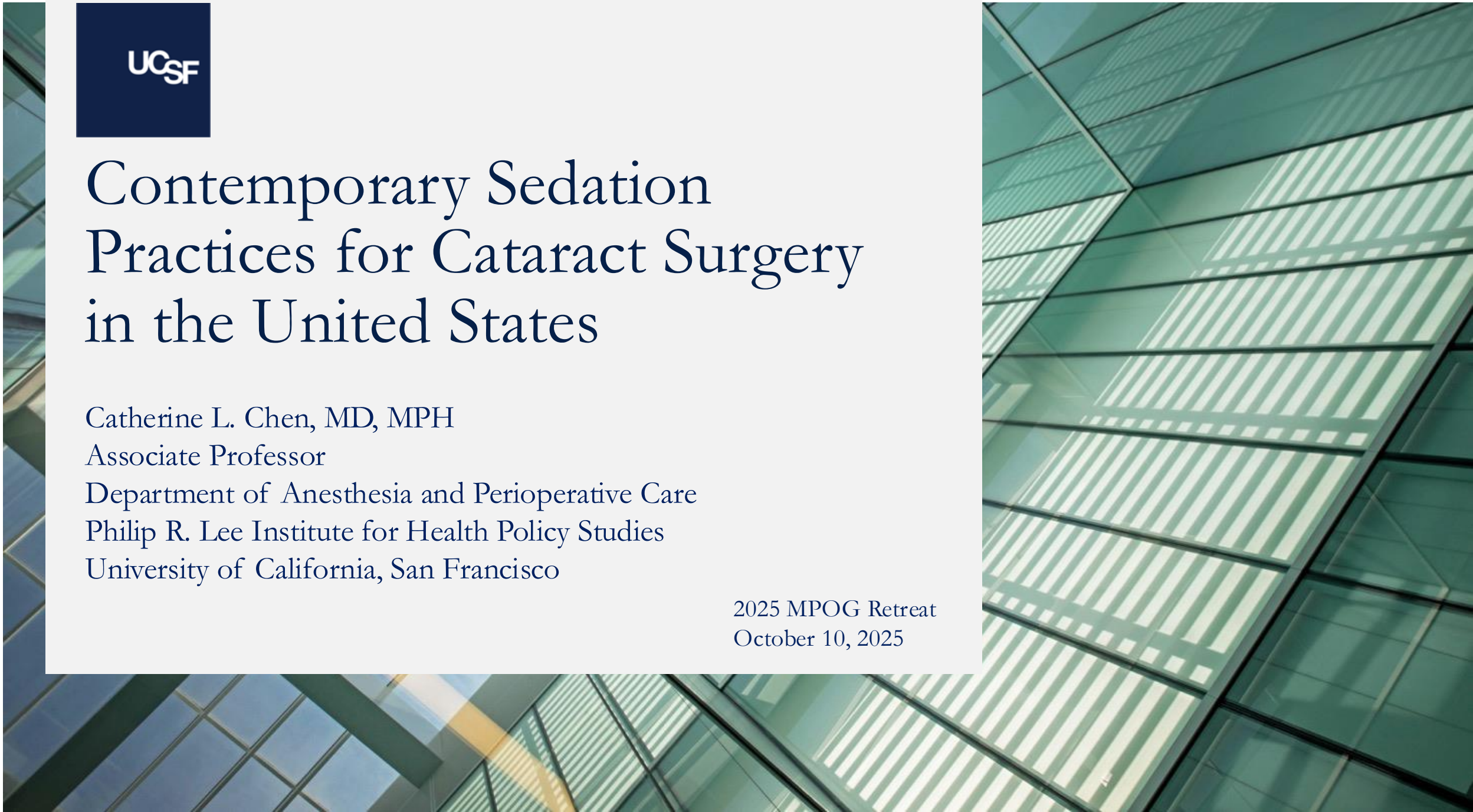

Contemporary Sedation Practices for Cataract Surgery in the United States

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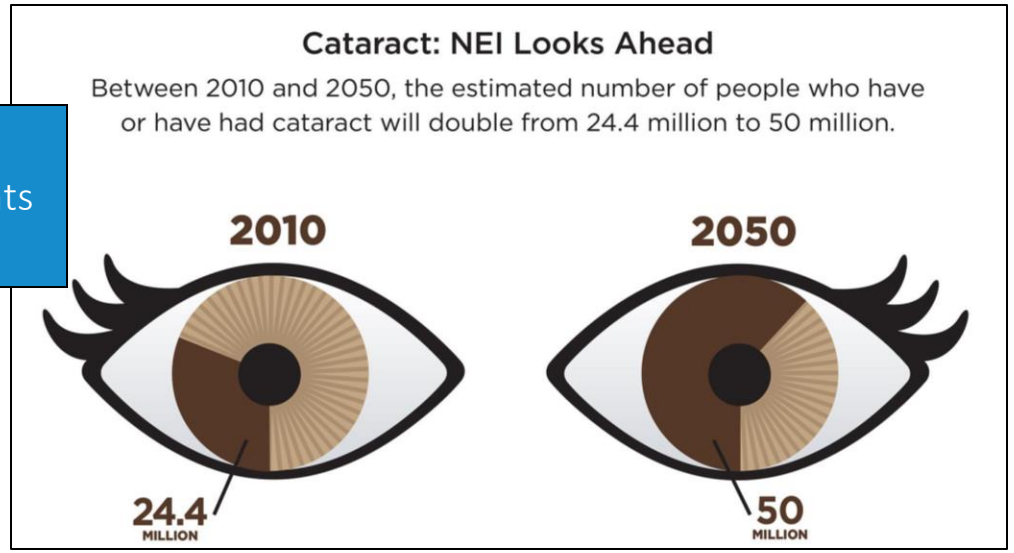
2025 MPOG Retreat
October 10, 2025

