Cost of Incisional Hernia After Emergent Laparotomy in Older Adults: A National Cohort Analysis

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Introduction

- Incisional hernia is a frequent and costly complication following emergent laparotomy, especially among older adults
- Despite improvements in technique, the burden of subsequent hernia formation and repair remains substantial regardless of surgical approach
- **The cost associated with downstream sequelae is poorly explored**

Objectives

- **Primary:** Define costs associated with post-operative hernia after emergency general surgery by surgical approach (MIS vs Open)
- **Secondary:** Quantify hernia diagnosis and repair rates within 2 years
- **Tertiary:** Evaluate the impact of surgical approach, comorbidity, and frailty on cost outcomes

Methods

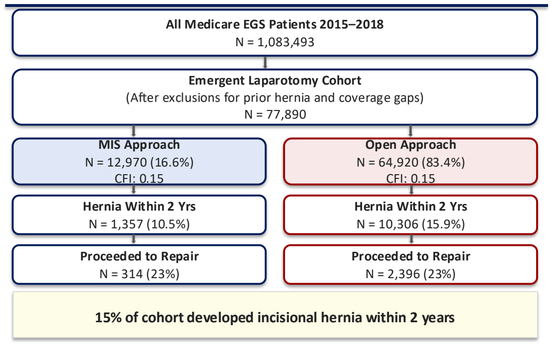
- **Design:** National retrospective cohort of Medicare beneficiaries ≥65.5 years (2016–2018)
- **Population:** Emergent laparotomy for abdominal emergency general surgery
  - EGS diagnoses identified using **NELA (National Emergency Laparotomy Audit) diagnostic categories**: colorectal (colitis, neoplasm, diverticular disease, obstruction, volvulus), upper GI (perforation, PUD, bleeding, obstruction), and vascular emergencies
  - EGS procedures identified using **Shafi procedure codes** for emergent abdominal operations
- **Exclusions:** Hernia diagnosis at index or within 6 months prior; femoral/inguinal hernia only; incomplete Medicare Part A/B coverage; HMO enrollment
- **Cost Analysis:** Patient-level costs calculated across four phases (see Definitions)
- **Statistical Analysis:** Multivariable quantile regression adjusting for surgical approach, age, frailty (CFI), race, sex, year, dual eligibility, index diagnosis, Angus sepsis score, index procedure, and Elixhauser comorbidities

Definitions: Cost Phases

Phase	Definition
Index hospitalization	All inpatient costs during index admission
Discharge → diagnosis	All claims from discharge to hernia diagnosis
Diagnosis → repair	All claims from diagnosis to repair
Total downstream	All claims from discharge through repair
Total episode	Total cumulative cost = index + total downstream repair

For patients without hernia diagnosis or repair, costs calculated through equivalent time windows (200 days to diagnosis, 400 days to repair) based on median time-to-event in the hernia cohort.

Patient Flow



Results

77,890	15.0%	23.0%
Final cohort patients	Hernia within 2 years	Repair among hernia

Groups were similar at baseline:

- Frailty Index (CFI): 0.15 vs 0.15 (p=0.11)
- Dual eligibility: 10.9% vs 11.3% (p=0.15)
- CHF: 14.1% vs 14.9% (p=0.02)
- Obesity: 12.5% vs 13.0% (p=0.12)

Table 1. Risk-Adjusted Outcomes

Outcome	MIS	Open	OR (95% CI)	P
Hernia (2 yr)	**10.5%**	**15.9%**	**1.52 (1.42–1.62)**	**<0.001**
Index mortality	5.2%	8.7%	1.62 (1.48–1.77)	<0.001
Any complication	31.4%	48.8%	1.70 (1.62–1.78)	<0.001
30-day readmit	19.1%	24.1%	1.17 (1.12–1.24)	<0.001
Routine disch.	43.0%	25.6%	0.54 (0.52–0.57)	<0.001
SNF discharge	21.7%	28.9%	1.30 (1.24–1.37)	<0.001
Median LOS	8 d	10 d	—	<0.001
ICU utilization	41.3%	56.8%	—	<0.001

All p < 0.001. Adjusted for age, CFI, Elixhauser comorbidities.

