

Postdischarge complications following nonoperative management of blunt splenic injury

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Abstract

BACKGROUND: Nonoperative management (NOM) is the standard of care in majority of blunt splenic injuries. However, little is known about the postdischarge complications.

METHODS: Patients admitted for blunt splenic injury were identified in the California State Inpatient Database (2007 to 2011). We examined patterns and risk factors for postdischarge complications among these patients.

RESULTS: In total, 2,704 (61.45%) patients had NOM without splenic artery embolization (SAE) and 257 (5.84%) had NOM with adjunct SAE. Thirty-day readmission rate was higher in those who had adjunct SAE (12.84% vs 7.36%, $P = .002$). Subsequent operations during readmission were seen in 18.10% of readmitted patients and 38.10% of all patients were readmitted at nonindex hospitals. Major diagnoses on readmission were spleen injury (36.2%) and respiratory complications (9.05%). Adjunct SAE was an independent risk factor for readmission (adjusted odds ratio 1.82, 95% confidence interval 1.19 to 2.78).

CONCLUSIONS: Nearly one fifth of readmitted patients initially managed nonoperatively required an operative intervention. Improving predischarge assessments and postdischarge follow-up may reduce readmissions among these patients.

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Nonoperative management (NOM) of blunt splenic injury (BSI) has been well established to be the standard of care in hemodynamically stable patients.¹ Although there are ample data that support the choice of NOM for treating BSI in stable patients,¹ few studies focus on outcomes of these patients following discharge. Failure of

NOM has been extensively studied among hospitalized patients, with failure usually occurring within 3 days of injury for the majority of patients.^{2,3} “Successful” cases of NOM in these studies are those who are discharged without having operations, thus forming the basis of recommending NOM in certain groups of patients. Because patients with traumatic injuries are at risk for complications following discharge⁴ and late complications of BSI have been previously reported,^{5,6} it is important to assess these complications among patients managed nonoperatively.

Studies that have assessed postdischarge outcomes in this patient population have been limited to single institution studies.^{2,7} There is evidence that trauma patients often return to hospitals different from the hospital of initial presentation.⁴ This implies that the majority of these studies do not provide a complete depiction of the outcomes in these patients following discharge. In addition, because individual hospitals have distinct management protocols before discharge, the results of these studies are not necessarily generalizable. Furthermore, previous studies do not distinguish patients who received adjunct splenic artery embolization (SAE) from other patients managed nonoperatively.⁸ Because of the unique selection criteria of these patients as well as the exposure to invasive procedures, it is possible that their postdischarge characteristics may differ from other patients.

Therefore, to accurately measure the postdischarge complications following NOM of BSI regardless of the hospital of presentation, we performed a statewide analysis of BSI patients discharged after successful NOM. To observe subtle differences between groups, we examined NOM patients who had adjunct SAE and those who did not separately.

Methods

Data source and study population

The California State Inpatient Database is a data repository of the Healthcare Cost and Utilization Project,⁹ Agency for Healthcare Research and Quality and comprises all discharge records from more than 98% of the hospitals in the State of California. Between 2007 and 2011, 19,920,098 discharge records were entered into the database.⁹ Individual patients are assigned unique patient identifiers that make it possible to track multiple admissions regardless of the hospital they are admitted. Diagnoses and procedures associated with each admission are recorded using International Classification of Disease, 9th revision (ICD-9) codes.¹⁰ This study was deemed Institutional Review Board exempt by the Partners Institutional Review Board, with protocol number 2014P002072.

Patients between 18 and 64 years old discharged from January 2007 to November 2011 with admitting ICD-9 diagnosis codes corresponding to splenic injury were included. Patients who were transferred to another acute

care facility or those who had E-codes indicating penetrating causes of injury were excluded.

Patients who had any procedure during their admission that corresponded to operations performed for BSI were classified as having operative management of BSI. All other patients were classified as having NOM. The subgroup of patients who had adjunct SAE was identified by the presence of ICD-9 procedure codes associated with SAE during a BSI admission. The full list of ICD-9 codes used to make these classifications can be found in [Appendix A](#).

Study variables

We assessed demographic variables of the patients including age (<45, ≥45), sex, race/ethnicity (White, Black, Hispanic, Others), and insurance type (public, private, self-pay, others including Worker’s Compensation, County Indigent Programs, and other Government aids).

We included details of clinical characteristics such as comorbidities as measured by the Charlson Comorbidity Index, which was calculated by the CHARLSON module in Stata 13 (StataCorp, Cary, NC).¹¹ The Charlson Comorbidity Index includes 19 diseases weighted on the basis of their association with mortality, ranging from 0 to 37 with a higher score indicating greater comorbidity.¹¹ The Charlson score was categorized as less than 2 and greater than or equal to 2. Anatomic severity of injury was measured by the Injury Severity Score (<9, 9 to 15, 16 to 24, ≥25), calculated with the ICD Programs for Injury Categorization (ICDPIC) module in Stata.^{12,13} The American Association for the Surgery of Trauma grade of splenic injury (I/II, III/IV,V) was derived from the ICD-9 codes.¹⁴

Other variables measured include length of index admission stay (0 to 3, 4 to 7, >7), discharge disposition (home, skilled nursing facility/intermediate care facility, Home Health Care, leave against medical advice), and the presence of in-hospital complications determined by new diagnoses made during admission.

Assessment of postdischarge complications and characteristics of readmission

All patients who were readmitted to a hospital within 30 days of discharge were identified. The reasons for readmission were assessed using the admitting ICD-9 diagnosis codes on readmission. These ICD-9 diagnosis codes were classified into previously described categories including gastrointestinal, infectious, respiratory, psychiatric, musculoskeletal, and pain-related complications.¹⁵ Additional categories were included for this unique population namely diagnosis of spleen injury and musculoskeletal complaints.

The location of readmission was also assessed. Patients who were readmitted at hospitals different from the hospitals they were initially admitted were identified. Other characteristics of readmitted patients assessed include the

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