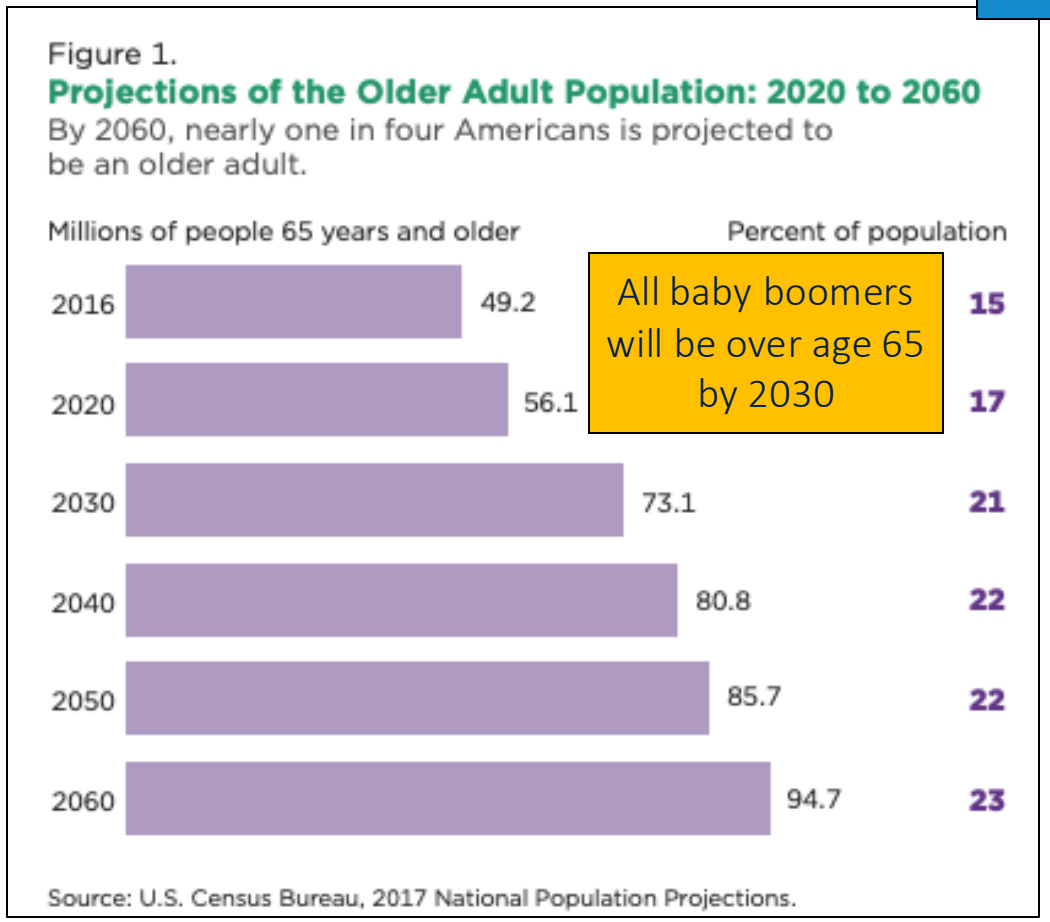
Disclosures

- Funded by the NIH (K23 AG072035 PI: Chen) “Frailty and Monitored Anesthesia Care for Cataract Surgery in Older Adults,” the Patricia Sander Award and UCSF Anesthesia Research
- No conflicts of interest

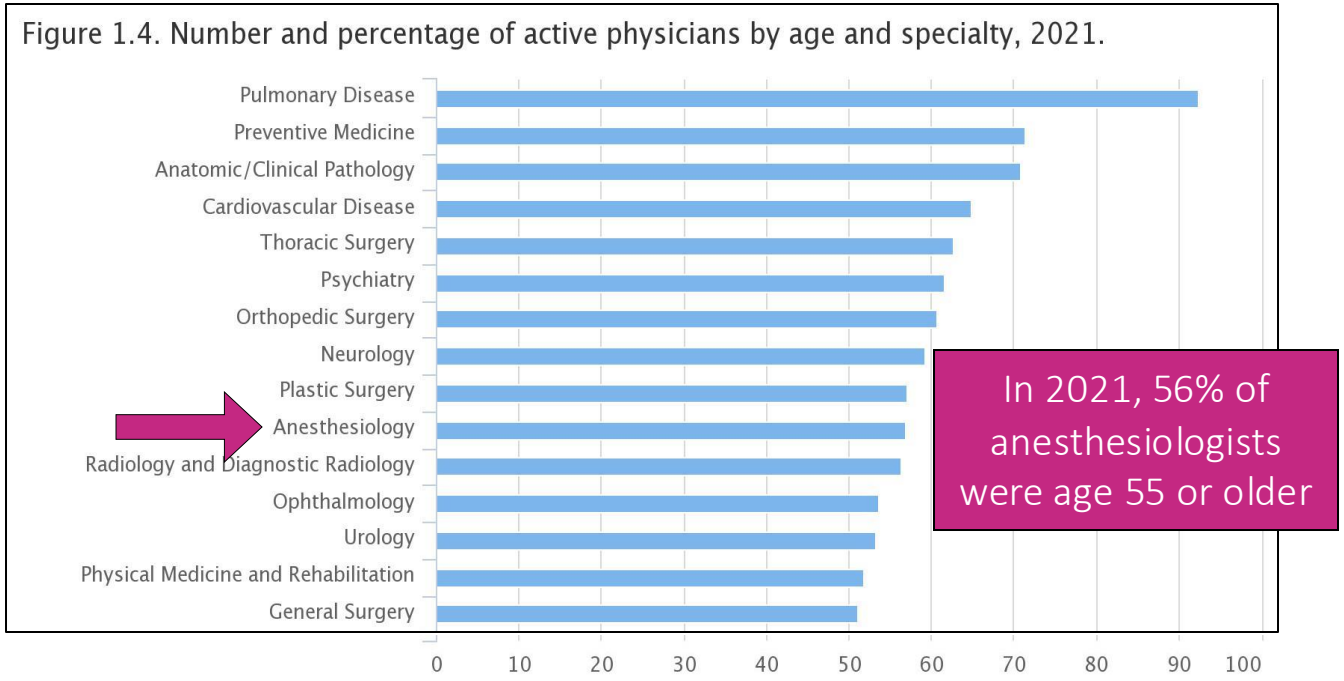
The big picture

38.7 million cataract patients by 2030





All baby boomers will be over age 65 by 2030



In 2021, 56% of anesthesiologists were age 55 or older

US Census Bureau February 2020; National Eye Institute. Eye Health Data and Statistics; American Medical Association Physician Masterfile (Dec. 31, 2021)

