# GAIT TRAINING AFTER DELAYED PROSTHETIC FITTING: A CASE REPORT

**By**

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**Abstract**

***Background and Purpose*:** Prosthetic training after below-knee amputation (BKA) is a long, collaborative process that generally begins within six months of surgery. For some patients, this process involves the use of temporary weight-bearing devices to prepare the patient for the mental and physical aspects of ambulating with a prosthesis. This case report discusses the treatment of a patient who had a prolonged period between a BKA and initialization of gait training with any prosthesis.

***Case Description*:** A 61-year-old male referred to physical therapy for prosthetic training over a year and a half after undergoing a BKA due to a gangrenous ulcer. Initial evaluation revealed strength, mobility, balance, and gait deficits that put him at a high fall risk. The patient underwent ten weeks of physical therapy with an emphasis on restoring balance, functional mobility, and optimal gait with a prosthesis.

***Outcomes*:** The patient initially progressed and then plateaued after the first month of therapy citing a fear of falling and increased pain with weight-bearing. After addressing underlying psychosocial concerns and following up with the prosthetist, the patient showed significant improvement in strength, function, and gait ability with the prosthesis.

***Discussion*:** Although this patient ultimately made progress towards his goals and improved his gait ability, a lack of trust in his prosthesis has notably prolonged his return to prior functioning. This case indicates a need for further investigation into the timing of prosthetic training and the use of temporary prostheses in patients who intend to return to ambulating following a BKA.

**Key Words:** BKA, Gait Training, Prosthetics

## Introduction

A below-knee amputation (BKA) is a transtibial lower-limb amputation (LLA) and comprises about 23% of all LLA.[1] Although it may be done after trauma, it is most commonly performed due to complications of peripheral vascular disease. Poor circulation in the distal extremity causes poor healing after an injury which is then susceptible to life-threatening infections requiring amputation to prevent further damage to the tissue. As the population continues to age, the rates of this surgical intervention are expected to rise by at least 50% in the next fifteen years.[2]

The decision to utilize a prosthesis after BKA is up to the patient and their functional goals. The type and functionality of that prosthesis is also dependent on those factors. No matter the type of prosthesis, the rehabilitative process of fitting a new prosthesis involves collaboration of the patient, prosthetist, and rehabilitation team. On average, prosthetic fitting begins two to six months after surgery to give the incision time to heal, decrease the swelling, and shape the residual limb. This may or may not include the use of a temporary prosthesis.[3] After which, it commonly takes six months to a year of intensive rehabilitation and follow-up care to return to normal activities. During that time, the residual limb is conforming to the new method of weight-bearing and the patient is relearning how to control balance, gait, and daily activities.[3]

In this case report, I will discuss the rehabilitative process of a patient who received his first prosthesis over a year and half after undergoing a BKA. Although he initially received residual limb management in anticipation of eventually using a prosthesis, he did not undergo any gait or functional mobility training until he obtained the prosthesis. The results of the interventions and outcome measures are discussed, as well as the implications of the long interval between his surgery and prosthetic fitting.

**Case Description**

The patient is a 61-year-old male who presented to physical therapy for gait training with a newly received prosthesis. After developing a gangrenous ulcer on his left foot, he underwent a left BKA in November 2018. Due to insurance issues and the Covid-19 pandemic, he received his first prosthesis (blade foot) in May 2020. He did undergo shaping and desensitization interventions in preparation for the prosthesis shortly after the BKA. In the interim, the patient mobilized with a wheelchair and transferred with a two-wheeled rolling walker (RW). He had a six month history of an indwelling catheter because he was awaiting Transurethral Resection of the Prostate (TURP) surgery. He is on disability and dependent on his adult children for assistance with household activities and all transportation. Prior to the BKA, he worked as an acute care physical therapy technician, was fully independent with all daily activities, exercised regularly, and ambulated without an assistive device. His past medical history was notable for Cerebrovascular Accident, Myocardial Infarction, Benign Prostatic Hypertrophy, Diabetes Type II, and Hypertension. His chief complaints were stiffness of his left knee and difficulty walking. His goals for therapy were to walk independently with the prosthesis and return to jogging.

**Examination**

At the initial evaluation, his range of motion, strength, muscle flexibility, and sensation throughout both lower extremities were assessed (Table 1). Screening of his bilateral upper extremities and trunk did not reveal any significant limitations. Examination of the residual limb showed a fully closed incision with no signs of irritation. It appeared well-shaped and fit securely into the prosthesis. He was independent in donning and doffing the prosthesis and modified independent when performing a sit-to-stand with a RW.

