Budget Impact Analysis for Oliceridine in the Management of Moderate to Severe Acute Postoperative Pain

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BACKGROUND

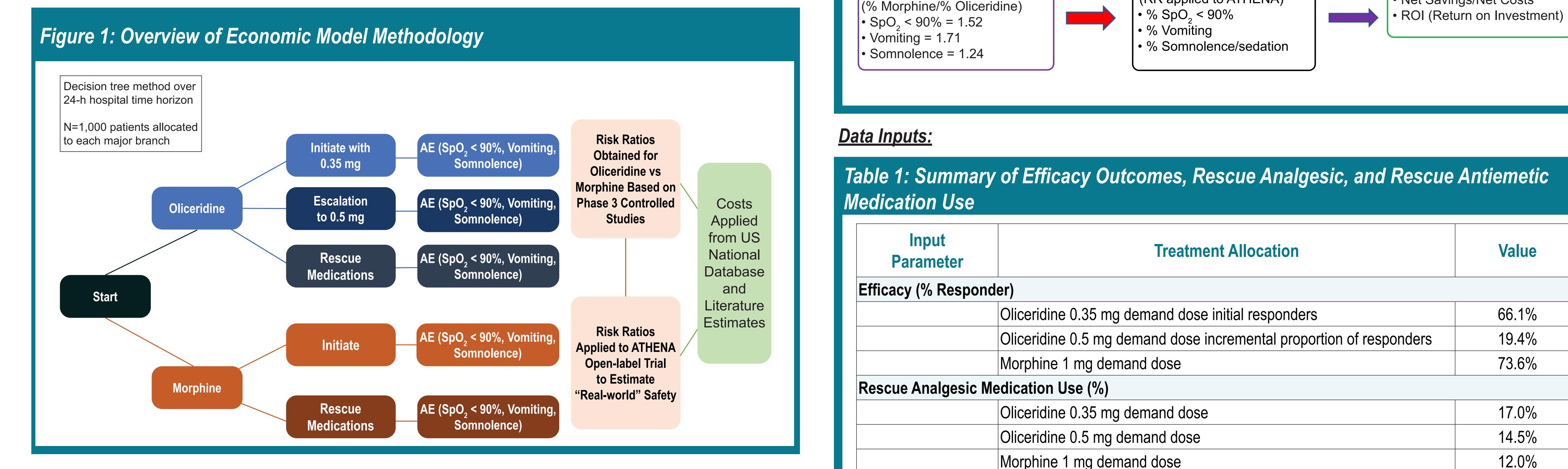
- Based on findings from a national survey, 86% of patients undergoing surgery experienced postsurgical pain overall, and 75% of those described its severity as moderate/extreme during the immediate postoperative period (Gan et al. 2014).
- Opioids remain an important component of therapy for the management of moderate to severe acute postoperative pain (Small and Laycock 2020).
- However, conventional opioids are associated with adverse events (AEs) that can affect patients' health outcomes, compromising optimal postoperative recovery (Small and Laycock 2020; Shafi et al. 2018).
- Oliceridine, a new class of IV opioid analgesic acting at μ-opioid receptors, is selective for G-protein signaling (achieving analgesia) with limited recruitment of β-arrestin [associated with opioid-related adverse events (ORAEs)].

OBJECTIVE

To estimate budget impact of oliceridine compared to morphine for postoperative pain.

