

OPIOID-RELATED ADVERSE EVENTS INCREASE LENGTH OF STAY AND DRIVE UP TOTAL COST OF CARE IN A NATIONAL DATABASE OF POSTSURGICAL PATIENTS

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ABSTRACT

INTRODUCTION:

The primary objective of this retrospective study was to identify the relationship between opioid use and related adverse drug events (ADEs) with increased length of stay (LOS) and total cost in patients undergoing some of the more common surgeries in hospitals in the United States.

METHODS:

The de-identified Premier database was queried for this study. Selection criteria included the following inpatient surgeries: open colectomy, laparoscopic colectomy and cholecystectomy, total abdominal hysterectomy and hip replacement surgery in patients 18 years of age and older between 2008 and 2010. ADEs were defined using ICD-9 diagnosis codes. LOS and total cost outliers were defined as ≥ 1 standard deviation above the mean values. Patients with ADEs in the population were matched (1:3) to patients without ADEs on age, severity of illness (SOI) and gender. Descriptive statistics and regression were used to analyze the outcomes of LOS and total cost. A p-value of <0.05 was considered statistically significant.

RESULTS:

Prior to matching, the incidence of opioid-related ADE was 19.4%. There were 45,342 patients with an opioid-related ADE matched to 135,941 without an opioid-related ADE. The mean unadjusted LOS for patients with an opioid-related ADE was statistically significantly longer than for patients without an opioid-related ADE; 5.2 days (± 3.5) versus 4.1 days (± 2.8) ($p < 0.0001$). The mean unadjusted total cost that included an opioid-related ADE compared to the total cost without an opioid-related ADE was \$18,309 ($\pm 11,267$) and \$17,281 ($\pm 10,209$), respectively. Patients who experienced an opioid-related ADE had a larger percentage of LOS and total cost outliers compared to patients who did not experience an opioid-related ADE; 8.3% versus 5.3% and 13.0% vs. 5.3%, respectively. The adjusted cost variation from the baseline cost was \$1,614 comparing opioid-related ADE to non-ADE and an adjusted LOS variation from baseline LOS of 0.70 days.

DISCUSSION:

From this large national database, postsurgical patients who experienced an opioid-related ADE had a statistically significantly longer LOS and a higher total cost than those without an opioid-related ADE. Reducing the incidence of opioid-related ADEs by reducing opioid dosages and overall consumption may in turn reduce LOS and total hospital costs. Further investigations regarding the impact of opioid dosage on the incidence of related ADEs would shed additional light on how to reduce LOS and hospitalization costs.

Purpose

Approximately 70 million surgeries are performed annually in the United States¹ and up to 70% of these patients experience pain post-surgery.²⁻⁴ Even though a majority of patients experience post-operative pain, insufficient management of pain is common and can lead to profound complications. Better management of postsurgical pain is hampered by the reliance on opioid medications, which are associated with numerous and potentially significant side effects. This retrospective study utilized a large, national hospital database to assess the hospital and healthcare burden of opioid-related adverse events (ORADE) on patient outcomes in patients undergoing open colectomy, laparoscopic colectomy, laparoscopic cholecystectomy, total abdominal hysterectomy, or hip replacement, procedures known to require significant postoperative pain management.

Objectives

- To assess the relationship between postsurgical opioid use and occurrence of opioid-related adverse drug events (ORADE)
- To determine ORADE impact on hospital length of stay (LOS) and total visit cost in unmatched and matched patient populations

Methods

Data Source

This study comprised a retrospective analysis of data queried from the Premier research database. The database is a complete census of all inpatients and hospital-based outpatients from a geographically diverse cohort of hospitals and contains records on approximately 85 million patients across more than 475 hospitals allowing for a broad national representation of results.

