



2019

# Acute Rehabilitation Management of a Patient with Bilateral Transtibial Amputation: Case Study

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ACUTE REHABILITATION MANAGEMENT OF A PATIENT WITH BILATERAL  
TRANSTIBIAL AMPUTATION: CASE STUDY

by

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Bachelor of General Health Science, University of North Dakota, 2017

A Scholarly Project Submitted to the Graduate Faculty of the

Department of Physical Therapy

School of Medicine

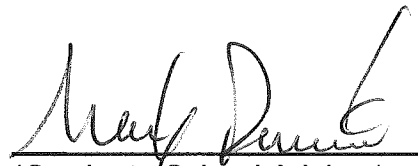
University of North Dakota


in partial fulfillment of the requirements for the degree of

Doctor of Physical Therapy

Grand Forks, North Dakota  
May, 2019

This Scholarly Project, submitted by Ashlee Wiebe in partial fulfillment of the requirements for the Degree of Doctor of Physical Therapy from the University of North Dakota, has been read by the advisor and Chairperson of Physical Therapy under whom the work has been done and is here by approved.

  
(Graduate School Advisor)

  
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## ABSTRACT

**Background and Purpose**—This case report describes the 14-day acute rehabilitation physical therapy management of a 43-year-old male who underwent bilateral transtibial amputations. The purpose of this report is to describe the interventions utilized and the change in the patient's status following their application and also to add to the limited amount of research in this area.

**Case Description**—The patient had a very complicated medical history. His primary goal was to return home with his wife and children. The treatment of this patient involved transfer training, wheelchair mobility, seated balance activities, strengthening exercises, stretching, endurance activities, and extensive patient and family education.

**Outcomes**—Following physical therapy intervention, the patient was able to reach his goal of returning home, safely, with his family. He was able to maintain range of motion, improve strength, and improve transfer ability and overall mobility.

**Discussion**— The patient is predicted to overcome anticipated postoperative complications and continue to progress towards successful prosthesis use.

**Key Words:** Transtibial, Below Knee Amputation, Rehabilitation, Diabetes

## CHAPTER I

### BACKGROUND AND PURPOSE

The current 1-year mortality rate for diabetic patients following lower-extremity amputation is about 45%.<sup>1</sup> However, individuals who have received rehabilitation for a bilateral transtibial amputation actually survive more than 4 years following discharge.<sup>2</sup> This highlights how essential rehabilitative care is to increase the likelihood of survival for these patients. It is also important for patients to receive therapy that will set them up to be successful in future prosthetic fitting in order to improve quality of life, as use of a prosthetic has a significant positive influence on quality of life after a lower limb amputation.<sup>3</sup> One study found 80% of patients with bilateral transtibial amputations to be prosthetically rehabilitated.<sup>4</sup> The importance of preserving the knee joint to increase success for prosthetic rehabilitation was also highlighted by the study.

Diabetes mellitus is a major contributor to patients requiring a lower extremity amputation.<sup>5</sup> 45% of lower extremity amputations are performed on individuals who have diabetes. This rate is also higher for males than females. The age category that is at the highest relative risk for a lower extremity amputation for a person with diabetes is under 45-years old. The presence of diabetes mellitus itself, as well as the coexistence of diabetes and cardiac disease, have also been shown to have a negative correlation with



postamputation mobility scores.<sup>6</sup> Since the patient in this case study has both of these conditions on his extensive medical history, it is important to understand the potential negative effects on his rehabilitation.

It is clear that continued case studies and research regarding patients after lower extremity amputations is vital to continuing to improve their quality of life and increase their survival rate, especially considering research on this topic is very limited.

## CHAPTER II

### CASE DESCRIPTION

#### History of Present Illness

The patient was a 43-year-old male, who initially presented with weakness, with significant past medical history including uncontrolled type 2 diabetes mellitus with peripheral neuropathy, hypertension, morbid obesity, hyperlipidemia, and chronic diabetic foot ulcer with recent presentation of MRSA bacteremia. The patient was followed and treated for MRSA bacteremia with bilateral diabetic foot ulcers, abscess, and osteomyelitis. The patient initially underwent bilateral incision and drainage but ultimately required bilateral transtibial amputations. The patient was deemed medically stable and was admitted to inpatient rehabilitation for a functional evaluation and management.

