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Early Mobilization And Functional Mobility Training For A Patient With Triple Vessel Coronary Artery Bypass Grafting: A Case Report

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The patient provided written consent to participate in this study and was given a written handout explaining the purpose of the study and the University of New England's compliance with the Health Insurance Portability and Accountability Act.

Key Words: CABG, Early Mobilization, Functional Mobility

ABSTRACT

Background and Purpose: Coronary artery disease (CAD) is the buildup of plaque in coronary blood vessels and is the most common type of heart disease in the United States. Coronary artery bypass grafting (CABG) is an invasive surgical procedure used to provide alternate blood supply to cardiac tissue in individuals with CAD using autografts. The goals of the surgery are often to prolong life, reduce symptoms, improve functioning, and improve vocational status. The purpose of this case report was to document the outcomes of a physical therapy (PT) plan of care for a complex patient after undergoing CABG.

Case Description: The patient was a 70-year-old male with evident CAD and many comorbidities including type II diabetes mellitus with peripheral neuropathy, hypertension, hyperlipidemia, post-traumatic stress disorder (PTSD), current tobacco use disorder, Chronic Obstructive Pulmonary Disease (COPD), obstructive sleep apnea, and chronic pain who underwent triple vessel CABG at a Veterans Affairs Hospital in Palo Alto, CA. A PT plan of care was implemented and based around the principles of early mobilization and functional mobility training.

Outcomes: Following five sessions, the patient progressed from being unable to attempt any transfers/ambulation to completing all basic transfers and ambulating independently without an assistive device at discharge. He was discharged to home with no complications at two-week follow-up.

Discussion: A PT plan of care that included early mobilization and functional mobility training appeared to be beneficial in timely hospital discharge for a patient post-CABG with many comorbidities. Future research that examines the effects of each comorbidity on CABG outcomes may improve the understanding of the specific needs of these patients.

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Background and Purpose

It is estimated that at least 83 million Americans have at least one form of heart disease. Coronary Artery Disease (CAD) is a common type of heart disease in which plaque build-up in coronary blood vessels impedes blood flow to the myocardium, which can lead to chronic stable angina, cardiac muscle dysfunction, acute coronary syndrome, or sudden cardiac death.[1] Risk factors for CAD include smoking, physical inactivity, obesity, suboptimal diet, hypertension, high cholesterol, diabetes mellitus, family history, age (risk increases with age), male gender, and stress.[1] Coronary artery bypass grafting (CABG) is an invasive surgical procedure used to provide alternate blood supply to cardiac tissue in individuals with CAD using autographs from the person's healthy blood vessels.[2] The goals of the surgery are often to prolong life, reduce symptoms, improve physical, psychological, and social functioning, and improve vocational status.[2] Annually in the United States, approximately 200,000 individuals undergo CABG, and it is the most common cardiac surgery worldwide.[2] The research indicates a mortality rate of 2%-3% due to surgical complications.[3] In patients with CAD, a 7% mortality rate was observed four years following CABG, while patients who received medical treatment instead of CABG had a mortality rate of 33% after four years.[2]

It is now the standard of care that early mobility and acute physical therapy (PT) services are provided to patients after CABG; however, some clinicians may be hesitant to provide PT services if the patient is on mechanical ventilation and/or still in the Intensive Care Unit (ICU).[4] A study by Dong et al[4] highlighted the importance of early rehabilitation in 106 patients who were mechanically ventilated after a CABG. Half of the patients received PT services in the ICU and half received PT after leaving the ICU. The PT sessions were all framed towards the achievement of six steps: head up; transferring from supine to sitting; sitting on the edge of the bed; sitting in a chair; transferring from sitting to standing; and walking along the bed. Overall,

the patients who received PT treatment in the ICU spent less time on mechanical ventilation (8.1 vs. 13.9 days), less time in the ICU (11.7 vs. 18.3 days), and less time in the hospital (22.0 vs. 29.1 days).[4]

Due to the knowledge and research available on CABG, surgeons have been able to confidently and safely operate on patients with comorbidities. Scrutinio and Gianuzzi[5] reported 29.9% of patients who received CABG also had diabetes mellitus, 16% had peripheral vascular disease, 18.6% had chronic obstructive pulmonary disease (COPD), and 27.5% had renal dysfunction. Patients with diabetes mellitus have been shown to yield similar outcomes in cardiac rehabilitation therapy after CABG than those without.[6] Hulzebos et al[7] however, identified diabetes mellitus as being a post-operative risk factor for developing postoperative pulmonary complications, along with age over 65, a productive cough, and a history of recent smoking.[7] Hillegass and McVey[8] conducted a case study that described cardiovascular PT sessions for a patient who underwent CABG; however, the patient also had end-stage renal disease and was receiving hemodialysis. The PT sessions were intertwined with the patient's hemodialysis treatments in order to ease the burden of multiple appointments and make the most of the patient's time.[8] The patient showed improvements in functional capacity, quality of life, and decreased risk factors for adverse cardiac events.[8]

Although there is an abundance of research available for rehab post-CABG in general, research that highlights specific combinations of medical conditions in patients undergoing CABG can still be strengthened. The purpose of this case report is to document an acute PT plan of care for a patient post-CABG with many comorbidities and review its outcomes.

