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# Improving Independent Functional Mobility Following A Left Basal Ganglia Hemorrhagic Stroke: A Case Report

John Covilli  
*University of New England*

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1 **Improving Independent Functional Mobility Following a Left Basal**  
2 **Ganglia Hemorrhagic Stroke: A Case Report**

3 John Covilli, BS

4 John Covilli, BS, is a Doctor of Physical Therapy student at the University of New  
5 England, 716 Stevens Ave. Portland, ME 04103

6 Address all correspondence to John Covilli at: [jcovilli@une.edu](mailto:jcovilli@une.edu)

7 The Patient signed an informed consent form allowing the use of medical records  
8 and the 3 photos for this report. He received information on the institution's policies  
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20 **Abstract**

21 **Background and Purpose**

22           The purpose of this case report is to compile and summarize the physical  
23 therapy management for improving independent functional mobility following a left  
24 basal ganglia hemorrhagic stroke in the outpatient setting. Additionally, this report  
25 will provide a brief overview of the presentation and medical management of a left  
26 basal ganglia hemorrhagic stroke.

27 **Case Description**

28           The patient, JD, had a stroke on 2012 and was left with multiple impairments  
29 ranging from his cognition to his strength and active range of motion. This case  
30 covers his physical therapy management over a 12 week period with hour long  
31 appointments twice each week .

32 **Outcomes**

33           At the end of the 12 week period JD had made significant improvement in almost all  
34 of his impairments, with the greatest improvements in functional mobility and  
35 balance. He showed improved independence with most of his activities of daily  
36 living, and showed decreased dependence on his assistive device and orthotics.

37 **Discussion**

38           JD had excellent family support from his wife and daughters. They transported him  
39 to therapy, and assisted with his home exercise program. While JD made significant  
40 improvement in his functional mobility, further research and case reports are  
41 needed on the physical therapy management of a basal ganglia stroke to determine  
42 the most effective means of improving functional mobility and overall health.

43 Word Count of manuscript: 3,492

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## 45 **Background**

46 A basal ganglia hemorrhage is due to severe hypertension. Elevated blood  
47 pressure has been found in over 90% of cases, regardless of if the person didn't have  
48 a history of hypertension prior to the stroke. According to Gutman and Schonfeld's  
49 guidelines for blood pressure, any hypertension over 160/100, known as stage 2  
50 hypertension, is at risk for an intracerebral hemorrhage<sup>1</sup>.

51 The signs and symptoms of an intracerebral hemorrhage depend on the  
52 location, size, and rate of expansion of the bleed. Symptoms typically evolve over the  
53 span of a few minutes up to a few hours depending on where the hemorrhage  
54 expands. It is now recognized that almost a third of patients have significant  
55 expansion of their hemorrhage in the first few hours after presentation, with an  
56 additional 12% having expansion in the next 20 hours<sup>1</sup>. The patient, JD, had a  
57 hemorrhage of his left putamen, which is housed in the basal ganglia. A bleed in the  
58 putamen is the most common form of basal ganglia hemorrhage and leads to  
59 symptoms that include: Right sided hemiparesis/hemiplegia, right sided  
60 hypertonicity and abnormal synergy of the extremities, right sided sensory loss,  
61 aphasia, dysphagia, perceptual deficits such as agnosia and spatial disorganization,  
62 visual disorders such as homonymous hemianopsia, short and long term memory  
63 loss, and decreased cognition<sup>1</sup>. JD experienced all of these symptoms except a visual  
64 disorder and an abnormal synergy in his right lower extremity. He did have the

65 stereotypical abnormal synergy of his right upper extremity.

66           It is important to have case reports covering the physical therapy (PT) care  
67 and management of a patient that had a basal ganglia stroke for two reasons. The  
68 first reason is that a patient that had a basal ganglia stroke can be in multiple  
69 settings a PT may work in. The patient will be in an acute care setting immediately  
70 following the stroke. After the acute care stay, the patient can go to either a skilled  
71 nursing facility, an outpatient setting, or may receive home health services  
72 depending on how the patient presents. The second reason is because these patients  
73 require long-term care. Progress after this type of stroke is typically slow primarily  
74 because therapy is focused on facilitating voluntary muscle contractions. Voluntary  
75 muscle contraction is usually lost in select muscle groups depending on the location  
76 of the stroke<sup>2</sup>. Returning voluntary muscle control where it has been lost can take  
77 upwards of one thousand repetitions to return to normal<sup>2</sup>. Because of these factors,  
78 it would be beneficial to have examples of how to progress these patients in terms of  
79 therapeutic interventions.

