Supplementary Online Content

Patient-Surgeon Racial and Ethnic Concordance and Outcomes of Older Adults Operated on by California Licensed Surgeons: An Observational Study

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eTable 1: Coding schema for Medical Board of California survey question regarding “cultural background” translated to racial and ethnic background

Race and ethnicity category	MBC survey response for "Cultural Background"
Black or African American	African
	African American
	Black
Hispanic	Central American
	Cuban
	Mexican
	Other Hispanic
	Puerto Rican
	South American
Non-Hispanic White	European
	Middle Eastern
	White

eTable 2: Association of patient-surgeon racial and ethnic concordance with 30-day post-operative mortality rate among Black and Hispanic patients

	Black patients		Black patients Adjusted risk difference, pp (95%CI)	p-value	Hispanic patients		Hispanic patients Adjusted risk difference, pp (95%CI)	p-value
	Concordant	Discordant			Concordant	Discordant		
Adjusted mortality rate, % (95%CI)	0.8 (0 to 2.7)	1.4 (0.8 to 1.9)	-0.5 (-2.6 to +1.6)	0.63	1.2 (0.3 to 2.1)	1.7 (1.3 to 2.2)	-0.5 (-1.6 to +0.5)	0.32
Adjusted readmission rate, % (95%CI)	10.4 (6.1 to 14.7)	7.3 (6.1 to 8.6)	+3.1 (-1.5 to +7.6)	0.19	4.2 (2.6 to 5.8)	6.6 (5.8 to 7.4)	-2.4 (-4.3 to -0.5)	0.014
Adjusted LOS, days (95%CI)	5.3 (4.1 to 6.5)	5.1 (4.8 to 5.4)	+0.2* (-1.1 to +1.5)	0.79	4.1 (3.8 to 4.4)	4.6 (4.4 to 4.8)	-0.5* (-0.8 to -0.2)	0.003

Association between patient-surgeon racial and ethnic concordance and 30-day mortality, 30-day readmissions, and length of stay among Black and Hispanic patients using Medicare data from 2016-2019 calculated using marginal standardization from generalized linear probability models, controlling for patient (age, sex, race and ethnicity, 27 chronic conditions, median household income, dual-eligibility for Medicaid) procedure (procedure type, weekend surgery, electiveness of surgery, month, year), surgeon (age, sex, procedure volume), and hospital (size, teaching, urban/rural, and ownership status) characteristics. Estimated adjusted outcome lower bound set at 0. Abbreviations: d, day; LOS, length of stay.; pp, percentage point. *unit: day

eTable 3: Baseline characteristics among sample with surgeon self-reported race and ethnicity missing versus study cohort with surgeon race-ethnicity reported

Characteristic	Surgeons without self-reported race & ethnicity	Surgeons with self-reported race & ethnicity	P-value
Patients, No. (%)	(N=324,074)	(N=45,547)	NA
Patient characteristics			
Patient age, y, mean (SD)	75.0 (6.7)	75.1 (6.8)	<0.001
Patient sex			
Male	143,611 (44.3)	19,911 (43.7)	0.02
Female	180,463 (55.7)	25,636 (56.3)	
Dual Medicare Medicaid, No. (%)	32,546 (10.0)	5,848 (12.8)	<0.001
Median household income*, $, mean (SD)	77,132 (31521.1)	80,304 (33423.6)	<0.001
Coexisting conditions, No. (%)			
Congestive heart failure	77,073 (23.8)	11,354 (24.9)	<0.001
Chronic obstructive pulmonary disease	78,560 (24.2)	11,076 (24.3)	0.72
Diabetes	114,719 (35.4)	16,342 (35.9)	0.04
Chronic kidney disease	107,285 (33.1)	15,066 (33.1)	0.91
Neurological disorders	61,072 (18.9)	8,902 (19.5)	<0.001
Cancer	68,182 (21.0)	9,882 (21.7)	0.001
Surgeon Characteristics			
Surgeon age, y, mean (SD)	49.4 (10.3)	52.0 (11.0)	<0.001
Surgeon Gender, No (%)			
Male	5,716 (88.7)	878 (89.5)	0.47
Female	727 (11.3)	103 (10.5)	
Surgical volume (tertiles)			
1 (Lowest)	11,618 (3.6)	1,671 (3.7)	
2	61,363 (18.9)	9,408 (20.7)	<0.001
3 (Highest)	251,093 (77.5)	34,468 (75.7)	
Hospital Characteristics			
Hospital size, beds			
≤399	216,215 (66.7)	31,446 (69.0)	<0.001
>399	107,859 (33.3)	14,101 (31.0)	
Teaching hospital			
Yes	209,421 (64.6)	27,168 (59.7)	<0.001
No	114,653 (35.4)	18,379 (40.4)	
Hospital ownership			
For-profit	50,755 (15.7)	6,822 (15.0)	
Not-for-profit	245,245 (75.7)	32,672 (71.7)	<0.0001
Public	28,074 (8.7)	6,053 (13.3)	
Urban area			
Yes	320,703 (99.0)	45,157 (99.1)	<0.001
No	3,371 (1.0)	390 (0.9)	

*Median household income is estimated from the beneficiary's zip code of residency. Medicare data from 2016-2019.

eTable 4: Sensitivity analysis to model adjusted outcomes, controlling for surgeons without self-reported race and ethnicity using inverse probability weighting

A. Black and Hispanic patients

	Black patients		Black patients Adjusted risk difference, pp (95%CI)	p-value	Hispanic patients		Hispanic patients Adjusted risk difference, pp (95%CI)	p-value
	Concordant	Discordant			Concordant	Discordant		
Adjusted mortality rate, % (95%CI)	0.8 (0 to 2.6)	1.2 (0.7 to 1.8)	-0.4 (-2.4 to +1.6)	0.69	1.1 (0.3 to 2.0)	1.7 (1.3 to 2.1)	-0.6 (-1.6 to +0.5)	0.29
Adjusted readmission rate, % (95%CI)	10.0 (5.8 to 14.2)	7.4 (6.0 to 8.7)	+2.6 (-1.8 to +7.0)	0.25	4.2 (2.5 to 6.0)	6.6 (5.7 to 7.4)	-2.3 (-4.3 to -0.4)	0.02
Adjusted LOS, d (95%CI)	5.1 (3.9 to 6.3)	5.0 (4.7 to 5.2)	+0.1* (-1.1 to +1.4)	0.83	4.1 (3.8 to 4.3)	4.5 (4.4 to 4.7)	-0.5* (-0.8 to -0.2)	0.004

B. White patients

	White patients		White patients Adjusted risk difference, pp (95%CI)	p-value
	Concordant	Discordant		
Adjusted mortality rate, % (95%CI)	1.5 (1.4 to 1.6)	1.4 (1.0 to 1.8)	+0.2 (-0.3 to +0.6)	0.51
Adjusted readmission rate, % (95%CI)	6.6 (6.3 to 6.9)	7.0 (6.3 to 7.8)	-0.4 (-1.3 to +0.4)	0.34
Adjusted LOS, d (95%CI)	4.3 (4.3 to 4.4)	4.2 (4.1 to 4.4)	+0.1* (0 to +0.3)	0.13

Association between patient-surgeon racial and ethnic concordance and 30-day mortality, 30-day readmissions, and length of stay among Black, Hispanic, and White patients, controlling for surgeons without self-reported race and ethnicity, using Medicare data from 2016-2019 calculated using marginal standardization from inverse probability weighting of linear probability models, controlling for patient (age, sex, race and ethnicity, 27 chronic conditions, median household income, dual-eligibility for Medicaid) procedure (procedure type, weekend surgery, electiveness of surgery, month, year), surgeon (age, sex, procedure volume), and hospital (size, teaching, urban/rural, and ownership status) characteristics. Estimated adjusted outcome lower bound set at 0. Abbreviations: d, day; LOS, length of stay.; pp, percentage point. *unit: adjusted days

eTable 5: Sensitivity analysis for adjusted outcomes, excluding surgeons with multiple race and ethnicity categories