#### Social History

At baseline the patient was utilizing a single point cane for all mobility and was independent with all activities of daily living (ADLs). The patient did not drive and was a stay-at-home dad and home caretaker. The patient lived with his wife and 3 school-age children in a single level home. The home had tile flooring throughout and a single threshold step at both entrances to the home. The patient stated his goal during the physical therapy evaluation was, "to return

home and get around by myself.” The patient’s hobbies included completing improvements around the home, building model cars, and drawing.

### Examination

Contact precautions were maintained during the evaluation per Center of Disease Control (CDC) guidelines due to the MRSA bacteremia that was present.<sup>7</sup> The patient was oriented to person, situation, and year, but not date or place. The patient was able to follow 2-step commands. His sensation was grossly intact with pain and light touch sensation testing, and the patient reported no phantom pain during the evaluation. Lower extremity active and passive ranges of motion were assessed as WFL/WNL bilaterally. Patient’s vital signs were as follows: blood pressure - 177/92 mmHg, heart rate - 88bpm, and oxygen saturation - 96%. Lower extremity strength was assessed bilaterally with resistive isometric testing in supine, and no pain was reported with strength testing. See Table 1 below for initial lower extremity strength.

Table 1. Initial Lower Extremity Strength:		
Muscle Group	Right	Left
Hip Flexors	3+/5	3+/5
Hip Extensors	3+/5	3+/5
Hip Abductors	3+/5	3+/5
Hip Adductors	3+/5	3+/5
Knee Flexors (hamstrings)	3-/5	3-/5
Knee Extensors (quadriceps)	3/5	3/5

The patient was asked to reach for objects away from midline in order to assess sitting balance. He was able to move and return to truncal midpoint 1 to 2 inches

in 1 plane. Mobility performance was assessed in the patient's hospital bed with bed rails present per the Quality Indicator Tool. The patient did not complete the car transfer activity due to MRSA precautions. Refer to Table 2 for the initial mobility performance.

Table 2. Initial Mobility Performance	
Motion	Performance (Level of Assistance)
Roll Left/Right	Supervision or touching assistance
Sit to lying	Setup assistance
Lying to sitting in bed	Setup assistance
Sit to Stand	Not attempted due to medical conditions/safety
Chair/bed transfer	Partial/moderate assistance
Patient walk?	No, and walking goal not clinically indicated
Wheelchair 50 feet 2 turns	Supervision or touching assistance
Wheelchair 150 feet	Supervision or touching assistance

The Functional Independence Measurement (FIM)<sup>8</sup> was the outcome measurement tool utilized with every patient to assess transfers, wheelchair mobility, walking, and stair negotiation. Transfers were assessed from the bed, to the wheelchair and to the bed. This patient scored a 4/7 requiring minimal assistance (minA). The patient required supervision with bed mobility and transferred with contact guard assistance (CGA)/minA, a slide board, verbal cues, and demonstrations. For wheelchair mobility, the patient scored a 5/7 requiring supervision assistance. The patient negotiated 180 ft utilizing bilateral upper extremities and verbal cueing for technique. The patient did not complete the walking or stair FIM activities due to lower extremity amputation non-weight bearing (NWB) contraindications.

## Evaluation

The items included in the evaluation were based off FIM guidelines and Quality Indicator Tool. The patient's prospective payment system (PPS) date is determined based off FIM scores, current health condition, and admitting diagnosis. Extreme emphasis was placed on accurately capturing FIM scores so that the patient would receive the most appropriate level and length of care possible. Initial evaluation indicated this patient had deficits in bed mobility, transfers and wheelchair mobility. His barriers to discharge were architectural barriers in home, limited caregiver support, medical condition, obesity, and orthopedic precautions. The evaluation process allowed functional and appropriate goals to be set within the allotted time determined per the PPS date. The functional goals set for this patient included improving bed mobility, transfer with slide board, wheelchair mobility and management of parts, and sitting balance. The goals set for this patient focused on the ability of the patient to return home independently and continue responsibilities of caring for home and children.