Table 2: Independent Cost Drivers

Factor	Δ Cost	95% CI
Open (vs MIS)	+$1,196	$1,001–$1,391
Frailty (per CFI unit)	+$3,821	$1,948–$5,695
LOS (per day)	+$830	$810–$849
Dual eligible	+$1,347	$1,017–$1,677
Vascular emergency	+$8,767	$8,066–$9,468
Sepsis (Angus criteria)	+$3,486	$3,196–$3,776
Upper GI emergency	+$2,011	$1,760–$2,262
Weight loss	+$2,423	$2,179–$2,667
Severe renal failure	+$2,856	$2,316–$3,396
CHF	+$1,185	$861–$1,509
Chronic lung disease	+$725	$507–$943

Table 3: Cost by Surgical Approach & Hernia Diagnosis

Group	Index	Downstream	Episode
MIS, no hernia	$19,729	$27,932	$47,661
MIS, hernia	$19,660	$28,683	$48,343
Open, no hernia	$24,510	$29,032	$53,542
Open, hernia	$23,743	$29,402	$53,145

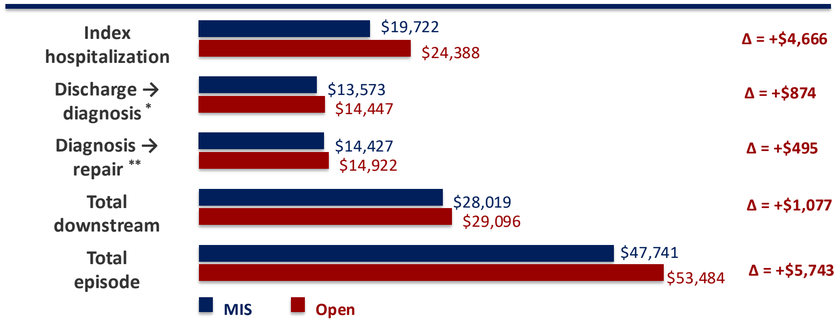
Downstream costs for non-hernia patients may reflect utilization unrelated to index surgery (frailty, comorbidities, etc.)

Interpretation: open laparotomy = more expensive at every phase of care. Approach = dominant *modifiable* cost driver. Increased cost likely driven by longer LOS, higher ICU utilization, and greater complication rates observed in the open group.

Limitations

- Observational design with possible residual confounding despite comprehensive adjustment
- Claims-based hernia detection may underestimate true incidence
- Cannot capture intraoperative decision-making or technical factors

Figure 1:Cost Cascade for Hernia Patients by Surgical Approach



Total episode difference: Δ = $5,743 per patient.

*Hernia patients only (MIS n=1,357; Open n=10,306) ** Among hernia patients proceeding to repair (MIS n=314; Open n=2,396)

Conclusions

Population-Level Burden:

- **15% developed hernia within 2 years**; 23% of these proceeded to repair
- Hernia patients cost **$48,000–$53,000 per episode** (index through repair)
- Total downstream costs (discharge → repair): **$28,000–$29,000** per hernia patient

Mechanism (Adjusted Analysis):

- Cost differences were driven by **approach selection** and associated complications/utilization
- Open surgery patients had higher costs **regardless of hernia status**
- Frailty and comorbidities independently amplified costs (+$3,821/CFI unit)
- Consider MIS when feasible in emergency general surgery

Discussion

- Hernia diagnosis and repair following emergent laparotomy represent a **considerable clinical and financial burden** in the aging population. Hernia is a surgery-attributable complication that can be measured, prevented, and tracked — making it an ideal quality metric for EGS.
- Current policy should incorporate post-laparotomy **hernia incidence and repair rates into cost projections and bundled-payment models** to more accurately inform resource allocation and drive quality improvement in surgical care.

Policy / Clinical Implications

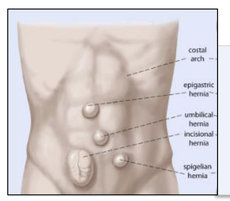
In older adults undergoing emergent laparotomy:

✓ **15% develop hernia** — substantial, measurable, surgery-attributable

✓ **Hernia episode costs $48K–$53K** — supports inclusion in bundled payments

✓ **Hernia may be a marker for higher utilization**

✓ **Surgical approach is the modifiable cost driver** — MIS saves ~$5,700/patient



TAKE HOME POINT:

- Track hernia rates as a quality metric in EGS for patients ≥65 years
- Adopt MIS when feasible to reduce hernia incidence and downstream costs

References

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