A. Black and Hispanic patients

	Black patients		Black patients Adjusted risk difference, pp (95%CI)	p-value	Hispanic patients		Hispanic patients Adjusted risk difference, pp (95%CI)	p-value
	Concordant	Discordant			Concordant	Discordant		
Adjusted mortality rate, % (95%CI)	0.8 (0 to 2.7)	1.4 (0.8 to 1.9)	-0.5 (-2.6 to +1.6)	0.63	1.2 (0.3 to 2.1)	1.7 (1.3 to 2.2)	-0.5 (-1.6 to +0.5)	0.32
Adjusted readmission rate, % (95%CI)	10.4 (6.1 to 14.7)	7.3 (6.1 to 8.6)	+3.1 (-1.5 to +7.6)	0.19	4.2 (2.6 to 5.9)	6.6 (5.7 to 7.4)	-2.3 (-4.2 to -0.4)	0.02
Adjusted LOS, d (95%CI)	5.3 (4.1 to 6.5)	5.1 (4.8 to 5.4)	+0.2* (-1.1 to +1.5)	0.79	4.1* (3.8 to 4.4)	4.6 * (4.4 to 4.8)	-0.5* (-0.9 to -0.2)	0.001

B. White patients

	White patients		White patients Adjusted risk difference, pp (95%CI)	p-value
	Concordant	Discordant		
Adjusted mortality rate, % (95%CI)	1.6 (1.4 to 1.7)	1.5 (1.1 to 1.9)	+0.1 (-0.3 to +0.5)	0.68
Adjusted readmission rate, % (95%CI)	6.5 (6.2 to 6.8)	7.2 (6.4 to 7.9)	-0.6 (-1.5 to +0.2)	0.12
Adjusted LOS, d (95%CI)	4.3 (4.3 to 4.4)	4.2 (4.1 to 4.3)	+0.1* (0 to +0.3)	0.07

Association between patient-surgeon racial and ethnic concordance and 30-day mortality, 30-day readmissions, and length of stay among Black, Hispanic, and White patients, excluding surgeons with multiple race and ethnicity categories, using Medicare data from 2016-2019 calculated using marginal standardization from linear probability models, controlling for patient (age, sex, race and ethnicity, 27 chronic conditions, median household income, dual-eligibility for Medicaid) procedure (procedure type, weekend surgery, electiveness of surgery, month, year), surgeon (age, sex, procedure volume), and hospital (size, teaching, urban/rural, and ownership status) characteristics. Estimated adjusted outcome lower bound set at 0. Abbreviations: d, day; LOS, length of stay.; pp, percentage point. *unit: adjusted days

eTable 6: Adjusted outcomes for hospitals with any Black or Hispanic concordant dyads compared to those without concordant dyads

A. Black and Hispanic patients

	Black patients		Black patients Adjusted risk difference, pp (95%CI)	p-value	Hispanic patients		Hispanic patients Adjusted risk difference, pp (95%CI)	p-value
	Concordant hospital	No concordant hospital			Concordant hospital	No concordant hospital		
Adjusted mortality rate, % (95%CI)	1.2 (0.4 to 1.8)	1.4 (0.7 to 2.1)	-0.3 (-1.3 to +0.7)	0.56	1.5 (0.9 to 2.0)	1.8 (1.2 to 2.4)	-0.3 (-1.1 to +0.5)	0.44
Adjusted readmission rate, % (95%CI)	8.0 (6.1 to 9.9)	7.5 (5.8 to 9.1)	+0.5 (-2.1 to +3.1)	0.70	5.7 (4.7 to 6.8)	6.5 (5.5 to 7.6)	-0.8 (-2.3 to +0.8)	0.32
Adjusted LOS, d (95%CI)	5.3 (4.8 to 5.7)	5.0 (4.7 to 5.4)	+0.2* (-0.4 to +0.8)	0.52	4.5 (4.3 to 4.7)	4.6 (4.4 to 4.8)	-0.1* (-0.4 to +0.2)	0.51

B. White patients

	White patients		White patients Adjusted risk difference, pp (95%CI)	p-value	All patients		All patients Adjusted risk difference, pp (95%CI)	p-value
	Concordant hospital	No concordant hospital			Concordant hospital	No concordant hospital		
Adjusted mortality rate, % (95%CI)	1.5 (1.3 to 1.7)	1.6 (1.4 to 1.7)	-0.2 (-0.4 to +0.2)	0.42	1.5 (1.3 to 1.6)	1.6 (1.5 to 1.8)	-0.2 (-0.4 to +0.1)	0.24
Adjusted readmission rate, % (95%CI)	6.6 (6.2 to 7.0)	6.6 (6.3 to 6.9)	0.0 (-0.6 to +0.6)	0.99	6.6 (6.2 to 7.0)	6.6 (6.3 to 6.9)	+0.1 (-0.1 to +0.1)	0.85
Adjusted LOS, d (95%CI)	4.3 (4.3 to 4.4)	4.3 (4.3 to 4.4)	0* (-0.1 to +0.1)	0.96	4.4 (4.3 to 4.5)	4.4 (4.3 to 4.4)	0* (-0.1 to +0.1)	0.98

Association between hospital presence of a concordant dyad and 30-day mortality, 30-day readmissions, and length of stay among Black, Hispanic, White, and All patients, using Medicare data from 2016-2019 calculated using marginal standardization from linear probability models, controlling for patient (age, sex, race and ethnicity, 27 chronic conditions, median household income, dual-eligibility for Medicaid) procedure (procedure type, weekend surgery, electiveness of surgery, month, year), surgeon (age, sex, procedure volume), and hospital (size, teaching, urban/rural, and ownership status) characteristics. Abbreviations: d, day; LOS, length of stay.; pp, percentage point. *unit: adjusted days

eTable 7: Sensitivity analysis for adjusted outcomes, excluding hospitals without Black or Hispanic surgeons

A. Black and Hispanic patients

	Black patients		Black patients Adjusted risk difference, pp (95%CI)	p-value	Hispanic patients		Hispanic patients Adjusted risk difference, pp (95%CI)	p-value
	Concordant	Discordant			Concordant	Discordant		
Adjusted mortality rate, % (95%CI)	1.3 (0 to 3.3)	1.1 (0.3 to 1.9)	+0.2 (-2.2 to +2.6)	0.88	1.5 (0.6 to 2.4)	2.0 (1.4 to 2.6)	-0.5 (-1.7 to +0.6)	0.36
Adjusted readmission rate, % (95%CI)	9.9 (5.5 to 14.3)	7.2 (5.4 to 9.1)	+2.6 (-2.4 to +7.7)	0.31	4.8 (3.1 to 6.4)	7.0 (5.9 to 8.2)	-2.3 (-4.3 to -0.2)	0.03
Adjusted LOS, d (95%CI)	5.3 (4.1 to 6.6)	5.3 (4.9 to 5.8)	+0.02* (-1.4 to +1.5)	0.98	4.3 (4.0 to 4.6)	4.8 (4.5 to 5.0)	-0.5* (-0.9 to -0.1)	0.008

B. White patients

	White patients		White patients Adjusted risk difference, pp (95%CI)	p-value
	Concordant	Discordant		
Adjusted mortality rate, % (95%CI)	1.6 (1.4 to 1.8)	1.6 (1.2 to 2.0)	0 (-0.5 to +0.5)	0.93
Adjusted readmission rate, % (95%CI)	6.3 (6.0 to 6.7)	7.2 (6.5 to 8.0)	-0.9 (-1.8 to 0.02)	0.05
Adjusted LOS, d (95%CI)	4.3 (4.3 to 4.4)	4.3 (4.1 to 4.4)	+0.1* (-0.1 to +0.2)	0.42

Association between patient-surgeon racial and ethnic concordance and 30-day mortality, 30-day readmissions, and length of stay among Black, Hispanic, and White patients, excluding hospitals without Black or Hispanic surgeons, using Medicare data from 2016-2019 calculated using marginal standardization from linear probability models, controlling for patient (age, sex, race and ethnicity, 27 chronic conditions, median household income, dual-eligibility for Medicaid) procedure (procedure type, weekend surgery, electiveness of surgery, month, year), surgeon (age, sex, procedure volume), and hospital (size, teaching, urban/rural, and ownership status) characteristics. Estimated adjusted outcome lower bound set at 0. Abbreviations: d, day; LOS, length of stay.; pp, percentage point. *unit: adjusted days

eTable 8: Sensitivity analysis for adjusted outcomes using a continuous indicator variable for number of chronic conditions