Patient History

The patient provided written consent to participate in this case study. The patient was a 70-year-old Caucasian male who underwent an on-pump, three-vessel CABG using autografts

from his left saphenous vein and left internal mammary artery. He was divorced and was employed most recently by his neighbor, cleaning and maintaining a motorcycle shop until the procedure. The surgery was elective after recommendations from his doctor based on the patient's evidence of CAD from a coronary angiography less than two months prior to the surgery. The angiography was conducted during a follow up appointment after a non-ST elevation myocardial infarction (NSTEMI) ten months prior. The patient did not have any symptoms relating to the diagnosis at the time of the procedure or during the work-up visits. The patient's relevant comorbidities included type II diabetes mellitus with peripheral neuropathy, hypertension, hyperlipidemia, post-traumatic stress disorder (PTSD), current tobacco use disorder, COPD, obstructive sleep apnea, and chronic pain. His significant past medical history included two drug-eluting stent placements 13 years prior to his CABG, a non-ST elevation myocardial infarction 10 months prior, previous alcohol use disorder, and medication non-compliance. He lived with his son in a single-story home with no steps to enter the house. His landlord (also his neighbor and boss) was a good friend who, along with his son, voiced they would be able to provide him with any support he needed after surgery. The patient stated that he believed the surgery was necessary for the long-term health of his heart after speaking with his doctor about the evident CAD. He purchased a hospital bed and a shower chair prior to the surgery in order to use post-operatively. Refer to Table 1 for a complete list of the patient's medications at the time of surgery.

Systems Review

After a systems review, the patient presented with notable deficits in multiple systems. Table 2 outlines the systems review results.

Primary Problem

The primary problem at the initial evaluation was a severe decrease in mobility. Due to

the post-surgical nature of this case, no differential diagnoses were appropriate. Based on the chart review and background information obtained, assessments of cognition, vital signs, subjective pain rating, skin integrity, functional mobility, muscular strength and endurance, and response to patient education and sternal precautions were planned to be used at the evaluation. The patient was a good candidate for this case report due to his multiple relevant comorbidities and the limited research on patients who underwent a CABG with these comorbidities.

Tests and Measures

Upon examination of the patient, specific tests and measures were used to determine the patient's subjective symptoms, static and dynamic balance, and functional mobility in order to ensure a safe discharge home. Measures of heart rate, blood pressure and oxygen saturation were taken prior to and following each treatment session to monitor for responses to the listed interventions. The Numeric Pain Rating Scale (NPRS) was used to determine a subjective report of the patient's overall pain level prior to and at the cessation of each session, using a scale from 0 (no pain at all) to 10 (worst imaginable pain). The NPRS was shown to have adequate test-retest reliability and excellent inter-rater reliability.[9] At the initial assessment, the acuity of the patient's post-surgical state rendered him unable to attempt the Performance Oriented Mobility Assessment (POMA) or functional mobility measures. However, these measures were taken at visit two and retested each visit until discharge. McDonnell et al[10] described functional mobility scores to be an important consideration in discharge of patients from acute PT services in terms of minimizing hospital readmission and fall risk, in addition to the POMA.[10] The POMA (found in Appendix 1) is an outcome measure designed to measure static and dynamic balance in the elderly population, and was also shown by Faber et al[11] to have good inter-rater and test-retest reliability (R=.74-.93), as well as good concurrent validity (R=|.64|-|.68|) with the following outcome measures: Timed Up and Go; Maximum Walking

Speed; Frailty and Injuries: Cooperative Studies of Intervention Testing; Groningen Activity Restriction Scale; and the Longitudinal Aging Study Amsterdam Physical Activity Questionnaire. The patient's scoring on outcome measures at the initial assessment and at discharge is documented in Table 3.

Clinical Impression

The initial impression of impaired cardiac function and surgical sternal incision were confirmed at the initial assessment. The patient required an initial three days in the ICU followed by three days in the intermediate intensive care unit (IICU), and an additional day back in the ICU due to atrial fibrillation. He was also found to have behavioral issues manifested by voicing intent to disregard the sternal precautions; all making his case unique, continuing to be a good subject for this report and PT.