80           During the evaluation, tests for strength, range of motion (ROM), sensation,  
81 cognition, gait, balance, coordination, and his functional mobility will be  
82 emphasized. Treatment will initially focus on improving his strength, ROM, and  
83 balance. Once those begin to improve, treatment will shift to normalizing his gait  
84 cycle and improving his transfers.

85 **Purpose Statement**

86 The purpose of this case report is to compile and summarize the physical therapy  
87 management for improving independent functional mobility following a left basal  
88 ganglia hemorrhagic stroke in the outpatient setting. Additionally, this report will  
89 provide a brief overview of the presentation and medical management of a left basal  
90 ganglia hemorrhagic stroke.

## 91 **History**

92 Prior to JD's initial evaluation, he signed an informed consent form for treatment  
93 and an informed consent form so his data could be used in this case report.

94 **Social History:** Prior to his stroke, JD used to golf 3-4 times a week. JD most  
95 recently worked as a purchasing agent, but has not worked since his stroke. He  
96 doesn't drink, or participate in illicit drug use. Prior to the stroke he smoked  
97 cigarettes for 25 years at the rate of a pack a day. He hasn't smoked since his stroke.

98 **Living Environment:** JD lives at home with his wife and 32-year-old daughter who  
99 moved in to help while his wife works. He also has two other daughters who are 29  
100 and 31 years old. He has one flight of stairs in his home that he does not use  
101 anymore. His wife and daughters help him with car transfers and bathing.

102 **General Health Status:** JD is a 55-year-old male that presents with an ectomorphic  
103 body type. Since his stroke he has noticed significant declines in his right upper and  
104 lower extremity strength, endurance, and ROM. His right upper extremity typically  
105 is held in the stereotypical abnormal synergy position with a tightly clenched fist. He  
106 has decreased sensation on his right side, but particularly his right lower extremity.  
107 He shows decreased respiratory capacity as well. He presents with Broca's aphasia

108 and has difficulty expressing himself verbally. He wears bilateral ankle-foot  
109 orthotics (AFOs) to help with his mobility and to avoid hyperextension of his right  
110 knee.

111 **Family History:** His father died of a heart attack at 74, otherwise unremarkable.

112 **Medical/Surgical History:** Suffered a left basal ganglion stroke on 3/09/12. Prior  
113 to his stroke he suffered from chronic low back pain for 10 years. He has had a  
114 history of hypertension for the past 15 years.

115 **Functional Status/Activity Level:** His activity level is very low due to fatigue  
116 following his stroke. He does attend physical therapy twice a week, occupational  
117 therapy twice a week, and speech therapy once a week. His favorite activities are  
118 watching the Red Sox or Patriots, and when his family visits for dinner. However, he  
119 wants to be able to play golf and mow his lawn. After physical therapy he is  
120 exhausted and usually takes a nap at home. He cannot ambulate for more than 5  
121 minutes without a sitting break. See Table 1 for medications and usages.

## 122 **Systems Review**

123 Integument=Intact except for dry and cracked skin on the right foot and toes.

124 Cardiopulmonary=Impaired

125 -Hypertension controlled by medication

126 -Impaired respiratory capacity (fatigues easily with activity)

127 -Slight edema present in his right lower leg

128 Musculoskeletal= Impaired

129 -Gross strength impairments of his right lower extremity joints.

130 -Gross range of motion (ROM) deficits of his right lower extremity joints.

131 -Impaired gait cycle due to weakness

132 -His posture presented with a forward head and rounded shoulders

133 Neuromuscular= Impaired

134 -Impaired standing balance without an assistive device.

135 -Impaired coordination (finger to nose, and heel up shin).

136 -Impaired discriminative touch on both right extremities.

137 Communication, Affect, Cognition= Impaired

138 -Impaired short term memory

139 -Impaired expressive speech (Broca's Aphasia)

140 - Flat affect

### 141 **Clinical Impression 1**

142 There was no need for a differential diagnosis because his primary problem was  
143 already known. At this point I made the decision to perform manual muscle testing  
144 and proprioception testing of his right lower extremity muscles. I also wanted to  
145 perform further functional mobility testing and The Berg Balance Test on him to  
146 track improvements in his balance and ambulation. Since he was already going to  
147 occupational therapy, speech therapy, and regular check ups with his primary care  
148 physician I saw no need for a referral. I planned on proceeding with interventions  
149 once I finished performing the tests mentioned above.