Patient selection:

- Hospital discharge between 2008 and 2010
- Adult (18+ years of age) patients having an open colectomy, laparoscopic colectomy, laparoscopic cholecystectomy, total abdominal hysterectomy, or hip replacement

Methods

Patient selection (cont.):

- Postsurgical opioid administration identified through charge master records
- Patients with and without ORADE were assessed in unmatched and matched cohorts (1:3) based on age, APR-DRG severity of illness, and gender

Independent Variables:

- Demographics recorded for age, race/ethnicity, geographic region, and urban/rural status (Tables 1A and 1B)
- ORADEs identified using ICD-9 diagnosis codes for respiratory, GI, CNS, GU events and other probable opioid-related ADEs

Dependent Variables:

- Length of Stay (LOS) and Total Hospitalization Cost (US \$) unadjusted and adjusted for (race, urban status, teaching status of hospital, use of other analgesics)

Statistical analysis:

- Descriptive statistics for continuous data included mean, standard deviation T-tests were used to determine statistical significance between ORADE and no ORADE. Chi-square tests determined significance between ORADE and no ORADE in categorical data and expressed as percentages of patients
- Logistic and Gamma Regression were used for multivariable modeling
- A p-value of ≤ 0.05 was considered statistically significant

Results

Table 1. Unmatched Study Population Patient Demographics

| | ORADE | no ORADE | p-value |
|--------------------------|-----------------|-----------------|---------|
| Number of Discharges | 62,814 | 261,754 | |
| Age at index (mean, SD) | 68.0 \pm 16.4 | 57.0 \pm 17.3 | <0.0001 |
| Gender (% female) | 60.4% | 69.1% | <0.0001 |
| Race/Ethnicity (% white) | 72.0% | 66.4% | <0.0001 |
| Geographic Location | | | |
| Midwest | 20.1% | 18.3% | <0.0001 |
| South | 41.7% | 41.8% | 0.6469 |
| Northeast | 17.9% | 18.3% | 0.0188 |
| West | 20.4% | 21.6% | <0.0001 |

- 19.4% of patients exhibited an ORADE
- Unmatched (Figure 1 & 2)
 - Mean total cost was \$22,579 ($\pm 25,205$) in patients exhibiting an ORADE vs. \$13,043 ($\pm 12,043$) in patients not exhibiting an ORADE (p -value < 0.0001)
 - Unadjusted Mean LOS was 8.3 (± 9.6) days in patients exhibiting an ORADE vs. 4.3 (± 4.4) days in patients not exhibiting an ORADE (p -value < 0.0001)

Table 2. Matched Study Population Patient Demographics

| | ORADE | no ORADE | p-value |
|--------------------------|-----------------|-----------------|----------|
| Number of Discharges | 45,342 | 135,941 | |
| Age at index (mean, SD) | 64.8 \pm 16.4 | 64.4 \pm 16.4 | 0.2575 |
| Gender (% female) | 62.8% | 62.8% | 0.9925 |
| Race/Ethnicity (% white) | 72.0% | 69.8% | <0.0001* |
| Geographic Location | | | |
| Midwest | 20.4% | 20.7% | 0.1254 |
| South | 42.7% | 41.9% | 0.0033* |
| Northeast | 16.8% | 16.0% | 0.0001* |
| West | 20.1% | 21.3% | <0.0001* |

Results

- Matched (Figure 1 & 2)
 - Mean total cost was \$18,309 ($\pm 11,267$) in patients exhibiting an ORADE vs. \$17,281 ($\pm 10,209$) in patients not exhibiting an ORADE (p -value < 0.0001)
 - Unadjusted Mean LOS was 5.2 (± 3.5) days in patients exhibiting an ORADE vs. 4.1 (± 2.8) days in patients not exhibiting an ORADE (p -value < 0.0001)

