

12-3-2014

# Inpatient Physical Therapy For A Patient With Dementia After Right Above Knee Amputation: A Case Report

Benjamin Blanchette  
*University of New England*

Follow this and additional works at: [http://dune.une.edu/pt\\_studcrpaper](http://dune.une.edu/pt_studcrpaper)

 Part of the [Physical Therapy Commons](#)

© 2014 Benjamin Blanchette

---

## Recommended Citation

Blanchette, Benjamin, "Inpatient Physical Therapy For A Patient With Dementia After Right Above Knee Amputation: A Case Report" (2014). *Case Report Papers*. 10.  
[http://dune.une.edu/pt\\_studcrpaper/10](http://dune.une.edu/pt_studcrpaper/10)

This Course Paper is brought to you for free and open access by the Physical Therapy Student Papers at DUNE: DigitalUNE. It has been accepted for inclusion in Case Report Papers by an authorized administrator of DUNE: DigitalUNE. For more information, please contact [bkenyon@une.edu](mailto:bkenyon@une.edu).

1 Inpatient Physical Therapy for a Patient with Dementia after Right Above Knee Amputation: A  
2 Case Report

3 Benjamin Blanchette, BS

4

5

6

7 B. Blanchette, BS is a DPT student at the University of New England, 716 Stevens Ave.

8 Portland, ME 04103

9 Address all correspondence to Benjamin Blanchette at [bblanchette@une.edu](mailto:bblanchette@une.edu)

10

11

12 **The patient signed an informed consent allowing the use of medical information and the**  
13 **photos for this report and received information on the Institution's policies regarding the**  
14 **Health Insurance Portability and Accountability Act.**

15

16

17 The author acknowledges Scott Andresen PT, BS for the supervision and assistance while  
18 collecting data and treating this patient and Mike Fillyaw PT, MS for assistance with  
19 conceptualizing the case report.

20 **Abstract**

21 Background and Purposes

22 A sarcoma is a cancer found in certain tissues such as muscle, fat, cartilage or bone. Some  
23 sarcomas require amputation in order to avoid further growth or metastasis. There is limited  
24 research on dementia involving motor planning impairments. Physical therapy exercises and  
25 activities are more difficult for a patient with poor motor planning compared with a healthy  
26 individual. The purpose of this case report is to describe the inpatient physical therapy  
27 management of a patient with motor planning deficits and a right above knee amputation.

28 Case Description

29 The patient was a pleasant 82 year old female status post right above knee amputation. Her  
30 general health status was good and she had a supportive family. She also had a diagnosis of  
31 dementia which caused short term memory and motor planning impairments. Her chief  
32 complaint was decreased functional mobility. She was transferred to a skilled nursing facility  
33 from an acute rehabilitation hospital four weeks post amputation.

34 Outcomes

35 The patient was able to meet most of her physical therapy goals at discharge. She was unable to  
36 perform a sit to stand transfer independently with a walker but she was able to improve slide  
37 board transfers to a modified independent level to allow discharge to an assisted living facility.

38 Discussion

39 The patient made good progress from initial to discharge. She was able to improve strength,  
40 range of motion and functional mobility and decrease pain sensation. Her comorbidities such as

41 immobility prior to surgery, age, dementia, and above knee amputation affected her from  
42 progressing to higher levels of functional mobility. Further research is recommended to explore  
43 optimal physical therapy intervention strategies for patients with motor planning deficits.

44 **Manuscript body word count = 3153**

## 45 **Background and Purpose**

46 Lower limb amputation is a procedure most commonly performed on patients who are  
47 diabetic or have peripheral vascular disease. Above the knee amputations comprises  
48 approximately 27% of lower limb amputations and its highest prevalence is among individuals  
49 above the age of 65. Other causes for above the knee amputations include infection, trauma or  
50 cancer.<sup>1</sup>

51 A sarcoma is cancer in certain tissues such as muscle, fat, cartilage or bone.<sup>2</sup> Refer to  
52 Figure 1 for an example of a right femoral sarcoma. The main goals for treatment of a sarcoma  
53 are to prevent further growth or metastasis. The current most common treatment choice is limb  
54 sparing surgery, which involves removal of only the tumor and surrounding tissue and replacing  
55 removed tissue with an implant. Limb sparing surgery along with chemo and radiation therapy  
56 can save the limbs of about 90% of all extremity sarcoma cases.<sup>3</sup> If limb sparing surgery is  
57 unsuccessful or not indicated then an amputation will be performed proximal to the site of the  
58 sarcoma. Both procedures have similar survival rates but limb sparing surgery results in higher  
59 independent functioning.<sup>4</sup>

60 There is limited research in the literature regarding dementia involving motor planning  
61 deficits and physical therapy. However based upon the interventions provided by physical  
62 therapy, which include education, mobility, functional training, wound healing, optimizing range

63 of motion and preventing contractures, it is believed that an individual who has an above knee  
64 amputation combined with motor planning deficits and short term memory loss will have some  
65 difficulty with these interventions.<sup>5</sup>

66 I selected this patient (MC) as a case report because she was a highly motivated  
67 individual who had underlying motor planning deficits and a transfemoral amputation. I believe  
68 that this case will add to the body of knowledge of physical therapy because it is a very high  
69 amputation which may not allow prosthesis to fit. There is a chance that after treatment she can  
70 improve her independent functioning dramatically and I thought it would be interesting to  
71 document that progress. The purpose of this case report is to describe the inpatient physical  
72 therapy management of a patient following right above knee amputation with motor planning  
73 deficits.

#### 74 **History/Systems Review**

75 MC was a pleasant 82 year old female status post right above knee amputation at  
76 approximately five inches below the inferior border of the greater trochanter. The decision for  
77 amputation was made to prevent metastasis after surgical removal of the sarcoma and  
78 chemotherapy was unsuccessful. The medical diagnosis for MC was ICD-9 code 897.3  
79 Traumatic Amputation of Leg(s) (complete) (partial) unilateral at or above knee complicated.

80 Prior to the traumatic amputation, MC resided in an elderly living facility alone with  
81 frequent family member support and no stairs to enter. She had started to consider moving to an  
82 assisted living facility after surgery to receive assistance with daily activities. She has three  
83 daughters who live in the area and are very supportive. Her general health status was good. She  
84 was a non-smoker and non-drinker. Family history was positive for cancer on father's side exact

85 location unknown; MC was a poor historian at times due to impaired short term memory. Her  
86 medical history was relatively unremarkable up until this traumatic amputation due to a sarcoma  
87 in her thigh. Her main complaint was decreased functional mobility due to right transfemoral  
88 amputation.