150 I decided JD was a great candidate for this case report. His diagnosis piqued



151 my interest, but once I learned he would be coming to therapy for the entirety of the  
152 12 weeks I would be working, I chose to ask him to be in my case report.

### 153 **Tests and Measures**

154 1. Manual Muscle Testing (MMT) and Active Range of Motion (AROM) Testing- See  
155 Table 2 for results. According to Fan et al, MMT has adequate to excellent interrater  
156 reliability for both upper extremities (ICC= .62-1.00) and lower extremities (ICC-  
157 .66-1.00) in patients that have survived a stay in the ICU<sup>7</sup>. According to Cuthbert et  
158 al, MMT has great construct validity<sup>8,9</sup>.

159 Active range of motion (AROM) for joints with less than a 3/5 strength were not  
160 all formally measured due to weakness. All joints were WNL with Passive Range of  
161 Motion (PROM) indicating no structural block. His AROM will be measured with  
162 goniometry as soon as he strong enough. A review of the literature didn't find any  
163 information on the reliability and validity of PROM goniometric measures following a  
164 stroke.

165 2. Proprioception Testing: This measures if the patient is capable of knowing where their  
166 joints are in space. According to Desphande et al, the reliability and construct validity of  
167 proprioception testing is very good ( $r=.99$ )<sup>10</sup>. JD had impaired proprioception in his right  
168 lower extremity joints.

169 3. Berg Balance Test: This test measures balance and coordination<sup>11</sup>. According to  
170 Hiengkaew et al, The Berg has excellent test-retest reliability (ICC=.95)<sup>12</sup>. According to  
171 Mao et al, the Berg has excellent construct validity as well<sup>13</sup>. JD scored 27/56. He did  
172 better on this test than I expected, but his score shows he is a high fall risk<sup>1</sup>.

173 Gait Observation= Patient ambulates with a step through pattern, minimal arm swing and  
174 trunk rotation, right foot drop (hikes right hip to compensate), decreased stride and step  
175 length, decreased gait speed, a left later trunk lean, and a quad cane in his left hand. He  
176 wears bilateral AFOs when walking at all times.

## 177 **Clinical Impression 2**

### 178 **Evaluation**

179 The examination confirmed that he had classic impairments resulting from his  
180 stroke. These impairments have led to functional limitations and disabilities for JD.

181 **Impairments:** JD exhibits decreased right-sided lower extremity strength, AROM,  
182 and proprioception through all joints, Increased muscle tone and abnormal synergy  
183 of his right upper extremity, decreased sensation of his right sided extremities,  
184 impaired gait cycle, impaired balance and coordination, decreased ability to perform  
185 transfers, impaired cognition and short-term memory, impaired expressive  
186 communication, flat affect, Edema of his right lower extremity, hypertension, and  
187 decreased respiratory capacity.

188 **Functional Limitations:** JD's biggest limitation is functional mobility. This includes  
189 car transfers, supine to sit, sit to stand, stand to sit, and logrolling. He is also limited  
190 in his ability to negotiate stairs and complete his self-care tasks independently  
191 (bathing, eating, etc.).

192 **Disabilities:** JD can no longer work, golf, or mow his lawn.

193 **Diagnosis:** JD displays two physical therapy preferred practice patterns.

194 5D: Impaired Motor Function and Sensory Integrity Associated with Non-  
195 progressive Disorders of the Central Nervous System – Acquired in Adolescence or  
196 Adulthood<sup>14</sup>.

197 5A: Primary Prevention / Risk Reduction for Loss of Balance and Falling <sup>14</sup>.

198 5D was selected because he has decreased motor control and sensation on his right  
199 side, which clearly was acquired in adulthood following his stroke. 5A was chosen  
200 because his Berg Balance score, as well as my clinical judgment, shows he is a fall  
201 risk.

202 **Prognosis:** JD has great support from his family, he is motivated to continue  
203 improving, and his past medical history shows a slow but steady improvement over  
204 time. However, the most dramatic recovery following a stroke occurs in the first 3-6  
205 months<sup>2</sup> and JD is past that stage of his recovery. That being said, JD 's prognosis for  
206 recovery is good. A full recovery is unlikely due to the location of his stroke, but it is  
207 expected that he will continue to improve as long as he continues to attend therapy.