A. Black and Hispanic patients

	Black patients		Black patients Adjusted risk difference, pp (95%CI)	p-value	Hispanic patients		Hispanic patients Adjusted risk difference, pp (95%CI)	p-value
	Concordant	Discordant			Concordant	Discordant		
Adjusted mortality rate, % (95%CI)	0.8 (0 to 2.6)	1.4 (0.8 to 1.9)	-0.6 (-2.6 to +1.4)	0.57	1.2 (0.3 to 2.1)	1.7 (1.3 to 2.2)	-0.6 (-1.6 to +0.5)	0.29
Adjusted readmission rate, % (95%CI)	10.5 (6.2 to 14.8)	7.3 (6.0 to 8.6)	+3.2 (-1.4 to +7.8)	0.31	4.4 (2.7 to 6/0)	6.6 (5.7 to 7.4)	-2.2 (-4.1 to -0.3)	0.02
Adjusted LOS, d (95%CI)	5.2 (4.0 to 6.4)	5.1 (4.8 to 5.4)	+0.1* (-1.2 to +1.3)	0.93	4.1 (3.8 to 4.4)	4.6 (4.4 to 4.8)	-0.5* (-0.9 to -0.2)	0.002

B. White patients

	White patients		White patients Adjusted risk difference, pp (95%CI)	p-value
	Concordant	Discordant		
Adjusted mortality rate, % (95%CI)	1.6 (1.4 to 1.7)	1.4 (1.0 to 1.8)	+0.1 (-0.3 to +0.6)	0.56
Adjusted readmission rate, % (95%CI)	6.5 (6.3 to 6.8)	7.1 (6.3 to 7.8)	-0.6 (-1.4 to 0.3)	0.17
Adjusted LOS, d (95%CI)	4.4 (4.3 to 4.4)	4.2 (4.1 to 4.4)	+0.1* (0 to +0.3)	0.10

Association between patient-surgeon racial and ethnic concordance and 30-day mortality, 30-day readmissions, and length of stay among Black, Hispanic, and White patients, using Medicare data from 2016-2019 calculated using marginal standardization from linear probability models, controlling for patient (age, sex, race and ethnicity, indicator variable for number of 27 chronic conditions, median household income, dual-eligibility for Medicaid) procedure (procedure type, weekend surgery, electiveness of surgery, month, year), surgeon (age, sex, procedure volume), and hospital (size, teaching, urban/rural, and ownership status) characteristics. Estimated adjusted outcome lower bound set at 0. Abbreviations: d, day; LOS, length of stay.; pp, percentage point. *unit: adjusted days

eTable 9: Sensitivity analysis for definition of 30-day readmission as readmission within 30-days of discharge from initial procedure hospitalization

A. Black and Hispanic patients

	Black patients		Black patients Adjusted risk difference, pp (95%CI)	p-value	Hispanic patients		Hispanic patients Adjusted risk difference, pp (95%CI)	p-value
	Concordant	Discordant			Concordant	Discordant		
Adjusted readmission rate, % (95%CI)	12.6 (8.0 to 17.3)	8.3 (6.9 to 9.7)	+4.3 (-0.6 to +9.3)	0.09	5.1 (3.4 to 6.9)	7.7 (6.8 to 8.6)	-2.5 (-4.6 to -0.5)	0.014

B. White patients

	White patients		White patients Adjusted risk difference, pp (95%CI)	p-value
	Concordant	Discordant		
Adjusted readmission rate, % (95%CI)	7.5 (7.2 to 7.8)	8.1 (7.3 to 8.9)	-0.6 (-1.5 to +0.3)	0.17

Association between patient-surgeon racial and ethnic concordance and 30-day readmissions (new definition) among Black, Hispanic, and White patients, using Medicare data from 2016-2019 calculated using marginal standardization from linear probability models, controlling for patient (age, sex, race and ethnicity, 27 chronic conditions, median household income, dual-eligibility for Medicaid) procedure (procedure type, weekend surgery, electiveness of surgery, month, year), surgeon (age, sex, procedure volume), and hospital (size, teaching, urban/rural, and ownership status) characteristics.
Abbreviations: d, day; LOS, length of stay.; pp, percentage point. *unit: adjusted days

eTable 10. The effect of patient-surgeon racial and ethnic concordance on outcomes among Black and Hispanic patients, stratified by procedure

A. 30-day postoperative mortality among Black patients

	Concordance		Discordance			
Procedure	No. patients (No. surgeons)	Adjusted mortality rate, % (95%CI)	No. patients (No. surgeons)	Adjusted mortality rate, % (95%CI)	Adjusted risk difference, pp (95%CI)	p-value
Knee replacement	45 (7)	0.3 (0 to 1.0)	617 (108)	0.1 (0 to 0.4)	+0.1 (-0.4 to +0.7)	0.65
Hip replacement	43 (8)	1.9 (0 to 9.5)	325 (100)	1.0 (0 to 2.3)	+1.0 (-7.4 to +9.3)	0.82
Laminectomy	30 (6)	0 (0 to 2.6)	267 (67)	1.9 (0 to 3.9)	-5.9 (-13.9 to +2.2)	0.15
Cholecystectomy	20 (10)	8.9 (0 to 18.6)	98 (70)	1.3 (0 to 4.0)	+7.6 (-2.8 to +18.1)	0.15
Colectomy	39 (10)	0.8 (0 to 13.4)	85 (56)	6.7 (0 to 14.2)	-5.9 (-24.4 to +12.5)	0.52
CABG	11 (3)	6.5 (0 to 22.8)	68 (29)	0.4 (0 to 3.9)	+6.1 (-12.7 to +24.8)	0.51
Lobectomy	13 (3)	0 (0 to 20.9)	64 (17)	8.1 (0 to 16.6)	-17.4 (-54.3 to +19.4)	0.33
Appendectomy	7 (6)	-	28 (25)	-	-	-
Prostatectomy	9 (3)	-	47 (21)	-	-	-
AAA repair	3 (3)	-	25 (18)	-	-	-
Cystectomy	0 (0)	-	5 (5)	-	-	-
Hysterectomy	1 (1)	-	1 (1)	-	-	-
Thyroidectomy	1 (1)	-	3 (3)	-	-	-
Liver	0 (0)	-	3 (3)	-	-	-

B. 30-day postoperative mortality among Hispanic patients

	Concordance		Discordance			
Procedure	No. patients (No. surgeons)	Adjusted mortality rate, % (95%CI)	No. patients (No. surgeons)	Adjusted mortality rate, % (95%CI)	Adjusted risk difference, pp (95%CI)	p-value
Knee replacement	317 (20)	0.3 (0 to 0.9)	1340 (164)	0.1 (0 to 0.2)	+0.2 (-0.3 to +0.8)	0.38
Hip replacement	97 (23)	0.3 (0 to 3.3)	548 (149)	1.6 (0.5 to 2.7)	-1.3 (-4.8 to +2.3)	0.48
Laminectomy	100 (10)	0 (0 to 0.5)	388 (86)	0.7 (0 to 1.8)	-1.6 (-4.0 to +0.7)	0.17
Cholecystectomy	94 (31)	0 (0 to 1.3)	386 (143)	1.6 (0.3 to 2.9)	-1.8 (-3.9 to +0.4)	0.11
Colectomy	55 (29)	4.9 (0 to 13.4)	257 (107)	10.2 (6.7 to 13.8)	-5.3 (-15.1 to +4.5)	0.29
CABG	32 (5)	0.6 (0 to 8.3)	154 (38)	3.8 (0.2 to 7.3)	-3.1 (-12.9 to +6.6)	0.52
Lobectomy	1 (1)	-	71 (21)	-	-	-
Appendectomy	23 (15)	2.4 (0 to 17.9)	98 (66)	6.6 (1.5 to 11.6)	-4.2 (-22.1 to +13.8)	0.65
Prostatectomy	17 (4)	0 (0 to 8.2)	87 (40)	2.4 (0 to 6.4)	-2.9 (-14.1 to +8.4)	0.61
AAA repair	9 (3)	-	36 (25)	-	-	-
Cystectomy	0 (0)	-	3 (3)	-	-	-
Hysterectomy	7 (2)	-	7 (7)	-	-	-
Thyroidectomy	0 (0)	-	10 (6)	-	-	-
Liver	3 (2)	-	6 (5)	-	-	-