Plan of Care

The medical diagnosis of the patient was *Atherosclerotic Heart Disease of Native Coronary Artery with Other Forms of Angina Pectoris* (IDC-10-CM I25.118). The physical therapy diagnosis was *Impaired Cardiopulmonary Endurance*. At the time of the initial assessment, the patient's prognosis was good based on his functional independence prior to the surgery, his absence of symptoms prior to surgery, and the good overall prognosis level for patients undergoing CABG. Shroyer et al[12] described an 11.9% post-CABG mortality rate in patients who underwent on-pump CABG. Based on the clinical experience and clinical judgment of the physical therapist and the available literature, negative factors that might have affected the patient's prognosis were his multiple comorbidities, the fact that three vessels were bypassed as opposed to fewer, his tobacco use disorder, and his previous non-compliance with medications. The patient's non-compliance with the sternal precautions, which he voiced in subsequent visits, was an additional negative factor. The plan was for the patient to be referred to

home-based PT due to the likeliness of remaining cardiovascular impairments at the time of discharge and inability to drive a car due to the sternal precautions. The physical therapist planned to assess functional mobility in later sessions. Planned interventions included bed mobility training, transfer training, gait training, therapeutic exercise, and patient education. Due to the acute setting, only short-term goals were created (see Table 4).

Interdisciplinary Communication

The patient was seen by medicine, cardiology, nursing, anesthesiology, respiratory, case management, social work, occupational therapy, and PT services during his stay at the hospital. The student physical therapist (SPT) conducted the initial examination and evaluation, conducted each treatment session, and provided assistance during transfers and ambulation where applicable. The SPT was directly supervised at all times by the primary physical therapist. The SPT and physical therapist closely reviewed each new note from other disciplines before each treatment session. Each PT treatment session (including the initial evaluation and discharge) was documented electronically in the hospital's online documentation system, Computerized Patient Record System (VistA, Washington, DC), which was accessible to any hospital-employed health care professional.

Patient Education

During the initial assessment, the patient was educated on the role of PT and the importance of the patient's adherence and participation during his stay. The purpose and proper instruction of each new intervention was described to the patient prior to its commencement. The referring physician ordered acute PT services to describe, instruct and foster maintenance of precautions to the patient relating to his sternal surgical incision. Refer to Appendix 2 for these sternal precautions. The description and importance of the sternal precautions were taught to the patient at the initial examination and the patient was provided a written handout.