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Anesthesia Care for Cataract Surgery in Medicare Beneficiaries

Dhivya Perumal, MD; R. Adams Dudley, MD, MBA; Siqi Gan, MPH; W. John Boscardin, PhD; Aditya Gill, MD; Adrian W. Gelb, MBChB; Sei J. Lee, MD, MAS; Catherine L. Chen, MD, MPH

Prevalence of anesthesia care for selected low-risk procedures in the 2017 Medicare 5% sample

JAMA Intern Med. 2022;182(11):1171-1180. doi:10.1001/jamainternmed.2022.4333

Evidence from the Multicenter Perioperative Outcomes Group (MPOG) Registry

Methods

Retrospective observational cohort study

Study cohort

- Adult patients undergoing cataract surgery from 2018-2021
- Exclusion criteria: <18 years of age, emergency surgery, cataract surgery combined with another procedure; institutions with low surgical volume or who did not report data in all study years

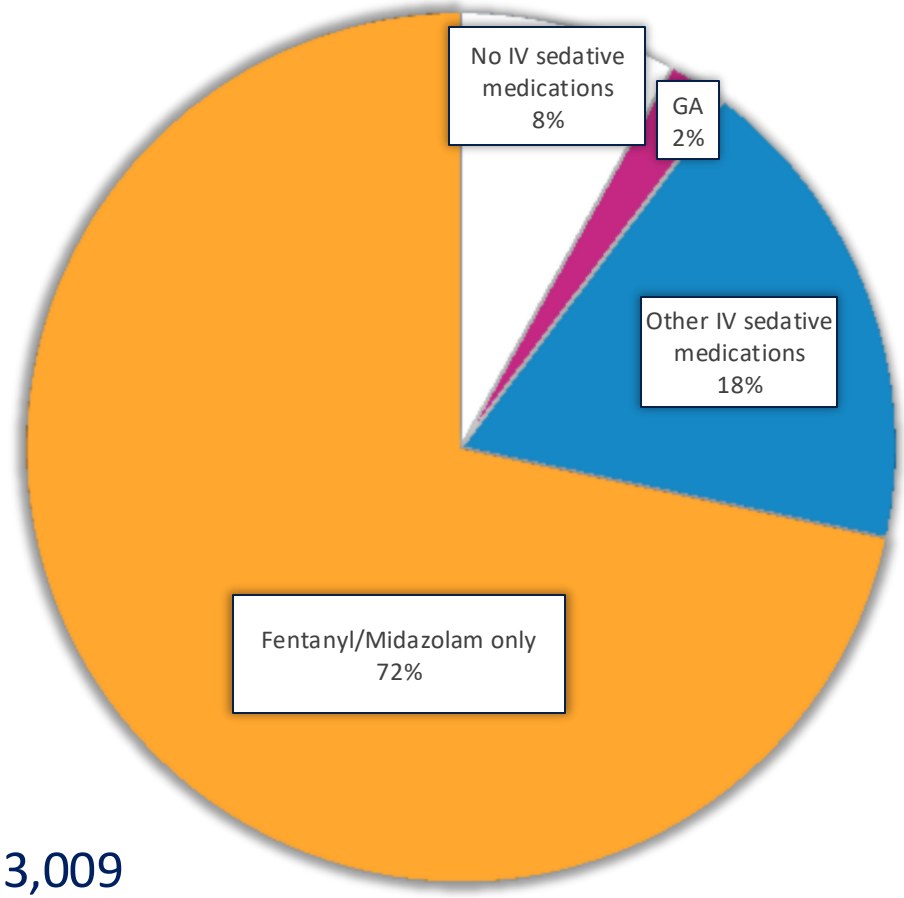
Exposure

- Anesthetic approach

Outcomes

- Primary: Perioperative events requiring intervention by an anesthesia professional
- Sensitivity analyses: Propensity adjusted model, Difference in initial vs. final sedation cohort assignment

What anesthetic approaches are being used for cataract surgery patients in the US?



Everyone got "Monitored Anesthesia Care" (MAC), but 80% of patients received nothing or just IV fentanyl and midazolam during surgery

