

**Critical Review Form
Economic Evaluation**

[Rattan R, Parreco J, Namias N, Pust GD, Yeh DD, Zakrison TL. Hidden Costs of Hospitalization After Firearm Injury: National Analysis of Different Hospital Readmission. Ann Surg. 2018 May;267\(5\):810-815.](#)

Objectives: “to identify the risk factors and costs associated with readmission nationally, including readmission to a different hospital, after firearm injury.” (p. 810)

Methods: This retrospective cohort study was conducted using the [Nationwide Readmissions Database \(NRD\)](#) to identify patients admitted for a firearm injury in 2013 and 2014. This database comprises admissions across 22 states and represents 51.2% of US hospitalizations. It also includes total charges billed by the hospital and [methodology to convert charges to estimated cost.](#) The NRD was used to identify the first hospital readmission, within 30 days after discharge. Using the total charges and the conversion process, the cost of each admission and readmission were calculated.

Patients who died during the index admission were excluded, as were those with missing data and those whose discharge disposition was transfer to a short-term hospital. All patients had an [Injury Severity Score \(ISS\)](#) and [Charleston Comorbidity Index \(CCI\)](#) calculated, and the intent of each injury was determined.

Out of 54,201 patients in the database for 2013 and 2014, 1333 (2.5%) were excluded due to missing data. Of the remaining patients, 45,462 were admitted following firearm injury, of whom 7.6% were readmitted within 30 days. Among these readmissions, 16.8% occurred at a different hospital from the index admission. Higher rates of readmission were seen with self-inflicted injury, age ≥ 65, primary payer of Medicare, CCI > 0, ISS > 15, LOS > 7 days, major operating room procedure, and nonroutine discharge.

Guide		Comments
I.	Are the Recommendations Valid?	Answer questions IA-D below
A.	Did the investigators adopt a sufficiently broad viewpoint?	Yes. The authors included all patients enrolled in the NRD with readmission following a firearm injury, regardless of the nature or severity of the injury.
B.	Are the results reported separately for patients whose baseline risk differs?	Sort of. The authors did assess risk factors for hospital readmission or readmission to an outside hospital. Several risk factors were identified as independent predictors, but the

		authors did not provide actual costs for each subgroup.
C.	Were costs measured accurately?	Likely yes. The total charges billed by the hospital were available in the NRD, as was a methodology for converting hospital to charges to actual cost that includes variations across hospitals and conditions. The validity of this methodology is not known but should presumably provide an accurate estimate of cost.
D.	Did investigators consider the timing of costs and outcomes?	Yes. Specifically, the authors wanted to assess the “hidden” cost of hospital readmission within 30 days to a different hospital. No specific justification is provided for the timeframe of 30 days, but this should capture the majority of hospital readmissions for immediate complications of the initial injury, though not for the long-term complications associated with some injuries.
II.	What Are the Results?	Answer questions II A-C below.
A.	What are the incremental costs and effects of each strategy?	<ul style="list-style-type: none"> • The overall cost of initial admission for a firearm-related injury was \$1.45 billion. <ul style="list-style-type: none"> ○ The median cost for each admission was \$14,907 (IQR 7956-28,654). • The total cost of 30-day readmissions following hospitalization for a firearm-related injury was \$54.2 million. <ul style="list-style-type: none"> ○ The median cost for each readmission was \$8311 (IQR 4320-16772).
B.	Do incremental costs and effects differ between subgroups?	<ul style="list-style-type: none"> • 61.6% of the cohort were victims of assault while 27.2% suffered accidental firearm injury. <ul style="list-style-type: none"> ○ The intent of injury had no effect on 30-day readmission rates. • The overall median age was 27 years and the median age of readmitted patients was 29 years. The median age of patients readmitted to a different hospital was 32 years. <ul style="list-style-type: none"> ○ Age group did not have a significant impact on readmission rates. • Patients with an ISS > 15 were at increased risk for readmission (OR 1.41, 95% CI 1.30 to 1.53). • LOS > 7 days was associated with increased risk of readmission (OR 1.43, 95% CI 1.31 to 1.56) but a decreased risk of readmission

		<p>to a different hospital (OR 0.61, 95% CI 0.49 to 0.76).</p> <ul style="list-style-type: none"> • Need for a major operating room procedure was associated with increased risk of readmission (OR 1.40, 95% CI 1.28 to 1.53), but not readmission to a different hospital (OR 0.61, 95% CI 0.49 to 0.76). • Private insurance was associated with a decreased rate of readmission (OR 0.81, 95% CI 0.72 to 0.90). • While median income was not associated with increased risk of readmission, patients in the highest quartile (\$64K or more) were at increased risk of readmission to a different hospital (OR 1.43, 95% CI 1.01 to 2.12). • Nonroutine disposition, particularly leaving AMA, was associated an increased risk of readmission and readmission to a different hospital.
C.	How much does allowance for uncertainty change the results?	This was not addressed in this study.
III.	How Can I Apply the Results to Patient Care?	Answer questions III A-C below.
A.	Are the treatment benefits worth the harms and costs?	N/A. This study did not assess the cost of a particular treatment or strategy, but rather the economic impact of hospital readmission following firearm injuries.
B.	Could my patients expect similar health outcomes?	Yes. This study was conducted on a cohort of patients admitted to the hospital following firearm injury in the US and should be similar to our patient population. Only 20.4% of patients in the cohort had private insurance, which is likely similar to those patients suffering GSW seen in our institution.
C.	Can I expect similar costs at my setting?	Likely yes. Again, this study was conducted in the US, and while costs may vary from institution to institution, it seems likely that costs at our institution would be similar to most hospitals that admit patients for firearm injuries.

III.	How Can I Apply the Criteria to Patient Care?	
A.	<p>Are the criteria relevant to your practice setting?</p> <p><i>Medical practice is shaped by an amalgam of evidence, values, and circumstances; clinicians should consider their local medical culture and practice circumstances before importing a particular set of audit criteria.</i></p>	Yes. We see a large of number of patients suffering firearm injuries and would expect similar rates of hospital readmission and similar costs associated with care.
B.	Have the criteria been field-tested for feasibility of use in diverse settings, include settings similar to yours?	N/A.

Limitations:

1. Cost was not directly measured, but was calculated based off of hospital charges using a [conversion ratio](#), which may over or under-estimate the actual costs.
2. There were 1333 cases excluded due to missing data, representing 2.5% of the entire cohort.
3. The database does not appear to track readmissions to a different state.
4. Some predictor variables, such as need for a “major operation” were not well-defined.
5. Despite purportedly attempting to identify the “hidden” costs associated with readmission to a different hospital, the authors did not quantify these costs in this study.

Bottom Line:

This retrospective chart review of patients admitted to the hospital following firearm injuries found that the overall cost of initial admission was \$1.45 billion, while the costs of 30-day readmission was \$54.2 million. Several factors were associated with an increased risk of readmission, including ISS > 15, hospital LOS > 7 days, need for a major operating room procedure, and lack of private insurance.