Because the patient's final goal was to ambulate solely with the prosthesis, it was imperative to evaluate his balance and fall risk to determine his safety during ambulation. Balance testing (Table 2) was completed via single-leg stance (SLS) testing and the Berg Balance Scale (BBS). The BBS (Appendix 1) has excellent inter-rater reliability (ICC = 0.945) and convergent validity with the L test (r = -0.802).[4] It was also found to show a significant correlation between balance ability and walking ability making it useful for this patient's goals.[5]

To obtain a detailed analysis of the patient's functional mobility (Table 2) with the prosthesis, the Amputee Mobility Predictor (AMPPRO) was administered (Appendix 2). The AMPPRO has excellent test-retest reliability (ICC = 0.96), inter-rater reliability (ICC = 0.99), predictive validity (r = 0.78), and concurrent validity with the six minute walk test (r = 0.82) for patients with unilateral LLA.[6] From this measure, the patient's K level, indicative of his rehabilitation potential with the prosthesis, was determined. The other assessment of functional mobility administered was the L Test (Appendix 3).[7] This timed test was specifically created for LLA and further data was gathered by administering it using both the RW and axillary crutches since the goal was to progress his assistive device throughout gait training. The L Test has excellent intra-rater reliability (ICC = 0.97), inter-rater reliability (ICC = 0.96), and concurrent validity with the Timed Up and Go test (r = 0.93).[8]

The patient was highly motivated to begin ambulating, so on the second visit, a 6 Minute Walk Test (6MWT) with the RW was added to the assessed outcome measures. There are not specific statistics for the 6MWT for patients with amputations, but there are normative values based on age and gender, as well as statistics for post-stroke patients, with which to compare this patient's mobility.[9,10] Lastly, the Numeric Pain Rating Scale (NPRS) was used to assess his pain while weight-bearing in the prosthesis. Excess pain during weight bearing can be indicative of an improperly fitting prosthesis and incompliance in regard to the prescribed wearing schedule.[3]

After examination, it was determined that the patient presented with mobility deficits, strength deficits, and gait deficits due to a prolonged period without ambulating or weight bearing on the left lower extremity. He also exhibited balance and sensation deficits which put him at an increased risk of falls. These deficits limit his ability to independently perform daily activities, exercise, and self-care. The initial plan of care was twice a week for six weeks to improve his functional mobility, establish an exercise regimen, and initiate a safe weight-bearing routine. His initial short-term and long-term goals are listed in Table 3 and his prognosis was determined to be good.

**Intervention**

Following the published guidelines set forth by the Department of Defense and other institutions, the treatment sessions focused on four major areas: therapeutic activities, therapeutic exercises, neuro reeducation, and gait training.[11,12,13,14] The specific interventions and subsequent progressions are listed in Table 4. The therapeutic activities aimed to improve independence and safety with transfers and functional mobility. The therapeutic exercises aimed to increase muscular strength, flexibility, and overall endurance. Neuro reeducation focused on static balance, dynamic balance, and sensory/proprioceptive training. Lastly, gait training focused on increasing weight-bearing, normalizing gait patterns, and progressing assistive devices. Throughout all of these interventions, the patient was challenged to increase his trust in the prosthesis and his comfort with weight-bearing within it.[12,13] Full length mirrors, tape markers along the floor, and cues were used to provide feedback, when necessary. Additionally, he was also educated on a home exercise program (HEP), a prosthesis wearing schedule (Appendix 4), and regular skin checks to ensure long-term functional success and maintain residual limb health.[13]

**Outcomes**

The results of all follow-up testing throughout treatment is listed in Table 5. Towards the end of his first plan of care, the patient began to plateau functionally and reported an increase in NPRS while weight-bearing in the prosthesis. It was determined that there were underlying psychosocial concerns that needed to be addressed. Most notably, was a sense of hopelessness paired with a lack of control of his environment. Throughout his entire plan of care, he was always 20-30 minutes late to therapy which resulted in shortened treatments and added patient frustration. He was given resources for mental health and educated on a new "daily routine" (i.e. a reformatted HEP) to help add structure to his regular activity. His plan of care was extended for 6 more weeks. Throughout which, he increased his HEP compliance, started progressing again, and met regularly with his prosthetist to ensure a correct fit. Aside from the psychosocial factors, the patient's indwelling catheter proved to be more problematic than anticipated. During some treatments, the patient spent a significant portion of the session focused on the catheter because it was irritating which further limited his progression. By the end of his second plan of care, the patient completed eighteen physical therapy visits over ten weeks with the intention to continue treatment after his recovery from TURP surgery.

**Discussion**

The patient showed marked improvement in all assessed outcome measures and met all of his initial goals. He also showed significantly improved gait ability and progressed to ambulating with two axillary crutches. As suggested in the clinical guidelines, the strengths of this treatment approach were that it focused on all aspects of functional mobility and not solely on gait training.[11,12,13] Care was also taken to ensure the health of the residual limb through education and skin checks. Lastly, the interventions challenged the patient to trust the residual limb in and out of the prosthesis to help promote his bodily awareness.

