

Examination of Unplanned 30-Day Readmissions to a Comprehensive Cancer Hospital

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Abstract

Purpose: The Centers for Medicare and Medicaid Services (CMS), under the Hospitals Readmissions Reductions Program, may withhold regular reimbursements for excessive 30-day readmissions for select diagnoses. Such penalties imply that some readmissions reflect poor clinical decision making or care during the initial hospitalization. We examined factors related to potentially preventable readmissions in CMS patients at a tertiary cancer hospital.

Methods: The medical records of all CMS patients with unplanned readmissions within 30 days of index admission were reviewed over 6 months (October 15, 2011–April 15, 2012). Each readmission was classified as not preventable or potentially preventable. Factors associated with potentially preventable readmissions were sought.

Results: Of 2,531 inpatient admissions in CMS patients over 6 months, 185 patients experienced at least one readmission for 282 total readmissions (11%). Median time to readmission was 9 days (range, 0 to 30 days). The most common causes for first readmission were new diagnoses not present at first admission ($n = 43$, 23%), new or worsening symptoms due to cancer progression ($n = 40$, 21%) and complications of procedures ($n = 25$, 13%). There were 38 (21%) initial readmissions classified as potentially preventable. Use of total parenteral nutrition at the time of discharge was associated with potentially preventable readmission ($P = .028$).

Conclusion: Most unplanned readmissions to a tertiary cancer hospital are related to progression of disease, new diagnoses, and procedure complications. Minimizing readmissions in complex cancer patients is challenging. Larger multi-institutional datasets are needed to determine a reasonable standard for expected readmission rates.

Introduction

For at least three decades, hospital readmissions have been recognized as a common event with significant costs to payers, including the Centers for Medicare and Medicaid Services (CMS).¹ In an effort to decrease hospital readmissions, CMS developed the Hospital Readmissions Reduction Program on October 1, 2012. As part of this program, CMS may assess financial penalties to hospitals for excess readmissions. Initial efforts have focused on acute myocardial infarction, heart failure, and pneumonia; excessive readmission rates for these patients are subject to penalty.

It has been suggested that early readmission reflects poor quality of care during the initial index hospital admission.^{2,3} However, others suggest that some readmissions are necessary after complex therapies, such as major oncologic operations, in order to appropriately manage treatment-related complications.^{4,5} Hospitals with particular areas of specialty emphasis may be expected to have higher or lower readmission rates compared with national averages, such as tertiary care cancer hospitals for the former or hand surgery hospitals for the latter. This study evaluates the rate of 30-day readmission in CMS patients over a 6-month period at a high volume, comprehensive cancer hospital. Unplanned readmissions were classified as potentially preventable or not preventable hoping to identify modifiable risk factors in the potentially preventable group.

Methods

Approval for this project was provided by the Institutional Review Board of The Ohio State University Wexner Medical Center (Columbus, OH). Patients included in the study had CMS as the primary insurance payer and at least one unplanned related readmission to a single tertiary cancer hospital within 30 days of an initial inpatient hospital stay. The study period was 6 months (October 15, 2011–April 15, 2012) corresponding to the first 6 months after introduction of a new electronic medical record (EMR). Planned readmissions, such as elective operations or inpatient chemotherapy, and unrelated readmissions, such as readmissions for diagnoses such as trauma unrelated to the existing cancer, were excluded. Readmissions to the cancer hospital in patients with benign disease were included, most commonly patients with sickle-cell anemia cared for by the inpatient hematology service.

Medical records were reviewed independently by three authors (N.D.S., S.D.N., and C.R.S.) and readmissions defined as potentially preventable or not. Criteria for potentially preventable readmissions included inadequate pain or other symptom control within 48 hours of discharge, inadequate treatment of a condition present at index admission such as unrecognized or inadequately treated infection, missed diagnosis, medication errors or errors in discharge planning, and inadequate patient education. Readmissions for new symptoms related to progression of disease or adverse effects of therapy were generally classified as not preventable. Progression of disease was defined

according to the opinion of the treating oncologists in the setting of worsening symptoms combined with objective criteria (imaging and tumor markers). The primary purpose of this analysis was to define readmissions which, in the authors' opinion, may have been prevented around the time of discharge. This would typically involve either choosing an alternate therapy for existing conditions, delaying discharge or improvements in the discharge process. If any of three reviewers classified an initial readmission as potentially preventable, the case was included in the total number of potentially preventable cases used in subsequent analysis.