Total N=123,009

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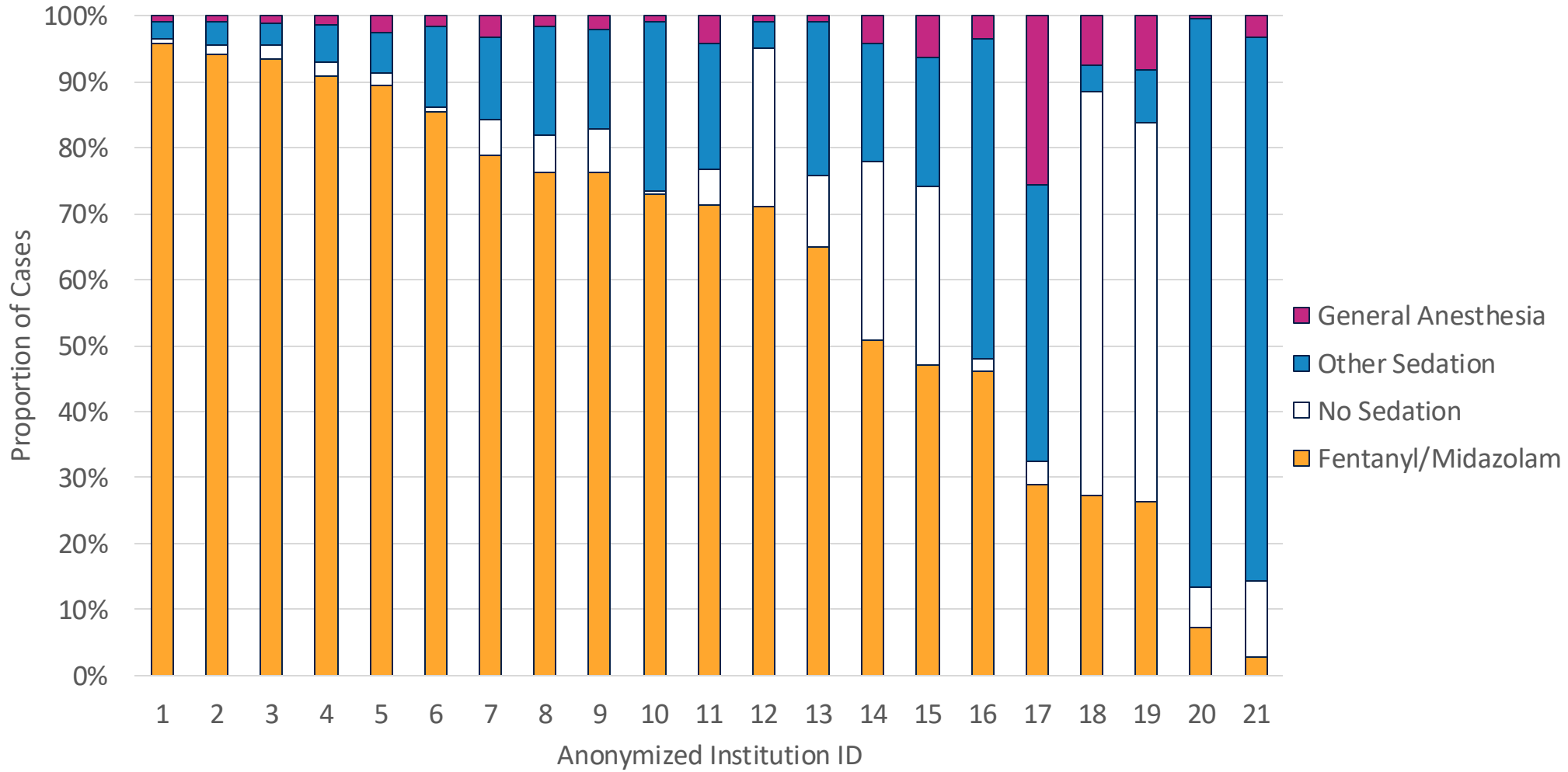
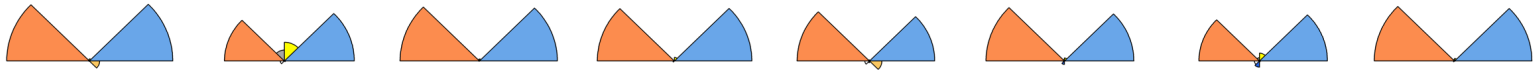
Proportion of patients receiving each anesthetic approach stratified by institution



Institutional intraoperative IV medication patterns for MAC cases only

Cluster 1

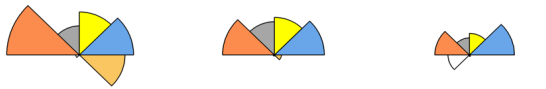


6 (N=6,538) 11 (N=1,196) 1 (N=8,643) 3 (N=19,615) 8 (N=11,957) 5 (N=5,616) 9 (N=4,251) 2 (N=5,814)

Cluster 2

10 (N=7,252) 4 (N=1,535) 7 (N=8,216) 14 (N=4,696) 13 (N=9,125) 12 (N=3,809)

Cluster 3

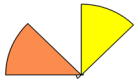


17 (N=706) 16 (N=6,409) 15 (N=3,459)

Cluster 4

19 (N=2,974) 18 (N=1,286)

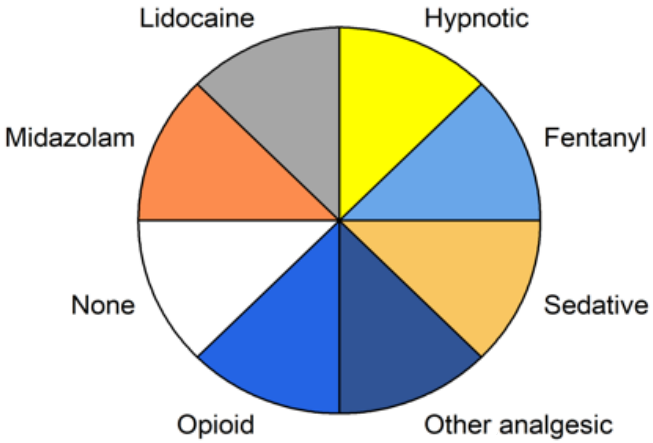
Cluster 5



20 (N=4,430)