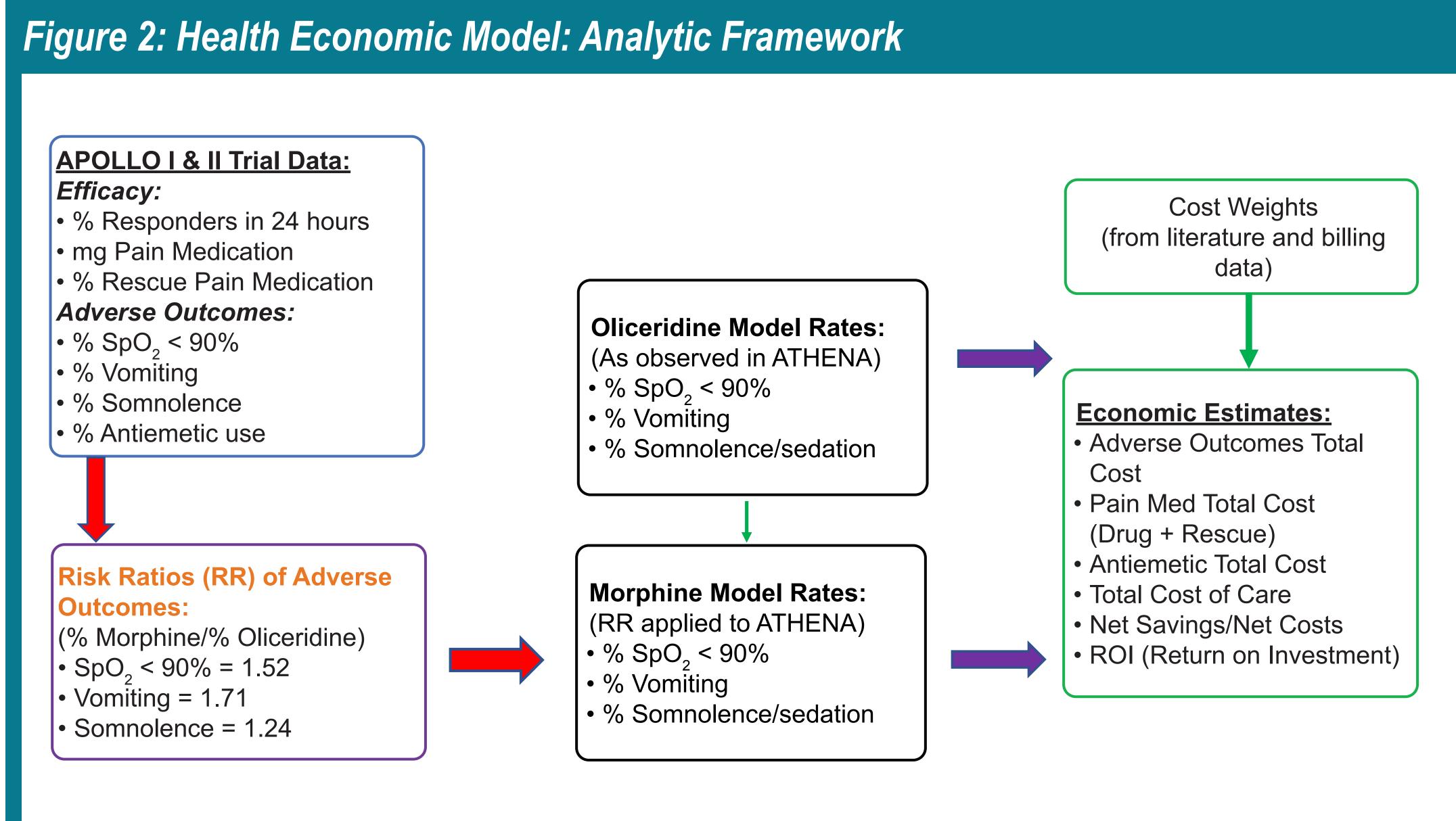
METHODS

- The overview of the economic model methodology is shown in Figure 1.
- We directly compared costs and outcomes of patients managed with demand-dosing of oliceridine (0.35 mg and 0.5 mg) to those with morphine (1 mg), using a decision tree with a 24-hour time horizon (with costs estimated for a sample population of 1,000 surgeries allocated to each arm).



- Nonresponse to oliceridine 0.35 mg demand dose was assumed to lead to escalation to 0.5 mg demand dose and use of rescue analgesics when 0.5 mg demand dose was inadequate. Nonresponse to morphine was assumed to lead directly to use of rescue analgesics.
- Three common and costly ORAEs, oxygen desaturation (SpO₂ < 90%) as a measure of opioid-induced respiratory depression (OIRD), vomiting, and somnolence were utilized.