#### 208 **Plan of Care**

209 After evaluating what was found in the exam, I decided there was no reason for a  
210 referral or a consult at this time. I did want to perform the Romberg<sup>15</sup> test at his  
211 next session to challenge his static balance.

212 I was able to perform the Romberg test during his next session. According to  
213 the Rehab Measures Database, the reliability and validity of the Romberg test has  
214 not been established<sup>15</sup>. JD was able to hold the Romberg stance for 16 seconds,  
215 which shows he is a fall risk<sup>1</sup>.

216 For procedural interventions I initially wanted to work on his functional  
217 mobility, his balance, coordination, his strength, and AROM. With this in mind I  
218 wanted to begin with transfer training. Once he improved in these areas I intended  
219 to focus on normalizing his gait cycle and continuing to work on transfers and any  
220 functional mobility problems he still had.

221 **Patient Goals** – See Table 3 for patient goals.

222 **Discharge Criteria**

223 JD is to be discharged once he has accomplished all of his long-term goals or  
224 when he reaches his maximum amount of visits covered by his insurance.

225 **Interventions**

226 I was given JD's full medical chart and documentation of past PT treatments  
227 prior to his initial evaluation so I could appropriately prepare for his treatment  
228 sessions. When treating I documented his interventions on a paper flow chart with  
229 what interventions were performed that day, why they were performed, and the  
230 length of time each intervention took. I communicated and coordinated with his  
231 neurologist, occupational therapist, and speech pathologist.

232 His wife or daughter accompanied him to all of his PT visits, and were  
233 actively engaged in his care. I gave each of them a copy of his home exercise  
234 program, which they helped him carry out on a daily basis. His family was also in  
235 constant communication regarding his assistive devices and orthotics. JD's wife  
236 helped me organize a treatment session at an adaptive golf driving range during

237 week 8 of his therapy. The treatment at the golf course challenged his balance and  
238 coordination in a new setting, while also dictating his therapy towards one of his  
239 goals. He hit golf balls for over 30 minutes with an adaptive golf instructor. He was  
240 capable of swinging one of his irons and striking the ball with his left arm in  
241 standing without losing his balance for 5 minutes at a time. During this session, JD  
242 needed frequent breaks and was being guarded by his adaptive golf instructor and  
243 myself while also wearing his gait belt for safety.

244           For procedural interventions I initially worked on his functional mobility,  
245 balance and coordination, and lower extremity strength and AROM, and knee  
246 hyperextension. His lower extremity strength and AROM impairments needed to be  
247 treated immediately in order to maximize the improvement that could be made with  
248 his functional mobility and balance as he progressed. Balance, transfers, and knee  
249 hyperextension were targeted early too, because he could easily hurt himself  
250 without the ability to do these things. With this in mind I began with transfer  
251 training. This started with sit to stands, logrolling, and supine to sit during the next  
252 treatment with assistance and cues for proper form and posture. I then had him  
253 reach out of his base of support in different directions, grab an object I held at  
254 different heights, and say the name of the object with proper pronunciation while  
255 alternating arms that reach out to improve balance, proprioception, and  
256 coordination<sup>2</sup> I also used the Romberg stance as treatment to further improve  
257 balance<sup>15</sup>. To challenge his strength and coordination he did step ups/step downs  
258 beginning with a 4-inch step<sup>16</sup>. This intervention causes a concentric contraction of  
259 his right hamstrings when stepping down with the left leg. Furthermore, step downs

260 lead to stronger hamstrings, and improve control of his right knee extension to help  
261 avoid knee hyperextension<sup>16</sup>. To improve his gait and hip flexion strength I had him  
262 walk for 5 feet and then step over a 4-inch hurdle. During this intervention I knew I  
263 needed to facilitate his right hip flexors via quick tapping to the iliopsoas muscle  
264 belly while he tried to flex his hip over the hurdle. Quick tapping to a muscle belly  
265 facilitates and increases the strength of that muscles contraction<sup>2</sup>. Another  
266 intervention targeting gait was for him to walk on a 15- foot line while I blocked his  
267 right knee from hyperextension. By blocking his right knee from hyperextension, it  
268 forced JD to walk with a normalized gait cycle and avoided potential injury due to  
269 excessive hyperextension<sup>17</sup>. Side stepping was another common intervention used  
270 to improve his gluteus medius strength and balance<sup>16</sup>.