## CHAPTER III

### INTERVENTION

The patient was seen daily for 1.5 hours of physical therapy, and 1.5 hours of occupational therapy, for a minimum of 5 of 7 days per week for the duration of 14 total days. He was cleared of his previous MRSA diagnosis, and contact precautions were not longer considered necessary. Interventions were based on noted deficits/goals, and are supported by Brigham and Women's Hospital amputee protocol.<sup>9</sup> Patients who have undergone a major lower extremity amputation secondary to diabetes and receive comprehensive inpatient rehabilitation have improved mobility success.<sup>10</sup>

#### Transfer Training

Transfer training included demonstration and verbal cues for proper utilization and management of wheelchair equipment, residual limb protectors, and a slide board. The patient's program progressed to include transfers from level surfaces, unlevel surfaces, and to/from wheelchair, bed, commode, and shower chair.

#### Wheelchair Mobility

The patient completed wheelchair mobility at a variety of distances, surfaces, and obstacles. The patient was instructed to perform wheelchair mobility whenever possible to build up upper extremity endurance and strength.

An obstacle course with cones set to the parameters of the patient's hallways and doorways was set up and the patient practiced navigation to simulate a home environment. The patient was instructed on proper technique and demonstrated negotiation over ramps and bumps. He negotiated the wheelchair indoors and outdoors to simulate functional community distances and environments. After the home evaluation was completed, measurements were taken to order a custom fit wheelchair that would allow for comfort of the patient and accessibility within the home.

#### Therapeutic Exercise

Lower extremity (LE) muscle strength, endurance, and tissue mobility were crucial to the prevention of contractures, atrophy, and attaining the highest possible level of functional mobility. The patient performed supine, sidelying, and prone strength exercises including hip flexion, short arc quad exercise (SAQ), hip abduction, hip adduction, bridging with a bolster under LE, crunches, oblique crunches, plank, side plank, hip extension, 4-point series, hamstring curls, and pushups. He typically performed 30 repetitions of each exercise bilaterally with rest breaks as needed. Patient performed hamstring, quad, hip flexor, hip extensor, hip abduction, hip adduction active stretches and static stretches for 30 seconds and 2 repetitions bilaterally.

#### Education

Significant time was spent educating the patient and his wife regarding the importance of positioning in prevention of contractures and pressure injuries. Education and a demonstration were provided regarding safety with transfers

and proper technique with slide board. Compliance with his home exercise program was emphasized to increase the patient's potential for successful prosthetic fitting. Education was provided to address home equipment including ramp, drop arm commode, hospital bed, residual limb protectors, and manual wheelchair equipment.

#### Home evaluation

A home evaluation was completed with patient and wife present, to ensure safety upon discharge. Entrance to home, access within bedroom, living room, dining room, laundry room, bathroom, and kitchen were addressed. A portable ramp was recommended for access into the home over the threshold step. The living room was accessible to the patient, but it was recommended that he not utilize the sofa, as he required total assistance to get from sofa to wheelchair. The bedroom was accessible to the patient after removal of the door. A hospital bed was recommended for safe transferring. The dining area and kitchen were accessible to the patient. Bathrooms were not accessible to him. A drop arm commode was recommended at the foot of the bed, and sponge bathing was recommended.



## CHAPTER IV

### OUTCOMES

Following 14 days of physical therapy intervention, the patient was able to make significant progress and meet all goals set at evaluation. He was extremely compliant and motivated throughout treatment, and tolerated treatments well.

