Real-world assessment of the impact of intraoperative hypotension on healthcare resource utilization (HCRU) after elective non-cardiac surgery

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Background and Objectives

- Intraoperative hypotension (IOH, defined as mean arterial pressure [MAP] <65 mmHg for a cumulative 15 minutes[1-3]) may be associated with increased mortality, acute kidney injury, myocardial injury, and secondary surgical site infections in non-cardiac surgery patients.[4-7]
- This study aimed to assess healthcare resource utilization (HCRU) in an ePreop31 IOH Quality Measure-defined population[1-3] and to expand upon a previous cost analysis[8] through addition of healthier patients at baseline.

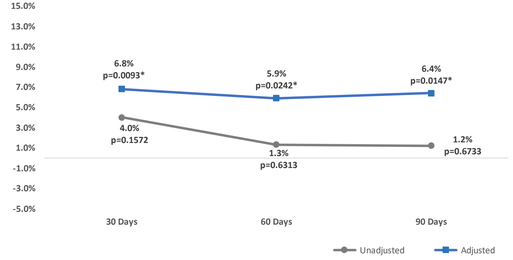
Methods

- Optum Market Clarity Linked Electronic Health Record with Claims dataset was used to identify adults undergoing elective non-cardiac/non-cesarian procedures (2010-2023).
- Patient selection: The ePreop31 IOH Quality Measure was used to define eligible patients/procedures[1-3] with ≥6 months of continuous enrollment before index, and ≥90 days after (or death ≤90 days). Procedures were ≥15 minutes in duration, with start times identified via clusters of MAP readings.[9]
- Outcomes: Costs were assessed for patients with American Society of Anesthesiologists (ASA) class 1-4; HCRU (days with a claim for any service) was assessed for ASA class 2-4.
  - Mean total costs (all claims per patient per time period) and HCRU were presented as descriptive values, and ratios of per patient per day (PPPD; index) costs, per patient per month (PPPM) costs, and HCRU.
- Unadjusted cost and HCRU ratios were calculated using univariate analysis; adjusted ratios were calculated using generalized linear modeling with multivariable analysis using a gamma distribution with log link, adjusting for baseline characteristics, as described previously.[8]

HCRU Results [ASA 2-4]

- The cohort (ASA class 2-4) assessed for HCRU comprised 10,850 patients, of whom 2,038 (18.8%) experienced IOH. Overall adjusted mean HCRU was higher for IOH vs. no IOH by 6.4% at 90d (p=0.0147; Figure 1).

Figure 1. Percentage increase in mean total HCRU associated with IOH, expressed as unadjusted and adjusted HCRU ratios (ASA class 2-4)



* indicates significant results (p<0.05). Data labels represent the percent increase in mean total days with HCRU among the IOH group vs. the no IOH group.
Percentage increases calculated using HCRU ratio (HR = PPPM HCRU for IOH patients / PPPM HCRU for no IOH patients) as: (HR – 1)*100 = % increase

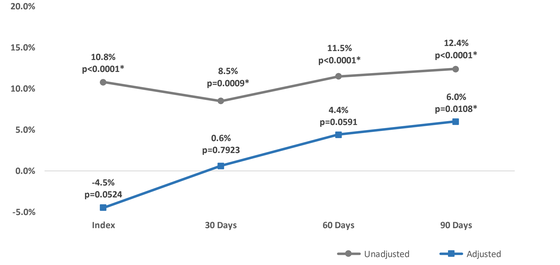
Cost Results [ASA 1-4]

- Among patients in ASA classes 1-4, the incidence of IOH was highest among those in ASA class 1 (Table 1).
- Unadjusted mean total cost ratios showed significantly higher costs among patients who experienced IOH vs. those with no IOH at all time points (Figure 2).
  - Adjusted mean total cost ratios showed significantly higher costs among patients who experienced IOH at 90-days post-index (Figure 2).

Table 1. IOH incidence among patients in ASA class 1-4

		Patient Counts	
		N	Percent
ASA 1	IOH	70	25.2%
	No-IOH	208	74.8%
ASA 2	IOH	758	20.7%
	No-IOH	2,911	79.3%
ASA 3	IOH	1,155	18.3%
	No-IOH	5,170	81.7%
ASA 4	IOH	125	14.6%
	No-IOH	731	85.4%
Total	**IOH**	**2,108**	**18.9%**
	No-IOH	**9,020**	**81.1%**

Figure 2. Percentage increase in mean total cost associated with IOH, expressed as unadjusted and adjusted cost ratios[a] (ASA class 1-4)



* indicates significant results (p<0.05). Data labels represent the percent increase in mean total costs among the IOH group vs. the no IOH group.
[a]Cost ratios of PPPD (at index) and PPPM (30-,60-,90- day follow-up) costs.
Percentage increases calculated using cost ratio (CR = PPPM Cost for IOH patients / PPPM Cost for no IOH patients) as: (CR – 1)*100 = % increase

- Observed unadjusted mean total costs tended to be higher for patients who experienced IOH (vs. no IOH) at all time points for ASA classes 1-3 (Figure 3A and B).
  - For patients in ASA class 4, unadjusted costs at index were lower among patients who experienced IOH, but were higher than patients with no IOH by 60 days post-index (Figure 3B).

Figure 3A. Unadjusted mean total costs of patients who experienced IOH vs. those with no IOH (ASA class 1 and 2)

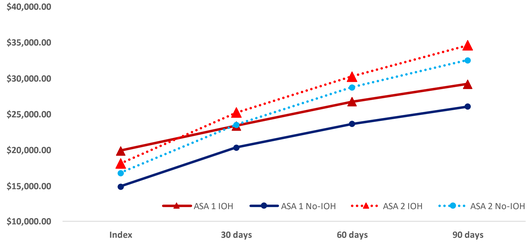
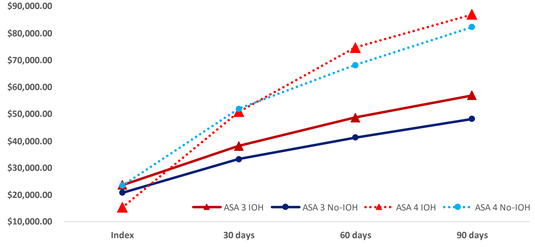


Figure 3B. Unadjusted mean total costs of patients who experienced IOH vs. those with no IOH (ASA class 3 and 4)



ASA, American Society of Anesthesiologists; IOH, intraoperative hypotension

Conclusions

- IOH incidence ranged from 14.6 to 25.2%, depending on ASA class, and was highest among the healthiest patients (ASA 1).
- IOH was associated with higher costs and HCRU vs. no IOH:
  - Among patients in ASA class 1, IOH was associated with an increase of $3,168 in unadjusted costs (90 days post-index).
  - Mean total costs were 6.0-12.4% higher among patients who experienced IOH (adjusted-unadjusted cost ratios at 90 days, p=0.0108 [adjusted], p<0.0001 [unadjusted]).
  - HCRU was 6.4% higher for patients who experienced IOH after adjustment (p=0.0147, 90 days).
- IOH prevention may lead to cost and HCRU savings over the first 3 postoperative months.
- Interventions, protocol-driven strategies, and adoption of innovative monitoring technologies may reduce IOH incidence and mitigate financial and resource burdens.

Limitations

- Study criteria required insurance coverage and specific ASA classification.
- Interventions to mitigate IOH and associated costs were not included.

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Disclosures

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