271 To work on posture, JD was educated on scapular retractions with a three  
272 second hold once retracted<sup>16</sup>. I also constantly cued him to hold a proper posture  
273 throughout all interventions. All of these interventions were performed in the  
274 parallel bars and with JD wearing a gait belt to ensure he was safe. The  
275 interventions listed above are just some of the treatments that were used the most.  
276 See figure 1 to view the parameters of each intervention and which interventions  
277 were performed on a week-to-week basis. I planned the interventions knowing that  
278 I would be able to modify them to make them more challenging as he progressed. JD  
279 took frequent breaks throughout each treatment session due to his decreased  
280 respiratory capacity and exercise tolerance.

281 JD's home exercise program focused on postural alignment and lower  
282 extremity strength and AROM. Prior to these interventions being added to his

283 program, he was educated on proper form and needed to be able to perform them  
284 independently, or with his family assisting him. These included: scapular  
285 retractions with a three second hold, heel raises, mini squats, and AROM of his lower  
286 extremity joints as close to end range as he could manage. Heel raises improve  
287 gastrocnemius strength, which normalizes his gait by improving propulsion during  
288 toe off<sup>18</sup>. JD and his family were instructed to walk in and outdoors with a family  
289 member every day for as long as he could tolerate. Once he began improving on his  
290 transfers and stair negotiating, JD and his family were instructed to practice  
291 transfers and stairs at home with a family member as well. I didn't give JD a  
292 comprehensive HEP because he already had a lower extremity stretching,  
293 strengthening, and AROM HEP from his prior physical therapist and an occupational  
294 therapy HEP. His HEP is included in table 4.

295 JD was incredibly motivated to regain as much function as he possibly could.  
296 He may not have been as compliant with his treatments and HEP without his family.  
297 Due to his cognitive deficits and his inability to drive, without his family to assist  
298 him with transportation and his HEP he may have struggled to make the progress  
299 that he accomplished.

### 300 **Outcomes**

301 JD showed good improvement in his functional mobility and steadily  
302 progressed towards his goals over the span of 12 weeks of therapy. However, JD  
303 continued to receive treatment following the end of my internship. Therefore, no  
304 discharge evaluation is included in this case report. See table 5 for JD's initial

305 functional mobility, and see figure 1 for his functional mobility progress over the  
306 course of 12 weeks.

307 JD made good improvements in his right lower extremity and upper  
308 extremity strength, AROM, and proprioception. That said, his biggest improvements  
309 occurred in functional mobility, balance, and coordination. At the beginning of  
310 therapy he needed at least 15 breaks over his treatment session. By the final week  
311 he was taking less than 10 breaks per session. His Berg Balance score increased  
312 from 27/56 (high fall risk) to 32/56 (moderate fall risk)<sup>1</sup>. He normalized his gait  
313 cycle by controlling his knee hyperextension, increasing his arm swing and trunk  
314 rotation, decreased the amount of foot drop on his right, lengthening his stride and  
315 step length, and increasing his gait speed. He was also able to ambulate for over 10  
316 minutes with his quad cane in and outdoors, meeting one of his short- term goals.  
317 The increased muscle tone and abnormal synergy of his right upper extremity made  
318 no improvement, nor did his right - sided sensation at the end of 12 weeks. He  
319 steadily increased his independence with all transfers, but still needed minimal  
320 assistance from his wife with car transfers at the end of my stay.

## 321 **Discussion**

322 JD's most significant improvements occurred in functional mobility and  
323 balance. Positive factors for this improvement include: JD's motivation to improve,  
324 positive family support, treatment from an extensive interprofessional healthcare  
325 team, and improved exercise tolerance. Negative factors limiting him from further  
326 recovery include: advanced age, short-term memory loss and other cognitive



327 impairments, fear of falling, and slower than expected improvements in strength  
328 and AROM. Improving JD's functional mobility was the purpose of this case and  
329 while JD was not completely independent with all of his functional mobility at the  
330 time I left, he made vast improvements in it. JD didn't come close to what the  
331 literature recommends as the amount of repetitions (over 1000) to regain full  
332 voluntary control of his right-sided muscles. With only 12 weeks to work with  
333 though, he made great strides. He is still in therapy, and will continue to try and  
334 regain full voluntary control of his right-sided muscles. His steadily improving  
335 exercise tolerance will make this easier to reach as he continues in therapy.

