

## **SUPPLEMENTAL DIGITAL CONTENT 1, APPENDIX 1**

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## I. Matching Results:

<b>I.A. Match without BMI</b>	<b>Blacks N = 779 (%)</b>	<b>Matched Whites N = 779 (%)</b>	<b>All Whites N = 14,596 (%)</b>	<b>DIFFAVE Before Matching (SD)</b>	<b>P-value</b>	<b>DIFFAVE After Matching (SD)</b>	<b>P-value</b>
<b>Variables (all matched except BMI)</b>							
BMI (body mass index) mean	30.24	29.53	28.96	0.19	<0.0001	0.10	0.1113
<b>Demographics</b>							
Age (years)	72.05	71.95	72.78	-0.18	<0.0001	0.03	0.6859
Sex Male (%)	35.94	35.94	42.34	-0.13	0.0004	0.00	1.0000
Race:							
White (%)	0	100.0	100.0	.	.	.	.
Black (%)	100.0	0	0	.	.	.	.
Other (%)	0	0	0	.	.	.	.
<b>Principal Procedure (ICD-9):</b>							
Hip (%)	19.51	19.51	25.35	-0.14	0.0002	0.00	1.0000
Total hip replacement (8151)	17.59	17.59	22.50	-0.12	0.0012	0.00	1.0000
Partial hip replacement (8152)	0.51	0.51	0.68	-0.02	0.8204	0.00	1.0000
Revision of hip (8153)	1.41	1.41	2.17	-0.06	0.2009	0.00	1.0000
Knee (%)	30.55	30.55	36.98	-0.14	0.0003	0.00	1.0000
Total knee replacement (8154)	29.14	29.14	35.79	-0.14	0.0001	0.00	1.0000
Revision of knee (8155)	1.41	1.41	1.19	0.02	0.5005	0.00	1.0000
Colectomy for cancer (%)	25.03	25.03	14.45	0.27	< 0.0001	0.00	1.0000
Open/other right hemicolectomy (4573)	15.92	15.92	8.71	0.22	< 0.0001	0.00	1.0000
Open/other resection of transverse colon (4574)	0.90	0.90	0.62	0.03	0.3485	0.00	1.0000
Open/other left hemicolectomy (4575)	3.47	3.47	1.67	0.11	0.0007	0.00	1.0000
Open/other sigmoidectomy (4576)	3.08	3.21	2.62	0.03	0.4212	-0.01	1.0000
Open/other unspecified excision of colon (4579)	1.16	1.03	0.57	0.05	0.0515	0.01	1.0000
Total intraabdominal colectomy (458)	0.51	0.51	0.26	0.04	0.1620	0.00	1.0000
Colectomy not for cancer (%)	8.86	8.86	7.33	0.06	0.1220	0.00	1.0000
Open/other right hemicolectomy (4573)	1.93	1.93	0.63	0.12	0.0003	0.00	1.0000
Open/other resection of transverse colon (4574)	0.00	0.00	0.05	-0.03	1.0000	0.00	1.0000
Open/other left hemicolectomy (4575)	1.28	1.28	1.31	0.00	1.0000	0.00	1.0000
Open/other sigmoidectomy (4576)	3.47	3.47	4.68	-0.06	0.1355	0.00	1.0000
Open/other unspecified excision of colon (4579)	0.90	0.90	0.44	0.07	0.0288	0.00	1.0000
Total intraabdominal colectomy (458)	1.16	1.16	0.23	0.11	0.0003	0.00	1.0000
Thoracotomy (%)	16.05	16.05	15.89	0.00	0.9199	0.00	1.0000
Segmental resection of lung (323)	1.28	1.28	1.49	-0.02	0.7612	0.00	1.0000
Lobectomy (324)	9.88	9.88	8.63	0.04	0.2397	0.00	1.0000
Pneumonectomy (325)	0.64	0.64	0.50	0.02	0.5983	0.00	1.0000
Radical dissociation of thoracic structures (326)	0.00	0.00	0.06	-0.03	1.0000	0.00	1.0000
Other local excision or destruction of lesion or tissue of lung (3229)	4.24	4.24	5.21	-0.05	0.2790	0.00	1.0000
Other excision of lung (329)	0.00	0.00	0.00	.	.	.	.
Other excision of bronchus (321)	0.00	0.00	0.00	.	.	.	.
Other local excision or destruction of lesion or tissue of bronchus (3,209)	0.00	0.00	0.00	.	.	.	.

