

# Are We Underutilizing Minimally Invasive Approaches to Emergency General Surgery Conditions in Older Adults? A Nationwide Cohort Study

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## Introduction

- Minimally Invasive Surgery (MIS) improves recovery in elective surgery, but its role in emergency general surgery (EGS) for older adults is less well defined.
- This study evaluated national practice patterns and outcomes for MIS versus open emergent inpatient laparotomy.

## Background

- Older adults represent a high-risk EGS population with substantial perioperative morbidity, mortality, and non-home discharge.
- Understanding whether MIS is underused—and whether outcomes differ after adjustment for case mix—has direct clinical relevance.

## Objectives

- Characterize current use of MIS among older adults undergoing emergent laparotomy.
- Compare adjusted outcomes for open versus MIS approaches.
- Visualize diagnosis mix and risk-adjusted outcome profile by operative approach.

## Methods

- Design:** Nationwide retrospective cohort study of fee-for-service Medicare beneficiaries undergoing laparotomy (MIS vs open) during EGS hospitalization, 2016–2018
- Population:** Patients ≥65 years with emergent laparotomy for EGS condition
- Patient Identification:**
  - EGS diagnoses identified using National Emergency Laparotomy Audit (NELA) diagnostic categories
  - Procedures identified using Shafi procedure codes for emergent abdominal operations

## Statistical Model

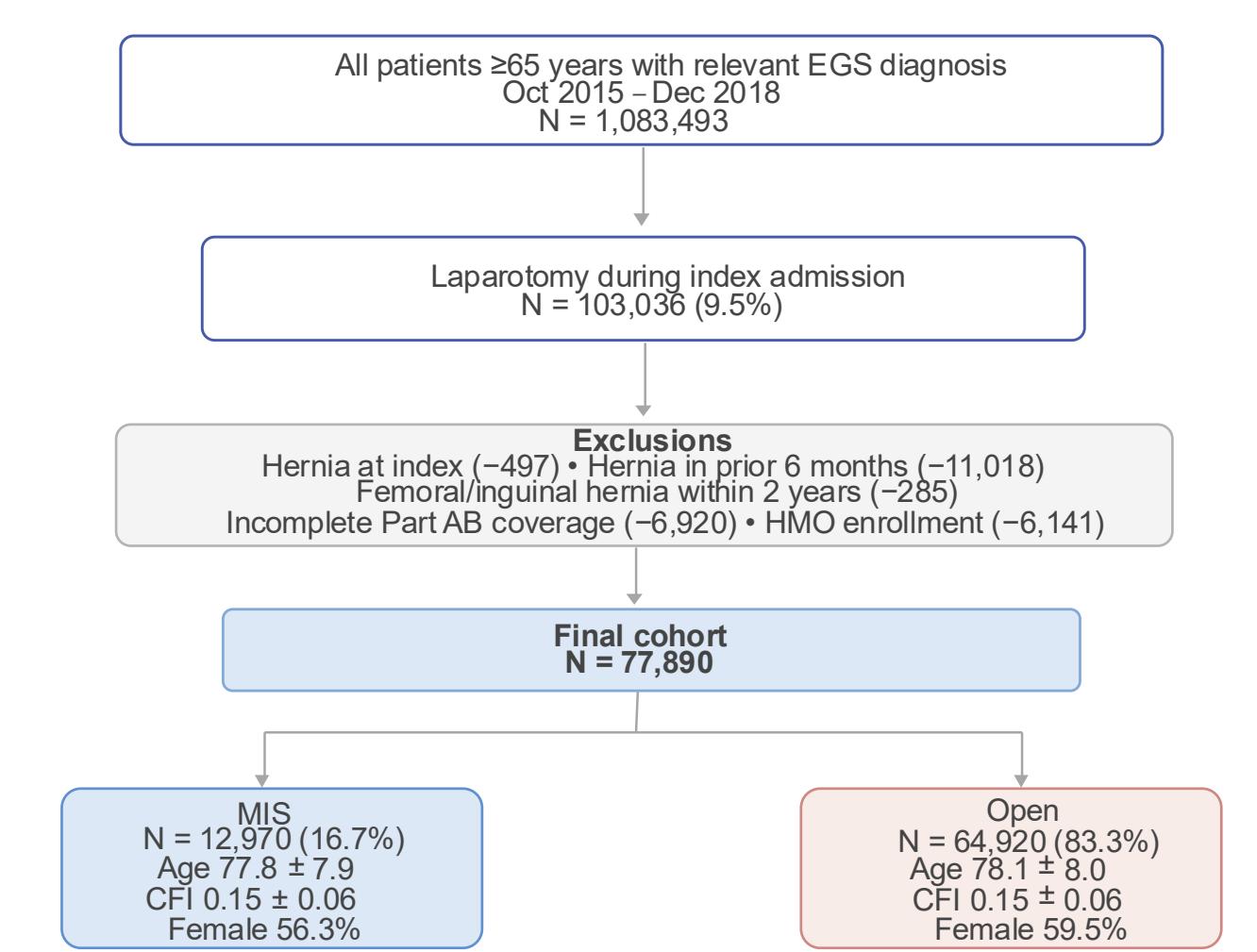
- Exposure: open laparotomy versus MIS (reference).
- Primary adjusted analyses focused on inpatient mortality, 30-day readmission, SNF discharge, index complication, 2-year hernia diagnosis, and routine discharge.