C. 30-day postoperative readmissions among Black patients

	Concordance		Discordance			
Procedure	No. patients (No. surgeons)	Adjusted readmission rate, % (95%CI)	No. patients (No. surgeons)	Adjusted readmission rate, % (95%CI)	Adjusted risk difference, pp (95%CI)	p-value
Knee replacement	45 (7)	14.2 (3.3 to 25.1)	617 (108)	5.8 (3.9 to 7.6)	+8.4 (-2.7 to +19.6)	0.14
Hip replacement	43 (8)	7.0 (0 to 17.5)	325 (100)	5.5 (3.0 to 8.0)	+1.5 (-9.8 to +12.8)	0.79
Laminectomy	30 (6)	9.3 (0 to 23.4)	267 (67)	9.8 (6.1 to 13.6)	-0.6 (-15.8 to +14.7)	0.94
Cholecystectomy	20 (10)	25.2 (7.9 to 42.6)	98 (70)	7.1 (1.8 to 12.3)	+18.1 (-0.7 to +36.9)	0.06
Colectomy	39 (10)	2.7 (0 to 18.4)	85 (56)	12.9 (3.7 to 22.0)	-10.2 (-32.1 to +11.7)	0.35
CABG	11 (3)	62.9 (18.1 to 107.7)	68 (29)	4.5 (0 to 14.1)	+58.4 (+7.6 to +109.3)	0.03
Lobectomy	13 (3)	14.0 (0 to 74.1)	64 (17)	8.1 (0 to 22.5)	+6.0 (-65.2 to +77.1)	0.86
Appendectomy	7 (6)	-	28 (25)	-	-	-
Prostatectomy	9 (3)	-	47 (21)	-	-	-
AAA repair	3 (3)	-	25 (18)	-	-	-
Cystectomy	0 (0)	-	5 (5)	-	-	-
Hysterectomy	1 (1)	-	1 (1)	-	-	-
Thyroidectomy	1 (1)	-	3 (3)	-	-	-
Liver	0 (0)	-	3 (3)	-	-	-

D. 30-day postoperative readmissions among Hispanic patients

	Concordance		Discordance			
Procedure	No. patients (No. surgeons)	Adjusted readmission rate, % (95%CI)	No. patients (No. surgeons)	Adjusted readmission rate, % (95%CI)	Adjusted risk difference, pp (95%CI)	p-value
Knee replacement	317 (20)	1.9 (0 to 3.8)	1340 (164)	4.4 (3.3 to 5.5)	-2.5 (-4.9 to -0.2)	0.04
Hip replacement	97 (23)	5.6 (0 to 11.5)	547 (148)	6.3 (4.2 to 8.4)	-0.8 (-7.5 to +5.9)	0.82
Laminectomy	100 (10)	4.4 (0 to 11.0)	388 (86)	8.9 (5.9 to 11.9)	-4.6 (-12.6 to +3.5)	0.27
Cholecystectomy	94 (31)	7.6 (1.7 to 13.6)	384 (142)	6.7 (4.1 to 9.3)	+0.9 (-6.0 to +7.8)	0.80
Colectomy	55 (29)	4.5 (0 to 13.5)	256 (107)	12.3 (7.9 to 16.7)	-7.8 (-18.6 to +3.0)	0.15
CABG	32 (5)	6.3 (0 to 24.7)	154 (38)	13.0 (6.4 to 19.5)	-6.7 (-29.0 to +15.7)	0.56
Lobectomy	1 (1)	0 (0 to 109.1)	71 (21)	7.8 (0.4 to 15.2)	-61.7 (-225.1 to +101.6)	0.42
Appendectomy	23 (15)	7.3 (0 to 19.1)	97 (65)	4.5 (0 to 9.1)	+2.9 (-10.5 to +16.2)	0.67
Prostatectomy	17 (4)	9.4 (7.1 to 11.7)	87 (40)	2.0 (0 to 10.2)	+7.4 (-1.6 to +16.3)	0.11
AAA repair	9 (3)	-	36 (25)	-	-	-
Cystectomy	0 (0)	-	3 (3)	-	-	-
Hysterectomy	7 (2)	-	7 (7)	-	-	-
Thyroidectomy	0 (0)	-	10 (6)	-	-	-
Liver	3 (2)	-	6 (5)	-	-	-

E. Length of stay among Black patients

	Concordance		Discordance			
Procedure	No. patients (No. surgeons)	Adjusted LOS, d (95%CI)	No. patients (No. surgeons)	Adjusted LOS, d (95%CI)	Adjusted difference, d (95%CI)	p-value
Knee replacement	45 (7)	4.4 (3.2 to 5.7)	617 (108)	2.9 (2.7 to 3.1)	+1.5 (+0.2 to +2.8)	0.02
Hip replacement	43 (8)	4.1 (2.5 to 5.6)	325 (100)	3.6 (3.2 to 4.0)	+0.5 (-1.2 to +2.2)	0.58
Laminectomy	30 (6)	4.6 (2.0 to 7.2)	267 (67)	5.9 (5.1 to 6.7)	-1.3 (-4.2 to +1.6)	0.37
Cholecystectomy	20 (10)	3.4 (0 to 8.3)	98 (70)	8.5 (6.4 to 10.5)	-5.0 (-11.1 to +1.0)	0.10
Colectomy	39 (10)	13.7 (6.3 to 21.1)	85 (56)	6.6 (4.0 to 9.1)	+7.1 (-1.9 to +16.1)	0.12
CABG	11 (3)	10.7 (0 to 26.3)	68 (29)	12.1 (8.1 to 16.0)	-1.4 (-20.0 to +17.2)	0.88
Lobectomy	13 (3)	7.7 (0.7 to 14.7)	64 (17)	7.2 (5.3 to 9.2)	+0.5 (-8.1 to +9.1)	0.91
Appendectomy	7 (6)	-	28 (25)	-	-	-
Prostatectomy	9 (3)	-	47 (21)	-	-	-
AAA repair	3 (3)	-	25 (18)	-	-	-
Cystectomy	0 (0)	-	5 (5)	-	-	-
Hysterectomy	1 (1)	-	1 (1)	-	-	-
Thyroidectomy	1 (1)	-	2 (2)	-	-	-
Liver	0 (0)	-	3 (3)	-	-	-

F. Length of stay among Hispanic patients

	Concordance		Discordance			
Procedure	No. patients (No. surgeons)	Adjusted LOS, d (95%CI)	No. patients (No. surgeons)	Adjusted LOS, d (95%CI)	Adjusted difference, d (95%CI)	p-value
Knee replacement	317 (20)	2.8 (2.6 to 3.0)	1340 (164)	2.8 (2.7 to 2.9)	0.0 (-0.2 to +0.2)	0.90
Hip replacement	97 (23)	5.3 (4.1 to 6.5)	548 (149)	4.2 (3.8 to 4.6)	+1.1 (-0.1 to +2.3)	0.06
Laminectomy	100 (10)	4.5 (2.9 to 6.1)	388 (86)	6.1 (5.5 to 6.8)	-1.6 (-3.5 to +0.3)	0.09
Cholecystectomy	93 (30)	4.7 (3.7 to 5.7)	385 (143)	5.1 (4.6 to 5.6)	-0.4 (-1.6 to +0.8)	0.53
Colectomy	54 (29)	6.3 (4.5 to 8.1)	257 (107)	8.2 (7.3 to 9.1)	-1.9 (-4.0 to +0.2)	0.08
CABG	32 (5)	11.3 (7.4 to 15.2)	154 (38)	9.7 (8.4 to 11.1)	+1.6 (-2.8 to +6.0)	0.48
Lobectomy	1 (1)	19.9 (0 to 49.6)	71 (21)	5.6 (4.3 to 6.8)	+14.4 (-15.6 to +44.4)	0.31
Appendectomy	23 (15)	5.6 (3.3 to 7.8)	98 (66)	4.8 (3.9 to 5.7)	+0.7 (-1.8 to +3.3)	0.57
Prostatectomy	17 (4)	2.4 (0.5 to 4.2)	87 (40)	3.3 (2.7 to 4.0)	-0.9 (-3.1 to +1.2)	0.38
AAA repair	9 (3)	-	36 (25)	-	-	-
Cystectomy	0 (0)	-	3 (3)	-	-	-
Hysterectomy	7 (2)	-	7 (7)	-	-	-
Thyroidectomy	0 (0)	-	10 (6)	-	-	-
Liver	3 (2)	-	6 (5)	-	-	-