Cluster 6

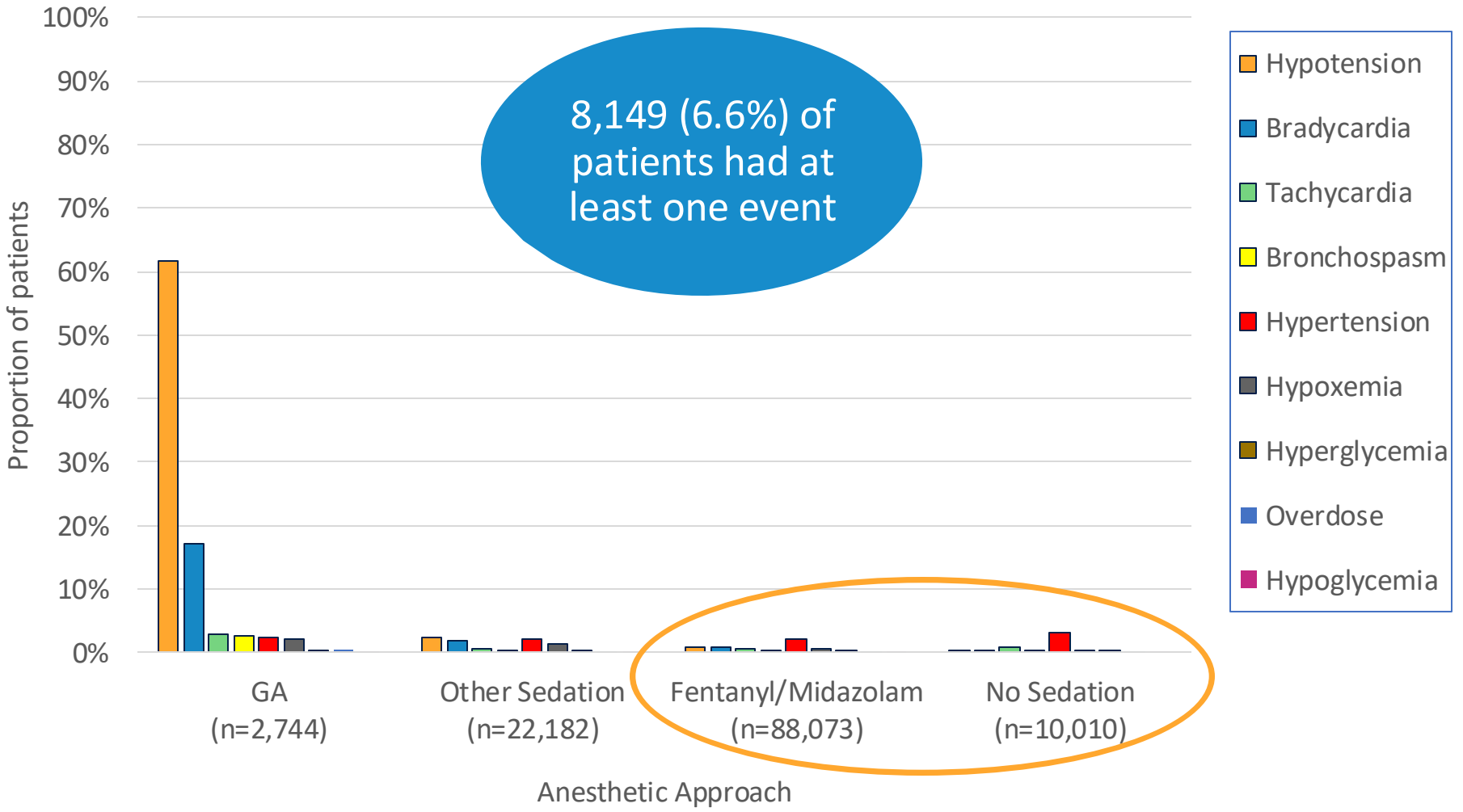
4 (N=2,701)



Perioperative events requiring intervention by an anesthesia professional

Event	Defined by IV administration of
Hypertension	Antihypertensives
Hypotension	Vasopressors
Tachycardia	Beta-blockers
Bradycardia	Antimuscarinics
Hyperglycemia	Insulin
Hypoglycemia	Dextrose
Opioid or Benzodiazepine Overdose	Naloxone or Flumazenil
Bronchospasm	Inhaled bronchodilators
	Defined as
Hypoxemia	Intraoperative oxygen saturation less than 90% for more than 3 minutes.

Proportion of patients within each group experiencing an event requiring intervention by an anesthesia professional



Association between anesthetic approach and events requiring intervention by an anesthesia professional

Sedation Approach	Unadjusted OR (95% CI)	Adjusted OR (95% CI)*
No Sedation	ref.	ref.
Fentanyl/Midazolam	1.00 (0.70, 1.42)	1.03 (0.74, 1.44)
Other Sedation	1.81 (1.18, 2.78)	1.96 (1.34, 2.89)
GA	45.38 (30.30, 67.96)	51.89 (34.59, 77.86)

*Adjusted for age, gender, race, ASA score, selected comorbidities

Sensitivity Analyses

Sensitivity Analysis #1: Account for Treatment Assignment

Association between anesthetic approach and events adjusted for the propensity to receive that anesthetic approach in the first place

Sedation Approach	Original Model	
	Unadjusted OR (95% CI)	Adjusted OR (95% CI)*
No Sedation	ref.	ref.
Fentanyl/Midazolam	1.00 (0.70, 1.42)	1.03 (0.74, 1.44)
Other Sedation	1.81 (1.18, 2.78)	1.96 (1.34, 2.89)
GA	45.38 (30.30, 67.96)	51.89 (34.59, 77.86)

*Adjusted for age, gender, race, ASA score, and selected Elixhauser comorbidities

Sensitivity Analyses #2: Account for Misclassification Bias

To account for possibility that some patients in the “Other Sedation” or “GA” groups could have started in “No Sedation” or “Fentanyl/Midazolam”

1. Within “Other Sedation” and “GA” groups, review timing of medications and airway management relative to surgery start time

2. Flag anyone who began receiving medications requiring anesthesia training or placement of an advanced airway only AFTER surgery start time

Add 251 additional patients to the “No Sedation” group and 1,683 additional patients to the “Fentanyl/Midazolam” group

Sensitivity Analysis #2: Account for Misclassification bias

Association between anesthetic approach and events after re-categorizing “Other Sedation” or “GA” patients whose initial anesthetic approach was ”No Sedation” or “Fentanyl/Midazolam”

	Original Model	
Sedation Approach	**Unadjusted OR (95% CI)**	**Adjusted OR (95% CI)***
No Sedation	ref.	ref.
Fentanyl/Midazolam	1.00 (0.70, 1.42)	1.03 (0.74, 1.44)
Other Sedation	1.81 (1.18, 2.78)	1.96 (1.34, 2.89)
GA	45.38 (30.30, 67.96)	51.89 (34.59, 77.86)

*Adjusted for age, gender, race, ASA score, and selected Elixhauser comorbidities

Factors associated with conversion from "No Sedation" or "Fentanyl/Midazolam" groups to "Other Sedation" or "GA" groups after surgery start time

	Adjusted OR (95% CI)
Age	0.97 (0.97, 0.98)
Gender	
Male	ref.
Female	0.96 (0.91, 1.02)
Race/Ethnicity	
White	ref.
Asian/Pacific Islander	0.90 (0.63, 1.29)
Black	1.79 (1.15, 2.78)
Hispanic	1.30 (0.79, 2.13)
Other	0.44 (0.23, 0.86)
Unknown race	1.18 (0.68, 2.04)
ASA Class	
1	ref.
2	1.19 (0.92, 1.54)
3	1.44 (1.04, 1.99)
4	1.66 (0.91, 3.02)
Comorbidities*	
Hypertension	0.67 (0.53, 0.84)
Diabetes	0.98 (0.75, 1.28)
Congestive heart failure	1.23 (0.84, 1.81)
Cardiac arrhythmia	0.74 (0.59, 0.94)
Chronic Pulmonary Disease	0.89 (0.68, 1.17)
Renal Failure	0.98 (0.72, 1.32)
Obesity	0.87 (0.63, 1.21)
Substance abuse	1.39 (0.71, 2.70)

*Reference group for each comorbidity is patients who did not have the comorbidity.