89 MC was referred to a skilled nursing facility from an acute rehabilitation facility four  
90 weeks post amputation to receive inpatient rehabilitation. Physical therapy will address  
91 weakness, pain, swelling, skin breakdown, functional mobility, gait and transfer training,  
92 neuromuscular reeducation, patient education and safety.

93 The initial system review revealed the following resting vitals: heart rate 84, blood  
94 pressure 124/78, respiratory rate 16 and no edema. Integumentary System: Impaired,  
95 Musculoskeletal system: Impaired, Neuromuscular system impaired, Communication not  
96 impaired, Affect not impaired, cognition alert and oriented to person place and time. However,  
97 she has a diagnosis of mild dementia and her short term memory is impaired. No learning  
98 barriers. MC learns through pictures and practical demonstration. The patient and her family's  
99 goals and outcomes are realistic based upon the severity of her medical condition. They all  
100 realize that she will be primarily using a wheelchair for mobility and plan for a discharge to an  
101 assisted living facility at a modified independent level in the wheelchair.

## 102 **Clinical Impression 1**

103 The primary problem for MC is the right transfemoral amputation which severely affects  
104 her functional mobility. Her dementia needs to be better understood because it may impede  
105 progress with functional activities and discharge planning. The plan for the examination  
106 procedure was to address all systems found to be impaired in the systems review. The

107 integumentary system was impaired due to a recent surgical intervention. The plan to examine  
108 and monitor this impairment is to observe the wound healing process and collaborate with the  
109 skilled nursing staff to ensure adequate wound healing. The neuromuscular system was also  
110 impaired and the plan is to assess transfer ability with the Functional Independence Measure  
111 (FIM) and balance with the Berg Balance Scale (BBS). The musculoskeletal system was  
112 impaired. I plan to take goniometric measurements for any joint ranges of motion that are not  
113 within functional limits and perform manual muscle tests (MMTs) where indicated. Finally, I  
114 plan to assess pain because I believe that it is important to monitor all patients' pain levels.

115 MC is a good candidate for a case report because she is very unique. She has significant  
116 co morbidities such as cognitive deficits and poor motor planning as well as a recent high above  
117 knee amputation. She is also very motivated to participate in all rehabilitation services and home  
118 exercises.

### 119 **Examination- Test and Measures**

120 Tests and measures were completed at admission to the facility and shortly before  
121 discharge from the facility to an assisted living facility. (Table 1) FIM scores were assessed  
122 during all treatment sessions and changes were reported to other rehabilitation personnel.

123 The FIM is a uniform system of measurement for disability and measures the amount of  
124 assistance an individual requires to complete activities of daily living.<sup>6</sup> It is scored from zero to  
125 seven which ranges from the inability to complete the task with assistance to independent  
126 completion. It has two subscales which are cognitive and motor. The FIM has construct  
127 validity and high test-retest reliability in patients aged 80 and older. The intraclass correlation  
128 coefficient (ICC) for the motor score was .9 which demonstrates excellent interrater reliability.<sup>7</sup>

129 Hip range of motion (ROM) was assessed with a goniometer. Nussbaumer et al.<sup>8</sup>  
130 reported that the measurement of hip ROM is reliable and valid. However, they found that the  
131 concurrent validity between a goniometer and an electromagnetic tracking system was not good  
132 for hip flexion, adduction and external rotation.<sup>8</sup>

133 The BBS is a fourteen item scale designed to measure balance and indicate fall risk in  
134 some populations.<sup>9</sup> (Appendix 1) Major, Fatone and Roth<sup>10</sup> examined the validity and reliability  
135 of the BBS for in people with lower limb amputation. They discovered that the BBS is a valid  
136 and reliable instrument for assessing balance in patients who have had an amputation, but not for  
137 predicting falls.<sup>10</sup>

138 MMT is a standardized method used by physical therapists for testing muscular  
139 strength.<sup>11</sup> The grading system ranges from zero to five. A grade of zero represents no palpable  
140 muscle contraction and a grade of five represents normal strength or able to within strong  
141 resistance. A systematic review by Cuthbert and Goodheart<sup>12</sup> found that MMT used on patients  
142 with neuromusculoskeletal dysfunction had good validity and reliability.

143 The Numeric Pain Scale is a scale that measures a patient's perceived pain levels.<sup>13</sup>  
144 The scale ranges from zero to ten. A score of zero indicates no pain and a score of ten indicates  
145 the worst pain imaginable. Young et al.<sup>14</sup> discovered that the Numeric Pain Scale had a fair  
146 reliability and good validity. However, Herr, Spratt, Mobily and Richardson<sup>15</sup> found that the  
147 Verbal Descriptor Scale is a better assessment tool for older adults with mild to moderate  
148 cognitive impairment.

## 149 **Clinical Impression 2**

### 150 **Evaluation**



151           Based upon the examination results there were a few areas of concern for MC. Otherwise  
152 her vitals were normal; communication and affect were not impaired. Cognitive impairments  
153 were mild with slight short term memory impairments. Cognitively MC was appropriate but  
154 demonstrates apprehension and poor motor planning with higher level functional activities such  
155 as sit to stand and squat pivot transfers using a rolling walker or bed railing. The wound on the  
156 right residual limb is a concern and is monitored by her surgeon and skilled nursing. I believe  
157 this wound is MC's biggest challenge and if it heals properly her functioning will improve. Her  
158 strength and range of motion were relatively normal based upon her age and history. She needs  
159 to build up strength in order to make up for the right transfemoral amputation. After a surgery of  
160 this extent, she complains of minimal pain which is remarkable and encouraging for the future.  
161 Her transfer performance at initial was good especially based upon her cognitive deficits and  
162 poor motor planning. I believe that with practice she will be able to improve her ability to  
163 transfer modified independent on the FIM.

164           Her impairments include muscle weakness, decreased right hip ROM, poor motor  
165 planning, fair balance, short term memory deficits, amputation wound present on the right lower  
166 extremity and pain. These impairments cause difficulties with all functional activities such as  
167 transfers. She requires assistance with bed mobility and transfers and is unable to ambulate or  
168 hop any distances with two caregivers assisting. These functional limitations and impairments  
169 cause MC to live in a skilled nursing facility in order to meet her needs. This environment does  
170 not allow her to participate in community activities outside of the nursing home but she is able to  
171 frequently attend events and activities in the facility.

172           Her cognitive impairments, apprehension and poor motor planning highly affect her  
173 prognosis. There is a possibility that with transfer practice she will be able to perform all needed

174 transfers from a wheelchair to function with modified independence to discharge to an assisted  
175 living facility. Her primary diagnosis of an above knee amputation especially the location of the  
176 amputation leaving a short residual limb highly affects her prognosis. It is unclear whether there  
177 is a possibility of fitting prosthesis.