Stratified analysis by procedure shows the association of patient-surgeon racial and ethnic concordance with adjusted 30-day post-operative mortality (A,B), 30-day post-operative readmission (C,D), and length of stay (E,F) among Black and Hispanic patients following 14 common procedures (abdominal aortic aneurysm repair, appendectomy, coronary artery bypass grafting, cholecystectomy, cystectomy, hip replacement, hysterectomy, knee replacement, laminectomy, liver resection, lung resection, prostatectomy, and thyroidectomy) using Medicare data from 2016-2019, calculated using marginal standardization from linear probability models, controlling for patient (age, sex, race and ethnicity, 27 chronic conditions, median household income, dual-eligibility for Medicaid) procedure (weekend surgery, electiveness of surgery, month, year), surgeon (age, sex, procedure volume), and hospital (size, teaching, urban/rural, and ownership status) characteristics.. Abbreviations: AAA, abdominal aortic aneurysm; CABG, coronary artery bypass grafting. Separate regressions were performed for each surgical procedure; due to small sample sizes for certain operations, the model did not

converge and we are unable to report adjusted mortality rate for those individual procedures. Estimated adjusted outcome lower bound set at 0.
Abbreviations: d, day; LOS, length of stay.; pp, percentage point.

eTable 11. The effect of patient-surgeon racial and ethnic concordance on outcomes among Black and Hispanic patients, stratified by high versus low morbidity procedures

A. 30-day postoperative mortality among Black patients

		Concordance	Discordance		
Procedure Morbidity	No. patients	Adjusted mortality rate, % (95%CI)	Adjusted mortality rate, % (95%CI)	Adjusted risk difference, pp (95%CI)	p-value
High	527	2.0 (0 to 6.1)	0.1 (0 to 0.4)	-1.1 (-6.0 to +3.9)	0.67
Low	1331	0.5 (0 to 2.7)	0.7 (0.2 to 1.2)	-0.2 (-2.6 to +2.2)	0.87

B. 30-day postoperative mortality among Hispanic patients

		Concordance	Discordance		
Procedure Morbidity	No. patients	Adjusted mortality rate, % (95%CI)	Adjusted mortality rate, % (95%CI)	Adjusted risk difference, pp (95%CI)	p-value
High	1346	3.2 (0.7 to 5.6)	4.3 (3.1 to 5.5)	-1.1 (-3.9 to +1.7)	0.44
Low	2800	0.4 (0 to 1.1)	0.5 (0.2 to 0.8)	-0.1 (-0.9 to +0.7)	0.79

C. 30-day postoperative readmission among Black patients

		Concordance	Discordance		
Procedure Morbidity	No. patients	Adjusted mortality rate, % (95%CI)	Adjusted mortality rate, % (95%CI)	Adjusted risk difference, pp (95%CI)	p-value
High	527	13.6 (6.4 to 20.9)	8.7 (5.9 to 11.5)	+4.9 (-3.1 to 1+3.0)	0.23
Low	1331	8.8 (3.2 to 14.4)	6.7 (5.3 to 8.1)	+2.1 (-3.8 to +7.9)	0.49

D. 30-day postoperative readmission among Hispanic patients

		Concordance	Discordance		
Procedure Morbidity	No. patients	Adjusted mortality rate, % (95%CI)	Adjusted mortality rate, % (95%CI)	Adjusted risk difference, pp (95%CI)	p-value
High	1342	6.3 (2.9 to 9.7)	8.7 (7.0 to 10.4)	-2.4 (-6.3 to +1.5)	0.28
Low	2799	3.2 (1.4 to 5.0)	5.6 (4.6 to 6.5)	-2.4 (-4.6 to -0.3)	0.029

E. Length of stay among Black patients

		Concordance	Discordance		
Procedure Morbidity	No. patients	Adjusted LOS, d (95%CI)	Adjusted LOS, d (95%CI)	Adjusted difference, d (95%CI)	p-value
High	527	8.8 (5.8 to 11.8)	8.4 (7.6 to 9.3)	+0.4 (-2.9 to +3.6)	0.83
Low	1330	4.2 (3.2 to 5.2)	3.8 (3.5 to 4.0)	+0.4 (-0.6 to +1.5)	0.43

F. Length of stay among Hispanic patients

		Concordance	Discordance		
Procedure Morbidity	No. patients	Adjusted LOS, d (95%CI)	Adjusted LOS, d (95%CI)	Adjusted difference, d (95%CI)	p-value
High	1343	5.5 (4.8 to 6.1)	6.4 (4.8 to 6.1)	-0.9 (-1.7 to -0.1)	0.027
Low	2800	3.5 (3.2 to 3.8)	3.7 (3.6 to 3.9)	-0.2 (-0.6 to +0.1)	0.16

Stratified analysis by procedure morbditiy (high v low) shows the association of patient-surgeon racial and ethnic concordance with adjusted 30-day post-operative mortality (A,B), 30-day post-operative readmission (C,D), and length of stay (E,F) among Black and Hispanic patients. High morbidity

procedures include abdominal aortic aneurysm repair, appendectomy, coronary artery bypass grafting, cholecystectomy, cystectomy, hysterectomy, liver resection, lung resection, and prostatectomy; low morbidity procedures include hip replacement, knee replacement, laminectomy and thyroidectomy. Using Medicare data from 2016-2019, calculated using marginal standardization from linear probability models, controlling for patient (age, sex, race and ethnicity, 27 chronic conditions, median household income, dual-eligibility for Medicaid) procedure (weekend surgery, electiveness of surgery, month, year), surgeon (age, sex, procedure volume), and hospital (size, teaching, urban/rural, and ownership status) characteristics. Separate regressions were performed for each surgical procedure mordibity class. Estimated adjusted outcome lower bound set at 0. Abbreviations: d, day; LOS, length of stay.; pp, percentage point.

eTable 12. Baseline characteristics of White patients, according to patient-surgeon racial and ethnic concordance

Total= 39,543	**White patients**		
Characteristic	Concordant patient-surgeon	Discordant patient-surgeon	p- value
Patients, No. (%)	34,505 (87.3)	5,038 (12.7)	NA
Patient characteristics			
Patient age, y, mean (SD)	75.2 (6.8)	75.4 (7.0)	0.48
Patient sex			
Male	15,166 (44.0)	2,326 (46.2)	0.0031
Female	19,339 (56.1)	2,712 (53.8)	
Dual Medicare Medicaid	2,691 (7.8)	522 (10.4)	<0.001
Median household income*, $, mean (SD)	83,384 (34308.4)	72,501 (29540.0)	<0.001
Coexisting conditions			
Congestive heart failure	8,182 (23.7)	1,402 (27.8)	<0.001
Chronic obstructive pulmonary disease	8,206 (23.8)	1,356 (26.9)	<0.001
Diabetes	11,159 (32.3)	1,910 (37.9)	<0.001
Chronic kidney disease	10,785 (31.3)	1,780 (35.3)	<0.001
Neurological disorders	6,552 (19.0)	1,112 (22.1)	<0.001
Cancer	7,609 (22.1)	1,076 (21.4)	0.27
Surgeon characteristics			
Surgeon age, y, mean (SD)	52.8 (10.9)	49.4 (10.5)	<0.001
Surgeon Gender			
Male	687 (90.5)	147 (87.0)	0.17
Female	72 (9.5)	22 (13.0)	
Surgical volume (tertiles)			
1 (Lowest)	1,045 (3.0)	200 (4.0)	<0.001
2	6,647 (19.3)	1,036 (20.6)	
3 (Highest)	26,813 (77.7)	3,802 (75.5)	
Hospital Characteristics			
Hospital size, beds			
≤399	24,765 (71.8)	2,603 (51.7)	<0.001
>399	9,740 (28.2)	2,435 (48.3)	
Teaching hospital			
Yes	20,240 (58.7)	3,111 (61.8)	<0.001
No	14,265 (41.3)	1,927 (38.3)	
Hospital ownership			
For-profit	5,271 (15.3)	624 (12.4)	<0.001
Not-for-profit	25,010 (72.5)	3,416 (67.8)	
Public	4,224 (12.2)	998 (19.8)	