Procedural Interventions

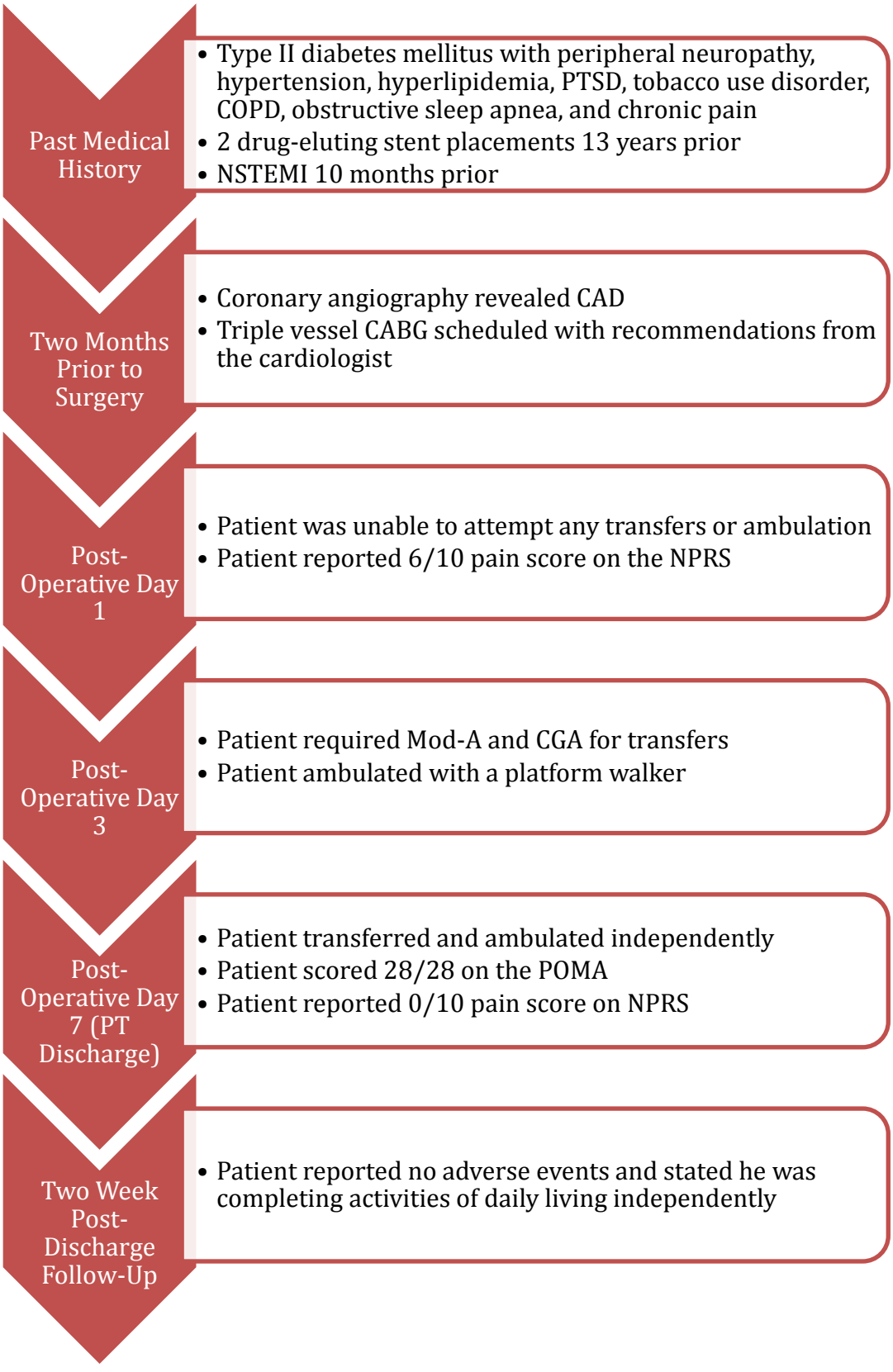
Procedural interventions were implemented in order to target the patient's impairments in the cardiovascular/pulmonary, musculoskeletal, and neuromuscular systems. Initial impairments noted in communication and affect/cognition/language were not present at the first follow-up visit and were likely due to acute post-surgical fatigue. Impairments in the integumentary system were managed by the nursing staff as well as other disciplines, however maintenance of the integrity of the sternal incision was targeted in PT through patient education of the sternal precautions each visit. Interventions by day are organized in Table 5 and descriptions of each intervention can be found in Appendix 3.

A cardiac warm-up was implemented each visit through lower extremity active range of motion in order to gradually increase the heart rate and blood pressure prior to functional mobility so immediate and overwhelming demand was not placed on the heart in this acute stage of rehabilitation. Macedo et al[13] described a cardiac warm-up to be an important part of rehabilitation in the acute stages in patients post-CABG. The patient was provided a home exercise program (HEP), which involved completing the cardiac warm-up three times per day, as well as just prior to transferring to another position or ambulating. Transfers and ambulation were implemented to mimic the functional needs of the patient once returning home so mobility strategies could be assessed for safety and optimized for energy conservation. O'Sullivan[14] described this type of functional activity training to be extremely beneficial with helping patients regain the ability to complete activities of daily living (ADLs) after major traumatic illnesses such as stroke. A platform walker (Follo Futura AS, Norway) was used for ambulation in visits two and three, and a front-wheeled walker (Invacare, Elyria, OH) was used in visit four. Based on the patient's personal goal of returning to his prior level of function, the clinical judgment of

the physical therapist, and this recommendation in the literature[14], functional mobility training was the major focus of acute PT.

Overall throughout the episode of care, the patient was non-compliant with the sternal precautions. The patient initially voiced that he was going to put little effort into remembering the precautions, and later stated that upon returning to his home, he planned to ride his motorcycle which involved pushing and pulling greater than 10 pounds and raising his arms above 90 degrees in front of him. Despite the continued effort by the SPT to explain the importance of adherence to the sternal precautions during each visit, the patient voiced his intentions to refuse to comply. The patient was, however, compliant with the rest of the PT interventions and reported consistent completion of his HEP. He agreed to PT treatment at each attempt. No co-interventions were used. Progression of interventions was based on patient presentation. The patient declined the performance of hip flexion as part of the cardiac warm-up on the first two visits due to fatigue. The patient was unable to attempt any transfers or ambulation at the initial assessment due to post-surgical fatigue. The level of assistance during functional mobility was given as needed and graded at the cessation of the task. Grading of level of assistance was derived from the terminology described by Scalzitti[15] and can be found in Appendix 4.