Descriptive statistics were used to summarize demographic and clinical data. Comparisons between groups were made using Fisher's exact test for categorical variables and comparison of means or the appropriate nonparametric test for continuous variables. Factors possibly associated with potentially preventable readmission were analyzed using binary logistic regression analysis from the following: age, sex, race, medical or surgical service at index admission, use of parenteral nutrition, nausea within 24 hours, pain service consult, and labs at time of discharge (WBC count, hemoglobin, sodium, potassium, and creatinine). *P* values were considered significant at the 0.05 level. Intraobserver reliability was calculated using Cohen's kappa score. All statistical analysis was done using SPSS for Windows (v. 21, SPSS Inc, Chicago, IL).

Results

Of 4,900 inpatient admissions during the study period, 2,531 (52%) were for patients with CMS as the primary insurance payer. There were 185 CMS patients with one or more unplanned and related readmissions within 30 days of an index inpatient hospitalization for a total of 282 readmissions (11%). Medicare was the primary insurance in 117 patients (63%), Medicare HMO in 61 patients (33%), and Medicaid in seven patients (3.8%). In the cohort, there were 72 patients (38%) discharged from a surgical service and 113 (62%) from medical services (Table 1). There were 12 patients (6%) who were initially admitted for inpatient chemotherapy. The median length of stay before index readmission was 6 days (range, 2 to 42 days). The median number of days from discharge to readmission was 8.5 days (range, 0 to 30 days) and the mode was 4 days.

The most common causes for initial readmission were new diagnosis not present at initial admission (*n* = 43; 23%) such as bowel obstruction or venous thromboembolism, worsening symptoms due to cancer progression (*n* = 40; 22%), procedure complications (*n* = 25; 14%), and treatment adverse effects such as diarrhea, febrile neutropenia, nausea/vomiting (*n* = 17; 9.2%). Other reasons for readmission included worsening of prior infection, new infection, dehydration, and poor pain control (Table 2). When the index readmission was related to progression of disease, the most common causes were increased or new pain due to disease (*n* = 9; 4.9%), bowel obstruction (*n* = 3; 1.6%), nausea and vomiting (*n* = 3; 1.6%), and altered mental status (*n* = 3; 1.6%).

Of the 185 initial readmissions, 38 (21%) were classified as potentially preventable. Seventeen (45%) were readmitted

within 48 hours of initial discharge and 4 (11%) within 24 hours. The most common causes for potentially preventable initial readmission were related to errors in discharge planning (*n* = 9; 24%), inadequate treatment of infection present at index admission (*n* = 7; 18%), inadequate treatment of non-infectious diagnosis (*n* = 3; 7.9%) and missed diagnosis (*n* = 3; 7.9%). Use of TPN was associated with potentially preventable readmission (*P* = .028). Of the seven patients discharged with TPN, no readmission was directly related to a complication of TPN.

There were 67 (9.5%) patients with multiple readmissions (range, 2 to 4 readmissions) for a total of 282 readmissions during the study period. A total of 51 (18%) of the 282 readmissions were potentially preventable. Ten (5.4%) of the 185 patients readmitted at least once during the study period died while in the hospital. Half of these had a solid malignancy and the other half leukemia or lymphoma. All of these patients were admitted with progression of disease, and six (60%) were in the group of patients with more than one readmission. None of the patients who died in the hospital were readmitted within 24 hours of discharge and none of these readmissions were in the group classified as potentially preventable.

Intraobserver variability for designating preventable versus unpreventable readmission was quantified using a Cohen's kappa score. The first two author reviewers independently categorized 24 and 29 of the initial readmissions as preventable. There was concordance on 11 cases for a kappa score of 0.318 (95% CI, 0.13 to 0.50) representing fair agreement. The concordance between the third reviewer (C.R.S.) and the first two reviewers was represented by kappa scores of 0.578 (95% CI, 0.42 to 0.73) and 0.837 (95% CI, 0.73 to 0.94) for moderate and substantial agreement respectively.

Discussion

Readmissions in CMS patients are common at a tertiary cancer hospital, and many readmissions are related to complications and progression of disease. At least 20% of readmissions may be potentially preventable at the time of initial discharge related to suboptimal symptom management, discharge planning, or medication errors. TPN was associated with the classification of potentially preventable readmission. Important factors we did not evaluate might include smoking, weight loss, or other modifiable factors which are associated with complications and readmissions.^{6,7} Nevertheless, this article adds to the current literature regarding readmissions by describing a specific patient population (comprehensive cancer hospital).