## Adjustment Variables

- Age
  - Claims-Based Frailty Index
  - Race
  - Sex
  - Year of index admission
- Dual eligibility
  - Index diagnosis
  - Angus sepsis score
  - Individual Elixhauser comorbidities

**Novelty:** To our knowledge, no prior national-level study has quantified the minimally invasive surgery utilization gap (16.7%) and evaluated frailty-adjusted outcomes among Medicare EGS patients

## Study Flow



## Results

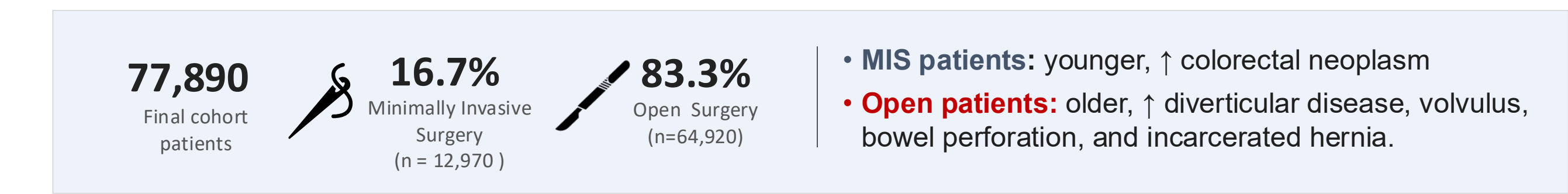


Table 1: Patient Demographics by Surgical Approach

| Characteristic   | MIS (n=12,970) | Open (n=64,920) | P-value |
|------------------|----------------|-----------------|---------|
| Age, mean (SD)   | 77.8 (7.9)     | 78.1 (8.0)      | 0.001   |
| Female           | 56.3%          | 59.5%           | 0.001   |
| White race       | 86.2%          | 86.7%           | 0.001   |
| CFI, mean (SD)   | 0.15 (0.06)    | 0.15 (0.06)     | 0.11    |
| Dual eligible    | 10.9%          | 11.3%           | 0.15    |
| Comorbidities ≥3 | 59.1%          | 61.8%           | 0.001   |