240 **Timeline**



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Outcomes

Over the course of five PT visits and seven total days, the patient displayed improvements in functional mobility, performance on the POMA, and pain. Both functional mobility measurements and POMA scores were unable to be obtained at the initial evaluation due a patient report of extreme fatigue. The patient transitioned through using a platform walker, front-wheeled walker, and eventually no assistive device for ambulation, and required progressively less levels of assistance for transfers from visit to visit. At discharge, the patient scored "Independent" in all functional mobility categories assessed (supine-to-sit transfer, sit-to-stand transfer, and ambulation), and scored a 28/28 on the POMA. The minimal detectible change for the POMA is documented by Faber et al[11] to be 5 points. The patient also reported a 6/10 on the NPRS at the initial evaluation and improved to a 0/10 at discharge. Two weeks following discharge from the hospital, the patient reported that he was completing all ADLs without any assistance and experienced no complications.

Although heart rate, blood pressure, and oxygen saturation were all intermittently outside normal values,[17] the patient remained in stable condition throughout most of his inpatient episode of care, with the exception of a bout of atrial fibrillation which temporarily warranted a regression back to the ICU. This was initially influenced heavily by medication, however medication was weaned through the hospital stay to a level that was maintained through discharge. The patient also experienced a bout of suspected delirium in the evening of post-operative day four in which he showed physical and verbal aggression towards nurses and other hospital staff. This episode was managed safely with police officers reporting on-scene to calm the patient down, who then returned to bed until he returned to baseline cognitive function. Although an unanticipated event, it did not seem to affect the PT plan of care, as the patient continued to progress the next visit. No additional diagnostic tests occurred during the patient's

episode of care, however a follow-up with the cardiologist was scheduled for several months after hospital discharge.

Upon discharge from acute PT services, the patient reported that he was satisfied with the progress he had made in regard to physical therapy. At discharge, both the physical therapist and the SPT felt confident the patient would be able to return home and complete ADLs with the accommodations he had in place with a low risk for future complications, based on clinical judgement. However, both the physical therapist and the SPT agreed that the patient may be at a moderate to high risk for complications outside of completing ADLs due to a probable lack of adherence to the sternal precautions while riding his motorcycle.

Interventions were tolerated well by the patient overall. Tolerance was assessed by patient report of symptoms during and following treatment. Tolerance was additionally assessed in the ICU by the reaction of heart rate, blood pressure, and oxygen saturation to activity, which was read using a continuous heart rate monitor (General Electric, New York City, NY). The patient denied any substantial increase in pain or symptoms and denied having any other complaints following the preceding PT session at each visit, with the exception of his bout of atrial fibrillation. The patient adhered well to all interventions with the exception adherence to sternal precautions. The patient reported adherence to his HEP, which was also confirmed by the nursing staff.

Discussion

The purpose of this case report was to highlight a PT plan of care for a patient post-CABG with many comorbidities and review the outcomes. The original plan of care was carried out with minimal barriers and the purpose was achieved. Although the patient presented prior to surgery with many comorbidities, surgery appeared to be successful and the patient met all PT goals within the expected time frame. Wu et al[6] described patients with diabetes mellitus to have

similar outcomes than those without, which was supported in this case. The well-established concept of early mobilization proposed by Dong et al[4] was also supported through the patient's quick recovery. The patient's length of hospital stay (14 days), length of ICU stay (5 days), and length of time on mechanical ventilation (2 days) were all shorter than both the experimental group (hospital stay: 22.0 days, ICU stay 11.7 days, mechanical ventilation: 8.1 days) and control groups (hospital stay: 29.1 days, ICU stay: 18.3 days, mechanical ventilation: 13.9 days) in the study.[4]

The strengths of this case report are its continuity through the PT plan of care, as well as the medical complexity of the patient. The fact that neither adverse nor unanticipated events did not appear to influence progression through PT allows the reader to reference potential outcomes and timeframes in their own patients that present similarly. The complexity of the patient's medical history may assist a physical therapist in managing a patient with a similarly complex diagnostic profile. A limitation of this report is that follow-up was only available up to two weeks post-discharge. It is unknown whether or not the patient experienced any complications past the two-week follow-up. The patient's lack of adherence to the sternal precautions may also be viewed as a limitation, however it did not appear to negatively affect the plan of care.

In conclusion, a PT plan of care including a cardiac warm-up, early functional mobility training including ambulation as soon as possible, and patient education appeared to be effective in treating a patient post-CABG with many comorbidities. The PT goals revolved around the patient being able to safely return home and complete his ADLs while minimizing the risk of an adverse cardiac event. Each goal was met or exceeded in a time frame that exceeded the normative discharge values stated by Dong et al.[4] The primary take-away message from this report is that although the patient presented with many comorbidities and experienced several unexpected events during his hospital course, his progression through acute PT appeared

unaffected and he was still discharged from the hospital in a timely fashion. The outcomes of this report suggest that a physical therapist may not need to drastically change their practice or make modifications for a patient post-CABG who also presents with diabetes mellitus, COPD, PTSD, chronic pain, or other impairments previously listed. However, it is important to appreciate that each of these conditions may affect each patient differently, and particular modifications may be required under certain circumstances. Future research that examines the effects each comorbidity has on a patient post-CABG, as well as research that tracks the progress of this patient population months to years after discharge, may improve the understanding of these patients' specific needs and provide further insight to PT clinical practice.