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Take home points

There is wide variation in sedation approaches for cataract surgery.

We have an opportunity to consider whether some cases could be done without routine anesthesia care.

More research is needed to determine which patients would be safe to proceed without anesthesia care.

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Kaiser SF Dept. of Anesthesiology: Andrea Olmos

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UCSF Medical Center

Baseline Characteristics of Patients Undergoing Cataract Surgery

	All (N=123,009)	General Anesthesia (N=2,744)	Monitored Anesthesia Care		
			No Sedation (N=10,010)	Fentanyl/ Midazolam (N=88,073)	Other Sedation (N=22,182)
Age	69.5 (10.2)	61.4 (15.9)	71.5 (9.7)	69.6 (9.7)	69.3 (10.8)
Gender					
Male	52,075 (42.3%)	1,279 (46.6%)	4,695 (46.9%)	36,783 (41.8%)	9,318 (42.0%)
Female	70,934 (57.7%)	1,465 (53.4%)	5,315 (53.1%)	51,290 (58.2%)	12,864 (58.0%)
Race/Ethnicity					
White	84,595 (68.8%)	1,904 (69.4%)	7,103 (71%)	59,737 (67.8%)	15,851 (71.5%)
Asian or Pacific Islander	8,429 (6.9%)	106 (3.9%)	928 (9.3%)	6,165 (7.0%)	1,230 (5.6%)
Black	13,475 (11.0%)	393 (14.3%)	1,027 (10.3%)	9,568 (10.9%)	2,487 (11.2%)
Hispanic	1,948 (1.6%)	47 (1.7%)	135 (1.4%)	1,241 (1.4%)	525 (2.4%)
Other	1,731 (1.4%)	36 (1.3%)	66 (0.7%)	1551 (1.8%)	78 (0.4%)
Unknown race	12,831 (10.4%)	258 (9.4%)	751 (7.5%)	9,811 (11.1%)	2,011 (9.1%)
ASA Class					
1	4,110 (3.3%)	76 (2.8%)	318 (3.2%)	2,929 (3.3%)	787 (3.6%)
2	58,215 (47.3%)	939 (34.2%)	4,333 (43.3%)	41,732 (47.4%)	11,211 (50.5%)
3	57,670 (46.9%)	1,602 (58.4%)	4,913 (49.1%)	41,441 (47.1%)	9,714 (43.8%)
4	3,014 (2.5%)	127 (4.6%)	446 (4.5%)	1,971 (2.2%)	470 (2.1%)
Comorbidities*					
Hypertension	45,672 (37.1%)	864 (31.5%)	3,185 (31.8%)	35,583 (40.4%)	6,040 (27.2%)
Diabetes	18,577 (15.1%)	429 (15.63%)	1,176 (11.8%)	14,461 (16.4%)	2,511 (11.3%)
Congestive heart failure	5,144 (4.2%)	112 (4.1%)	475 (4.8%)	3,729 (4.2%)	828 (3.7%)
Cardiac arrhythmia	9,725 (7.9%)	189 (6.9%)	808 (8.1%)	7,358 (8.4%)	1,370 (6.2%)
Chronic Pulmonary Disease	12,224 (9.9%)	307 (11.2%)	849 (8.5%)	9,312 (10.6%)	1,756 (7.9%)
Renal Failure	8,319 (6.8%)	199 (7.3%)	626 (6.3%)	6,186 (7.0%)	1,308 (5.9%)
Obesity	39,389 (32.0%)	1,010 (36.8%)	3,025 (30.2%)	28,329 (32.2%)	7,025 (31.7%)
Substance abuse	407 (0.3%)	18 (0.7%)	21 (0.2%)	294 (0.3%)	74 (0.33%)

*Less than one percent of patients missing data in each comorbidity category reported

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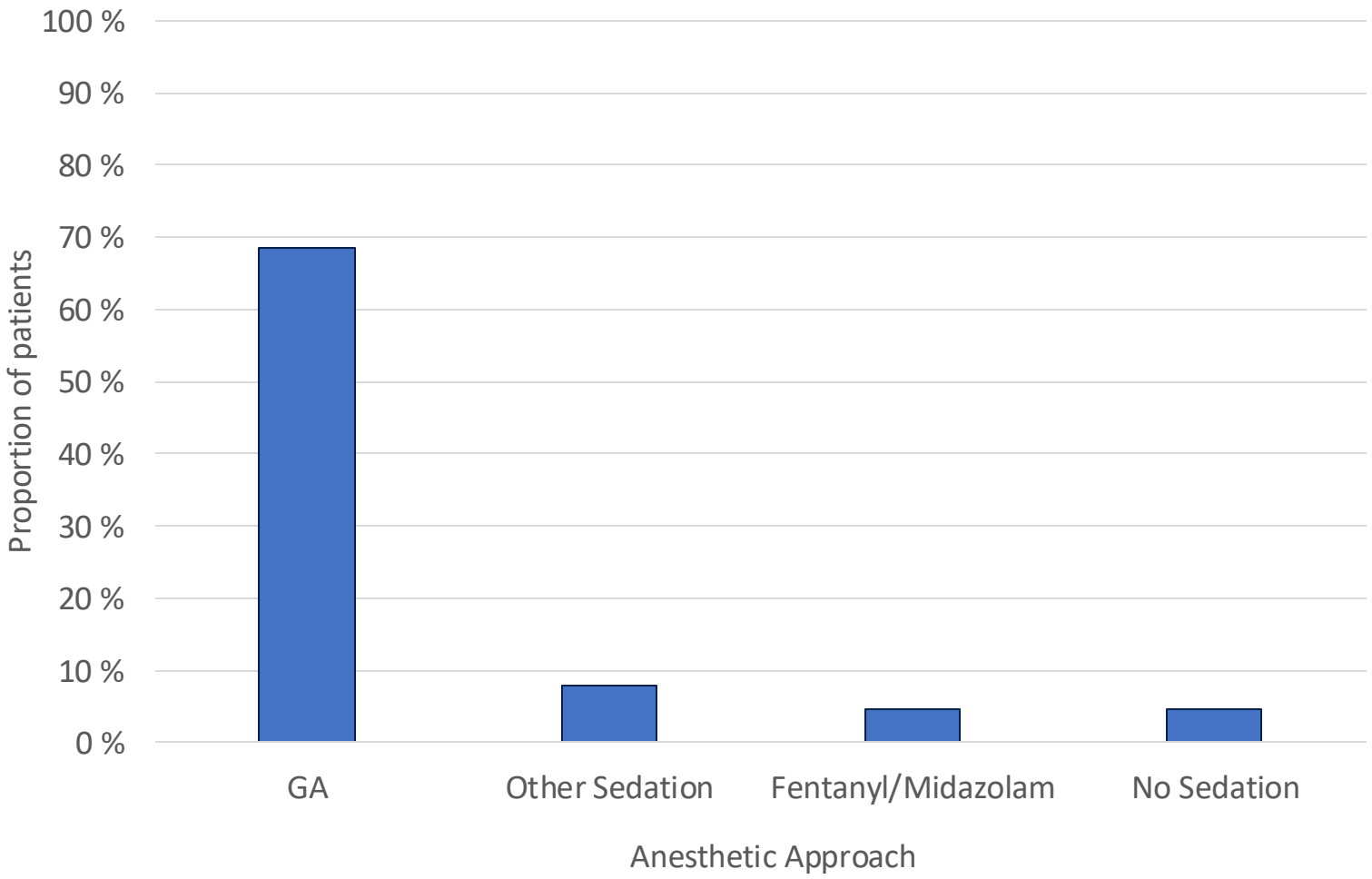
Proportion of patients within each group experiencing an event requiring intervention by an anesthesia professional



