General Versus Spinal Anesthesia and 30-Day Pulmonary Complications after Primary Elective Total Hip and Knee Arthroplasty: An ACS NSQIP Analysis

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Background

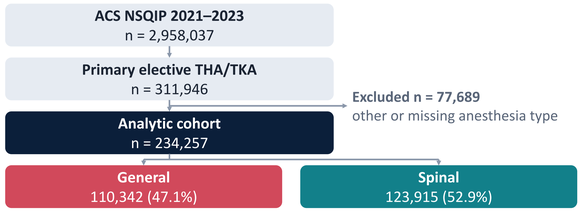
- Pulmonary complications after THA/TKA are rare but drive longer stays, non-home discharge, and death.
- Spinal anesthesia avoids airway instrumentation, positive-pressure ventilation, and neuromuscular blockade.

Aim: compare 30-day pulmonary complications after general vs spinal anesthesia in a contemporary national cohort.

Methods

- **Data:** ACS NSQIP 2021–2023 (>650 U.S. hospitals)
- **Population:** adults undergoing primary elective THA or TKA
- **Exposure:** principal anesthesia, general vs spinal (spinal + GA supplement → GA)
- **Primary outcome:** 30-day composite of pneumonia, unplanned reintubation, or ventilator >48 h
- **Analysis:** modified Poisson (robust variance) adjusted for demographics, BMI, smoking, ASA, mFI-5, procedure, operative time, comorbidities; IPTW, E-value, Holm correction

Cohort flow



58%
higher adjusted risk

General anesthesia was associated with more 30-day pulmonary complications than spinal anesthesia after hip and knee replacement.

aRR 1.58 (95% CI 1.35–1.85), P < .001
234,257 patients · ACS NSQIP 2021–2023

GENERAL ANESTHESIA
0.43%
470 / 110,342 patients

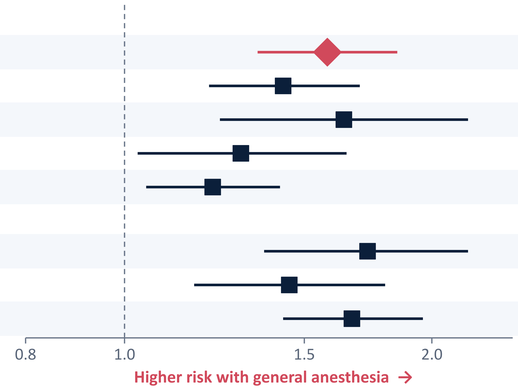
SPINAL ANESTHESIA
0.21%
260 / 123,915 patients

ABSOLUTE DIFFERENCE
+0.22 pp
≈ 1 extra event per 455 patients

Composite 30-day pulmonary complication (pneumonia, unplanned reintubation, or ventilator >48 h), unadjusted rates

Adjusted risk ratios: general vs spinal anesthesia

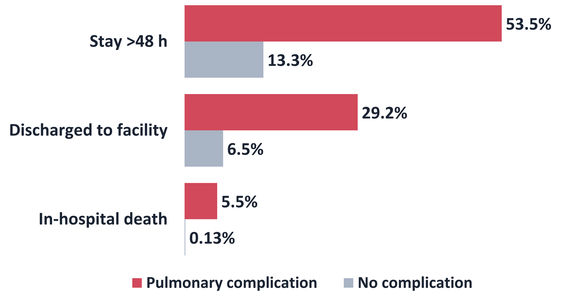
Outcome	aRR (95% CI)
Pulmonary outcomes	
Composite (primary)	**1.58 (1.35–1.85)**
Pneumonia	1.43 (1.21–1.70)
Unplanned reintubation	1.64 (1.24–2.17)
Ventilator >48 h	1.30 (1.03–1.65)
Pulmonary embolism	1.22 (1.05–1.42)
Composite by procedure and weighting	
THA only	1.73 (1.37–2.17)
TKA only	1.45 (1.17–1.80)
IPTW (propensity-weighted)	1.67 (1.43–1.96)



Reference = spinal anesthesia; log scale. Secondary outcomes significant after Holm correction (all P ≤ .03). No THA × TKA effect modification (P = .213).

When a complication occurs

Patients with vs without a pulmonary complication (n = 730 vs 233,527; descriptive)



Robust findings

1.39–1.73
aRR range across all 7 sensitivity & subgroup models

2.54
E-value for unmeasured confounding (CI limit 2.04)

Conclusion

1. GA carried ~1.6× the adjusted risk of 30-day pulmonary complications, consistent in THA and TKA.
2. Absolute risk is low, but each event brings 4× more prolonged stays and ~40× in-hospital mortality.
3. Consider spinal anesthesia when appropriate; observational data, so individualize decisions.

Abbreviations: aRR, adjusted risk ratio; GA, general anesthesia; IPTW, inverse probability of treatment weighting; mFI-5, 5-item modified frailty index; pp, percentage points.

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