Urban area			
Yes	34,130 (98.9)	5,032 (99.9)	<0.001
No	375 (1.1)	6 (0.1)	

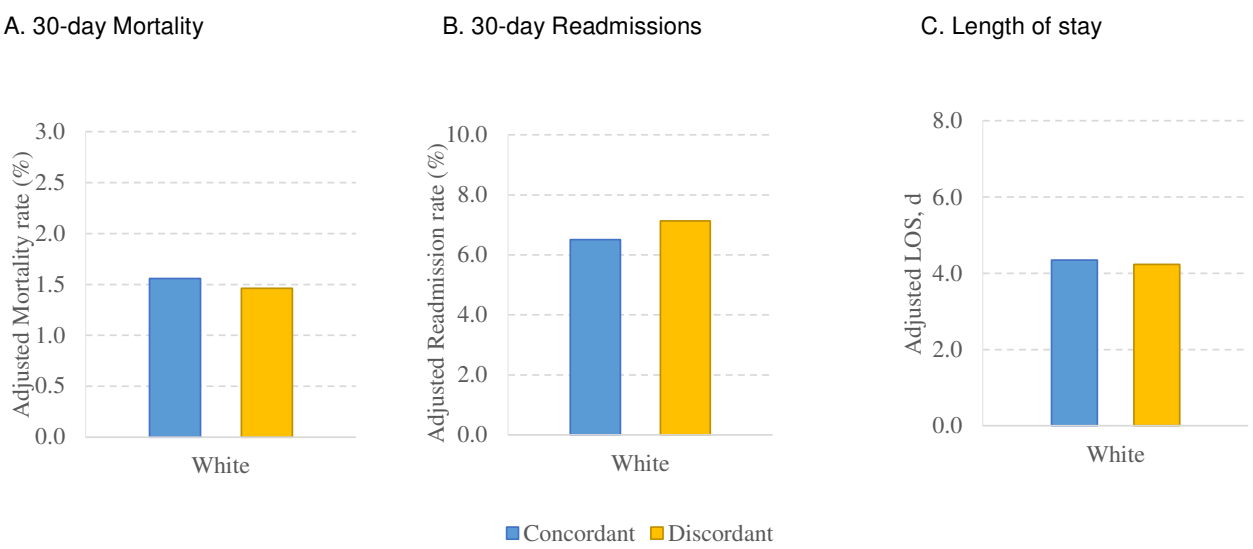
*Median household income is estimated from the beneficiary's zip code of residency. Medicare data from 2016-2019.

eTable 13. Association of patient-surgeon racial and ethnic concordance with postoperative outcomes among White patients

	White patients		White patients Adjusted risk difference, pp (95%CI)	p-value
	Concordant	Discordant		
Adjusted mortality rate, % (95%CI)	1.6 (1.4 to 1.7)	1.5 (1.1 to 1.9)	+0.1 (-0.3 to +0.5)	0.67
Adjusted readmission rate, % (95%CI)	6.5 (6.2 to 6.8)	7.1 (6.4 to 7.9)	-0.6 (-1.4 to +0.2)	0.13
Adjusted LOS, days (95%CI)	4.3* (4.3 to 4.4)	4.2* (4.1 to 4.4)	+0.1* (-0.05 to +0.3)	0.16

Association between patient-surgeon racial and ethnic concordance and 30-day mortality, 30-day readmissions, and length of stay among White patients using Medicare data from 2016-2019 calculated using marginal standardization from generalized linear probability models, controlling for patient (age, sex, 27 chronic conditions, median household income, dual-eligibility for Medicaid) procedure (procedure type, weekend surgery, electiveness of surgery, month, year), surgeon (age, sex, procedure volume), and hospital (size, teaching, urban/rural, and ownership status) characteristics. Abbreviations: d, day; LOS, length of stay. *unit: adjusted days

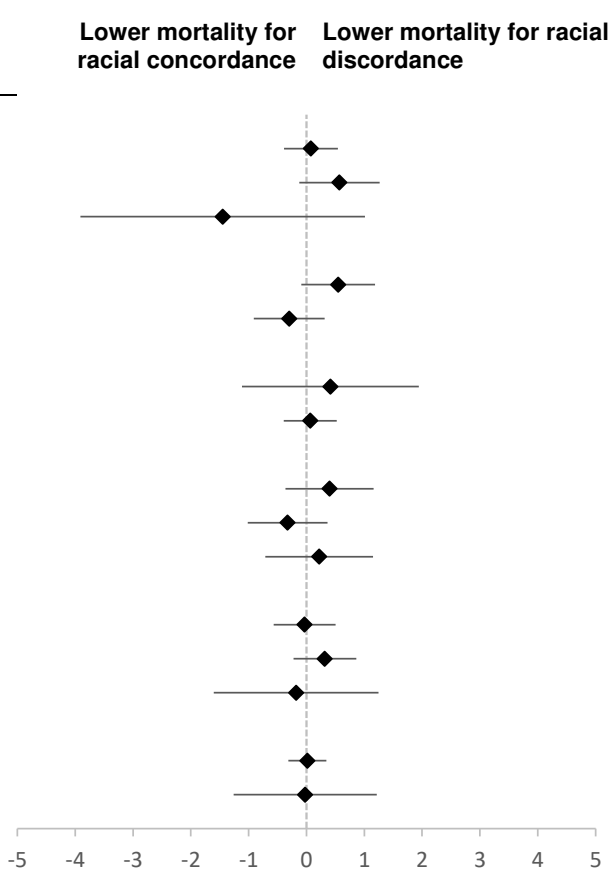
eFigure 1: Association of patient-surgeon racial and ethnic concordance with postoperative outcomes among White patients



Association between patient-surgeon racial and ethnic concordance and 30-day mortality, 30-day readmissions, and length of stay among White patients using Medicare data from 2016-2019 calculated using marginal standardization from generalized linear probability models, controlling for patient (age, sex, 27 chronic conditions, median household income, dual-eligibility for Medicaid) procedure (procedure type, weekend surgery, electiveness of surgery, month, year), surgeon (age, sex, procedure volume), and hospital (size, teaching, urban/rural, and ownership status) characteristics. Abbreviations: d, day; LOS, length of stay.

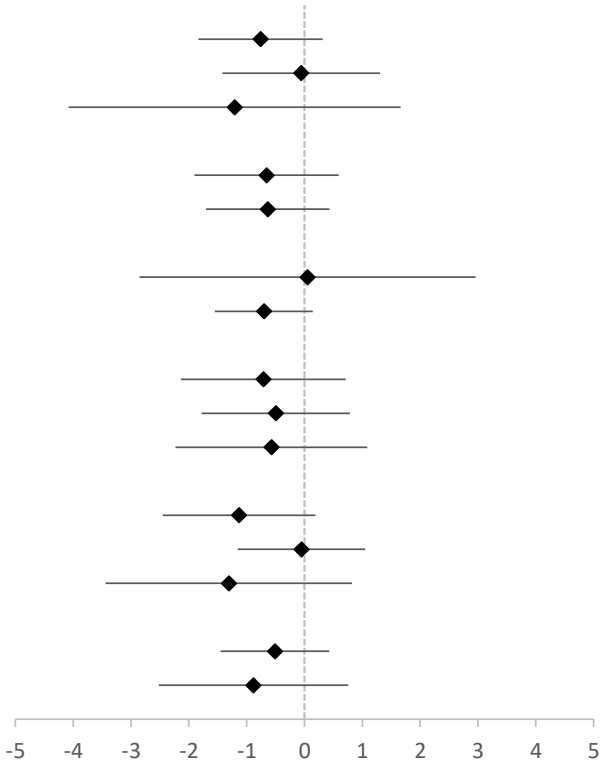
eFigure 2: Subgroup analysis of postoperative outcomes by patient and procedure characteristics among White patients
A. 30-day postoperative mortality