## 178 **Diagnosis**

179 The physical therapy practice pattern for MC is 4J: Impaired Gait, Locomotion and  
180 Balance and Impaired Motor Function Secondary to Lower Extremity Amputation.<sup>16</sup> I chose 4J  
181 because the majority of impairments, functional limitations and disabilities are all directly related  
182 to amputation. Her motor planning deficit is not related to this diagnosis and is attributed to  
183 dementia.

## 184 **Prognosis**

185 MC's prognosis is good, but is highly dependent upon progress with transfers out of the  
186 wheelchair and right residual limb wound healing status post above knee amputation. Her  
187 dementia affecting motor planning and short term memory highly impacts the prognosis. The  
188 patient's day to day transfer performance was highly variable. One day she could perform a  
189 supine to sit transfer without assistance. The next day she was unable and required a step by step  
190 explanation of how to complete the transfer. The level of amputation is also a cause for concern  
191 and chance of fitting prosthesis is questionable at this time. This information is based upon my  
192 own limited clinical experience with patient's status post amputation and my clinical instructor's  
193 judgment.

## 194 **Plan of Care**

195 The plan of care for MC was to practice transfers and bed mobility as well as a  
196 strengthening and stretching program. Repetition and problem solving were a main focus with  
197 transfers to progress towards a modified independent level on the FIM due to her motor planning  
198 difficulties. Occupational therapy assisted with activities of daily living training such as toileting,  
199 dressing and bathing. The goals were based upon the family goals for discharge and impairments  
200 and functional limitations found during examination. (Table 2)

201 The discharge plan for MC was between returning to her home in a senior community or  
202 placement in an assisted living facility. The decision was made through collaboration with  
203 rehabilitation personnel, the patient and her family. She was discharged to an assisted living  
204 facility to receive assistance with medications and meals. She uses a wheelchair to mobilize and  
205 a slide board for transferring between surfaces.

## 206 **Intervention**

207 MC was scheduled to receive physical therapy every day on weekdays and once on  
208 weekends for approximately 30-45 minutes. The main components of interventions were  
209 repetition and problem solving due to MC's cognitive deficits and motor planning difficulties.  
210 MC was asked to perform functional activities such as slide board transfers and bed mobility  
211 activities from different surfaces and directions. Each session, the patient was asked to perform  
212 all aspects of functional mobility as independently as possible and only received assistance when  
213 required.

## 214 **Coordination, communication and documentation**

215 MC was rehabilitated in a skilled nursing facility which has many different medical  
216 professionals on site. Physical therapy coordinated treatment with occupational therapy, skilled

217 nursing, speech therapy, dietary and a physician specializing in wound care. Skilled nursing and  
218 certified nursing assistants were communicated with regarding safe patient handling techniques  
219 and required level of assistance. MC was referred to a wheelchair professional that custom fit her  
220 for a wheelchair. Two interdisciplinary team meetings were held to discuss necessary patient  
221 care and to plan for her discharge from the facility. Daily notes and weekly assessments were  
222 completed for MC in order to keep up with her performance to follow progress and make  
223 changes when necessary.

#### 224 **Patient related instruction**

225 MC was given and instructed in a home exercise program. (Appendix 2) She performed  
226 the exercises with supervision until she was able to continuously perform the exercises correctly.  
227 It then became an adjunct treatment to normal therapy sessions. She was educated in all transfer  
228 sequencing and residual limb contracture prevention. Contracture prevention was an education  
229 focus including the importance of attaining the prone position to stretch the soft tissue of the  
230 anterior thigh. MC was instructed to prevent contractures because she may be unable to reduce  
231 them after they have developed.<sup>17</sup> A site visit was performed for the assisted living facility that  
232 MC was discharged to and equipment recommendations were given to both the patient and  
233 facility.

#### 234 **Procedural Interventions**

235 Therapeutic Exercise: Therapeutic exercise is one of the key elements of programs designed to  
236 improve or restore an individual's function or to prevent dysfunction.<sup>18</sup> MC was provided with a  
237 written bed exercise program including quadriceps sets, glut sets, combined quadriceps and  
238 gluteal sets to improve sit to stand transfer ability, straight leg raises and bridging. (Appendix 2)

239 Additional exercises included long arc quads, wheelchair pushups, latissimus pull down  
240 exercises, and forward and backward hopping in parallel bars. (Figure 3) Another important  
241 exercise MC performed was dynamic reaching. She was encouraged to weight shift onto her  
242 residual limb and maintain balance while completing a task such as retrieving various items from  
243 her bedside table. MC also required core strengthening to promote higher functional mobility.  
244 Exercises included crunches, diagonal curl ups, supine pelvic tilts and supine bike with low  
245 abdominals. (Figure 3)

246 Therapeutic Activities: Transfer activities are a necessary component of treatment for patients  
247 because it allows them to change position, move from one surface to another and promote  
248 independence.<sup>19</sup> MC was asked to perform many therapeutic activities throughout the day by all  
249 health care professionals. The focus during all therapeutic activity interventions was consistent  
250 demonstration of safety by MC. This was important because she was being treated by many  
251 different professionals with different skill levels. Therapeutic activities included bed mobility,  
252 supine to and from sitting, sit to and from standing, squat pivot transfers, stand pivot transfers  
253 and slide board transfers. MC received a practical demonstration and cueing for proper  
254 sequencing and safety when required during functional activities. These activities were practiced  
255 in different settings, transfer surfaces and directions to promote motor learning.

## 256 **Outcome**

257 MC was discharged from a skilled nursing facility to an assisted living facility shortly  
258 after reexamination. The initial and final examinations were conducted by the same student  
259 therapist to maximize reliability of testing. (Table 1) The final examination showed that MC met  
260 most of her physical therapy goals. She experienced difficulty throughout all treatment sessions

261 executing a sit to stand transfer without assistance. However, the assisted living facility she was  
262 discharged to does not require her to be able to stand independently. She was able to reach a  
263 modified independent level with a slide board to transfer in and out of the wheelchair. This  
264 allowed for her discharge to the assisted living facility. She was extremely motivated to continue  
265 with her home exercise program and will receive home health physical therapy at her new  
266 location for further rehabilitation. This new setting will allow her to start reintegrating back into  
267 the community. MC seemed satisfied with her outcome and was ready to progress to a more  
268 independent living facility.

## 269 **Discussion**

270 MC made good progress during her inpatient rehabilitation. She was able to improve her  
271 functional mobility from requiring assistance with all aspects of mobility to a modified  
272 independent level with a slide board. It seems that combining strengthening exercises and  
273 functional mobility training along with the treatments from the other healthcare professionals  
274 helped assist with MC's progress.<sup>20</sup> She was able to improve her strength and functional mobility  
275 and decrease pain from initial examination to final. Frederiks and Visagie<sup>20</sup> reported that it is  
276 vital to treat the patient as an individual and encourage social integration rather than only  
277 focusing on impairments.