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Tables and Figures

Table 1: Medication List

Medication	Dosage	Intended Purpose
Acetaminophen	325 mg, prn every 6 hrs	For pain or fever
Albuterol	2 puffs, prn every 6 hrs	For shortness of breath
Aspirin	81 mg, prn every 6 hrs	To prevent heart attack and stroke
Docusate	250 mg, prn 2x/day	To soften stool
Gabapentin	600 mg, 2x/day	For pain
Glyburide	5 mg, 1x/day	For diabetes
Lisinopril	15 mg, 1x/day	For blood pressure
Metformin HCL	1000 mg 2x/day	To regulate blood sugar
Morphine SO4	30 mg 2x/day	For pain
Nicotine Gum	4 mg, prn 1x/day	To assist with smoking cessation
Nicotine Patch	7 mg, 1x/day	To assist with smoking cessation
Polyethylene Glycol	17 g, prn 1x/day	For constipation
Warfarin	2.5 mg 1x/day	To prevent blood clots

mg = milligrams, prn = as needed, hrs = hours, x = times, / = per, g = grams

Table 2: Systems Review

Cardiovascular/Pulmonary	Impaired. Compensatory mechanisms in the form of medication were in place to control the patient's cardiovascular and pulmonary function. Vital Signs Heart Rate: 44 beats per minute (bpm) Blood Pressure: 156/98 mmHg (millimeters of mercury) Oxygen Saturation: 94% via 5 liters through nasal cannula
Integumentary	Impaired. A surgical chest incision was present under wound dressing.
Communication	Impaired. The patient was unable to hold a continuous conversation likely due to post-surgical fatigue.
Musculoskeletal	Impaired. Unable to assess at the initial examination.
Neuromuscular	Impaired. Unable to assess at the initial examination.
Affect, Cognition, Language, Learning Style	Unimpaired. The patient was oriented to person, place, time and situation. His language was appropriate, and affect was flat. The patient's learning style was unable to be assessed.

Table 3: Tests and Measures

Tests & Measures	Initial Evaluation Results	Discharge Results
Numeric Pain Rating Scale	6/10 at the surgical chest incision site	0/10
Performance Oriented Mobility Assessment	Unable to Attempt	28/28
Functional Mobility: Supine to Sit Transfer	Unable to Attempt	Independent: Preferred method sitting up in sagittal plane and swinging LEs over edge of bed (HOB flat).
Functional Mobility: Sit to Stand Transfer	Unable to Attempt	Independent: No use of UEs and no verbal cues needed.
Functional Mobility: Ambulation	Unable to Attempt	Independent: No assistive device used for 350 feet.

LEs = Lower Extremities, HOB = Head of Bed, UEs = Upper Extremities

Table 4. Short-Term Goals

Goal	Level of Assistance	Time Frame	Status at Time of Discharge
Supine-to-Sit Transfer	Modified independence with the use of a hospital bed (Hill-Rom, Batesville, Inc.) similar to that of his own at home	2 weeks	Met and Exceeded
Sit-to-Stand Transfer	Modified independence with increased time and effort to rise allotted	2 weeks	Met and Exceeded
Ambulation of 150 feet	Modified Independence with use of a front-wheeled walker	2 weeks	Met and Exceeded
Home Exercise Program Performance	Independent	2 weeks	Met