<b>I.A. Match without BMI</b>	<b>Blacks N = 779 (%)</b>	<b>Matched Whites N = 779 (%)</b>	<b>All Whites N = 14,596 (%)</b>	<b>DIFFAVE Before Matching (SD)</b>	<b>P-value</b>	<b>DIFFAVE After Matching (SD)</b>	<b>P-value</b>
<b>Variables (all matched except BMI)</b>							
Plication of emphysematous bleb (3221)	0.00	0.00	0.00	.	.	.	.
Lung volume reduction (3222)	0.00	0.00	0.00	.	.	.	.
Pneumonectomy	0.64	0.64	0.56	0.01	0.8051	0.00	1.0000
Lobectomy	10.91	11.04	10.12	0.03	0.5453	0.00	1.0000
Wedge resection	4.49	4.36	5.21	-0.03	0.3646	0.01	1.0000
Thoracotomy with dx of cancer	14.89	15.15	14.27	0.02	0.7540	-0.01	0.9435
Closed thoracotomy	2.70	2.31	3.29	-0.03	0.4093	0.02	0.7461
Other thoracotomy	0.00	0.00	0.00	.	.	.	.
Transfer-In (%)	0.51	0.26	0.45	0.01	0.7811	0.03	0.6869
Admission from ER (%)	13.35	12.97	6.28	0.24	<0.0001	0.01	0.8809
<b>Comorbidities</b>							
Hx Congestive Heart Failure (%)	19.64	19.51	10.71	0.25	<0.0001	0.00	1.0000
Hx Myocardial Infarction (%)	4.36	3.21	6.1	-0.08	0.0525	0.05	0.2883
Hx Arrhythmia (%)	20.41	23.23	21.91	-0.04	0.3499	-0.08	0.1977
Hx Angina (%)	4.75	3.47	3.27	0.08	0.0311	0.07	0.2504
Hx Unstable Angina (%)	1.03	0.77	1.05	0	1	0.04	0.7896
Hx Valvular Heart Disease (%)	14.25	12.84	12.5	0.05	0.1497	0.04	0.4591
Hx Chronic Lung Disease (%)	23.62	22.72	24.36	-0.02	0.6683	0.02	0.7187
Hx Asthma (%)	9.76	8.73	7.72	0.07	0.0467	0.04	0.5405
Hx Postinflammatory Pulmonary Fibrosis (%)	4.49	4.11	5.58	-0.05	0.2266	0.02	0.8030
Hx Cancer (%)	47.88	48.01	40.63	0.15	0.0001	0.00	1.0000
Hx Hypertension (%)	87.42	86.26	74.89	0.32	<0.0001	0.03	0.5489
Hx Diabetes (%)	38.38	36.59	22.5	0.35	<0.0001	0.04	0.4963
Hx Renal Dysfunction (%)	6.8	5.52	3.56	0.15	<0.0001	0.05	0.3431
Hx Renal Failure (%)	5.39	3.59	2.75	0.13	0.0001	0.04	0.1113
Hx Stroke (%)	6.42	4.75	5.08	0.06	0.1129	0.07	0.1852
Hx Paraplegia (%)	0.9	0.64	0.72	0.02	0.5144	0.03	0.7735
Hx Dementia (%)	4.49	3.72	3.53	0.05	0.1648	0.04	0.5236
Hx Seizures (%)	0.13	0.51	0.42	-0.06	0.3756	-0.07	0.3742
Hx Hypothyroidism (%)	10.65	8.34	17.92	-0.21	<0.0001	0.07	0.1416
Hx Hepatic Abnormalities (%)	8.73	8.99	5.09	0.14	<0.0001	-0.01	0.9290
Hx Thrombocytopenia (%)	0.51	0.26	0.86	-0.04	0.4186	0.03	0.6869
Hx Coagulopathy (%)	0	0.26	0.27	-0.07	0.2674	-0.07	0.4997
Hx Hemophilia/Congenital Coagulopathy (%)	2.82	3.47	3.24	-0.02	0.6023	-0.04	0.5619
Hx Collagen Vascular Disease (%)	6.03	5.01	5.48	0.02	0.5186	0.04	0.4376
Hx Sleep Apnea (%)	0	0	0	.	.	.	.
Hx Smoking (%)	10.65	9.88	10.91	-0.01	0.8596	0.02	0.6766
Hx Weight Loss (%)	5.91	6.29	4.34	0.07	0.0483	-0.02	0.8324
Hx Electrolyte and Fluid Abnormality (%)	6.03	5.01	5.42	0.03	0.4655	0.04	0.4376
Hx Alcoholism (%)	1.54	1.03	1.01	0.05	0.1483	0.05	0.5006
30-day mortality (probability)	0.0228	0.0238	.0158	0.18	<0.0001	-0.03	0.8031