One of the biggest weaknesses of this patient case was the lack of treadmill training. A 2016 systematic review concluded that it is effective in isolation or as a supplement to overground training.[15] The outpatient clinic did not have access to a support system that would permit safe utilization of a treadmill and therefore earlier, more challenging weight-bearing interventions. Another weakness of this patient case was the psychosocial component. That should have been addressed and resources should have been provided from the beginning of his care. A 2010 study found a correlation between perceived control and depression rates in individuals with LLA.[16] Since I knew he was highly reliant on family members for household activities and transportation, I could have incorporated more task training (including driving) and/or referred him to occupational therapy to help promote his household independence. It is possible that addressing those factors throughout his care would have translated to improved overall patient satisfaction.

There is also evidence to support early weight-bearing and mobility after BKA using a temporary prosthetic device. This is shown to promote healing, reduce complications, and increase psychological acceptance of the prosthesis.[11,17] The risks of utilizing a temporary prosthesis early on are increased skin breakdown, residual limb pain, and potential for falls.[11] This patient was not a recipient of any temporary weight-bearing devices. Although he has made significant gains in his ambulatory ability, he is an example of a patient who likely would have benefitted from a temporary prosthesis to prepare him for both the functional and psychological aspects of

ambulation after a BKA. One of the biggest obstacles for this patient was trusting the prosthesis. With over a year without weight-bearing on that extremity, he required a lot of feedback and cueing to equalize his weight distribution. Gait after a non-traumatic BKA requires 40% more energy which is further increased with any gait deviations.[18] This patient's treatment sessions were already shortened due to transportation issues, so the fatigue generated by his altered mechanics due to fear and the subsequent time needed for recovery likely delayed his progression with ambulation.

This patient case supports the need for further investigation into the timing of prosthetic fitting following a BKA. This patient did not decide to wait over a year for his prosthesis and the enthusiasm that came with finally receiving it was quickly overshadowed by fear and pain. A shorter interim period or a temporary low-level device may have helped that life-changing transition. Although his gait has already progressed, it will be a long and arduous process before he will be able to return to his prior level of function.

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**Tables and Figures**

Table 1*: Initial Evaluation Objective Findings*

| | | |
|---|---|---|
| **Range of Motion** | Left Knee | Flexion: 123 degrees<br>Extension: -10 degrees |
| | Right Knee | Flexion: 125 degrees<br>Extension: 0 degrees |
| | Bilateral Hips | Within Functional Limits |
| **Manual Muscle Testing** | Left Knee | Flexion: 4+/5<br>Extension: 4+/5 |
| | Right Knee | Flexion: 5/5<br>Extension: 5/5 |
| | Left Hip | Flexion: 5/5<br>*Abduction (modified): 4-/5<br>Extension: 4/5 |
| | Right Hip | Flexion: 5/5<br>Abduction: 4/5<br>Extension: 4/5 |
| | Right Ankle | Dorsiflexion: 5/5<br>Plantarflexion: 3-/5 |
| **Flexibility** | Left Rectus Femoris | No restriction |
| | Right Rectus Femoris | No restriction |
| | Left Hamstring | Minimal restriction |
| | Right Hamstring | No restriction |
| **Sensation Testing** | Left Residual Limb | No sensation to light touch around surgical incision and distal to knee |
| | Right Lower Extremity | Mild neuropathy noted throughout R foot |
| *Resistance applied proximal to lateral knee | | |

Table 2*: Initial Balance and Functional Testing*

| | | |
|---|---|---|
| **Single Leg Stance** | Left (with prosthesis) | Unable to perform<br>Tolerated ~50% weight-bearing |
| | Right | 1 second |
| **Berg Balance Scale** | 20/56 (wheelchair bound) | |
| **Amputee Mobility Predictor** | 20/47 (K1) | |
| **L-Test** | 1 minute and 52 seconds with a rolling walker<br>2 minutes and 17 seconds with axillary crutches | |
| **6 Minute Walk Test** | 215 feet with a rolling walker | |

Table 3*: Initial Short-term and Long-term Functional Goals*

| | |
|---|---|
| **Short-term Goals** | 1. Patient will be able to demonstrate and verbalize HEP in 2 weeks in order to improve long-term success and functioning.<br>2. Patient will perform a sit-to-stand safely without the use of upper extremities in 3 weeks in order to reduce his risk of falls.<br>3. Patient will decrease max NPRS pain rating while weight-bearing in the prosthesis to ≤3/10 in 3 weeks for improved comfort during ambulation. |
| **Long-term Goals** | 1. Patient will improve L knee extension to <5 degrees lacking in 6 weeks to improve mechanics during gait.<br>2. Patient will increase LLE strength to equal RLE in 6 weeks to improve ability to independently perform transfers at home.<br>3. Patient will safely pick up an object from the floor in 4 weeks in order to improve ability to safely perform ADLs.<br>4. Patient will demonstrate safe mobility going up and down one step with prosthesis and < axillary crutches in 6 weeks in order to improve independent community mobility.<br>5. Patient will improve AMPPRO score to >37/47 in 6 weeks for improved ability to mobilize while using the prosthesis.<br>6. Patient will decrease L-test duration to ≤2 minutes with axillary crutches in 6 weeks for improved independence with household ambulation. |