336         This case demonstrated how important family support is following a basal  
337 ganglia stroke. It is important for clinicians to remember that cognitive deficits from  
338 a basal ganglia stroke can be severe. This means that without family support or  
339 assistance the patient may have difficulty attending therapy, performing their HEP,  
340 or maintaining motivation. JD continually stated how important his family was in his  
341 rehabilitation.

342         Future research for improving functional mobility and overall health  
343 following a basal ganglia stroke should focus on the most effective interventions for  
344 improving functional mobility, interventions to improve exercise tolerance, and  
345 interventions to improve cognition. Uncovering these three could potentially  
346 improve outcomes of the physical therapy management following a basal ganglia  
347 stroke and make it more efficient and cost-effective for future patients.

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413 Table 1: Medications

Medication	Usage
Prozac	Antidepressant, Selective Serotonin Reuptake Inhibitor <sup>3</sup> .
Lisinopril	Anti-hypertensive, Angiotensin- Converting Enzyme Inhibitor <sup>4</sup> .
Baby Aspirin	Blood thinner, Non Steroidal Anti-Inflammatory <sup>3</sup> . (NSAID)
Atenolol	Anti-hypertensive, Beta Blocker <sup>5</sup> .
Tramadol	Pain reliever, Opiate Analgesic.
Amlodipine	Anti-hypertensive, Calcium Channel Blocker <sup>6</sup> .
Bethanechol Chloride	Encourages bladder emptying, Cholinergic Agent <sup>3</sup> .

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424 Table 2: Manual Muscle Testing and Active Range of Motion (AROM) Testing

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Evaluation		
Hip	Right Strength, AROM	Left Strength, AROM
Flexion	2+/5, 68 degrees	4+/5, WNL
Abduction	2-/5, NT	4/5, WNL
Adduction	2/5, NT	4/5, WNL
Extension	2/5, NT	4-/5, WNL
Knee		
Flexion	2-/5, NT	4+/5, WNL
Extension	2/5, NT	4/5, WNL
Ankle		
Dorsiflexion	1/5, 0 degrees	4/5, WNL
Plantarflexion	2-/5, NT	4+/5, WNL
Great toe Extension	1/5, NT	4+/5, WNL

426 AROM= Active Range of Motion, NT= Not Tested, WNL= Within Normal Limits

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444 Table 3: Patient Goals

Short-Term Goals	Long-Term Goals
1. Independently ambulate for at least 10 minutes on even/uneven terrain with his quad cane and with proper biomechanics as deemed by his physical therapist within 6 weeks.	1. Independently ambulate for 30 minutes on even/uneven terrain with his quad cane and with proper biomechanics as deemed by his physical therapist within 12 weeks.
2. Independently perform all transfers (sit to stand, stand to sit, logrolling, supine to sit, car transfers) for at least 5 repetitions with proper biomechanics as deemed by his physical therapist within 6 weeks.	2. Independently perform all transfers (sit to stand, stand to sit, logrolling, supine to sit, car transfers) for at least 10 repetitions with proper biomechanics as deemed by his physical therapist within 12 weeks.
3. Hold a Romberg pose for at least 30 seconds with his eyes open and without any assistance within 6 weeks.	3. Hold a Sharpened Romberg position for at least 30 seconds with his eyes open and without any assistance within 12 weeks.
4. Right lower extremity strength will improve by at least a half grade (2/5 advances to 2+/5) through all joints within 6 weeks.	4. Right lower extremity strength will improve to at least a 3+/5 through all joints so his right lower extremity AROM can be measured within 12 weeks.

5. Hold a proper posture, as deemed by his physical therapist, for at least one full treatment session with no more than 5 cues within 6 weeks.	5. Hold a proper posture, as deemed by his physical therapist, for at least one full treatment session with no cueing within 12 weeks.
	6. Independent with a finalized home exercise program for long- term carryover within 12 weeks.