278 MC was unable to perform a sit to stand transfer without some level of assistance  
279 throughout her rehabilitation. It is important to discuss comorbidities when discussing her  
280 achievements in functional mobility. A study by Vogel<sup>21</sup> reported that age and prior level of  
281 functional mobility are prognostic indicators for gains in functional status post traumatic  
282 amputation. She was immobile for months prior to amputation and was 82 years old. Therefore,

283 the prognosis was poor for higher levels of independent mobility such as stand step transfers and  
284 sit to stand transfers at this acute stage status post above knee amputation.

285           There is little information in the literature regarding dementia and motor planning  
286 deficits. It is apparent that these impairments were vital components of MC's care and outcomes.  
287 Practical demonstration and constant repetition of functional mobility with variable task  
288 components seemed to help promote motor learning in MC. Further research on dementia and  
289 motor planning deficits should be conducted in order to discover the optimal intervention  
290 strategy for patients with these impairments.

291           Despite all of MC's negative factors affecting her outcome, she also had many positive  
292 factors. She was highly motivated to participate in all therapy related activities and exercises.  
293 Her family was very supportive, visited frequently and sometimes would attend therapy sessions.  
294 She was of a healthy weight with no underlying health concerns besides the recent amputation.

295           In conclusion, patients with significant comorbidities who have an above knee  
296 amputation benefit from an acute inpatient rehabilitation to improve functional mobility and  
297 strength to promote a safe return back to community living.

298

299

300

301

302

303 **Reference**

- 304 1. American Physical Therapy Association: Move Forward PT. Physical Therapist's  
305 Guide to Above-Knee Amputation, 2014. Available at  
306 [http://www.moveforwardpt.com/SymptomsConditionsDetail.aspx?cid=7e9549ef-](http://www.moveforwardpt.com/SymptomsConditionsDetail.aspx?cid=7e9549ef-0bff-4b50-88f1-8a8bf4f1e496#.VEPXG_lDVbc)  
307 [0bff-4b50-88f1-8a8bf4f1e496#.VEPXG\\_lDVbc](http://www.moveforwardpt.com/SymptomsConditionsDetail.aspx?cid=7e9549ef-0bff-4b50-88f1-8a8bf4f1e496#.VEPXG_lDVbc). Accessed Oct 19, 2014.
- 308 2. American Cancer Society. Sarcoma – Adult Soft Tissue Cancer. 2014. Available at  
309 <http://www.cancer.org/cancer/sarcoma-adultsofttissuecancer/>. Accessed September  
310 30, 2014.
- 311 3. Gorlick R, Bernstein ML, Toretsky JA, Randall RL, Gebhardt MC, Teot LA, et  
312 al. Pediatric bone tumors. *Cancer Medicine*, 7th ed Hamilton, ON: BC Decker; 2006:  
313 2019–2027
- 314 4. Ayerza MA, Farfalli GL, Aponte-Tinao L, Muscolo DL. Does increased rate of limb-  
315 sparing surgery affect survival in osteosarcoma? *Clin Orthop Relat Res*. 2010 Nov;  
316 468: 2854-2859.
- 317 5. Brigham and Women's Hospital. Standard of Care: Lower Extremity Amputation,  
318 2011. Available at  
319 [http://www.brighamandwomens.org/patients\\_visitors/pcs/rehabilitationservices/physi](http://www.brighamandwomens.org/patients_visitors/pcs/rehabilitationservices/physical%20therapy%20standards%20of%20care%20and%20protocols/general%20-%20le%20amputation.pdf)  
320 [cal%20therapy%20standards%20of%20care%20and%20protocols/general%20-](http://www.brighamandwomens.org/patients_visitors/pcs/rehabilitationservices/physical%20therapy%20standards%20of%20care%20and%20protocols/general%20-%20le%20amputation.pdf)  
321 [%20le%20amputation.pdf](http://www.brighamandwomens.org/patients_visitors/pcs/rehabilitationservices/physical%20therapy%20standards%20of%20care%20and%20protocols/general%20-%20le%20amputation.pdf). Accessed December 3, 2014.
- 322 6. Rehab Measures: Functional Independence Measure, 2014. Available at  
323 <http://www.rehabmeasures.org/Lists/RehabMeasures/DispForm.aspx?ID=889>.  
324 Accessed December 3, 2014



- 325 7. Pollak N, Rhealt W, Stoecker JL. Reliability and validity of the FIM for persons aged  
326 80 years and above from a multilevel continuing care retirement community. *Arch*  
327 *Phys Med Rehabil.* 1996 Oct; 77: 1056-1061.
- 328 8. Nussbaumer S, Leunig M, Glatthorn JF, Stauffacher S, Gerber H, Maffiuletti NA.  
329 Validity and test-retest reliability of manual goniometers for measuring passive hip  
330 range of motion in femoracetabular impingement patients. *BMC Musculoskel Dis.*  
331 2010 Aug; 11: 194
- 332 9. Rehabilitation Measures: Berg Balance Scale, 2014. Available at  
333 <http://www.rehabmeasures.org/Lists/RehabMeasures/DispForm.aspx?ID=888>.  
334 Accessed December 3, 2014
- 335 10. Major MJ, Fatone S, Roth EJ. Validity and reliability of the Berg Balance Scale for  
336 community dwelling persons with lower limb amputation. *Arch Phys Med Rehabil.*  
337 2013 Nov; 94: 2194-2202.
- 338 11. Rehabilitation Measures: Manual Muscle Test, 2014. Available at  
339 <http://www.rehabmeasures.org/Lists/RehabMeasures/DispForm.aspx?ID=1033>.  
340 Accessed December 3, 2014.
- 341 12. Cuthbert SC, Goodheart GJ. On the reliability and validity of manual muscle testing:  
342 a literature review. *Chiropractic & Osteopathy.* 2007, 15: 4
- 343 13. Rehab Measures: Numeric Pain Rating Scale, 2014. Available at  
344 <http://www.rehabmeasures.org/Lists/RehabMeasures/DispForm.aspx?ID=891>.  
345 Accessed December 3, 2014
- 346 14. Young IA, Cleland JA, Michener LA, Brown C. Reliability, Construct Validity, and  
347 Responsiveness of the Neck Disability Index, Patient-Specific Functional Scale, and