Variable	Adjusted risk difference (aRD, 95% CI)	Test for heterogeneity P value
Patient age, y		
65-74	0.1 (-0.4 to 0.5)	
75-84	0.6 (-0.1 to 1.3)	0.14
85-99	-1.4 (-3.9 to 1.0)	
Patient gender		
Male	0.6 (-0.1 to 1.2)	0.04
Female	-0.3 (-0.9 to 0.3)	
Medicaid dual eligibility		
Yes	0.4 (-1.1 to 1.9)	0.55
No	0.1 (-0.4 to 0.5)	
Median household income (tertiles)		
1 (Lowest)	0.4 (-0.4 to 1.2)	
2	-0.3 (-1.0 to 0.4)	0.28
3 (Highest)	0.2 (-0.7 to 1.2)	
Number of Chronic conditions		
0-5	-0.03 (-0.6 to 0.5)	
6-10	0.3 (-0.2 to 0.9)	0.23
>10	-0.2 (-1.6 to 1.2)	
Elective vs non-elective		
Elective	0.02 (-0.3 to 0.3)	1.00
Non-elective	-0.02 (-1.3 to 1.2)	



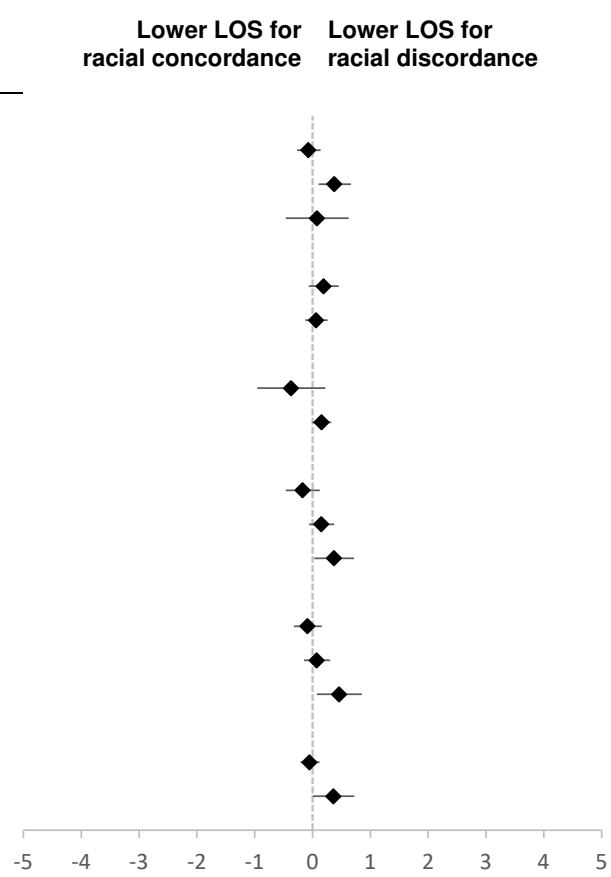
B. 30-day postoperative readmissions

Variable	Adjusted risk difference (aRD, 95% CI)	Test for heterogeneity P value
Patient age, y		
65-74	-0.8 (-1.8 to 0.3)	
75-84	-0.1 (-1.4 to 1.3)	0.61
85-99	-1.2 (-4.1 to 1.7)	
Patient gender		
Male	-0.7 (-1.9 to 0.6)	
Female	-0.6 (-1.7 to 0.4)	0.92
Medicaid dual eligibility		
Yes	0.1 (-2.9 to 3.0)	
No	-0.7 (-1.5 to 0.1)	0.68
Median household income (tertiles)		
1 (Lowest)	-0.7 (-2.1 to 0.7)	
2	-0.5 (-1.8 to 0.8)	0.85
3 (Highest)	-0.6 (-2.2 to 1.1)	
Number of Chronic conditions		
0-5	-1.1 (-2.5 to 0.2)	
6-10	-0.1 (-1.2 to 1.1)	0.64
>10	-1.3 (-3.4 to 0.8)	
Elective vs non-elective		
Elective	-0.5 (-1.4 to 0.4)	
Non-elective	-0.9 (-2.5 to 0.8)	0.92



C. Length of stay

Variable	Adjusted difference (aRD, 95% CI)	Test for heterogeneity P value
Patient age, y		
65-74	-0.1 (-0.3 to 0.1)	
75-84	0.4 (0.1 to 0.7)	0.41
85-99	0.1 (-0.5 to 0.6)	
Patient gender		
Male	0.2 (-0.1 to 0.5)	
Female	0.1 (-0.1 to 0.3)	0.26
Medicaid dual eligibility		
Yes	-0.4 (-1.0 to 0.2)	
No	0.2 (-0.003 to 0.3)	0.14
Median household income (tertiles)		
1 (Lowest)	-0.2 (-0.5 to 0.1)	
2	0.2 (-0.1 to 0.4)	0.07
3 (Highest)	0.4 (0.03 to 0.7)	
Number of Chronic conditions		
0-5	-0.1 (-0.3 to 0.2)	
6-10	0.1 (-0.1 to 0.3)	0.55
>10	0.5 (0.1 to 0.9)	
Elective vs non-elective		
Elective	-0.05 (-0.2 to 0.1)	
Non-elective	0.4 (0.01 to 0.7)	0.004



Subgroup analysis shows the associations between patient-surgeon racial and ethnic concordance and outcomes 30-day postoperative mortality (A), 30-day postoperative readmissions (B), and length of stay (C) using Medicare data from 2016-2019 by patient characteristics (age, gender, Medicaid dual eligibility, median household income estimated from beneficiary zip codes, number of chronic conditions) and procedure characteristics (elective versus non-elective). Diamonds represent point estimates for the adjusted outcomes for White patients following 14 common procedures (abdominal aortic aneurysm repair, appendectomy, coronary artery bypass grafting, cholecystectomy, cystectomy, hip replacement, hysterectomy, knee replacement, laminectomy, liver resection, lung resection, prostatectomy, and thyroidectomy), calculated using marginal standardization from linear probability models, controlling for patient (age, sex, 27 chronic conditions, median household income, dual-eligibility for Medicaid) procedure (procedure type, weekend surgery, electiveness of surgery, month, year), surgeon (age, sex, procedure volume), and hospital (size, teaching, urban/rural, and ownership status) characteristics. Horizontal lines indicate the associated 95% confidence intervals. Abbreviations: aRD, adjusted risk difference; CI, confidence interval; LOS, length of stay; y, year.

eTable 14. The effect of patient-surgeon racial and ethnic concordance on outcomes among White patients, stratified by procedure

A. 30-day mortality

	Concordance		Discordance			
Procedure	No. patients (No. surgeons)	Adjusted mortality rate, % (95%CI)	No. patients (No. surgeons)	Adjusted mortality rate, % (95%CI)	Adjusted risk difference, pp (95%CI)	p-value
Knee replacement	10317 (204)	0.2 (0.1 to 0.3)	984 (31)	0.1 (0 to 0.4)	+0.1 (-0.2 to +0.5)	0.48
Hip replacement	10213 (240)	1.5 (1.2 to 1.7)	1411 (40)	1.6 (0.8 to 2.4)	-0.1 (-1.0 to +0.7)	0.78
Laminectomy	5016 (115)	1.0 (0.7 to 1.3)	730 (24)	0.2 (0 to 1.0)	+0.8 (-0.1 to +1.8)	0.09
Cholecystectomy	1878 (209)	1.5 (0.9 to 2.0)	424 (66)	2.9 (1.3 to 4.5)	-1.4 (-3.1 to +0.3)	0.10
Colectomy	2181 (208)	5.8 (4.8 to 6.7)	414 (58)	6.5 (4.0 to 9.1)	-0.8 (-3.6 to +2.1)	0.60
CABG	1581 (53)	3.7 (2.7 to 4.6)	673 (11)	3.0 (1.5 to 4.4)	+0.7 (-1.1 to +2.5)	0.47
Lobectomy	1325 (50)	2.6 (1.7 to 3.4)	86 (15)	0 (0 to 2.2)	+3.5 (-0.03 to +7.0)	0.05
Appendectomy	721 (166)	2.3 (1.2 to 3.5)	128 (45)	4.7 (1.0 to 8.5)	-2.4 (-6.4 to +1.6)	0.24
Prostatectomy	636 (79)	0.8 (0.1 to 1.5)	53 (12)	0 (0 to 1.5)	+0.8 (-1.0 to +2.7)	0.38
AAA repair	431 (60)	6.0 (3.8 to 8.2)	106 (14)	4.9 (0.2 to 9.6)	+1.1 (-4.3 to +6.4)	0.69
Cystectomy	96 (23)	-	8 (3)	-	-	-
Hysterectomy	46 (29)	-	7 (6)	-	-	-
Thyroidectomy	42 (23)	-	2 (2)	-	-	-
Liver	22 (9)	-	12 (5)	-	-	-