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456 Table 4: Interventions

	Week 1-2	Week 3-4	Week 5-6,	Week 7-8	Week 9-10	Week 11-12
Intervention						
Sit to stand	6x10-mod. assist, standard chair	6x10-min assist, standard chair	3x5-standard chair	3x5-standard chair	3x10-standard chair	6x10- low chair
Logroll	6x8-mod. assist	6x10-min assist	3x5	3x5	3x10	6x10
Supine to sit	3x8-mod. assist	3x10-min. assist	3x5	3x5	3x10	6x10
Reaching out of BOS for cones			3x10-alternate arms and stack	3x 10-alternate arms and stack	3x10-alternate arms and stack	6x10
Romberg stance	3x20 s.	6x30 s.	3x30 s.	3x30 s.		
Step Ups	6x10- 4 in.	6x10-4 in.	6x5- 6in.	3x10-6 in.	6x10- 6 in.	6x10-6 in.
Step Downs	6x10-4 in.	6x10-4 in.	3x5-6 in.	3x10- 6 in.	6x10- 6 in.	6x10- 6 in.
Lateral step up/down				3x5- 4 in.	6x10-4 in	6x10- 6 in.
Gait	15x15 ft.-PT blocks knee	20x20 ft.-PT blocks knee	10x20 ft.-PT blocks knee	5x20 ft.-PT blocks knee	15x20 ft.-PT blocks knee	20x20 ft.-min. blocking
Side step	3x15 ft.	3x15 ft.				
Heel-toe walk		3x10 ft.	3x10 ft.	3x10 ft.	6x15 ft.	6x20 ft.
Step through with floor ladder*			4x10 ft.	4x10 ft.	4x10 ft.	8x10 ft.
Side step with floor ladder		4x10 ft.	4x10 ft.	4x 10 ft.	8x 10 ft.	
Leg press	3x10- 5 lbs.	6x10-7.5 lbs.	3x10-7.5 lbs.	3x10- 7.5 lbs.	6x10- 10 lbs.	3x10- 10 lbs.
Step over hurdle*		6x10-4 in.	3x10- 4 in.	3x8-6 in.	6x10-6 in.	6x10- 6 in.



Walking backwards					5x10 ft.	6x15 ft. 458
Ball catch from rebounder					5x10- 3 lbs. ball	6x10-3 lbs. ball 460
Standing on Airex foam		6x 20 s.	3x30 s.			461
Marching on Airex foam				3x10	6x15	3x15 462
Short-arc quads	3x10	5x10				463
Long-arc quads		1x10	3x10	3x10- 1 lbs.	3x10- 2 lbs.	464 465
Quad set	3x10- towel roll under knee	3x10- towel roll under knee				466 467 468
Quad set with SLR		3x10	3x10			469
Heel slides	3x10	6x10				470
Scapular retractions**	6x10- 3 s. hold	4x10-3 s. hold				471
Heel raises**	6x10	4x10				472
Mini squats**	6x10	4x10				473
Lower extremity AROM**	2x10- each joint	2x10- each joint				474

475 BOS= Base of Support, SLR= Straight Leg Raise, PT= physical therapist, AROM=Active

476 range of motion, mod.=moderate, min= minimum, s=Seconds, ft.= feet, , lbs.=pounds

477 \*= Tapped iliopsoas muscle to facilitate hip flexion, \*\*= Home exercises program

478 There were two 60 minute treatment sessions each week.

479 JD missed appointment at week 6, week 8, and week 10. The second session at week

480 8 was at the adaptive golf course.

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487 Table 5: Initial Functional Mobility

<b>Bed Mobility</b>	
Logrolling	Contact Guard Assistance
Supine to Sit	Contact Guard Assistance
Sit to Supine	Contact Guard Assistance
<b>Transfers</b>	
Sit to Stand	Contact Guard Assistance
Stand to Sit	Contact Guard Assistance
Car Transfers	Minimum Assistance in and out of the car
<b>Gait/Balance</b>	
Time	5 minutes
Assistive Device	Bilateral Ankle foot orthoses, quad cane
Assistance	Contact Guard Assistance
Stairs	Ascends and descends non-reciprocally, with his quad cane, and with contact guard assistance.