Table 4*: Procedural Interventions and Progressions*

| | |
|---|---|
| **Education** | • Initial HEP: sit to stand, weight shifting (forward/backward and lateral) → isometrics and stretches<br>• Prosthesis wearing schedule<br>• Skin checks, skin integrity, prolonged redness<br>• Throughout first plan of care: HEP compliance, realistic expectations<br>• Redesigned HEP: seated long-arc quads, seated marching, sit-to-stands, standing balance, weight shifting (forward/backward and lateral), standing marching |
| **Therapeutic Activities** | • Stair climbing: one step → two steps; bilateral upper extremity support → single upper extremity support<br>• Transfers: standing-to-floor, floor-to-standing, chair-to-chair, sit-to-stand, supine-to-sit, sit-to-supine<br>• Picking up objects from the floor, lifting, carrying |
| **Therapeutic Exercises** | • Recumbent bike<br>• Total Gym Squats<br>• Bridges (with and without prosthesis), knee isometrics, prone lying, long-arc quads (→ with resistance)<br>• Side stepping (→ with resistance), Marching, Sit-to-stands (→ without upper extremity support → with weight)<br>• Planks at table → under the bridge → shoulder taps<br>• Hamstring stretch, Hip flexor stretch |
| **Neuro Reeducation** | • Static balance: SLS, tandem stance, ball rolling, ball catching, toe taps, standing balance, wide stance balance, Airex standing, Rockerboard balance and shifting<br>• Dynamic balance: weight shifting (forward/backward, lateral, and diagonal), step through, marching with holds, stepping over obstacles<br>• Sensory Training: proprioceptive tapping |
| **Gait Training** | • RW → Axillary crutches → no AD (in parallel bars)<br>• Forward walking, Backward walking, Obstacle stepping<br>• Areas emphasized: use of AD, step length, pelvic motion, posture, movement of prosthesis, hip and knee flexion, toe off, weight-bearing on prosthesis |
| → = Progression<br>AD = assistive device | |

Table 5*: Reassessment Findings and Outcome Measures*

| Visit Number | Range of Motion and Manual Muscle Testing | Pain w/ weight-bearing (NPRS) | Gait | Outcome Measures |
|---|---|---|---|---|
| 1 (Initial Evaluation) | L knee: 123 degrees of flexion and lacking 10 degrees of extension; 4+/5 flexion and extension<br><br>R knee: 125 degrees of flexion and full extension; 5/5 flexion and extension<br><br>L hip: within functional limits; 5/5 flexion, 4-/5 abduction (modified), 4/5 extension<br><br>R hip: within functional limits; 5/5 flexion, 4/5 abduction, 4/5 extension<br><br>L ankle: 5/5 dorsiflexion and 3-/5 plantar flexion | 6/10 | RW: uncoordinated with the prosthesis | AMPPRO: 20/47 (K1 – household ambulator)<br><br>BBS: 20/56 (wheelchair bound)<br><br>L-Test: 1 minute and 52 seconds (RW), 2 minutes and 17 seconds (axillary crutches) |
| 2 | NT | 4/10 | RW: x3 LOB noted requiring CGA for safety | 6MWT: 215 ft (RW) |
| 6 | NT | 4/10 | RW: good control of prosthesis, no LOB, step through gait pattern w/ equal stride length<br><br>Axillary crutches: x4 LOB requiring CGA for safety and balance | BBS: 24/56 (walking with assistance)<br><br>6MWT: 375 ft (RW) |
| 8 | L knee: lacking 8 degrees of extension | 8/10 | RW: Only able to take a few steps due to pain | NT |

| | | | | |
|---|---|---|---|---|
| 11 (Progress Note) | L knee: lacking 8 degrees of extension; 5/5 flexion and extension<br><br>L hip: 5/5 flexion, 4/5 abduction (modified), 4/5 extension | 3/10 | RW: equal stride length and weight-bearing, no LOB<br><br>Axillary crutches: no LOB noted, but requires supervision for safety, decreased stride length and weight-bearing on LLE | AMPPRO: 37/47 (K3 – community ambulator)<br><br>BBS: 40/56 (walking with assistance)<br><br>L-Test: 1 minute and 15 seconds (RW), 1 minute and 51 seconds (axillary crutches)<br><br>6MWT: 612 ft (RW) |
| 18 | L knee: lacking 5 degrees of extension; 5/5 flexion and extension<br><br>L hip: 5/5 flexion, 4/5 abduction (modified), 4/5 extension | 4/10 | RW: equal stride length and weight-bearing, no LOB<br><br>Axillary crutches: no LOB noted, but requires supervision for safety, decreased stride length and weight-bearing on LLE | AMPPRO: 40/47 (K3-community ambulator)<br><br>BBS: 42/56 (independent)<br><br>L-Test: 1 minute and 8 seconds (RW), 1 minute and 42 seconds (axillary crutches)<br><br>6MWT: 712 ft (RW) |