B. 30-day readmissions

	Concordance		Discordance			
Procedure	No. patients (No. surgeons)	Adjusted mortality rate, % (95%CI)	No. patients (No. surgeons)	Adjusted mortality rate, % (95%CI)	Adjusted risk difference, pp (95%CI)	p-value
Knee replacement	10315 (204)	4.2 (3.8 to 4.5)	984 (31)	5.2 (3.8 to 6.7)	-1.1 (-2.6 to +0.5)	0.18
Hip replacement	10198 (239)	5.8 (5.4 to 6.3)	1410 (40)	7.1 (5.7 to 8.5)	-1.3 (-2.8 to +0.2)	0.09
Laminectomy	5009 (115)	7.7 (7.0 to 8.5)	727 (24)	7.5 (5.3 to 9.8)	+0.2 (-2.2 to +2.6)	0.87
Cholecystectomy	1871 (209)	7.8 (6.6 to 9.0)	423 (66)	9.2 (6.3 to 12.1)	-1.4 (-4.6 to +1.8)	0.40
Colectomy	2171 (207)	10.6 (9.3 to 11.9)	413 (57)	8.9 (5.9 to 11.9)	+1.7 (-1.7 to +5.1)	0.33

CABG	1577 (53)	8.4 (7.0 to 9.8)	673 (11)	11.4 (8.7 to 14.0)	-3.0 (-6.1 to +0.2)	0.07
Lobectomy	1325 (50)	7.8 (6.4 to 9.3)	86 (15)	3.9 (0 to 9.7)	+3.9 (-2.3 to +10.0)	0.22
Appendectomy	717 (166)	6.7 (4.8 to 8.6)	128 (45)	5.2 (0.4 to 10.0)	+1.5 (-3.9 to +6.9)	0.58
Prostatectomy	636 (79)	9.4 (7.1 to 11.7)	53 (12)	2.0 (0 to 10.2)	+7.4 (-1.6 to +16.3)	0.11
AAA repair	430 (60)	10.1 (7.0 to 13.1)	106 (14)	8.2 (1.8 to 14.7)	+1.8 (-5.8 to +9.4)	0.64
Cystectomy	96 (23)	26.7 (16.1 to 37.2)	8 (3)	42.6 (0 to 108.9)	-15.9 (-89.0 to +57.2)	0.66
Hysterectomy	46 (29)	-	7 (6)	-	-	-
Thyroidectomy	42 (23)	-	2 (2)	-	-	-
Liver	22 (9)	-	12 (5)	-	-	-

C. Length of stay

	Concordance		Discordance			
Procedure	No. patients (No. surgeons)	Adjusted LOS, d (95%CI)	No. patients (No. surgeons)	Adjusted LOS, d (95%CI)	Adjusted risk, (95%CI)	p-value
Knee replacement	10319 (204)	2.6 (2.6 to 2.7)	984 (31)	2.7 (2.6 to 2.9)	-0.1 (-0.3 to +0.1)	0.18
Hip replacement	10217 (240)	3.4 (3.3 to 3.5)	1412 (40)	3.5 (3.3 to 3.7)	-0.1 (-0.3 to +0.1)	0.09
Laminectomy	5018 (114)	5.4 (5.2 to 5.6)	730 (24)	5.0 (4.5 to 5.6)	+0.4 (-0.2 to +1.0)	0.87
Cholecystectomy	1880 (209)	5.2 (4.9 to 5.5)	424 (66)	5.4 (4.8 to 6.0)	-0.2 (-0.9 to +0.4)	0.40
Colectomy	2177 (209)	7.6 (7.3 to 7.8)	410 (58)	7.2 (6.6 to 7.8)	+0.4 (-0.3 to +1.1)	0.33
CABG	1585 (53)	10.0 (9.6 to 10.4)	673 (11)	8.4 (8.0 to 8.9)	+1.5 (+0.9 to +2.2)	0.07
Lobectomy	1325 (50)	5.4 (5.0 to 5.7)	87 (15)	4.8 (3.4 to 6.1)	+0.6 (-0.8 to +2.0)	0.22
Appendectomy	723 (167)	5.1 (4.7 to 5.5)	128 (45)	5.1 (4.2 to 6.0)	+0.0 (-1.0 to +1.0)	0.58
Prostatectomy	636 (79)	3.2 (2.9 to 3.5)	53 (12)	2.4 (1.7 to 3.1)	+0.8 (0.0 to +1.6)	0.11
AAA repair	434 (60)	4.0 (3.4 to 4.6)	106 (14)	5.6 (3.9 to 7.3)	-1.6 (-3.5 to +0.2)	0.64
Cystectomy	96 (23)	9.8 (7.7 to 12.0)	8 (3)	0.6 (0 to 10.1)	+9.2 (-1.7 to +20.1)	0.66
Hysterectomy	46 (29)	-	7 (6)	-	-	-
Thyroidectomy	42 (23)	-	2 (2)	-	-	-
Liver	22 (9)	-	12 (5)	-	-	-

Stratified analysis by procedure shows the association of patient-surgeon racial and ethnic concordance with adjusted 30-day post-operative mortality (A,B), 30-day post-operative readmission (C,D), and length of stay (E,F) among White patients following 14 common procedures (abdominal aortic aneurysm repair, appendectomy, coronary artery bypass grafting, cholecystectomy, cystectomy, hip replacement, hysterectomy, knee replacement, laminectomy, liver resection, lung resection, prostatectomy, and thyroidectomy) using

Medicare data from 2016-2019, calculated using marginal standardization from linear probability models, controlling for patient (age, sex, race and ethnicity, 27 chronic conditions, median household income, dual-eligibility for Medicaid) procedure (weekend surgery, electiveness of surgery, month, year), surgeon (age, sex, procedure volume), and hospital (size, teaching, urban/rural, and ownership status) characteristics.. Abbreviations: AAA, abdominal aortic aneurysm; CABG, coronary artery bypass grafting. Separate regressions were performed for each surgical procedure; due to small sample sizes for certain operations, the model did not converge and we are unable to report adjusted mortality rate for those individual procedures. Estimated adjusted outcome lower bound set at 0. Abbreviations: d, day; LOS, length of stay.; pp, percentage point.

eTable 15: Secondary analysis for composite outcome of readmission or mortality within 30 days of procedure date

A. Black and Hispanic patients

	Black patients		Black patients Adjusted risk difference, pp (95%CI)	p-value	Hispanic patients		Hispanic patients Adjusted risk difference, pp (95%CI)	p-value
	Concordant	Discordant			Concordant	Discordant		
Adjusted outcome rate, % (95%CI)	11.2 (6.6 to 15.8)	8.5 (7.2 to 9.9)	+2.7 (-2.2 to +7.6)	0.28	5.2 (3.5 to 7.0)	8.2 (7.3 to 9.1)	-3.0 (-5.0 to -0.9)	0.005

B. White patients

	White patients		White patients Adjusted risk difference, pp (95%CI)	p-value
	Concordant	Discordant		
Adjusted outcomes rate, % (95%CI)	7.9 (7.6 to 8.2)	8.4 (7.6 to 8.2)	-0.5 (-1.4 to +0.4)	0.26

Association between patient-surgeon racial and ethnic concordance and composite outcome of 30-day mortality or readmission among Black, Hispanic, and White patients, using Medicare data from 2016-2019 calculated using marginal standardization from linear probability models, controlling for patient (age, sex, race and ethnicity, 27 chronic conditions, median household income, dual-eligibility for Medicaid) procedure (procedure type, weekend surgery, electiveness of surgery, month, year), surgeon (age, sex, procedure volume), and hospital (size, teaching, urban/rural, and ownership status) characteristics. Abbreviations: d, day; LOS, length of stay.; pp, percentage point. *unit: adjusted days