

# Frequency and Reasons for Return to the Primary Acute Care Service Among Patients With Lymphoma Undergoing Inpatient Rehabilitation

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**Objective:** To assess the frequency and risk factors for return to the primary acute care service among patients with lymphoma undergoing inpatient rehabilitation.

**Design:** Retrospective study.

**Setting:** Tertiary referral-based cancer center.

**Patients:** All patients with a history of lymphoma admitted to an inpatient rehabilitation between October 1, 2003, and January 30, 2013.

**Main Outcome Measures:** Items analyzed from patient records included return to the primary acute care service with demographic information, lymphoma characteristics, medications, hospital admission characteristics, and laboratory values.

**Results:** A total of 143 unique patient admissions were analyzed, and 54 of these 143 lymphoma inpatient rehabilitation admissions (38%) returned to the primary acute care service. However, 16 of 54 (30%) returned because they needed additional chemotherapy. Excluding patients who returned to the primary acute care service for chemotherapy, statistically significant or approaching statistically significant factors ( $P < .10$ ) associated with return to the primary acute care service included a creatinine level  $\geq 1.3$  mg/dL ( $P = .0002$ ), male gender ( $P = .001$ ), history of hematopoietic stem cell transplantation ( $P = .0355$ ), and presence of an intravenous antifungal agent ( $P = .0717$ ). Of the patients transferred back to the primary acute care service, 13 of 38 (34%) were discharged directly home, 10 of 38 (26%) died in the hospital, 7 of 38 (18%) were transferred to a subacute rehabilitation facility, and 4 of 38 (11%) were transferred to inpatient rehabilitation.

**Conclusions:** When excluding patients who returned for chemotherapy, patients with lymphoma who were male, had undergone hematopoietic stem cell transplantation, and had a creatinine level  $\geq 1.3$  mg/dL demonstrated increased risk for return to the primary acute care service.

PM R 2014;6:629-634

## INTRODUCTION

Lymphoma, its treatment, and associated complications can lead to significant functional impairment. Patients with cancer often experience cachexia, nausea, fatigue, lymphedema, deconditioning, myopathy, and peripheral neuropathy [1,2]. Patients with lymphoma may require inpatient rehabilitation to enable them to be discharged from the hospital and to prepare them for upcoming treatment. Whether a patient can receive radiation or chemotherapy often depends on his or her functional status [3]. Studies have shown that inpatient cancer rehabilitation can improve function and symptoms such as fatigue, well-being, and pain [4,5]. A transfer back to the primary acute care service from inpatient rehabilitation often is attributed to unexpected medical complications. An uninterrupted inpatient rehabilitation stay with consistent participation in therapy is preferred and is the most efficient way to use these rehabilitation resources [6].

Multiple studies have focused on return to the primary acute care service in a number of patient populations, including burn [7], stroke [8], traumatic brain injury [9,10], and cancer populations. Alam et al [11] found a return to primary acute care service rate of 21%

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Disclosure: nothing to disclose

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Disclosure: grants, NIH R01NR010162-01A1, R01CA122292-01, and R01CA124481-01

Research support: Supported in part by the M.D. Anderson Cancer Center support grant CA 016672.

This study was presented as a poster at the American Academy of Physical Medicine & Rehabilitation Annual Assembly, October 4, 2013.

Submitted for publication July 18, 2013; accepted December 19, 2013.

versus 9.7% for control subjects without cancer. Guo et al [12] found a return to primary acute care service rate of 35%. To further delineate factors relating to the return to the primary acute care service in specific cancer subpopulations, Fu et al performed 2 studies [13,14] and found a return to primary acute care service rate of 41% and 37% for patients undergoing hematopoietic stem cell transplantation and patients with leukemia, respectively. Patients with lymphoma, like other patients with liquid tumor, are a medically complex group. Neutropenia puts patients at high risk for infection. Anemia can contribute to fatigue and hypovolemic symptoms. Thrombocytopenia may lead to a greater risk of bleeding.

This study has 2 purposes. The primary purpose is to identify risk factors associated with return to the primary acute care service by patients with lymphoma; the other purpose is to describe the frequency and reasons for return to the primary acute care service. This study is the first to identify risk factors for return to the acute care primary service specifically among patients with lymphoma.

## METHODS

### Subjects

This retrospective study included all patients with a history of lymphoma admitted to the inpatient rehabilitation service at a tertiary referral-based cancer center between October 1, 2003, and January 30, 2013.

### Procedure

Institutional Review Board approval was obtained; the Board granted a waiver of informed consent in compliance with federal and institutional guidelines. Patients admitted after October 1, 2003, were analyzed because their medical records were easy to access electronically. An experienced physiatrist reviewed the medical records and collected data that could be divided into demographic information, lymphoma characteristics, medications, laboratory values, and hospital admission characteristics. Demographic information included age, gender, race, marital status, insurance type, and date of death (if applicable). Lymphoma characteristics included the type of lymphoma, whether the patient had any pathologic or radiographic evidence of central nervous system or leptomeningeal involvement, whether the patient had ever received intrathecal chemotherapy, time since last chemotherapy dose, whether the patient had received a bone marrow transplant in the past, and whether the patient had relapsed.

Medication data included the presence of oral and/or intravenous (IV) antibacterial agents, antiviral agents, and antifungal agents. Laboratory values consisted of the peripheral white blood cell count, platelet count, and creatinine, prealbumin, and albumin levels 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 if the patient had an indwelling Foley catheter, central venous catheter, or feeding tube at the time of admission to rehabilitation.

Variable frequencies were evaluated. Nonparametric statistical tests were performed for the previously described variables, including demographics, lymphoma characteristics, medications, bone marrow transplantation status, hospital admission characteristics, and laboratory values. A  $\chi^2$  analysis was performed for all the data categories with return to the primary acute care service. To remain consistent, a Fisher exact test was not used in sparse data cells. Because of categorical variables, unequal sample sizes, and distribution characteristics, nonparametric statistical techniques were used initially to test the proportional distributions of each category and later the parameter estimates in a logistic regression model. To remain conservative in our model analysis, we used only variables that were statistically significant or near statistically significant with return to the primary acute care service.

## RESULTS

A total of 143 patients with a history of lymphoma were admitted a total of 163 times to inpatient rehabilitation. One patient was admitted 4 times, 1 patient was admitted 3 times, and 15 patients were admitted 2 times. Of the patients admitted multiple times, only one admission was randomly selected for analysis. The reason categories for return to the primary acute care service were chemotherapy (16/54, 30%), infectious disease (18/54, 33%), gastrointestinal (5/54, 9%), neurologic (2/54, 4%), renal (2/54, 4%) pulmonary (1/54, 2%), and other reasons (10/54, 19%).

After we excluded the 16 patients who returned to the primary acute care service for chemotherapy, the mean age of the remaining 127 patients was 62.6 (SD, 13.4) years. The median age was 65 years, and the range was 24 to 87 years. Patients who did not return to the primary acute care service were 62.2 (SD, 14.4) years of age. Patients who did return to the primary acute care service were, on average, 63.5 (SD, 11.09) years of age. A *t*-test did not indicate that the age of patients who returned to the primary acute care service significantly differed from that of patients who did not return to the primary acute care service ( $P = .6107$ ).

Table 1 lists categorical demographic factors and their relationship with return to the primary acute care service while excluding patients who returned to the primary acute care service because of chemotherapy. Table 2 lists select categorical clinical/laboratory factors and their relationship with return to the primary acute care service while excluding

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