**Supplementary Table S1**  For case-mix normalization with machine learning, a multivariable random forest model was trained to generate "expected" MEU predictions for each surgical case. ►Table S1 presents all parameters included in this modeling and compares each parameter's relative influence upon intraoperative opioid utilization, as determined by the algorithm's optimal minimization of root mean square error (RMSE). Other factors that could influence opioid administration, but that were not incorporated into this analysis, include intraoperative vital signs and hemodynamic changes.

| Parameter | Data type | Relative importance with respect to RMSE reduction |
| --- | --- | --- |
| Procedure duration (hours) | Numerical | 124.4 |
| Patient weight (kg) | Numerical | 90.1 |
| Primary procedure (52 categories + "other") | Categorical | 74.8 |
| Primary surgeon (52 most common + "other") | Categorical | 55.7 |
| Patient age (years) | Numerical | 55.3 |
| Surgical service | Categorical | 55.1 |
| Presence of intraoperative nerve block | Categorical | 46.7 |
| ASA classification | Categorical | 24.0 |

Abbreviations: ASA classification, American Society of Anesthesiologists physical status classification system rating; RMSE, root mean square error.