Figure 1: Index Diagnosis by Surgical Approach

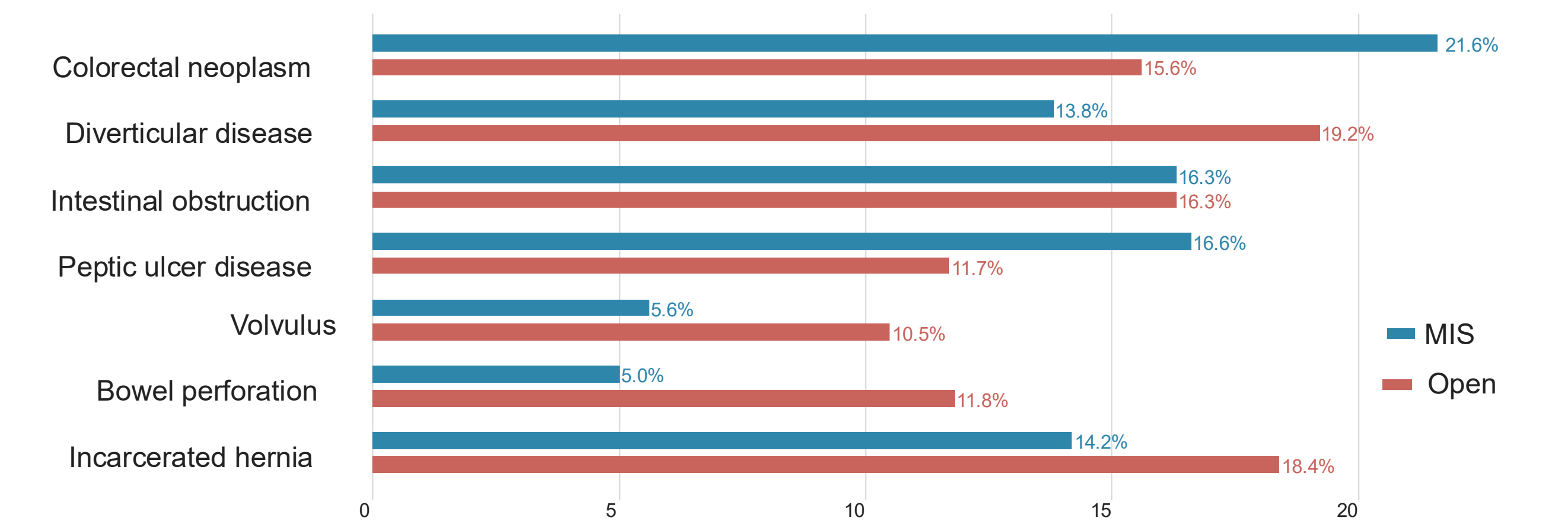
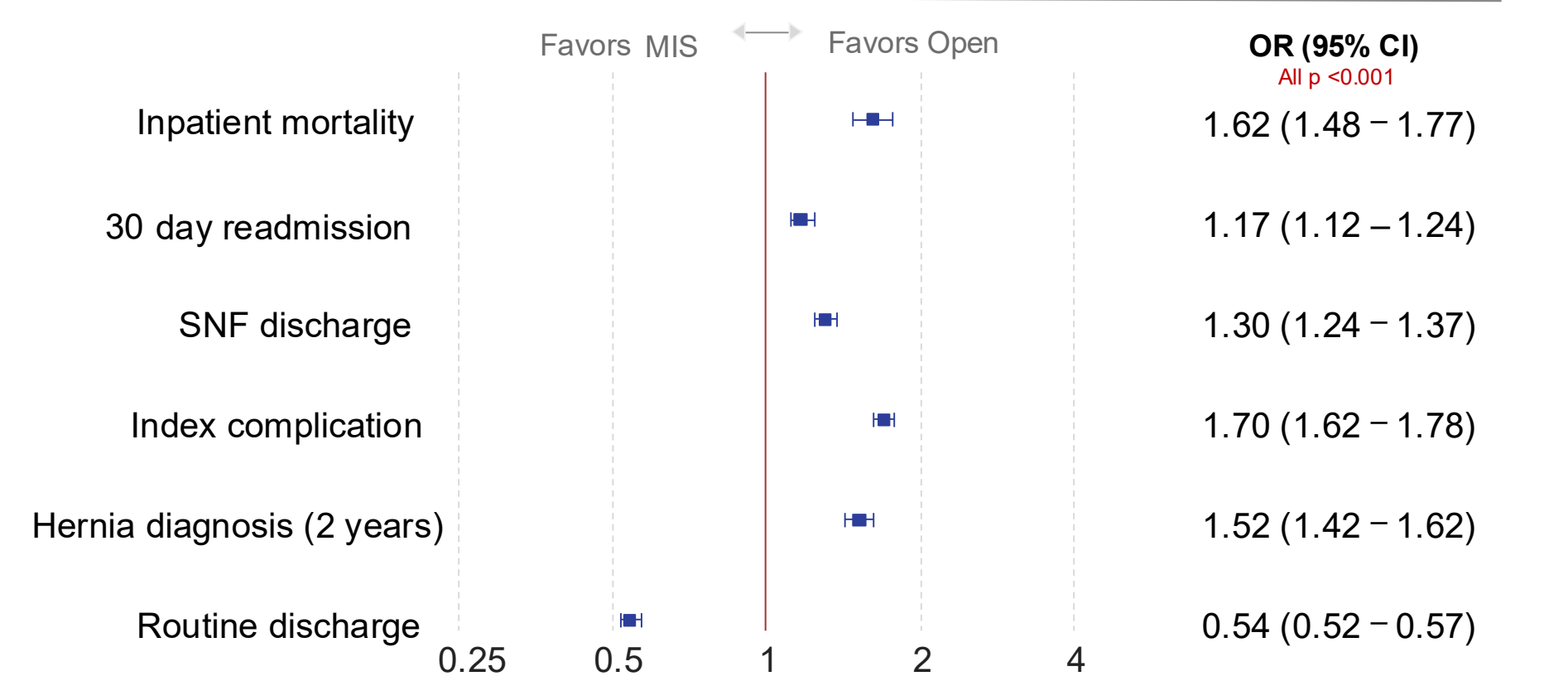