## Appendices

## **Appendix 1*:* Berg Balance Scale**

1. SITTING TO STANDING
INSTRUCTIONS: Please stand up. Try not to use your hand for support.
( ) 4 able to stand without using hands and stabilize independently
( ) 3 able to stand independently using hands
( ) 2 able to stand using hands after several tries
( ) 1 needs minimal aid to stand or stabilize
( ) 0 needs moderate or maximal assist to stand

2. STANDING UNSUPPORTED
INSTRUCTIONS: Please stand for two minutes without holding on.
( ) 4 able to stand safely for 2 minutes
( ) 3 able to stand 2 minutes with supervision
( ) 2 able to stand 30 seconds unsupported
( ) 1 needs several tries to stand 30 seconds unsupported
( ) 0 unable to stand 30 seconds unsupported

*If a subject is able to stand 2 minutes unsupported, score full points for sitting unsupported. Proceed to item #4.*

3. SITTING WITH BACK UNSUPPORTED BUT FEET SUPPORTED ON FLOOR OR ON A STOOL
INSTRUCTIONS: Please sit with arms folded for 2 minutes.
( ) 4 able to sit safely and securely for 2 minutes
( ) 3 able to sit 2 minutes under supervision
( ) 2 able to able to sit 30 seconds
( ) 1 able to sit 10 seconds
( ) 0 unable to sit without support 10 seconds

4. STANDING TO SITTING
INSTRUCTIONS: Please sit down.
( ) 4 sits safely with minimal use of hands
( ) 3 controls descent by using hands
( ) 2 uses back of legs against chair to control descent
( ) 1 sits independently but has uncontrolled descent
( ) 0 needs assist to sit

5. TRANSFERS
INSTRUCTIONS: Arrange chair(s) for pivot transfer. Ask subject to transfer one way toward a seat with armrests and one way toward a seat without armrests. You may use two chairs (one with and one without armrests) or a bed and a chair.
( ) 4 able to transfer safely with minor use of hands
( ) 3 able to transfer safely definite need of hands
( ) 2 able to transfer with verbal cuing and/or supervision
( ) 1 needs one person to assist
( ) 0 needs two people to assist or supervise to be safe

6. STANDING UNSUPPORTED WITH EYES CLOSED
INSTRUCTIONS: Please close your eyes and stand still for 10 seconds.
( ) 4 able to stand 10 seconds safely
( ) 3 able to stand 10 seconds with supervision
( ) 2 able to stand 3 seconds
( ) 1 unable to keep eyes closed 3 seconds but stays safely
( ) 0 needs help to keep from falling

7. STANDING UNSUPPORTED WITH FEET TOGETHER
INSTRUCTIONS: Place your feet together and stand without holding on.
( ) 4 able to place feet together independently and stand 1 minute safely
( ) 3 able to place feet together independently and stand 1 minute with supervision
( ) 2 able to place feet together independently but unable to hold for 30 seconds
( ) 1 needs help to attain position but able to stand 15 seconds feet together
( ) 0 needs help to attain position and unable to hold for 15 seconds

8. REACHING FORWARD WITH OUTSTRETCHED ARM WHILE STANDING
INSTRUCTIONS: Lift arm to 90 degrees. Stretch out your fingers and reach forward as far as you can. (Examiner places a ruler at the end of fingertips when arm is at 90 degrees. Fingers should not touch the ruler while reaching forward. The recorded measure is the distance forward that the fingers reach while the subject is in the most forward lean position. When possible, ask subject to use both arms when reaching to avoid rotation of the trunk.)
( ) 4 can reach forward confidently 25 cm (10 inches)
( ) 3 can reach forward 12 cm (5 inches)
( ) 2 can reach forward 5 cm (2 inches)
( ) 1 reaches forward but needs supervision
( ) 0 loses balance while trying/requires external support

