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Original Research

Return to the Primary Acute Care Service Among Patients With Multiple Myeloma on an Acute Inpatient Rehabilitation Unit

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Abstract

Background: Pancytopenia, immunosuppression, and other factors may place patients with multiple myeloma at risk for medical complications. These patients often require inpatient rehabilitation. No previous studies have looked at risk factors for return to the primary acute care service of this patient population.

Objective: To determine the percentage of and factors associated with return to the primary acute care service of multiple myeloma rehabilitation inpatients.

Design: Retrospective review.

Setting: Acute inpatient rehabilitation unit within a National Cancer Institute Comprehensive Cancer Center.

Participants: All patients with multiple myeloma admitted to the inpatient rehabilitation unit between March 1, 2004, and February 28, 2015.

Main Outcome Measures: Return to the primary acute care service was analyzed with demographic information, multiple myeloma characteristics, medications, laboratory values, and hospital admission characteristics.

Results: One hundred forty-three inpatient rehabilitation admissions were found during the study period. After we removed multiple admissions of the same patients and planned transfers to the primary acute care service, 122 admissions were analyzed. Thirty-two (26%) patients transferred back to the primary acute care service for unplanned reasons. Multivariate analysis revealed male gender and thrombocytopenia as significantly associated with return to the primary acute care service. The median survival of patients who transferred back to the inpatient primary acute care service was 180 days versus 550 days for those who did not ($P < .001$).

Conclusion: Because of their medical fragility, clinicians caring for rehabilitation inpatients with multiple myeloma should maintain close contact with the primary oncology service. Factors associated with an increased risk of transfer back to the primary acute care service include male gender and thrombocytopenia.

Level of Evidence: To be determined.

Introduction

Hematologic malignancies, including leukemia, myelodysplastic syndromes, lymphoma, and multiple myeloma, are cancers that begin in blood-forming cells. Approximately 26,850 new cases of multiple myeloma are diagnosed in the United States every year, and the disease accounts for more than 11,000 deaths annually [1]. Patients with multiple myeloma, like other patients with hematologic malignancy, are a medically complex group. Leukopenia (from chemotherapy and hematopoietic stem cell transplants) and the use of steroid immunosuppressants increase their risk for infection. Thrombocytopenia increases their risk of bleeding.

Reduced bone strength puts them at risk for fractures and pain. Patients with multiple myeloma often require acute inpatient rehabilitation as the result of complications of their cancer and treatment, including deconditioning, orthopedic long bone fractures, and spinal cord compression from vertebral compression fractures [2-4].

There have been some studies on predominantly outpatient rehabilitation of patients with multiple myeloma [5-8]; however, the published literature regarding rehabilitation inpatients with multiple myeloma is limited to one case series of 8 patients. In that study, 1 of 8 (12.5%) transferred back to the primary acute care inpatient service, 1 of 8 (12.5%)

transferred to a subacute rehabilitation facility, and 6 of 8 (75%) were discharged home [9]. An uninterrupted inpatient rehabilitation stay with ultimate discharge home is the most efficient and preferred outcome. Transfer back to the primary acute care service from inpatient rehabilitation is required when a clinical condition becomes unstable. This requires coordination between the primary acute care and psychiatry team and could contribute to an increase in medical costs. Therefore, identifying the frequency and main reasons for return to the primary acute care service might increase the safety of inpatient cancer rehabilitation and aid providers in triaging appropriate rehabilitation settings for these patients.

There have been published studies identifying risk factors for transfer to the primary acute care inpatient service from inpatient rehabilitation of various populations, including general rehabilitation [10], burn [11], stroke [12,13], and traumatic brain injury [14]. Four previous studies have looked at patients with cancer as a whole. The rate of return to the primary acute care service of general cancer rehabilitation inpatients has been reported to be between 17% and 35% [15-18]. Another 3 previous studies looked at specific hematologic malignancy populations and their risk for return to the primary acute care service, including rehabilitation inpatients with hematopoietic stem cell transplant [19], leukemia [20], and lymphoma [21]. The reported rates of return to the primary acute care service in hematologic malignancy populations have been quite high, between 35% and 41% [19-22]. A better understanding of factors associated with transfer back to acute care could assist in identifying high-risk patients, with potential for more effective care and cost savings.

The primary objective of this study is to identify the percentage of patients with multiple myeloma who transferred to the primary acute care inpatient service from inpatient rehabilitation for unplanned reasons. A secondary objective is to identify risk factors associated with unplanned transfers of patients with multiple myeloma from inpatient rehabilitation to the primary acute care inpatient service.

Methods

Subjects

This retrospective study included all patients with a history of multiple myeloma admitted to the inpatient rehabilitation unit within a tertiary referral-based National Cancer Institute Comprehensive Cancer Center from March 1, 2004, through February 28, 2015. If a patient had been admitted multiple times to inpatient rehabilitation during the study period, only one randomly selected admission was analyzed. Because the purpose of this study was to identify factors associated

with unplanned transfer to the primary acute care service, patients with planned transfers (eg, planned chemotherapy) were excluded from the study group.

Procedure

Institutional review board approval was obtained. The institutional review board granted a waiver of informed consent in compliance with federal and institutional guidelines. A fourth-year medical student and an experienced, board-certified psychiatrist reviewed medical records of patients with a history of multiple myeloma who were admitted to the acute inpatient rehabilitation unit during the study timeframe. A board-certified psychiatrist trained the medical student, who underwent orientation regarding chart review and consulted the psychiatrist at any time if the medical student felt anything was difficult to understand.

Relevant medical records data were recorded and organized into 5 categories: demographic information, multiple myeloma characteristics, medications, laboratory values, and hospital admission characteristics. Demographic information included age, race, gender, marital status, payer source, and date of death (if applicable). Multiple myeloma characteristics included myeloma (M) protein levels, Bence Jones protein levels, if the patient had ever received radiation, date of last chemotherapy, whether the last chemotherapy was intensive or nonintensive, if the patient ever had a plasmacytoma, if the patient had had a bone fracture within 1 year before admission, and if the patient had a history of hematopoietic stem cell transplant.

Intensive chemotherapy is more toxic than non-intensive intravenous and with the goal of eliminating existing bone marrow cells. Nonintensive chemotherapy is typically oral and often offered to older, frailer patients. Medication data included the presence of intravenous (IV) antibiotics, any antiviral agents, and IV antifungal agents at inpatient rehabilitation admission. Laboratory values consisted of peripheral white blood cell count, platelet count, creatinine, pre-albumin, serum calcium, and albumin on the day of transfer to inpatient rehabilitation. Hospital admission characteristics included the patient's location before admission, reason for hospitalization, length of hospitalization before transfer to rehabilitation, length of inpatient rehabilitation stay, reason for transfer to inpatient rehabilitation, if the patient had returned to the primary acute care service, reason for transfer back to the primary acute care service (if applicable), and whether the patient had an indwelling Foley catheter, central venous catheter, or feeding tube at the time of admission to rehabilitation. Patients transferred back to the primary acute care service for planned treatment were not included in further analysis.

SAS-JMP version 12 software (SAS Institute, Cary, NC) was used for statistical analysis. The data were

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