
Fragmentation of Care after Surgical Discharge: Non-Index Readmission after Major Cancer Surgery



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- BACKGROUND:** Despite national emphasis on care coordination, little is known about how fragmentation affects cancer surgery outcomes. Our study examines a specific form of fragmentation in post-discharge care—readmission to a hospital different from the location of the operation—and evaluates its causes and consequences among patients readmitted after major cancer surgery.
- STUDY DESIGN:** We used the State Inpatient Database of California (2004 to 2011) to identify patients who had major cancer surgery and their subsequent readmissions. Logistic models were used to examine correlates of non-index readmissions and to assess associations between location of readmission and outcomes, measured by in-hospital mortality and repeated readmission.
- RESULTS:** Of 9,233 readmissions within 30 days of discharge after major cancer surgery, 20.0% occurred in non-index hospitals. Non-index readmissions were associated with emergency readmission (odds ratio [OR] = 2.63; 95% CI, 2.26–3.06), rural residence (OR = 1.81; 95% CI, 1.61–2.04), and extensive procedures (eg hepatectomy vs proctectomy; OR = 2.77; CI, 2.08–3.70). Mortality was higher during non-index readmissions than index readmissions independent of patient, procedure, and hospital factors (OR = 1.31; 95% CI, 1.03–1.66), but was mitigated by adjusting for conditions present at readmission (OR = 1.24; 95% CI, 0.98–1.58). Non-index readmission predicted higher odds of repeated readmission within 60 days of discharge from the first readmission (OR = 1.16; 95% CI, 1.02–1.32), independent of all covariates.
- CONCLUSIONS:** Non-index readmissions constitute a substantial proportion of all readmissions after major cancer surgery. They are associated with more repeated readmissions and can be caused by severe surgical complications and increased travel burden. Overcoming disadvantages of non-index readmissions represents an opportunity to improve outcomes for patients having major cancer surgery. (*J Am Coll Surg* 2016;222:780–789. © 2016 by the American College of Surgeons. Published by Elsevier Inc. All rights reserved.)

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Readmissions after cancer surgery are common and costly. An estimated 13% to 30% of patients who have had major cancer surgery are readmitted within 30 days of discharge.¹⁻⁷ Recent studies have also shown that these readmissions raise the total cost of care substantially.^{1,4} Although it is imperative to reduce the burden of readmissions,^{8,9} they still serve the crucial function of rescuing patients from surgical complications in the postoperative period.^{4,10} Given the widespread, critical, and expensive nature of postoperative readmissions, factors that impact their outcomes warrant close examination.

National emphasis has been placed on improving care coordination in the postdischarge period.^{11,12} Postsurgical coordination across multiple settings has proven to be difficult and affects patients' clinical outcomes.¹³ It was

reported that among those readmitted after major cancer surgery, 22% to 79% are readmitted to a hospital other than that where the index cancer surgery was performed.^{1,7,14-18} Such non-index readmissions constitute a form of care fragmentation and challenge care coordination between index and readmitting hospitals.¹⁸ Despite the ponderous evidence from medical research that associates provider continuity with better patient outcomes and provider fragmentation with lower quality of care and higher costs,¹⁹⁻²² this hypothesis has not been sufficiently tested in postoperative settings. In the case of major cancer surgery, readmissions are known to be strongly driven by surgical complications,^{2,4-6,10,17,23,24} making provider and information continuity particularly relevant in such scenarios. However, the relationship between location and outcomes of readmission remains largely unexplored among cancer patients, with the exception of gastrectomy and radical cystectomy.^{15,25}

Owing to today's landscape of drastic regionalization in major cancer surgery, it is even more challenging to keep postdischarge care continuous and coordinated. An increasing proportion of patients might be readmitted to non-index hospitals as a result of the growing burden for patients to travel to the operative index hospital.^{26,27} It is therefore critical to evaluate causes and consequences of non-index readmission to inform clinical practice and policies on postdischarge patient management. To close this gap, our study sought to answer 3 central questions about this issue. First, what is the prevalence of non-index hospital readmissions after major cancer surgery? Second, what are the potential demographic and clinical drivers behind these readmissions to non-index hospitals? Third, is non-index readmission associated with worse outcomes, such as mortality and repeated readmissions?

METHODS

Data source

We chose to include the following 6 major cancer surgery procedures, all of which are complex oncologic resections performed in inpatient settings involving relatively high risk: esophagectomy, gastrectomy, pancreatectomy, hepatectomy, proctectomy, and lung resections.^{28,29} We identified 69,128 adult patients who underwent 1 of these 6 major cancer operations as the primary inpatient procedure between January 1, 2004 and September 30, 2011 from State Inpatient Database (SID) of California using ICD-9-CM procedure codes (Appendix 1; available online).

We chose to focus specifically on cancer procedures because cancer care requires a multidisciplinary team where care coordination is particularly crucial, and

readmission after surgery has been known to affect cancer patients by delaying life-saving adjuvant therapies.³⁰ In addition, cancer operations will likely be included in the target procedures of Affordable Care Act readmission penalties. This has been implied as part of the growing emphasis on bundle payment for oncology care, which has underestimated the impact of surgical treatment in cancer therapy outcomes.

The SID discharge database is a part of the AHRQ Healthcare Cost and Utilization Project.³¹ To appropriately track individual patients and their readmission, we restricted our sample to discharge records with a nonmissing person ID (visitLink³²) and the first complex cancer surgery on record for each patient. Our analytical dataset consists of 9,233 patients who were readmitted to a hospital in California within 30 days of index discharge. Patients transferred to other short-term hospitals at the end of index admission ($n = 49$) were excluded from the analysis.

To include hospital factors in the analyses, we linked the SID database to the 2009 American Hospital Association Annual Survey Database, a census of hospitals with detailed information on hospital structure and resources.

Variables

The variable of primary interest was the location of the first unplanned readmission within 30 days of the index admission. Location of readmission was dichotomized as index (where the index major cancer surgery was performed) hospital or non-index hospital. To qualify as an unplanned readmission, the hospitalization must be unscheduled and not a transfer (which does not constitute a new episode of hospitalization).

Patient characteristics included age, sex, race, insurance type, and location of residence (metropolitan vs micropolitan/rural). Patient's level of comorbidity was captured using Charlson's algorithm with Deyo's adaptations.³³ Hospital characteristics included region, teaching status, hospital control, bed size, system membership, and presence of cancer program. Year of admission was used as a categorical variable to adjust for possible fluctuations in yearly data collection. Dispositions from index admission were classified as routine, transfer to other facilities (excluding short-term hospitals, including skilled nursing facility, intermediate care facility, etc), home health care, and other. Counties in California were combined into 2 categories: Los Angeles/Bay Area and other.³⁴ It should be noted that only the county of hospitals, but not of patient residence, was available from SID.

Readmission diagnoses were classified using Clinical Classification Software developed by Healthcare Cost and Utilization Project.³⁵ The first 5 diagnoses on the

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