Table 5: Interventions

Intervention	Rx Day 1 POD 1	Rx Day 2 POD 2	Rx Day 3 POD 3	Rx Day 4 POD 6	Rx Day 5 POD 7
Therapeutic Exercise (Cardiac Warm-Up)	Ankle Pumps: 10 reps bilaterally in SF position. Heel Slides: 10 reps bilaterally in SF position.	Ankle Pumps: 10 reps bilaterally in SF position. Heel Slides: 10 reps bilaterally in SF position.	Ankle Pumps: 10 reps bilaterally in SF position. Heel Slides: 10 reps bilaterally in SF position. Hip Flexion: 10 reps bilaterally in SF position.	Ankle Pumps: 10 reps bilaterally in SF position. Knee Flexion: 10 reps bilaterally in sitting position. Hip Flexion: 10 reps bilaterally in sitting position.	Ankle Pumps: 10 reps bilaterally in SF position. Knee Flexion: 10 reps bilaterally in sitting position. Hip Flexion: 10 reps bilaterally in sitting position.
Supine-to-Sit Transfer	Unable to attempt.	Max-A: Support at trunk and LEs HOB raised to 45 degrees.	Mod-A: Support at trunk and LEs HOB raised to 45 degrees.	Not Attempted: Patient received in sitting and has already met functional goal.	Independent: Preferred method sitting up in sagittal plane and swinging LEs over edge of bed. HOB flat.
Sit-to-Stand Transfer	Unable to attempt.	Mod-A: Support at thorax and pelvis.	CGA: Required consistent reminders to refrain from using UEs.	SBA: Required consistent reminders to refrain from using UEs.	Independent: No use of UEs and no reminders needed.
Ambulation	Unable to attempt.	Min-A: Use of platform walker for 45 feet.	SBA: Use of platform walker for 200 feet.	SBA: Use of FWW for 300 feet.	Independent: No assistive device used for 350 feet.
Patient Education: Sternal Precautions	Administered: Receptive. Ability to recall not assessed.	Reviewed: Receptive. Recalled 2/6 precautions.	Reviewed: Unreceptive Recalled 1/6 precautions.	Reviewed: Unreceptive Recalled 0/6 precautions.	Reviewed: Unreceptive. Recalled 0/6 precautions.

Rx = Treatment, POD = Post-Operative Day, Reps= repetitions, SF=semi-fowler, Max-A = Maximum Assistance, Mod-A = Moderate Assistance, Min-A = Minimum Assistance, CGA = Contact Guard Assistance, SBA = Standby Assistance, HOB = Head of bed, LEs = Lower Extremities, UEs = Upper Extremities, FWW = Front-Wheeled Walker

Appendices

Appendix 1: Tinetti Performance Oriented Mobility Assessment (POMA)[15]

TINETTI BALANCE ASSESSMENT TOOL

Tinetti ME, Williams TF, Mayewski R, Fall Risk Index for elderly patients based on number of chronic dis- abilities. Am J Med 1986:80:429-434

PATIENTS NAME _____ D.O.B. _____ Ward _____

BALANCE SECTION

Patient is seated in hard, armless chair;

	Date		
Sitting Balance	Leans or slides in chair = 0 Steady, safe = 1		
Rises from chair	Unable to without help = 0 Able, uses arms to help = 1 Able without use of arms = 2		
Attempts to rise	Unable to without help = 0 Able, requires > 1 attempt = 1 Able to rise, 1 attempt = 2		
Immediate standing Balance (first 5 seconds)	Unsteady (staggers, moves feet, trunk sway) = 0 Steady but uses walker or other support = 1 Steady without walker or other support = 2		
Standing balance	Unsteady = 0 Steady but wide stance and uses support = 1 Narrow stance without support = 2		
Nudged	Begins to fall = 0 Staggers, grabs, catches self = 1 Steady = 2		
Eyes closed	Unsteady = 0 Steady = 1		
Turning 360 degrees	Discontinuous steps = 0 Continuous = 1		
	Unsteady (grabs, staggers) = 0 Steady = 1		
Sitting down	Unsafe (misjudged distance, falls into chair) = 0 Uses arms or not a smooth motion = 1 Safe, smooth motion = 2		
	Balance score	/16	/16

TINETTI BALANCE ASSESSMENT TOOL

GAIT SECTION

Patient stands with therapist, walks across room (+/- aids), first at usual pace, then at rapid pace.

	Date		
Indication of gait (Immediately after told to 'go'.)	Any hesitancy or multiple attempts = 0 No hesitancy = 1		
Step length and height	Step to = 0 Step through R = 1 Step through L = 1		
Foot clearance	Foot drop = 0 L foot clears floor = 1 R foot clears floor = 1		
Step symmetry	Right and left step length not equal = 0 Right and left step length appear equal = 1		
Step continuity	Stopping or discontinuity between steps = 0 Steps appear continuous = 1		
Path	Marked deviation = 0 Mild/moderate deviation or uses w. aid = 1 Straight without w. aid = 2		
Trunk	Marked sway or uses w. aid = 0 No sway but flex. knees or back or uses arms for stability = 1 No sway, flex., use of arms or w. aid = 2		
Walking time	Heels apart = 0 Heels almost touching while walking = 1		
	Gait score	/12	/12
Balance score carried forward		/16	/16
Total Score = Balance + Gait score		/28	/28

Risk Indicators:

Tinetti Tool Score	**Risk of Falls**
≤18	High
19-23	Moderate
≥24	Low

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439 **Appendix 2: Sternal Precautions (VA Palo Alto Health Care System, Palo Alto, CA)**

Precaution	Description
1	Do not lift your arms in front of you above 90 degrees.
2	Do not lift your arms out to the side above 90 degrees.
3	Do not push anything greater than 10 pounds.
4	Do not pull anything greater than 10 pounds.
5	Do not lift anything greater than 10 pounds.
6	Do not drive.
These precautions should be maintained for the initial 6-8 weeks following surgery.	