9. PICK UP OBJECT FROM THE FLOOR FROM A STANDING POSITION
INSTRUCTIONS: Pick up the shoe/slipper, which is place in front of your feet.
( ) 4 able to pick up slipper safely and easily
( ) 3 able to pick up slipper but needs supervision
( ) 2 unable to pick up but reaches 2-5 cm (1-2 inches) from slipper and keeps balance independently
( ) 1 unable to pick up and needs supervision while trying
( ) 0 unable to try/needs assist to keep from losing balance or falling

10. TURNING TO LOOK BEHIND OVER LEFT AND RIGHT SHOULDERS WHILE STANDING
INSTRUCTIONS: Turn to look directly behind you over toward the left shoulder. Repeat to the right. Examiner may pick an object to look at directly behind the subject to encourage a better twist turn.
( ) 4 looks behind from both sides and weight shifts well
( ) 3 looks behind one side only other side shows less weight shift
( ) 2 turns sideways only but maintains balance
( ) 1 needs supervision when turning
( ) 0 needs assist to keep from losing balance or falling

11. TURN 360 DEGREES
INSTRUCTIONS: Turn completely around in a full circle. Pause. Then turn a full circle in the other direction.
( ) 4 able to turn 360 degrees safely in 4 seconds or less
( ) 3 able to turn 360 degrees safely one side only 4 seconds or less
( ) 2 able to turn 360 degrees safely but slowly
( ) 1 needs close supervision or verbal cuing
( ) 0 needs assistance while turning

12. PLACE ALTERNATE FOOT ON STEP OR STOOL WHILE STANDING UNSUPPORTED
INSTRUCTIONS: Place each foot alternately on the step/stool. Continue until each foot has touch the step/stool four times.
( ) 4 able to stand independently and safely and complete 8 steps in 20 seconds
( ) 3 able to stand independently and complete 8 steps in > 20 seconds
( ) 2 able to complete 4 steps without aid with supervision
( ) 1 able to complete > 2 steps needs minimal assist
( ) 0 needs assistance to keep from falling/unable to try

13. STANDING UNSUPPORTED ONE FOOT IN FRONT
INSTRUCTIONS: (DEMONSTRATE TO SUBJECT) Place one foot directly in front of the other. If you feel that you cannot place your foot directly in front, try to step far enough ahead that the heel of your forward foot is ahead of the toes of the other foot. (To score 3 points, the length of the step should exceed

the length of the other foot and the width of the stance should approximate the subject's normal stride width.)

( ) 4 able to place foot tandem independently and hold 30 seconds
( ) 3 able to place foot ahead independently and hold 30 seconds
( ) 2 able to take small step independently and hold 30 seconds
( ) 1 needs help to step but can hold 15 seconds
( ) 0 loses balance while stepping or standing

14. STANDING ON ONE LEG

INSTRUCTIONS: Stand on one leg as long as you can without holding on.

( ) 4 able to lift leg independently and hold > 10 seconds
( ) 3 able to lift leg independently and hold 5-10 seconds
( ) 2 able to lift leg independently and hold ≥ 3 seconds
( ) 1 tries to lift leg unable to hold 3 seconds but remains standing independently.
( ) 0 unable to try of needs assist to prevent fall

( ) TOTAL SCORE (Maximum = 56)

## **Appendix 2**: Amputee Mobility Predictor

Initial instructions: Client is seated in a hard chair with arms. The following maneuvers are tested with or without the use of the prosthesis. Advise the person of each task or group of tasks prior to performance. Please avoid unnecessary chatter throughout the test. Safety First, no task should be performed if either the tester or client is uncertain of a safe outcome.

The **Right Limb** is: ❒ PF ❒ TT ❒ KD ❒ TF ❒ HD ❒ intact
The **Left Limb** is: ❒ PF ❒ TT ❒ KD ❒ TF ❒ HD ❒ intact