Figure 1. Mean Length of Stay (Days) Comparing ORADE to no ORADE

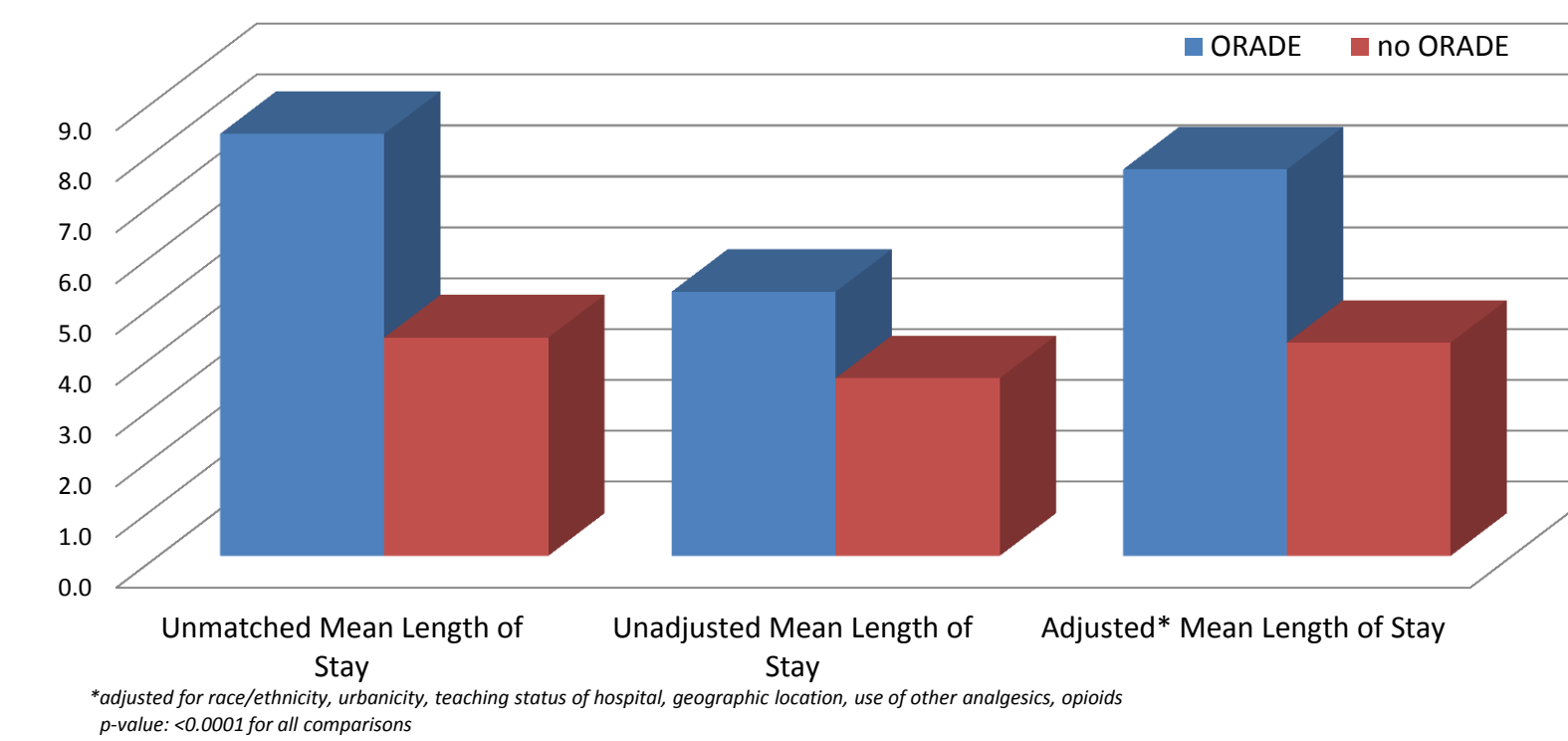
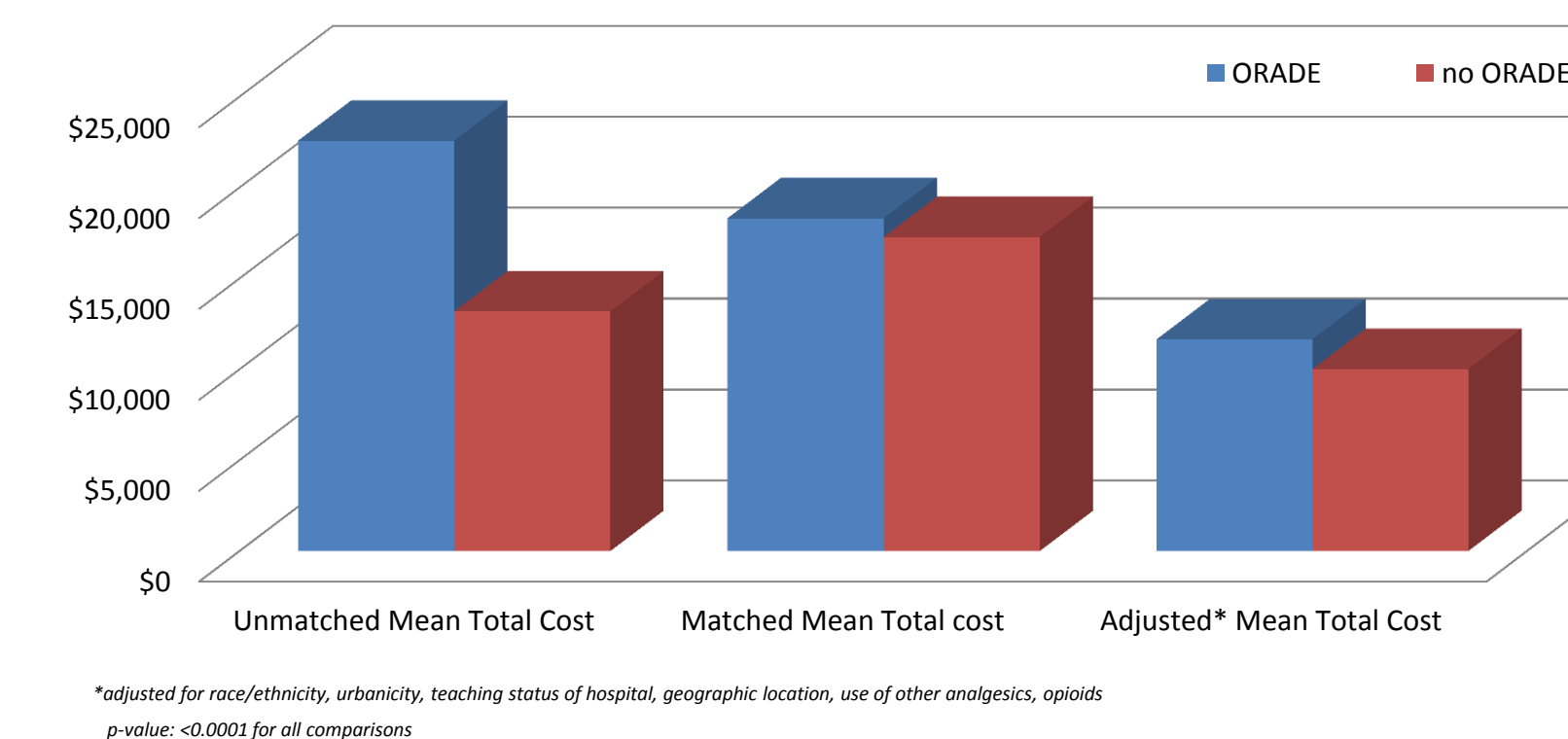