- 348            Numeric Pain Rating Scale in Patients with Cervical Radiculopathy. *Am J Phys Med*  
349            *Rehab.* 2010 Oct; 89: 831-839.
- 350            15. Herr KA, Spratt K, Mobily PR, Richardson G. Pain intensity assessment in older  
351            adults; use of experimental pain to compare psychometric properties and usability of  
352            selected pain scales with younger adults. *Clin J Pain.* 2004 Jul-Aug; 20: 207-219.
- 353            16. American Physical Therapy Association: Guide to Physical Therapy Practice, 2<sup>nd</sup>  
354            edition, 2003 revision
- 355            17. LaRaia N. Preventing Contractures. Amputee Coalition. 2011. Available at  
356            [https://www.amputee-](https://www.amputee-coalition.org/inmotion/may_jun_11/preventing_contractures.pdf)  
357            [coalition.org/inmotion/may\\_jun\\_11/preventing\\_contractures.pdf](https://www.amputee-coalition.org/inmotion/may_jun_11/preventing_contractures.pdf). Accessed December  
358            3, 2014.
- 359            18. Kisner C, Colby LA. Therapeutic Exercise Foundations and Techniques. 6<sup>th</sup> Edition.  
360            Philadelphia, PA; F.A. Davis Company; 2012.
- 361            19. Pierson FM, Fairchild SL. Principles & Techniques of Patient Care. 4<sup>th</sup> Edition. St.  
362            Louis, MO; Saunders Elsevier; 2008.
- 363            20. Frederiks JP, Visagie S. The rehabilitation programme and functional outcomes of  
364            persons with lower limb amputations at a primary level rehabilitation centre. *S Afr J*  
365            *Occup Ther.* 2013 Dec; 43: 18-28.
- 366            21. Vogel TR, Petroski GF, Kruse RL. Impact of amputation level and comorbidities on  
367            functional status of nursing home residents after lower extremity amputation. *J Vasc*  
368            *Surg.* 2014 May; 59(5): 1323-1330.

369

370

371 Table 1

372 Tests and Measures

	Initial Examination (Day 1)	Re-examination (Day 36)
<b><u>Integumentary System</u></b>	All exposed areas besides right residual limb intact, right residual limb warm to touch, red color and serosanguineous drainage. Negative pressure wound dressing in place.	Negative pressure wound dressing discontinued. Wound is packed and covered every three days. Stump shrinker stocking in place similar to the image in Figure 2A. She has been fitted for a custom shrinker similar to Figure 2B which has been ordered. Possibility of fitting a prosthesis is still unknown
<b><u>Musculoskeletal System</u></b>		
ROM	Bilateral upper extremity and left lower extremity ROM WFL  Right residual limb ROM: hip flexion/extension 0-95° all other ROM WFL. Flexion measurement taken in supine, extension in left sidelying. MC requested not to lay prone for measurement.	Bilateral upper extremity and left lower extremity ROM remain WFL  Right residual limb ROM: hip flexion/extension 5-0-100°. Flexion measurement taken in supine, extension in sidelying.
Strength	Upper extremities grossly 4/5.  Right residual limb tested to 3/5 due to acute healing process  Left lower extremity gluteus maximus, gluteus medius and tibialis anterior 3+/5.	Upper extremities remain grossly 4/5. Triceps, latissimus dorsi and pectoralis major 4+/5.  Right residual limb tested to grossly 3+/5 due to continued wound healing.  Left lower extremity gluteus maximus, gluteus medius and tibialis anterior 4/5.  Upper abdominal strength good  Lower abdominal strength fair

	Upper abdominal strength fair  Lower abdominal strength poor	
<b><u>Neuromuscular system</u></b>		
Balance	Seated static balance steady >30 seconds  Dynamic seated balance unsteady requires upper extremity support  Berg balance scale score 5/56 indicating a high fall risk	Seated static balance normal > 2 minutes  Dynamic seated balance good >15 seconds. Able to shift weight outside of base of support in both directions without upper extremity support.  Berg balance scale score 18/56 indicating a high fall risk
Transfers based upon the Functional Independence Measure	Rolling left and right minimum assistance of 1  Supine<>sit minimum assist of 1  Sit<>stand moderate assistance of 2 with rolling walker  Slide board transfer bed<>wheelchair moderate assistance of 1  Squat pivot transfer bed<>commode moderate to maximum assistance of 1  Unable to ambulate any distance at initial with maximum assistance of 2 and rolling walker	Rolling left and right modified independent with use of bed rail  Supine<>sit supervision  Sit<>stand performance inconsistent contact guard assist of 1 to minimum assist of 2 with rolling walker  Slide board transfer bed<>wheelchair, wheelchair<>standard chair modified independent  Squat pivot transfer bed<>commode supervision  Stand pivot transfer minimum assistance of 2 with rolling walker

<b><u>Pain</u></b>	1-2/10 on visual analog scale. MC describes as “phantom” pains in right little toe	Pain consistently 0/10 on the visual analog scale at rest and during activities.
--------------------	--	--

373 < > = to and from, ROM = range of motion, WFL = within functional limits

374

375

376

377

378

379

380

381

382

383

384

385

386

387

388

389 Table 2.

390 Short term and long term rehab goals set for MC.

Short term goals 1 week	Long term goals 5 weeks
#1 pain 0/10 at rest supine with mitigation	#1 supine<>sit transfer independent
#2 supine<>sit contact guard assist for safety	#2 squat pivot transfer bed<>WC and bed/WC to commode modified independent
#3 sit<>stand transfer min assist x2 standard walker	#3 sit<>stand with stand by assistance rolling walker
#4 slide board transfer with all skilled caregivers min/mod a x1 bed<>WC	#4 Discharge to assisted living facility with services

391 < > = to and from, WC = wheelchair

392

393

394

395

396

397

398

399

400

401



402

403

Figure 1. Image representing the sarcoma MC had removed which resulted in transfemoral amputation.

Image available at <http://www.mskcases.com/images/article/1/70-843.jpg> . Accessed September 24, 2014.

404

405

406

407

408

409

410

411

412

413  
414  
415  
416  
417  
418  
419  
420  
421  
422  
423  
424  
425  
426  
427  
428  
429  
430  
431  
432  
433  
434

**A.**



**B.**



Figure 2.

Image A. Original stump shrinker stocking supplied to MC by her surgeon. This stocking was too large for MC and a custom stocking was required.

Image B. Custom fitting stump shrinker stocking ordered for MC to assist with possible future prosthesis fitting

Images available at <http://www.juzo.com/fileadmin/Bilddatenbank/Produktbilder/Dynamic-Stumpfstrumpf.jpg> . Accessed September 24, 2014

[http://www.shanmedical.com/media/catalog/product/cache/1/image/300x300/9df78eab33525d08d6e5fb8d27136e95/3/5/3510CFHIPATT\\_1.jpg](http://www.shanmedical.com/media/catalog/product/cache/1/image/300x300/9df78eab33525d08d6e5fb8d27136e95/3/5/3510CFHIPATT_1.jpg) . Accessed September 24, 2014.