Table 2. Unadjusted Outcomes by Approach

| Outcome            | MIS   | Open  | p     |
|--------------------|-------|-------|-------|
| Index mortality    | 5.2%  | 8.7%  | 0.001 |
| 30-day readmission | 19.1% | 24.1% | 0.001 |
| Routine discharge  | 43.0% | 25.6% | 0.001 |
| Any complication   | 31.4% | 48.8% | 0.001 |
| Mean LOS (days)    | 9.3   | 11.8  | 0.001 |
| Median LOS (days)  | 8     | 10    | 0.001 |
| ICU utilization    | 41.3% | 56.8% | 0.001 |

Figure 2: Adjusted Outcomes by Approach (Open vs MIS)



Reference = MIS. Adjusted for age, CFI, race, sex, year, dual eligibility, Index diagnosis, Angus sepsis score, and Elixhauser comorbidities.

**Interpretation:** OR >1.0 = worse outcomes with open surgery. Open laparotomy associated with higher mortality, complications, readmission, SNF discharge, and hernia diagnosis. Routine discharge is the only variable that favored MIS. **Better outcomes favored MIS across the board.**

## Conclusions

- MIS remained underutilized: only 16.7% of older adults undergoing emergent laparotomy for EGS conditions received an MIS approach.
- Compared with MIS, open laparotomy was associated with higher adjusted odds of inpatient mortality, complications, readmission, SNF discharge.
- These findings support broader adoption of MIS-capable EGS pathways when technically feasible and clinically appropriate.

## Clinical Implications

- ✓ **Utilization gap:** Only 16.7% of eligible older adults receive MIS
- ✓ **Outcomes favor MIS:** Lower mortality, lower readmission, more home discharges
- ✓ **Patient selection matters:** MIS used more for neoplasm; open for perforation/volvulus
- ✓ **Systems opportunity:** Expand MIS-capable EGS pathways

## Limitations

- Retrospective claims-based design; no clinical granularity
- Selection bias possible despite similar frailty indices
- No conversion data; MIS reflects final coded approach only — conversions classified as open, biasing results against MIS
- Medicare only; may not generalize to younger patients

## References

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