Figure 2. Mean Total Visit Cost (US \$) Comparing ORADE to no ORADE



- Adjusted (Figure 3 & Table 3)
 - Odds of being a cost of length of stay outlier were higher among ORADE compared to no ORADE
 - The adjusted cost variation from the baseline cost was \$1,640 comparing ORADE to no ORADE
 - The adjusted length of stay variation from baseline was 0.7 days comparing ORADE to no ORADE

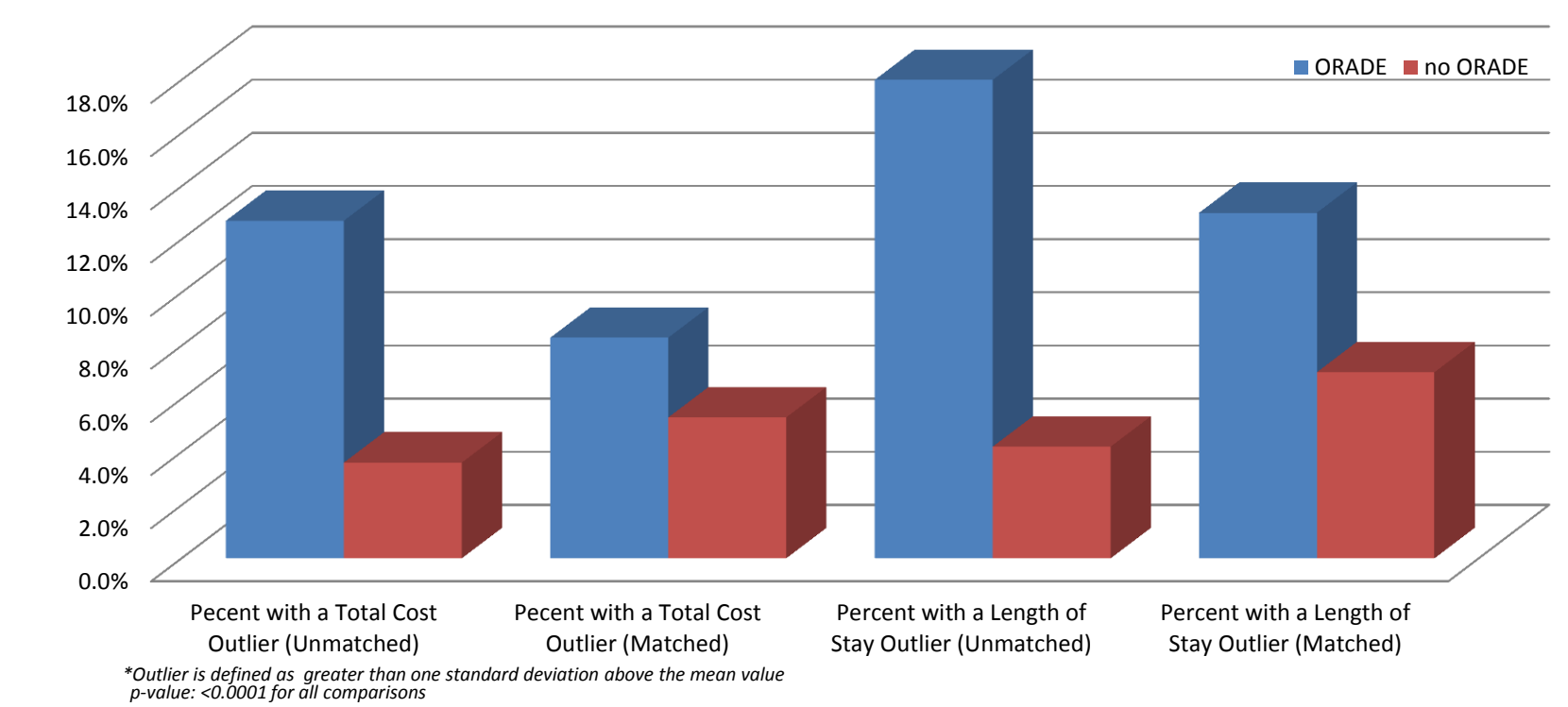
Table 3. Adjusted* Odds Ratios for Outcomes Comparing ORADE and no ORADE

| | OR | 95% CI |
|------------------------|------|-----------|
| Total Cost Outlier | 1.36 | 1.30-1.44 |
| Length of Stay Outlier | 2.14 | 2.06-2.22 |

*adjusted for race/ethnicity, urbanicity, teaching status of hospital, geographic location, use of other analgesics

Results

Figure 3. Mean Total Visit Cost (US \$) Comparing ORADE to no ORADE



Discussion

From this large national database, a considerable number of patients were identified as experiencing an opioid-related adverse event. Postsurgical patients who experienced an ORADE had a significantly longer LOS and a higher total cost than those without an ORADE. These findings were consistent in unmatched and matched analysis. Adjusted outcomes permitted a robust assessment of these outcomes and showed similar results. Reducing the incidence of opioid-related ADEs through reduction of opioid dosages and overall consumption should reduce LOS and total hospital costs. Further investigations regarding the impact of opioid dosage on the incidence of related ADEs would shed additional light on how to reduce LOS and hospitalization costs.

Limitations

Use of observational administrative databases has noted limitations which include selection bias and reliance on accurate and complete ICD-9 coding and billing, as utilized in this study.

References

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