- Risk ratios were based on adverse event (AE) rates observed in the two pivotal controlled Phase 3 studies (Viscusi et al. 2019; Singla et al. 2019). The pivotal studies used in the model were the basis of FDA approval for oliceridine.
- The risk ratios were then applied to AE rates observed in an open-label Phase 3 safety study of oliceridine (Bergese et al. 2019) to estimate the expected AE incidence in real-world patient sample.
- Costs of analgesics (including rescue) and antiemetics were tabulated based on rates of utilization observed in Phase 3 studies. Standard cost weights from national discharge data and literature sources were used to estimate hospital budget impact & costs for each AE.
- Average daily price was set to \$100 for oliceridine and \$15 for morphine.
- Costs were enumerated as differences in cost of analgesics and differences in resources utilized to manage these AEs in the first 24 hours post-surgery.
- The Analytic Framework of the model is provided in Figure 2.

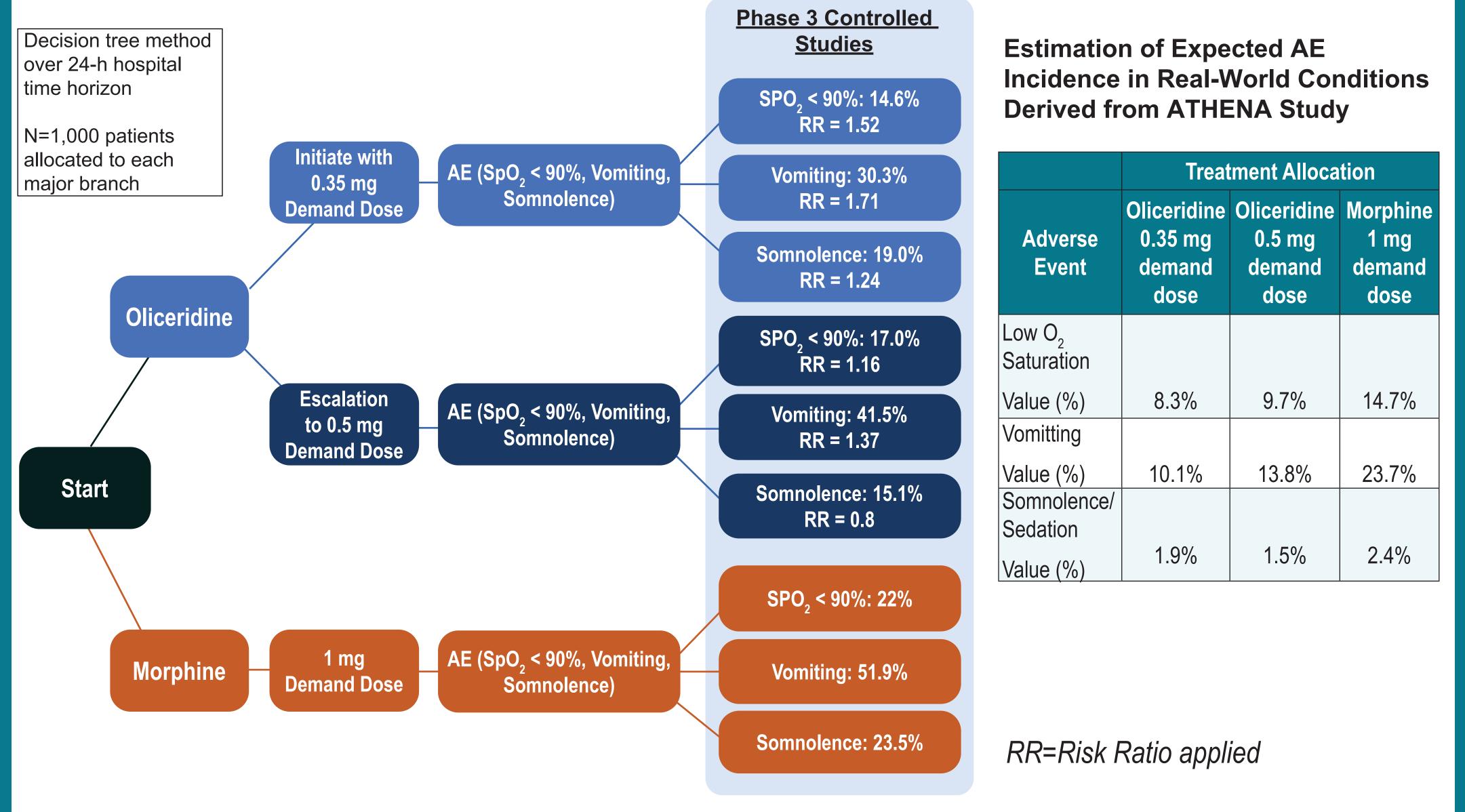


Data Inputs:

Medication Use **Treatment Allocation** Efficacy (% Responder) Oliceridine 0.35 mg demand dose initial responders 19.4% Oliceridine 0.5 mg demand dose incremental proportion of responders Morphine 1 mg demand dose Rescue Analgesic Medication Use (%) Oliceridine 0.35 mg demand dose Oliceridine 0.5 mg demand dose Morphine 1 mg demand dose Rescue Antiemetic Medication Use (%) Oliceridine 0.35 mg demand dose Oliceridine 0.5 mg demand dose Morphine 1 mg demand dose

 AE incidence risk-ratio computation from pooled Phase 3 controlled studies and estimations derived from ATHENA study in high-risk patients is shown in Figure 3.

Figure 3: AE Incidence Risk-Ratio Computation from Pooled Phase 3 Controlled Studies and Estimations Derived from ATHENA Study



RESULTS

 Incremental cost of OIRD, vomiting and somnolence was estimated at \$3,975, \$1,035, and \$991, respectively (Table 2).

Table 2: Health Economic Model Cost Weights for OIRD, Vomiting, and Somnolence Inflated to 2020 US Dollar Costs

Event Type	2020 Cost Weights Used for Base Model*	± 20% Range for Sensitivity Analysis	Cost in 2017 US Dollars (Low- High)
Respiratory depression	\$3,975	\$3,180 - \$4,770	\$4,589
(Low O ₂ saturation)			(\$3,625 - \$5,552)
Vomitting	\$1,035	\$828 - \$1,242	\$1,344
			(\$972 - \$1,716)
Somnolence	\$991	\$793 - \$1,189	\$1,250
			(\$904 - \$6,353)

- Considering cost of analgesics, use of oliceridine resulted in greater medication expenditures compared to morphine (\$127,181 vs \$30,558) (**Table 3**).
- Patients allocated to oliceridine treatment experienced fewer AEs, which resulted in \$324,005 less total cost of AEs (Table 3).
- Sensitivity analyses from the results of the probabilistic sensitivity analysis (e.g., Monte Carlo Simulations) showed that the Base Model estimates are relatively insensitive to variations in the mean model parameters.

Table 3: Estimates for the Comparative Cost of Care for 1,000 Surgical Patients Treated On-Demand with Either Oliceridine or Morphine

	Oliceridine [0.35 mg with escalation to 0.5 mg for nonresponse] (N=1,000)	Morphine 1 mg (N=1,000)	Difference (Oliceridine – Morphine)
Cost of pain medication for 24 hours/patient	\$ 108.14	\$ 15.00	(\$ 93.14)
Response rate %	66.1%	73.6%	(7.5%)
% Escalated to 0.5 mg	19.4%	N/A	N/A
Total number of AEs:	242	408	(166)
Respiratory depression (Low O ₂ saturation)	95	147	(52)
Vomiting	128	237	(109)
Somnolence	19	24	(5)
Cost of pain medication	\$127,181	\$30,558	\$96,623
Cost of managing AEs	\$528,424	\$852,429	(\$324,005)
TOTAL COST	\$656,775	\$885,229	(\$228,454)

The model results shown were based on an assumed average daily cost of oliceridine of \$100/day for the 0.35 mg dose and \$124/day for the 0.5 mg dose, resulting in \$108.14 as the weighted cost for day 1.

The total cost also includes the cost of antiemetics: \$1,170 in the oliceridine arm and \$2,242 in the morphine arm.

CONCLUSIONS

 Oliceridine has a favorable overall impact on the total cost of postoperative care compared to the use of the conventional opioid morphine, despite a modest increase in pharmacy costs.

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