Our findings agree with published readmission rates which have generally been reported at 10% to 20%.^{4,8} Common reasons for readmission include complications of therapy, particularly infection, and pain, especially in surgical patients.^{4,8,9} A high proportion of patients in the current study were readmitted with refractory nausea and vomiting, dehydration, or uncontrolled pain, not surprising in the population patient with cancer. Factors at the index admission often related to readmission include complications of therapy, high-risk surgical pa-

Table 1. Characteristics of CMS Patients With Unplanned Related Readmissions to a Comprehensive Cancer Hospital Within 30 Days

| Factor | Index Readmissions (n = 185) | | Potentially Preventable (n = 38; 20.5%) | | Unpreventable (n = 147; 79.5%) | | P |
|------------------------------------|---------------------------------|-------|--|-------|-----------------------------------|-------|------|
| | No. | % | No. | % | No. | % | |
| Age | | | | | | | .650 |
| Median | | 69.0 | | 69.5 | | 69.0 | |
| Range | | 19-90 | | 19-88 | | 22-90 | |
| Sex | | | | | | | |
| Male | 84 | 44.7 | 14 | 36.8 | 70 | 46.7 | .234 |
| Female | 101 | 53.7 | 24 | 63.2 | 77 | 51.3 | |
| Race/ethnicity | | | | | | | .692 |
| White | 161 | 85.6 | 32 | 84.2 | 129 | 86.0 | |
| African American | 23 | 12.2 | 6 | 15.8 | 17 | 11.3 | |
| Latino | 1 | 0.5 | 0 | 0.0 | 1 | 0.7 | |
| Surgical patient | 72 | 38.3 | 14 | 36.8 | 58 | 38.7 | .827 |
| Insurance | | | | | | | .756 |
| Medicare | 117 | 63.2 | 25 | 65.8 | 92 | 61.3 | |
| Medicare HMO | 61 | 33.0 | 11 | 28.9 | 50 | 33.3 | |
| Medicaid | 7 | 3.8 | 2 | 5.3 | 5 | 3.3 | |
| Readmission setting | | | | | | | .490 |
| Home | 145 | 78.4 | 28 | 73.7 | 117 | 79.6 | |
| ECF/SNF | 38 | 20.5 | 10 | 26.3 | 28 | 19.0 | |
| Assisted living | 2 | 1.1 | 0 | 0.0 | 2 | 1.4 | |
| Transfer from other hospital | 45 | 24.3 | 8 | 21.1 | 37 | 25.2 | .782 |
| Home | 35 | 18.9 | 5 | 13.2 | 30 | 20.4 | |
| ECF/SNF | 10 | 5.4 | 3 | 7.9 | 7 | 4.8 | |
| Index LOS, days | | | | | | | .638 |
| Mean | | 8.0 | | 7.5 | | 8.0 | |
| Range | | 2-42 | | 2-42 | | 2-30 | |
| Days to readmit | | | | | | | .000 |
| Mean | | 10.5 | | 5.7 | | 11.7 | |
| Range | | 0-30 | | 0-26 | | 1-30 | |
| Index admission laboratory results | | | | | | | |
| WBC | | 8.8 | | 7.4 | | 9.2 | .385 |
| Hgb | | 9.6 | | 9.6 | | 9.6 | .959 |
| Na | | 136.4 | | 135.8 | | 136.5 | .232 |
| K | | 4.0 | | 3.9 | | 4.0 | .562 |
| Cr | | 1.0 | | 0.8 | | 0.9 | .286 |
| Albumin | | 2.5 | | 2.4 | | 2.6 | .409 |
| TPN | 7 | 3.7 | 4 | 10.5 | 3 | 2.0 | .028 |

Abbreviations: CMS, Centers for Medicare and Medicaid Services; Cr, serum creatinine; ECF, extended care facility; Hgb, hemoglobin; LOS, length of stay; SNF, skilled nursing facility; TPN, total parenteral nutrition; WBC, white blood cell count.

tients and longer index length of stay.^{6,10,11} CMS, according to the Medicare Program Rule, has previously identified patient noncompliance as a potentially preventable readmission category and puts the burden on the hospital to take measures towards improving noncompliance. The rate of readmission for noncompliance in this study was low (< 5%).

It has been estimated that 20% of readmissions are preventable, representing costs in the hundreds of millions.¹² Preventable readmissions have been associated with severity of illness, extremes of age, and presence of mental health diagnoses.¹³

These factors are not modifiable at the time of hospital discharge, but identifying such factors may not be needed to effect meaningful change. For instance, Grewal et al⁹ examined rates of readmission after pancreaticoduodenectomy and found an association between the indication for operation (chronic pancreatitis) and blood transfusion with readmission. Altered discharge practices, such as earlier follow-up ambulatory appointments, are possible in this or any subset of patients at increased risk of readmission. Readmissions after pancreatic resection have been associated with worse survival, and therefore