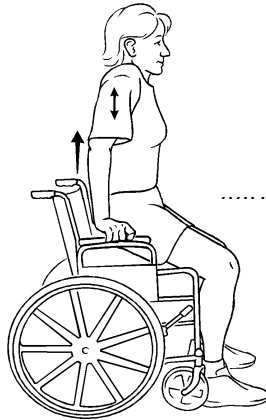


435 A.

ARM - 6 Triceps Dip / Depression

Feet on floor, hands on armrests, extend arms to lift buttocks from chair. While lifted, shrug then depress shoulders, lowering buttocks. Hold \_\_\_\_ seconds.

Repeat \_\_\_\_ times. Do \_\_\_\_ sessions per day.

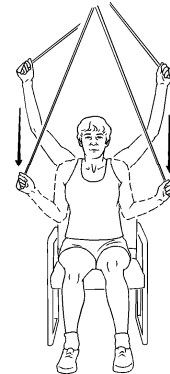


B.

UE MULTI JOINT - 18 Sitting: Lat Pull Down Resistance Band (Active)

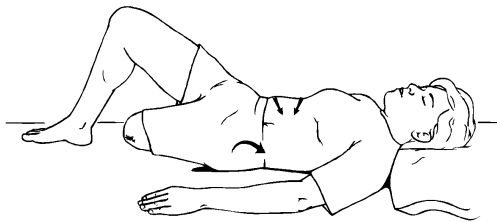
Sit, straight arms raised. Against yellow resistance band, bend arms, pulling elbows down toward sides.

Complete \_\_\_\_ sets of \_\_\_\_ repetitions. Perform \_\_\_\_ sessions per day.



443 C.

BACK / TRUNK - 1 Pelvic Tilt



Flatten back by tightening stomach muscles and tilting hips toward waist.

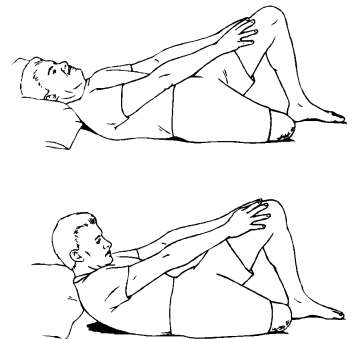
Hold \_\_\_\_ seconds. Repeat \_\_\_\_ times. Do \_\_\_\_ sessions per day.

D.

BASIC PROGRAM: TFA - 8 Abdominal Crunch

Tighten stomach muscles to tilt pelvis and flatten back. Raise head and shoulders, and slide fingers up thigh toward knee. Continue breathing normally.

Hold \_\_\_\_ seconds. Repeat \_\_\_\_ times. Do \_\_\_\_ sessions per day.



453

454

455 E.

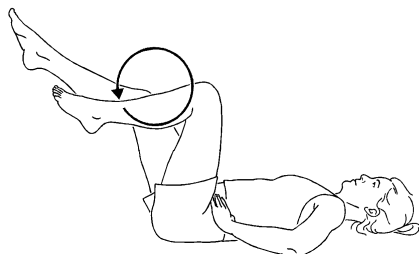
LOWER TRUNK - 21 Bike With Lower Abdominals Isometric

457

458

459

460



Alternate straightening slightly and bending legs in bike motion. Keep pelvis and back still.

Do \_\_\_\_ times, \_\_\_\_ times per day.

F.



461  
462  
463  
464  
465  
466  
467  
468  
469  
470  
471  
472  
473  
474  
475  
476  
477  
478  
479  
480  
481  
482  
483  
484  
485

Figure 3.

- A. Wheelchair push up exercise. She was encouraged to frequently perform this exercise throughout the day for pressure relief and strengthening.
- B. Latissimus pull down exercise. MC completed 3 sets of 10 repetitions frequently during treatment sessions. She was able to progress from yellow to green elastic band.
- C. Pelvic tilts. This exercise helped MC learn to engage her low abdominal musculature.
- D. Abdominal crunch. Exercise to strengthen upper abdominals to assist with transfers and bed mobility
- E. Bike with lower abdominals. Exercise to strengthen low abdominal musculature and pelvic stabilization
- F. Diagonal crunch. Exercise to strengthen oblique abdominal musculature.

MC= patient

Images available at:

<http://search.ebscohost.com.une.idm.oclc.org/login.aspx?direct=true&db=rrcv&AN=011000023bptf11&site=rrc-live>. Accessed October 20, 2014.

<http://search.ebscohost.com.une.idm.oclc.org/login.aspx?direct=true&db=rrcv&AN=0420000855umj018f&site=rrc-live>. Accessed October 20, 2014.

<http://search.ebscohost.com.une.idm.oclc.org/login.aspx?direct=true&db=rrcv&AN=0110000103back01&site=rrc-live>. Accessed October 20, 2014.

<http://search.ebscohost.com.une.idm.oclc.org/login.aspx?direct=true&db=rrcv&AN=011000020bptf08&site=rrc-live>. Accessed October 20, 2014.

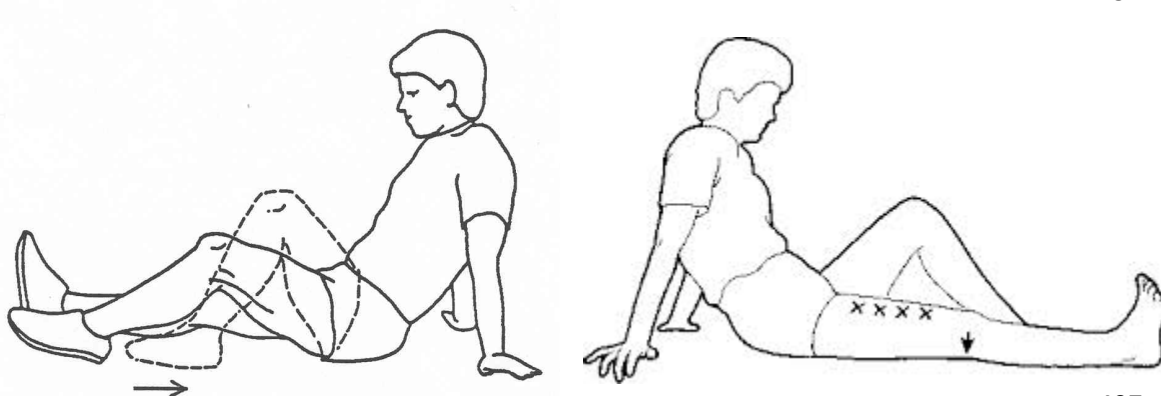
<http://search.ebscohost.com.une.idm.oclc.org/login.aspx?direct=true&db=rrcv&AN=0380000043lt021f&site=rrc-live>. Accessed October 20, 2014.

