. Begin."

Clinician Instructions[5]: Assess vital signs pre- and post-6MWT. Time the subject for 6 minutes, then say "stop." Measure the distance walked. If repeating the test, use the same course as the baseline test as the number of turns may affect the distance walked.[6] Patient may use assistive device if needed.

Do not perform if: systolic BP >180mmHg, diastolic BP>100mmHg, resting heart rate >120bpm OR SpO_2≤85%.[5, 11]

Procedure[5, 11]:

Do	Do NOT
Walk behind the patient if using a loop hallway.	Pace the patient if using a loop walkway (i.e., walk on their side).
Provide standardized encouragement every 30 seconds (i.e. "you're doing great" or "you're doing fine" or "keep going") and notify patient of time remaining every minute (i.e. "5 min remaining").	Converse with the patient other than to give standard encouragement, give time checkpoints, and to check symptom status.
Utilize a standard tone of voice	Use an excited tone as to "cheer" the patient on.
Roll measurement wheel along the patient's path & stop where he/she stops.	Roll the measurement wheel too close to the patient in case they stop suddenly.
Monitor pulse oximetry during test.	Allow participant to run or jog.
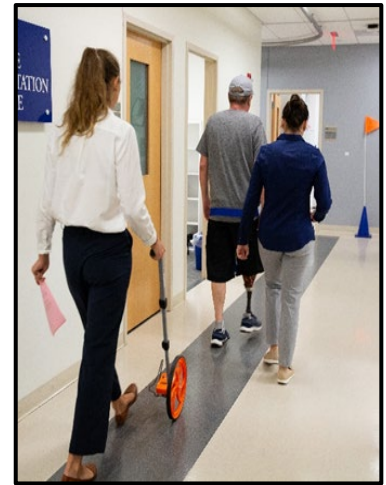
STOP testing based on the following criteria:
1. Angina symptoms (chest pain or tightness)
2. Any of the following symptoms:
   - Light-headedness
   - Confusion
   - Ataxia, staggering unsteadiness
   - Pallor
   - Cyanosis
   - Nausea
   - Marked dyspnea
   - Unusual fatigue
   - Signs of peripheral circulatory insufficiency
   - Claudication or other significant pain
   - Facial expressions signifying distress
3. Abnormal cardiac responses
   - Systolic BP drops > 10 mmHg
   - Systolic BP rises to > 250 mmHg
   - Diastolic BP rises to > 120 mmHg
   - Heart rate drops more than 15 bpm (given patient was walking the last minutes of the test)
   - SpO_2 drops to <80%[11]

Notify physician if test is terminated for above reasons.

Predictive Ability: ≤191m predictive of prosthesis nonuse at 1 year post-discharge from rehab.[4]
Discriminant Validity[3,7]
Test-Retest Reliability: ICC (95% CI): .97 (.95-.99)[8]
Standard Error of Measurement[8]: 20 m
Minimal Detectable Change (at 90% CI) [8]: 45 m

Longer-Term Prosthetic Users Reference Values (m)[3]		
K-Level	Mean±SD	Range
K0-1 (n=18)	50±30	4-96
K2 (n=43)	190±111	16-480
K3 (n=67)	299±102	48-475
K4 (n=39)	419±86	264-624

Longer-Term Unilateral Prosthesis Users Reference Values (m)[9]	
K-level	mean±SD (95% CI)
K3 (n=35; age: 60±12)	311±18 (273-349)
K4 (n=20; age: 46±12)	427±26 (373-481)

Outpatient Amputee Clinic Data Reference Values (m)[7]	
K-level	mean±SD
K1-2 (n=30)	271±96
K3 (n=34)	408±82
K4 (n=22)	540±79
Amputation Cause	
Trauma/Congenital (n=45)	457±120
Dysvascular (n=21)	345±104
Diabetes (n=9)	256±122
Infection (n=6)	261±76
Cancer (n=5)	445±90
Sex	
Male (n=66)	400±43
Female (n=20)	373±106
Age	
< 50 years (n=23)	514±113
≥ 50 years (n=63)	351±116
Amputation Level	
Syme (n=4)	503±100
Transtibial (n=63)	383±136
Knee Disarticulate (n=3)	441±98
Transfemoral (n=13)	343±82
Bilateral Transtibial (n=3)	451±111

Average Distance Walked **in Meters** per Age Group for Able-Bodied, Community-Dwelling Older Adults[10]							
Age	60-64 years	65-79 years	70-74 years	75-79 years	80-84 years	85-89 years	90-94 years
Female	474-628	427-611	411-591	361-569	315-529	272-508	211-441
Male	532-700	483-671	467-653	392-622	369-589	306-566	234-504

[1] Rikli R, Jones C. The reliability and validity of a 6-minute walk test as a measure of physical endurance in older adults. *J Aging Phys Act.* 1998;6:363-375. [2]Harada ND, et al. Mobility-related function in older adults: assessment with a 6-minute walk test. *Arch Phys Med Rehabil.* 1999; 80:837-841. [3]Gailey RS, et al. The Amputee Mobility Predictor: an instrument to assess determinants of the lower-limb amputee's ability to ambulate. *Arch Phys Med Rehabil.* 2002;83:613-627. [4]Roffman CE, et al. Locomotor performance during rehabilitation of people with lower limb amputation and prosthetic nonuse 12 months after discharge. *Phys Ther.* 2016;96:985-994. [5] American Thoracic Society. ATS statement: guidelines for the six-minute walk test. 2002. Available at: https://www.thoracic.org/statements/resources/pfet/sixminute.pdf. [6]Orendurff MS, et al. The kinematics and kinetics of turning: limb asymmetries associated with walking a circular path. *Gait Posture.* 2006;23:106-111. [7]Reid L, et al. Going places: does the two-minute walk test predict the six-minute walk test in lower extremity amputees? *J Rehabil Med.* 2015;47:256-261. [8] Resnik L, et al. Reliability of outcome measures for people with lower-limb amputations: distinguishing true change from statistical error. *Phys Ther.* 2011;91:555-565. [9]Sions JM, et al. Differences in physical performance measures among patients with unilateral lower-limb amputations classified as functional level K3 versus K4. *Arch Phys Med Rehabil.* 2018;99:1333-1341. [10]Rikli R, Jones C. Functional fitness normative scores for community-residing older adults, ages 60-94. *J Aging Phys Act.* 1999;7:162-181. [11]Holland AE, et al. An official European Respiratory Society/American Thoracic Society technical standard: field walking tests in chronic respiratory disease. *Eur Respir J.* 2014;44:1428-1446.