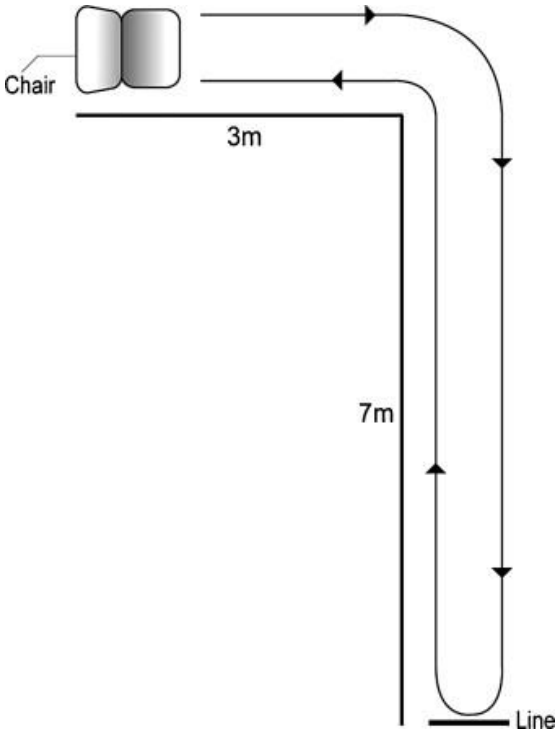
| | | | |
|---|---|---|---|
| **1.** Sitting Balance:<br>Sit forward in a chair with arms folded across chest for 60s. | Cannot sit upright independently for 60s<br>Can sit upright independently for 60s | = 0<br>= 1 | _____ |
| **2.** Sitting reach:<br>Reach forwards and grasp the ruler. (Tester holds ruler 12in beyond extended arms midline to the sternum) | Does not attempt<br>Cannot grasp or requires arm support<br>Reaches forward and successfully grasps item. | = 0<br>= 1<br>= 2 | _____ |
| **3.** Chair to chair transfer:<br>2 chairs at 90°. Pt. may choose direction and use their upper limbs. | Cannot do or requires physical assistance<br>Performs independently, but appears unsteady<br>Performs independently, appears to be steady and safe | = 0<br>= 1<br>= 2 | _____ |
| **4.** Arises from a chair:<br>Ask pt. to fold arms across chest and stand. If unable, use arms or assistive device. | Unable without help (physical assistance)<br>Able, uses arms/assist device to help<br>Able, without using arms | = 0<br>= 1<br>= 2 | _____ |
| **5.** Attempts to arise from a chair:<br>(stopwatch ready) If attempt in no. 4. was without arms then ignore and allow another attempt without penalty. | Unable without help (physical assistance)<br>Able requires >1 attempt<br>Able to rise one attempt | = 0<br>= 1<br>= 2 | _____ |
| **6.** Immediate Standing Balance:<br>(**first 5s**) Begin timing immediately. | Unsteady (staggers, moves foot, sways)<br>Steady using walking aid or other support<br>Steady without walker or other support | = 0<br>= 1<br>= 2 | _____ |
| **7.** Standing Balance (30s):<br>(stopwatch ready) For item no.'s 7 & 8, first attempt is without assistive device. If support is required allow after first attempt | Unsteady<br>Steady but uses walking aid or other support<br>Standing without support | = 0<br>= 1<br>= 2 | _____ |
| **8.** Single limb standing balance:<br>(stopwatch ready) Time the duration of single limb standing on both the sound and prosthetic limb up to 30s.<br><br>Grade the quality, not the time.<br><br>**Eliminate item 8 for AMPnoPRO**<br><br>Sound side _____ seconds<br><br>Prosthetic side _____ seconds | **Non-prosthetic side**<br>Unsteady<br>Steady but uses walking aid or other support for 30s<br>Single-limb standing without support for 30s<br><br>**Prosthetic Side**<br>Unsteady<br>Steady but uses walking aid or other support for 30s<br>Single-limb standing without support for 30s | = 0<br>= 1<br>= 2<br><br>= 0<br>= 1<br>= 2 | _____<br><br>_____ |
| **9.** Standing reach:<br>Reach forward and grasp the ruler. (Tester holds ruler 12in beyond extended arm(s) midline to the sternum) | Does not attempt<br>Cannot grasp or requires arm support on assistive device<br>Reaches forward and successfully grasps item no support | = 0<br>= 1<br>= 2 | _____ |
| **10.** Nudge test:<br>With feet as close together as possible, examiner pushes lightly on pt.'s sternum with palm of hand 3 times (toes should rise) | Begins to fall<br>Staggers, grabs, catches self, or uses assistive device<br>Steady | = 0<br>= 1<br>= 2 | _____ |
| **11.** Eyes Closed:<br>(at maximum position #7) If support is required grade as unsteady. | Unsteady or grips assistive device<br>Steady without any use of assistive device | = 0<br>= 1 | _____ |

