

Midwest Surgical Association

The appropriate measurement of postdischarge readmissions in Medicare colon surgery



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Abstract

BACKGROUND: Readmissions after inpatient care are being used as a metric for clinical outcomes for surgeons and hospitals, but without standardization of the appropriate postdischarge period.

METHODS: Elective colon surgery (ECS) for Medicare patients was reviewed to define the frequency and causes of readmission at 30, 60, and 90 days after discharge. Elective, trauma, and cancer readmissions were excluded. A prediction model at 90 days after discharge was designed to identify risk factors that were associated with readmissions.

RESULTS: A total of 107,459 live discharges after ECS had 12,746 readmissions at 30 days, 4,601 1st-time readmissions at 31 to 60 days, and another 4,042 1st-time readmissions from days 61 to 90; 40% of initial and nearly 50% of all readmissions occurred from days 31 to 90. Primary causes for readmission were gastrointestinal, infectious, and cardiopulmonary events.

CONCLUSIONS: The 90-day postdischarge time period provides the most accurate measurement interval for relevant readmissions after ECS.

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Prevention of readmission after an episode of inpatient care has become a focal point of interest among all payers. Among all hospitalized Medicare patients, readmission occurs in 19% of patients within 30 days of discharge and in 34% of patients within 90 days of discharge.¹ Because readmissions are expensive and are commonly

related to complications of the index inpatient episode of care, they are being used for quality assessment of provider performance. The Centers for Medicare and Medicaid Services have begun the assessment of penalties to hospitals for select medical hospitalizations if the 30-day rates of readmission are deemed to be excessive.²

An unanswered question in the evaluation of readmissions is the length of time that should be measured after the index hospitalization. A 30-day interval after discharge has been most commonly chosen, but this length of time does not have an evidence-based foundation. Longer postdischarge intervals have been examined but are complicated

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by readmission events that are unrelated to the index hospitalization as the periods beyond 30 days are examined. Exclusion criteria are necessary to separate unrelated readmissions if readmission rates are to be included with other metrics for surgical outcomes.

In the present study, we have examined readmission rates after elective colon surgery in a Medicare population of patients to evaluate the optimum postdischarge period of time. A selected exclusion list of readmissions was developed to give a more accurate assessment of events related to the index hospitalization. Readmissions and their cause were evaluated at 30, 60, and 90 days after discharge.

Methods

The Centers for Medicare and Medicaid Services Inpatient Limited Data Set for 2010-2012 was used to identify patients for the research database of this study. Patients with *International Classification of Diseases 9th Revision-Clinical Modification* procedure codes of 17.31 to 17.39, 45.72 to 45.79, 48.50 to 48.59, 48.62, and 48.63 that were performed in only those patients with an *International Classification of Diseases 9th Revision* code of 153.0 to 153.9, 154.0 to 154.8, 211.4, 211.4, 230.3, 230.4, and 562.1-562.13 were included. Additional inclusion criteria included only hospitals with acceptable coding accuracy by criteria that we have previously published,³ hospitals with a minimum of 20 qualifying colon resection cases, and only those cases performed on day 0, 1, or 2 of the admission. Case exclusions from the research database were patients less than 65 years of age, those without a hospital or patient identifier, absence of an admission or discharge date, transfers to-or-from another acute care hospital, and those discharged against medical advice.

All inpatient death cases were identified and removed from further analysis. All live discharges were then evaluated by hospital for development of a linear length of stay prediction model, the application of a moving-range control chart by methods previously published,⁴ and the identification of cases that were prolonged length-of-stay outliers (prLOS). The prLOS determination is reported in this analysis because it is a significant risk factor in the prediction of readmissions in prior studies.⁵

Among live discharges, all were evaluated for readmission to an acute care hospital within 90 days of discharge. All Medicare-Severity-Diagnosis Related Groups (MS-DRGs) of the readmission were identified. Readmissions for unrelated elective operations, interval trauma events, and for cancer-related diagnoses were considered unrelated to the index hospitalization and these were excluded from the subsequent analysis. Qualifying readmissions were then divided into those occurring within 30, 60, and 90 days of hospitalization for elective colon surgery. The MS-DRGs of qualifying cases were aggregated into categories for comparison.

The qualifying 90-day readmissions then were used as the dependent variable in a stepwise forward logistic prediction model. Comorbid and procedural risk factors were used as the independent variables to provide evidence of those clinical variables that were associated with readmission events. A prLOS was used as an additional risk factor to correlate whether severe complications of the inpatient care were significant in the prediction of readmission. Hospital dummy variables were used to eliminate hospital effects on final coefficients of significant variables. Schwarz criterion was used to avoid overfitting the model.⁶ The final risk equation was evaluated by c-statistic. All analysis in this study used SAS software (version 9.4, SAS Institute, Cary, NC).

Results

There were 110,768 patients that met inclusion criteria for the evaluation of readmissions. There were a total of 3,309 patients that were inpatient deaths or died within 90 days of discharge without readmission. This left a total of 107,459 patients who were live discharges and survived the full 90-day period for readmission evaluation.

Among these live discharges, there were 12,764 (11.9%) that were readmitted 14,362 times during the 30 days after discharge. A total of 17,365 (16.2%) patients were readmitted a total of 21,524 times by 60 days of which 4,601 patients were readmitted for the 1st time between days 31 and 60. A total of 21,407 (19.9%) patients were readmitted by 90 days for a total of 28,073 readmissions of which 4,042 were 1st-time readmissions between days 61 and 90 after discharge. For all 1st time readmissions, 59.6% (12,764/21,407) occurred within 30 days and 40.4% (8,643/21,407) occurred between days 31 and 90. Among all readmissions, 51.2% (14,362/28,073) occurred in the 1st 30 days after discharge, 25.5% (7,162/28,073) occurred between days 31 and 60, and 23.3% (6,549/28,073) occurred between days 61 and 90 after discharge. In [Table 1](#), the MS-DRGs of the readmission hospitalizations are identified. Gastrointestinal disorders (24.5%), infections (23.3%), and cardiopulmonary events (6.2%) were the most common specific reasons for readmission. Renal failure, metabolic disorders, peripheral vascular disorders, and stroke complete the major additional causes of readmission. All other readmissions were for a wide array of chronic medical decompensation issues after operation.

A total of 41 risk factors stepped into the prediction equation. Risk factors of clinical interest with associated odds ratios (OR) are identified in [Table 2](#). Open colectomy (OR = 1.46) was a risk factor for readmission when laparoscopic procedures were used as the reference group. Anterior resection (OR = 2.04) and abdominoperineal resection (OR = 1.92) were significant procedural risk factors and reflect the greater probabilities of adverse outcomes when these procedures are performed. The risks of preoperative chemo- or radiotherapy are not captured

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