The patient was discharged home with his family, and continued physical therapy was not recommended due to the patient demonstrating independence with his home exercise program. The patient demonstrated good dynamic sitting balance by moving 2 inches in all planes and returning to truncal midpoint. The patient was able to maintain range of motion WFL/WNL, demonstrate strength bilaterally WFL/WNL, and was independent with transfers and mobility. Refer to Table 3 for mobility performance at discharge.

Table 3. Mobility Performance at Discharge	
Motion	Performance (Level of Assistance)
Roll Left/ Right	Independent
Sit to Lying	Independent
Lying to Sitting in bed	Independent
Sit to Stand	Not attempted due to medical condition/safety
Chair/bed Transfer	Independent
Patient Walk?	No
Wheelchair 50 feet 2 turns	Independent
Wheelchair 150 feet	Independent

The patient also made significant gains in FIM scores. Although the patient did not walk or perform stairs at discharge due to his lower extremity status, he did improve in both the transfer and wheelchair categories. The patient performed bed to/from wheelchair transfer with modified independence, scoring a 6/7, due to utilization of a slide board with the transfer. The patient was able to negotiate a wheelchair over 200 feet independently, scoring a 6/6, and was able to negotiate a ramp, turning, and uneven surfaces. The patient was independent with management of wheelchair equipment.

## CHAPTER V

### DISCUSSION

The 1-year mortality rate for a first time amputee is 54%, and mortality is significantly related to preamputation morbidity.<sup>11</sup> Patients who received postoperative interdisciplinary inpatient rehabilitation had an increased 1-year survival rate and home discharge than those who did not.<sup>12</sup> With such a significant past medical history, our patient's 1-year survival rate potential is quite low. However, our patient was extremely successful during his acute care rehabilitation. With his current status, he is expected to overcome predicted postoperative complications and continue to progress towards successful prosthetic use.

Studies show that patients who receive expert level, multidisciplinary, care have markedly reduced risk of death following lower extremity amputation.<sup>13</sup> One article described and emphasized the importance of transfer training, limb positioning, mobility, household independence, safety, muscle strengthening, and endurance training for rehabilitative care following LE amputation.<sup>14</sup> The interventions utilized for the care of this patient are supported by the interventions described in this article. Although many factors contributed to the successful discharge of this patient, the physical therapy interventions that were

utilized are supported by interventions that have had successful outcomes for other therapists.

While this case study presents this patient during his 17-day stay at our rehabilitation center, a limitation to this study is the inability to follow him for a longer period of time. It would have been beneficial to assess his long-term response to this and future treatments as he proceeded with the prosthetic fitting to determine if he truly benefited from the therapy.

#### Reflective Practice

In my professional future with a client who has undergone any amputation, I want to be more involved with the wound care and residual limb protection. At this particular facility, the nursing staff completed this portion of care. While this was considered protocol at our rehabilitation center, I still believe it is important for the therapy team to work together with the nursing staff in order to provide high quality, continuous care in this scope. I am extremely interested in pursuing continued education regarding wound care and residual limb care. If I work in an acute rehabilitation facility, I feel that it would be beneficial to complete continued education pertaining to general rehabilitation for amputees as well.

For this particular patient, I learned that he was very motivated by autonomy. This makes sense to me now, as he had so much of this taken away from him so quickly. As I came to know this patient, I recognized that involving him in the decision regarding the therapy sessions was significantly more important than most patients. He needed to regain some sense of control, and an easy way for me to help him do so was to include him in decisions and allow him

to direct the therapy sessions. If I encounter a patient with a similar response to this traumatic life event, I feel I will be more equipped to help emotionally process frustrations and facilitate learning alternate ways to maintain this type of independence.

Significant risk factors for amputation in a population with diabetes mellitus include: age, smoking, history of pressure injuries and increased diastolic blood pressure.<sup>15</sup> With this information, I hope that as a future physical therapist, I can be involved and proactive in the prevention of lower extremity amputations. We know the high prevalence of amputation in specific populations, and physical therapists can play such a tremendous role in education and overall improved wellness for this population.

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