| | | | | |
|---|---|---|---|---|
| **12.** Pick up objects off the floor:<br>Pick up a pencil off the floor placed midline 12in in front of foot. | Unable to pick up object and return to standing<br>Performs with some help (table, chair, walking aid etc.)<br>Performs independently (without help) | | = 0<br>= 1<br>= 2 | _____ |
| **13.** Sitting down:<br>Ask pt. to fold arms across chest and sit. If unable, use arm or assistive device. | Unsafe (misjudged distance, falls into chair)<br>Uses arms, assistive device or not a smooth motion<br>Safe, smooth motion | | = 0<br>= 1<br>= 2 | _____ |
| **14.** Initiation of gait:<br>(immediately after told to "go") | Any hesitancy or multiple attempts to start<br>No hesitancy | | = 0<br>= 1 | _____ |
| **15.** Step length and height:<br>Walk a measured distance of 12ft twice (up and back). Four scores are required or two scores (a. & b.) for each leg. "Marked deviation" is defined as extreme substitute movements to avoid clearing the floor. | **a. Swing Foot**<br>Does not advance a minimum of 12in<br>Advances a minimum of 12in<br><br>**b. Foot Clearance**<br>Foot does not completely clear floor without deviation<br>Foot completely clears floor without marked deviation | <br>= 0<br>= 1<br><br><br>= 0<br>= 1 | Prosthesis<br><br>_____<br><br><br>_____ | Sound<br><br>_____<br><br><br>_____ |
| **16.** Step Continuity | Stopping or discontinuity between steps (stop & go gait)<br>Steps appear continuous | | = 0<br>= 1 | _____ |
| **17.** Turning:<br>180 degree turn when returning to chair. | Unable to turn, requires intervention to prevent falling<br>Greater than three steps but completes task without intervention<br>No more than three continuous steps with or without assistive aid | | = 0<br><br>= 1<br><br>= 2 | _____ |
| **18.** Variable cadence:<br>Walk a distance of 12ft fast as possible safely 4 times. (Speeds may vary from slow to fast and fast to slow varying cadence) | Unable to vary cadence in a controlled manner<br>Asymmetrical increase in cadence controlled manner<br>Symmetrical increase in speed in a controlled manner | | = 0<br>= 1<br>= 2 | _____ |
| **19.** Stepping over an obstacle:<br>Place a movable box of 4in in height in the walking path. | Cannot step over the box<br>Catches foot, interrupts stride<br>Steps over without interrupting stride | | = 0<br>= 1<br>= 2 | _____ |
| **20.** Stairs (must have at least 2 steps):<br>Try to go up and down these stairs without holding on to the railing. Do not hesitate to permit pt. to hold on to rail. Safety First if examiner feels that any risk in involved omit and score as 0. | **Ascending**<br>Unsteady, cannot do<br>One step at a time, or must hold on to railing or device<br>Step over step, does not hold onto the railing or device<br><br>**Descending**<br>Unsteady, cannot do<br>One step at a time, or must hold on to railing or device<br>Step over step, does not hold onto the railing or device | | <br>= 0<br>= 1<br>= 2<br><br><br>= 0<br>= 1<br>= 2 | <br><br><br>_____<br><br><br><br><br>_____ |
| **21.** Assistive device selection:<br>Add points for the use of an assistive device if used for two or more items. If testing without prosthesis use of appropriate assistive device is mandatory. | Bed bound<br>Wheelchair / Parallel Bars<br>Walker<br>Crutches (axillary or forearm)<br>Cane (straight or quad)<br>None | | = 0<br>= 1<br>= 2<br>= 3<br>= 4<br>= 5 | _____ |
| | **Total Score** AMPnoPRO _____/43<br>AMPPRO _____/47 | | | |

Abbreviation: PF = partial foot; TT = transtibial; KD = knee disarticulation; TF = transfemoral; HD = hip disarticulation

**K LEVEL (converted from AMPPRO score)** AMPPRO ☐ K1 (15-26) ☐ K2 (27-36) ☐ K3 (37-42) ☐ K4 (43-47)

**Appendix 3: The L-Test**




Equipment:

- Standard chair without armrests
- Lines on the floor indicating the 3-meter mark and the 7-meter mark (as shown above)
- Stopwatch
- Assistive device

Test Set-Up: Have patient sit on the chair with their back against the chair, arms resting on the arm rests, and if applicable, assistive device at hand.

Patient Instructions: On the word 'go,' stand up from the chair, walk to the first line, turn 90 degrees, and walk to the 2nd line, then turn 180 degrees, and return to sit in the chair.

Clinician Instructions: Start the timer on the word "go" and stop the timer when the patient's buttocks first touches the seat surface on the return. The patient may use an assistive device, if needed. Allow one practice and then time and record at least one trial. The patient walks at their comfortable walking speed.

Scoring:

- Objective Scoring = test time taken (generally average score of 3 test trials)
- Subjective Scoring = observational information regarding the quality of gait

## **Appendix 4: Prosthesis Wearing Schedule**

Wear prosthesis for 10 minutes 3 times per day.

You may increase wearing time by **15-30 minutes each day** if you do not have any problems with pain, prolonged redness, blisters, swelling or altered feeling.

*Example progression:*

*Day 1: 10 minutes, 3 times per day for a total of 30 minutes*
*Day 2: 10 minutes, 5 times per day for a total of 50 minutes*
*Day 3: 10 minutes, 6 times per day for a total of 60 minutes*

Prolonged Redness: When you take your prosthesis off, any redness noted on your residual limb should disappear within 15-20 minutes. If you notice redness, make a note of the time, and recheck in 15-20 minutes to be sure the redness is gone. If redness remains after 20 minutes, do not wear the prosthesis again until you speak with your prosthetist or therapist. You may want to mark the area with a pen if redness continues to identify the location.