<http://www.spine-health.com/images/rehabfus/fig10.gif>. Accessed October 20, 2014.

486 Figure 4. Home Exercise Program.

487 All exercises were recommended to start with 3 sets of 10 repetitions per day and add sets  
488 as the exercise gets easier.

491



497

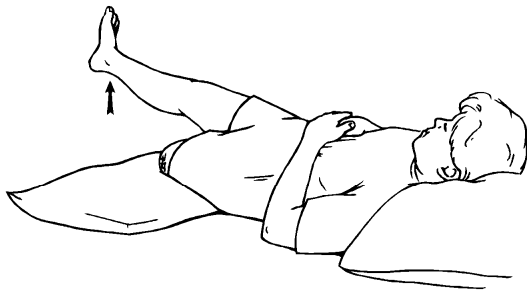
496 Heel slides: Left Leg 3 sets of 10  
497 repetitions. 2 times per day.

Quad sets: Left leg 3 sets of 10  
repetitions. 2 times per day.

498

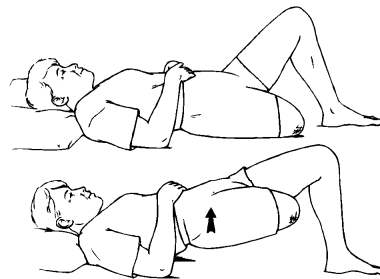
499

SOUND LOWER EXTREMITY - 4  
Straight Leg Raise



Support residual limb. Tighten muscle on front of sound limb thigh, then lift leg \_\_\_\_ inches, keeping knee locked.  
Hold \_\_\_\_ seconds. Repeat \_\_\_\_ times.  
Do \_\_\_\_ sessions per day.

BASIC PROGRAM: TFA - 9  
Bridging



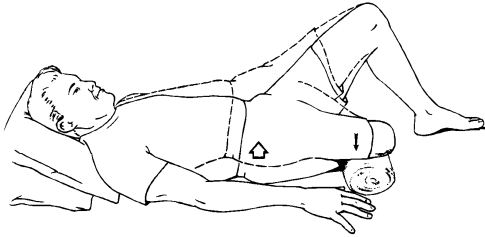
With sound knee bent and foot flat, tighten buttock muscles while lifting hips.  
Hold \_\_\_\_ seconds. Repeat \_\_\_\_ times.  
Do \_\_\_\_ sessions per day.

500

501

502

BASIC PROGRAM: TFA - I  
Hip Extension



With towel roll under residual limb, push down into towel roll while lifting buttocks.

Hold \_\_\_\_ seconds. Repeat \_\_\_\_ times.

Do \_\_\_\_ sessions per day.



Ankle pumps. Pump the ankle gently up and down. 3 sets of 10 repetitions 2 times per day.

510 Images available at:

511 [https://encrypted-tbn1.gstatic.com/images?q=tbn:ANd9GcRFjrWLDyyt483HuiOFchw5RbWMch7f0ITXR0ZuRa\\_4088pD9ID1Q](https://encrypted-tbn1.gstatic.com/images?q=tbn:ANd9GcRFjrWLDyyt483HuiOFchw5RbWMch7f0ITXR0ZuRa_4088pD9ID1Q). Accessed October 21, 2014.

514 <https://encrypted-tbn1.gstatic.com/images?q=tbn:ANd9GcQsPYzKQWpzqYBIG1ZNCAAdVF2puAY6uMwXVI9XpUrrw3hy8Vff>. Accessed October 21, 2014.

517 <http://search.ebscohost.com.une.idm.oclc.org/login.aspx?direct=true&db=rrcv&AN=0110000085lowx04&site=rrc-live>. Accessed October 21, 2014.

519 <http://search.ebscohost.com.une.idm.oclc.org/login.aspx?direct=true&db=rrcv&AN=0110000021bptf09&site=rrc-live>. Accessed October 21, 2014.

521 <http://search.ebscohost.com.une.idm.oclc.org/login.aspx?direct=true&db=rrcv&AN=0110000013bptf01&site=rrc-live>. Accessed October 21, 2014.

523 <http://www.borgess.com/images/bbji/joint%20camp/AnklePumps.jpg>. Accessed October 21, 2014.

525

526

527

528

529

530

531

532 Appendix 1. Berg Balance Scale

533 GENERAL INSTRUCTIONS

534 Please document each task and/or give instructions as written. When scoring, please record the  
535 lowest response category that applies for each item.

536

537 In most items, the subject is asked to maintain a given position for a specific time. Progressively  
538 more points are deducted if:

- 539 • the time or distance requirements are not met
- 540 • the subject's performance warrants supervision
- 541 • the subject touches an external support or receives assistance from the examiner

542 Subject should understand that they must maintain their balance while attempting the tasks. The  
543 choices of which leg to stand on or how far to reach are left to the subject. Poor judgment will  
544 adversely influence the performance and the scoring.

545

546 Equipment required for testing is a stopwatch or watch with a second hand, and a ruler or other  
547 indicator of 2, 5, and 10 inches. Chairs used during testing should be a reasonable height. Either  
548 a step or a stool of average step height may be used for item # 12.

549 **Berg Balance Scale**

550

551 SITTING TO STANDING

552 INSTRUCTIONS: Please stand up. Try not to use your hand for support.

553 ( ) 4 able to stand without using hands and stabilize independently

554 ( ) 3 able to stand independently using hands

555 ( ) 2 able to stand using hands after several tries

556 ( ) 1 needs minimal aid to stand or stabilize

557 ( ) 0 needs moderate or maximal assist to stand

558

559 STANDING UNSUPPORTED

560 INSTRUCTIONS: Please stand for two minutes without holding on.

- 561 ( ) 4 able to stand safely for 2 minutes  
562 ( ) 3 able to stand 2 minutes with supervision  
563 ( ) 2 able to stand 30 seconds unsupported  
564 ( ) 1 needs several tries to stand 30 seconds unsupported  
565 ( ) 0 unable to stand 30 seconds unsupported

566

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

569

570 SITTING WITH BACK UNSUPPORTED BUT FEET SUPPORTED ON FLOOR OR ON A  
571 STOOL

572 INSTRUCTIONS: Please sit with arms folded for 2 minutes.

- 573 ( ) 4 able to sit safely and securely for 2 minutes  
574 ( ) 3 able to sit 2 minutes under supervision  
575 ( ) 2 able to able to sit 30 seconds  
576 ( ) 1 able to sit 10 seconds  
577 ( ) 0 unable to sit without support 10 seconds

578

579 STANDING TO SITTING

580 INSTRUCTIONS: Please sit down.

- 581 ( ) 4 sits safely with minimal use of hands  
582 ( ) 3 controls descent by using hands  
583 ( ) 2 uses back of legs against chair to control descent  
584 ( ) 1 sits independently but has uncontrolled descent  
585 ( ) 0 needs assist to sit

586

587 TRANSFERS

588 INSTRUCTIONS: Arrange chair(s) for pivot transfer. Ask subject to transfer one way toward a  
589 seat with armrests and one way toward a seat without armrests. You may use two chairs (one  
590 with and one without armrests) or a bed and a chair.