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441 **Appendix 3: Description of Exercises**

Exercise	Description
Ankle Pumps	In the semi-fowler or seated position, the patient actively plantarflexed and dorsiflexed both ankles simultaneously through the full range at a mild intensity and moderate pace.
Heel Slides	In the semi-fowler position, the patient actively flexed his knee throughout the full range while maintaining heel contact with the bed. He then returned the knee to the starting position of full knee extension and continued to maintain heel contact with the bed. This was completed at a mild intensity and moderate pace.
Knee Flexion	In the seated position with the patient's femur extended at least three inches out from the edge of the seat, the patient actively flexed the knee throughout the full range, and then returned it to the starting position of 90 degrees of knee flexion.
Hip Flexion	In the semi-fowler or seated position, the patient actively flexed the hip through the full range, and then returned it to the starting position at a mild intensity and moderate pace.
Supine-to-sit Transfer	Starting in the semi-fowler or supine position, the patient flexed the trunk and both hips simultaneously, while rotating the trunk to the left and transitioned to a sitting position on the edge of the bed. Assistance was provided as described.
Sit-to-stand Transfer	Starting in the sitting position with the feet in contact with the floor, the patient braced his chest with a pillow using both upper extremities and rose to a standing position. Assistance was provided as described.
Ambulation	The patient ambulated at a mild intensity on flat tile flooring with several changes in direction while negotiating the hospital environment. Assistance was provided as described. Assistive devices were used as described.

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444 **Appendix 4: Functional Examination and Impairment Terminology[16]**

Terminology	Description
Independent	Patient is able to consistently perform skill safely with no one present.
Supervision	*Termed "Standby Assistance" in documentation for this patient and in this report.* Patient requires someone within arm's reach as a precaution; low probability of patient having a problem requiring assistance.
Close Guarding	Person assisting is positioned as if to assist, with hands raised but not touching the patient; full attention on patient; fair probability of patient requiring assistance.
Contact Guarding	*Termed "Contact Guard Assistance" in documentation for this patient and in this report.* Therapist is positioned as with close guarding, with hands on patient but not giving any assistance; high probability of patient requiring assistance.
Minimum Assistance	Patient is able to complete a majority of the activity without assistance.
Moderate Assistance	Patient is able to complete a part of the activity without assistance.
Maximum Assistance	Patient is unable to assist in any part of the activity.

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446 **CARE Checklist**

CARE Content Area	Page
1. **Title** – The area of focus and "case report" should appear in the title	1
2. **Key Words** – Two to five key words that identify topics in this case report	1
3. **Abstract** – (structure or unstructured) a. Introduction – What is unique and why is it important? b. The patient's main concerns and important clinical findings. c. The main diagnoses, interventions, and outcomes. d. Conclusion—What are one or more "take-away" lessons?	2
4. **Introduction** – Briefly summarize why this case is unique with medical literature references.	3
5. **Patient Information** a. De-identified demographic and other patient information. b. Main concerns and symptoms of the patient. c. Medical, family, and psychosocial history including genetic information. d. Relevant past interventions and their outcomes.	4
6. **Clinical Findings** – Relevant physical examination (PE) and other clinical findings	5
7. **Timeline** – Relevant data from this episode of care organized as a timeline (figure	11

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or table).	
8. **Diagnostic Assessment** a. Diagnostic methods (PE, laboratory testing, imaging, surveys). b. Diagnostic challenges. c. Diagnostic reasoning including differential diagnosis. d. Prognostic characteristics when applicable.	6
9. **Therapeutic Intervention** a. Types of intervention (pharmacologic, surgical, preventive). b. Administration of intervention (dosage, strength, duration). c. Changes in the interventions with explanations.	9
10. **Follow-up and Outcomes** a. Clinician and patient-assessed outcomes when appropriate. b. Important follow-up diagnostic and other test results. c. Intervention adherence and tolerability (how was this assessed)? d. Adverse and unanticipated events.	12
11. **Discussion** a. Strengths and limitations in your approach to this case. b. Discussion of the relevant medical literature. c. The rationale for your conclusions. d. The primary "take-away" lessons from this case report.	13
12. **Patient Perspective** – The patient can share their perspective on their case.	5
13. **Informed Consent** – The patient should give informed consent.	4