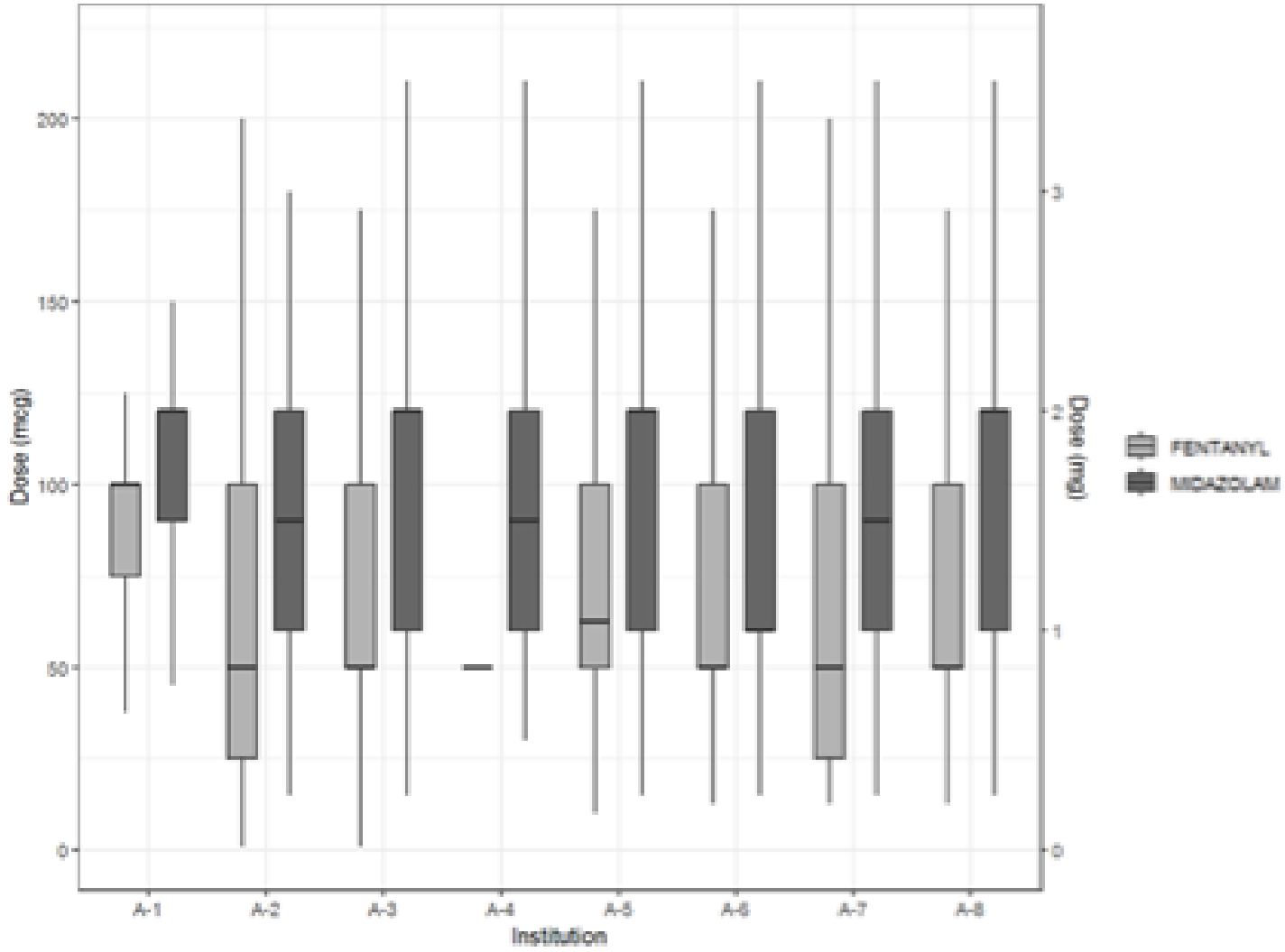
Association between anesthetic approach and events requiring intervention by an anesthesia professional (full model results)