Table 2. Reasons for Index Readmission to a Comprehensive Cancer Hospital Within 30 Days Among CMS Patients

| Reason | Index Readmissions (n = 185) | | Potentially Preventable (n = 38) | | Unpreventable (n = 147) | |
|--|---------------------------------|------|-------------------------------------|------|----------------------------|------|
| | No. | % | No. | % | No. | % |
| New diagnosis | 43 | 23.2 | 3 | 7.9 | 40 | 27.2 |
| Worse symptoms due to cancer progression | 40 | 21.6 | 1 | 2.6 | 39 | 26.5 |
| Procedure complications | 25 | 13.5 | 2 | 5.3 | 23 | 15.6 |
| Treatment side effect | 17 | 9.2 | 0 | 0.0 | 17 | 11.6 |
| Worsening of infection | 13 | 7.0 | 7 | 18.4 | 6 | 4.1 |
| Dehydration | 12 | 6.5 | 1 | 2.6 | 11 | 7.5 |
| Discharge plan gap | 10 | 5.4 | 9 | 23.7 | 1 | 0.7 |
| New infection | 5 | 2.7 | 1 | 2.6 | 4 | 2.7 |
| New pain | 5 | 2.7 | 1 | 2.6 | 4 | 2.7 |
| Readmit within 24 hours* | 4 | 2.2 | 4 | 10.5 | 0 | 0.0 |
| Inadequate treatment | 3 | 1.6 | 3 | 7.9 | 0 | 0.0 |
| Medication complication | 3 | 1.6 | 1 | 2.6 | 2 | 1.4 |
| Missed diagnosis | 3 | 1.6 | 3 | 7.9 | 0 | 0.0 |
| Poor pain control within 48 hours of discharge | 2 | 1.1 | 2 | 5.3 | 0 | 0.0 |

* Pain and nausea (n = 2), stroke (n = 1), and hemoptysis (n = 1).

it is possible that efforts to reduce readmissions may improve patient outcomes.¹⁴

This article has several important limitations to mention. First, we did not capture any readmissions to other institutions unless subsequently transferred; our readmission rate is therefore underestimated. Second, the definition of potentially preventable readmission is narrow in this study and our method used to classify readmissions was associated with low to moderate intraobserver reliability. This emphasizes the subjective nature of such a classification and perhaps suggests a more important analysis would identify factors for any readmission with a control group of patients not readmitted. The physician authors reviewing the medical records are likely biased in stating some patients' readmissions are not preventable since this is a direct or indirect criticism of the care at the index admission. Future studies may consider using unbiased reviewers such as independent experts in utilization management. A new inpatient EMR was launched at our hospital on October 15, 2011, so we chose to examine readmission rates in the initial 6 months after this change given the readily available data in the EMR. Although no readmissions were directly related to the new EMR, a potential confounding limitation is that discharge practices were likely more challenging during the several week learning curve for use of the EMR. A final limitation relating to external validity is our inclusion of only CMS patients.

Many readmissions related to complications of therapy or progression of disease were not classified as potentially preventable. However, the authors do not mean to imply that such readmissions do not deserve attention. In fact, a comprehensive approach to decreasing hospital readmissions would evaluate opportunities in these patients as well. Many innovative solutions are likely available to patients at higher risk for readmission, such as smoking cessation for patients before elective

operation and early palliative care and hospice intervention for patients with advanced cancer suffering multiple or intractable symptoms. The classification of potentially preventable is sometimes difficult. For instance, we generally agreed all readmissions within 24 hours should be classified as preventable. As such, one patient who suffered stroke due to brain metastases after transfer to a nursing home was labeled preventable although this event was not anticipated.

CMS and other payers have a heightened awareness about hospital readmissions, and they expect hospitals to implement process improvement measures to improve this quality metric. It is important to state that efforts to reduce readmissions may affect other resource utilization metrics negatively such as length of stay and cost and may even lead to unintended consequences such as increasing morbidity from nosocomial infections or other hospital complications. Programmatic change will require a comprehensive approach at many levels. Other hospitals have already implemented successful programs in this area, such as researchers at Johns Hopkins (Baltimore, MD) who found the use of a checklist with the daily progress note decreases readmissions in patients with gynecologic malignancies from 22.2% to 14.6%.¹⁵ Thus, we are optimistic that identifying risk factors for readmission, improving discharge and follow-up practices and expanding patient education will lead to decreased readmissions at cancer hospitals.

Readmissions are a concern for all hospitals including comprehensive cancer centers. Most unplanned readmissions to cancer hospitals are related to progression of disease, new diagnoses and complications of procedures. Some readmissions may not be avoidable, and direct relationships between any single readmission or overall readmission rate and poor quality of care are not consistent. Despite this, it is important to identify factors related to potentially prevent-

able readmissions in order to make any discharge process improvements or decisions that will result in less readmissions and better outcomes. It is concerning that acceptable rates of readmission as a whole or per diagnosis are arbitrary; therefore physicians and nurses alike have an important role to play in defining acceptable readmission rates and preventive steps as a reference for legislators and policymakers.

Authors' Disclosures of Potential Conflicts of Interest

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