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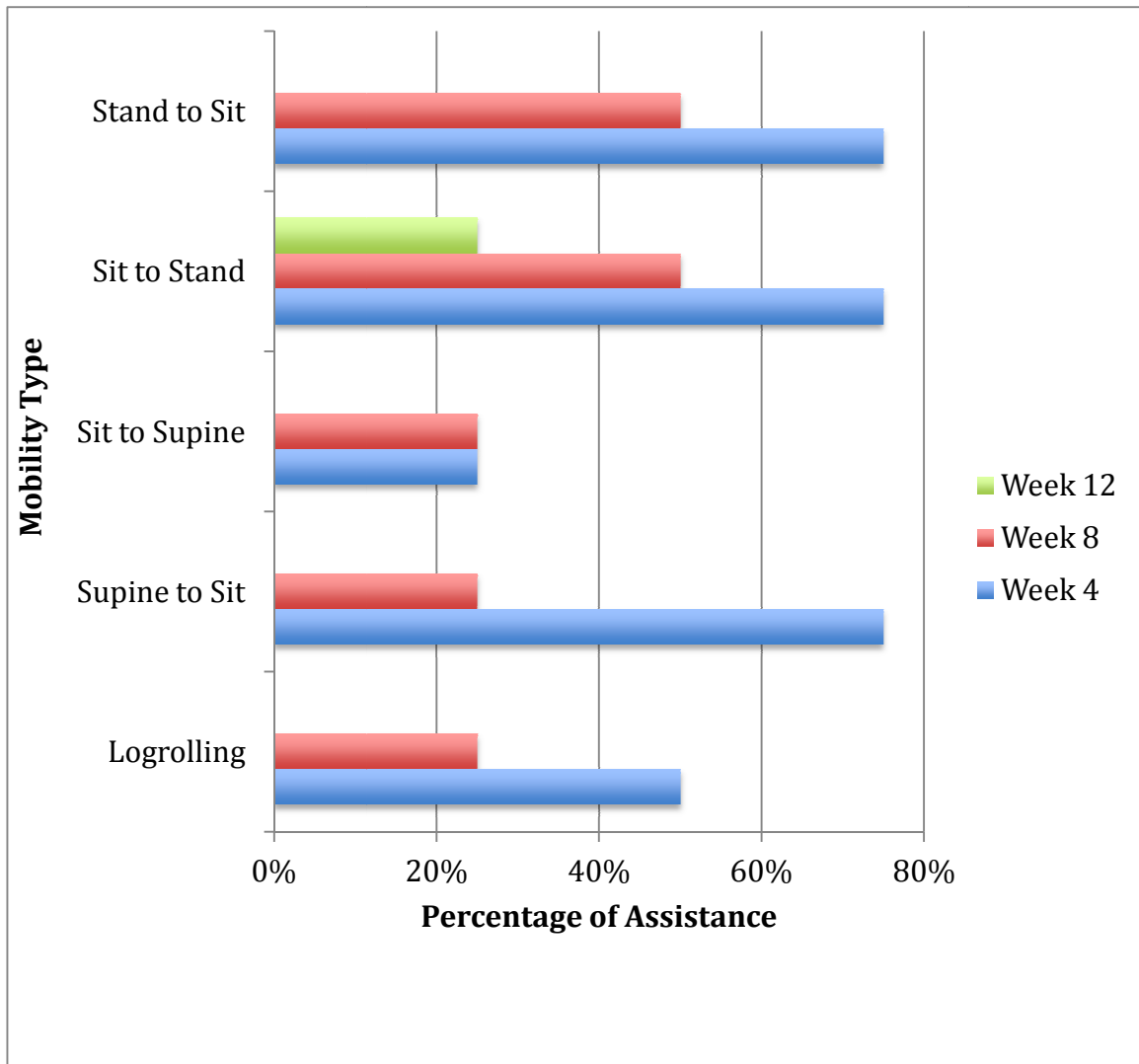
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493 Figure 1: Functional Mobility Progression Over 12 Weeks



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500 **Appendix**

501 **Berg Balance Scale**

502 Name: \_\_\_\_\_ Date: \_\_\_\_\_

503 Location: \_\_\_\_\_ Rater: \_\_\_\_\_

504	ITEM DESCRIPTION	SCORE (0-4)
505	1. Sitting to standing	_____
506	2. Standing unsupported	_____
507	3. Sitting unsupported	_____
508	4. Standing to sitting	_____
509	5. Transfers	_____
510	6. Standing with eyes closed	_____
511	7. Standing with feet together	_____
512	8. Reaching forward with outstretched arm	_____
513	9. Retrieving object from floor	_____
514	10. Turning to look behind	_____
515	11. Turning 360 degrees	_____
516	12. Placing alternate foot on stool	_____
517	13. Standing with one foot in front	_____
518	14. Standing on one foot	_____
519		

520 Total \_\_\_\_\_

521 **GENERAL INSTRUCTIONS**

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

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

- 526
- 527 • the time or distance requirements are not met
  - 528 • the subject's performance warrants supervision
  - 529 • the subject touches an external support or receives assistance from the  
530 examiner

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

534

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

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