	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
Sedation		
None	ref.	ref.
GA	45.38 (30.30, 67.96)	51.89 (34.59, 77.86)
MAC	1.81 (1.18, 2.78)	1.96 (1.34, 2.89)
Nurse sedation	1.00 (0.70, 1.42)	1.03 (0.74, 1.44)
Age	0.99 (0.98, 1.00)	1.01 (1.00, 1.02)
Gender		
Male	ref.	ref.
Female	0.87 (0.79, 0.96)	0.92 (0.83, 1.04)
Race/Ethnicity		
White	ref.	ref.
Asian or Pacific Islander	1.18 (0.90, 1.56)	1.53 (1.15, 2.03)
Black	1.84 (1.47, 2.32)	1.77 (1.46, 2.14)
Hispanic	1.40 (1.03, 1.90)	1.44 (1.07, 1.94)
Other	0.91 (0.53, 1.57)	1.02 (0.68, 1.54)
Unknown	1.32 (0.94, 1.86)	1.53 (1.12, 2.09)
ASA Class		
1	ref.	ref.
2	1.35 (1.06, 1.73)	1.37 (1.16, 1.62)
3	2.53 (1.88, 3.40)	2.27 (1.88, 2.75)
4	3.93 (2.83, 5.46)	3.02 (2.25, 4.04)
Comorbidities*		
Hypertension	1.16 (0.96, 1.40)	1.00 (0.82, 1.21)
Diabetes	1.38 (1.20, 1.59)	1.12 (0.99, 1.26)
Congestive heart failure	1.70 (1.45, 1.98)	1.17 (0.98, 1.39)
Cardiac arrhythmia	1.34 (1.07, 1.55)	1.14 (1.01, 1.29)
Chronic Pulmonary Disease	1.16 (0.97, 1.40)	0.97 (0.84, 1.12)
Renal Failure	1.68 (1.45, 1.94)	1.23 (1.14, 1.32)
Obesity	1.15 (0.97, 1.37)	0.98 (0.82, 1.17)
Substance abuse	1.98 (1.34, 2.92)	1.47 (0.84, 2.57)

List of perioperative events requiring intervention by anesthesia professionals

Event	No. (%)
Hypotension	2,894 (2.4%)
Hypertension	2,664 (2.2%)
Bradycardia	1,641 (1.3%)
Hypoxemia	852 (0.7%)
Tachycardia	645 (0.5%)
Hyperglycemia	73 (0.06%)
Hypoglycemia	64 (0.05%)
Opioid or Benzodiazepine Overdose	55 (0.04%)
Bronchospasm	166 (0.1%)
Total	**8,149 (6.6%)**

Median fentanyl and midazolam doses administered during cataract surgery in Cluster 1 institutions



Research

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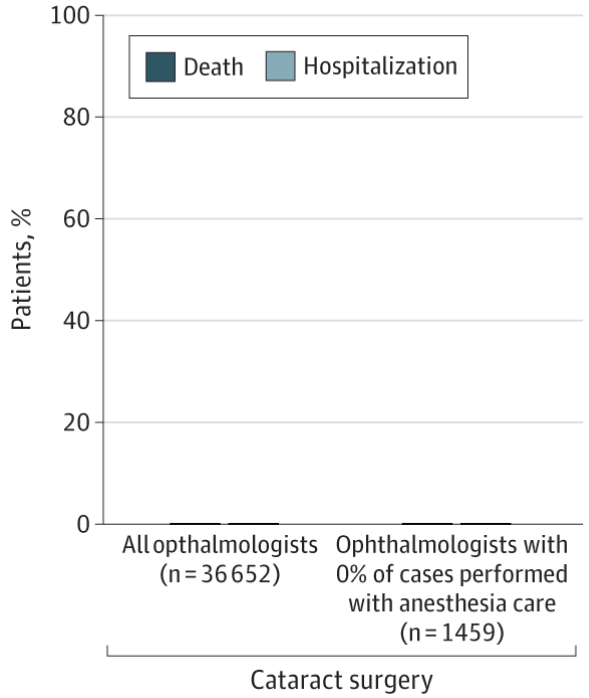
Death and hospitalization after selected low-risk procedures in the 2017 Medicare 5% sample



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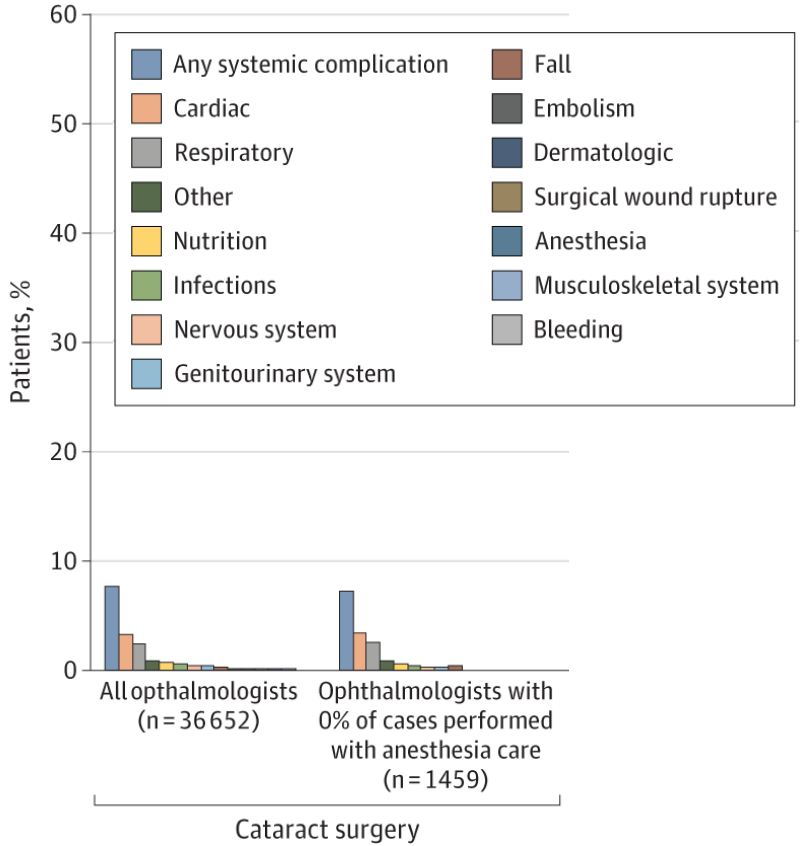

Systemic complications after selected low-risk procedures in the 2017 Medicare 5% sample

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