591 ( ) 4 able to transfer safely with minor use of hands

592 ( ) 3 able to transfer safely definite need of hands

593 ( ) 2 able to transfer with verbal cuing and/or supervision

594 ( ) 1 needs one person to assist

595 ( ) 0 needs two people to assist or supervise to be safe

596

597 STANDING UNSUPPORTED WITH EYES CLOSED

598 INSTRUCTIONS: Please close your eyes and stand still for 10 seconds.

599 ( ) 4 able to stand 10 seconds safely

600 ( ) 3 able to stand 10 seconds with supervision

601 ( ) 2 able to stand 3 seconds

602 ( ) 1 unable to keep eyes closed 3 seconds but stays safely

603 ( ) 0 needs help to keep from falling

604

605 STANDING UNSUPPORTED WITH FEET TOGETHER

606 INSTRUCTIONS: Place your feet together and stand without holding on.

607 ( ) 4 able to place feet together independently and stand 1 minute safely

608 ( ) 3 able to place feet together independently and stand 1 minute with supervision

609 ( ) 2 able to place feet together independently but unable to hold for 30 seconds

610 ( ) 1 needs help to attain position but able to stand 15 seconds feet together

611 ( ) 0 needs help to attain position and unable to hold for 15 seconds

612 **Berg Balance Scale** continued.....

613

614 REACHING FORWARD WITH OUTSTRETCHED ARM WHILE STANDING

615 INSTRUCTIONS: Lift arm to 90 degrees. Stretch out your fingers and reach forward as far as  
616 you can. (Examiner places a ruler at the end of fingertips when arm is at 90 degrees. Fingers  
617 should not touch the ruler while reaching forward. The recorded measure is the distance forward  
618 that the fingers reach while the subject is in the most forward lean position. When possible, ask  
619 subject to use both arms when reaching to avoid rotation of the trunk.)

620 ( ) 4 can reach forward confidently 25 cm (10 inches)

621 ( ) 3 can reach forward 12 cm (5 inches)

622 ( ) 2 can reach forward 5 cm (2 inches)

623 ( ) 1 reaches forward but needs supervision

624 ( ) 0 loses balance while trying/requires external support

625

626 PICK UP OBJECT FROM THE FLOOR FROM A STANDING POSITION

627 INSTRUCTIONS: Pick up the shoe/slipper, which is place in front of your feet.

628 ( ) 4 able to pick up slipper safely and easily

629 ( ) 3 able to pick up slipper but needs supervision

630 ( ) 2 unable to pick up but reaches 2-5 cm(1-2 inches) from slipper and keeps balance

631 independently

632 ( ) 1 unable to pick up and needs supervision while trying

633 ( ) 0 unable to try/needs assist to keep from losing balance or falling

634 TURNING TO LOOK BEHIND OVER LEFT AND RIGHT SHOULDERS WHILE  
635 STANDING

636 INSTRUCTIONS: Turn to look directly behind you over toward the left shoulder. Repeat to the  
637 right. Examiner may pick an object to look at directly behind the subject to encourage a better  
638 twist turn.

639 ( ) 4 looks behind from both sides and weight shifts well

640 ( ) 3 looks behind one side only other side shows less weight shift



641 ( ) 2 turns sideways only but maintains balance

642 ( ) 1 needs supervision when turning

643 ( ) 0 needs assist to keep from losing balance or falling

644

645 **TURN 360 DEGREES**

646 **INSTRUCTIONS:** Turn completely around in a full circle. Pause. Then turn a full circle in the  
647 other direction.

648 ( ) 4 able to turn 360 degrees safely in 4 seconds or less

649 ( ) 3 able to turn 360 degrees safely one side only 4 seconds or less

650 ( ) 2 able to turn 360 degrees safely but slowly

651 ( ) 1 needs close supervision or verbal cuing

652 ( ) 0 needs assistance while turning

653

654 **PLACE ALTERNATE FOOT ON STEP OR STOOL WHILE STANDING UNSUPPORTED**

655 **INSTRUCTIONS:** Place each foot alternately on the step/stool. Continue until each foot has  
656 touch the step/stool four times.

657 ( ) 4 able to stand independently and safely and complete 8 steps in 20 seconds

658 ( ) 3 able to stand independently and complete 8 steps in > 20 seconds

659 ( ) 2 able to complete 4 steps without aid with supervision

660 ( ) 1 able to complete > 2 steps needs minimal assist

661 ( ) 0 needs assistance to keep from falling/unable to try

662

663 **STANDING UNSUPPORTED ONE FOOT IN FRONT**

664 **INSTRUCTIONS: (DEMONSTRATE TO SUBJECT)** Place one foot directly in front of the  
665 other. If you feel that you cannot place your foot directly in front, try to step far enough ahead  
666 that the heel of your forward foot is ahead of the toes of the other foot. (To score 3 points, the

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

669 ( ) 4 able to place foot tandem independently and hold 30 seconds

670 ( ) 3 able to place foot ahead independently and hold 30 seconds

671 ( ) 2 able to take small step independently and hold 30 seconds

672 ( ) 1 needs help to step but can hold 15 seconds

673 ( ) 0 loses balance while stepping or standing

674

675 **STANDING ON ONE LEG**

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

677 ( ) 4 able to lift leg independently and hold > 10 seconds

678 ( ) 3 able to lift leg independently and hold 5-10 seconds

679 ( ) 2 able to lift leg independently and hold  $\geq 3$  seconds

680 ( ) 1 tries to lift leg unable to hold 3 seconds but remains standing independently.

681 ( ) 0 unable to try of needs assist to prevent fall

682

683

684 ( ) **TOTAL SCORE (Maximum = 56)**

685

686 Berg Balance Scale available at [geriatrictoolkit.missouri.edu/Berg-Balance-Scale.doc](http://geriatrictoolkit.missouri.edu/Berg-Balance-Scale.doc).

687

688

689

690

691