<b>I.A. Match without BMI</b>	<b>Blacks N = 779 (%)</b>	<b>Matched Whites N = 779 (%)</b>	<b>All Whites N = 14,596 (%)</b>	<b>DIFFAVE Before Matching (SD)</b>	<b>P-value</b>	<b>DIFFAVE After Matching (SD)</b>	<b>P-value</b>
<b>Variables (all matched except BMI)</b>							
Propensity to be black (probability)	0.1320	0.1296	.0470	0.95	<0.0001	0.03	0.9721
Time Score (minutes)	163.60	163.59	160.65	0.11	0.0015	0.00	0.9339

“DIFFAVE” is the standardized difference in a variable between cases and controls, in units of standard deviations. A usual rule of thumb is to attempt to achieve DIFFAVES below 0.2 after matching (please see the manuscript for further details). If a variable never occurs in the case and control groups, there are no *p*-values and DIFFAVES; a period is put in their place.

### I. Matching results (continued)

<b>I.B. Match with BMI</b>	<b>Blacks N = 779 (%)</b>	<b>Matched Whites N = 779 (%)</b>	<b>All Whites N = 14,596 (%)</b>	<b>DIFFAVE Before Matching (SD)</b>	<b>P-value</b>	<b>DIFFAVE After Matching (SD)</b>	<b>P-value</b>
<b>Variables (all matched)</b>							
BMI (body mass index) mean	30.24	30.07	28.96	0.19	<0.0001	0.03	0.9436
<b>Demographics</b>							
Age (years)	72.05	71.90	72.78	-0.18	<0.0001	0.04	0.5295
Sex Male (%)	35.94	35.94	42.34	-0.13	0.0004	0.00	1.0000
Race:							
White (%)	0	100.0	100.0	.	.	.	.
Black (%)	100.0	0.0	0.0	.	.	.	.
Other (%)	0	0.0	0.0	.	.	.	.
<b>Principal Procedure:</b>							
Hip (%)	19.51	19.51	25.35	-0.14	0.0002	0.00	1.0000
Total hip replacement (8151)	17.59	17.59	22.50	-0.12	0.0012	0.00	1.0000
Partial hip replacement (8152)	0.51	0.51	0.68	-0.02	0.8204	0.00	1.0000
Revision of hip (8153)	1.41	1.41	2.17	-0.06	0.2009	0.00	1.0000
Knee (%)	30.55	30.55	36.98	-0.14	0.0003	0.00	1.0000
Total knee replacement (8154)	29.14	29.14	35.79	-0.14	0.0001	0.00	1.0000
Revision of knee (8155)	1.41	1.41	1.19	0.02	0.5005	0.00	1.0000
Colectomy for cancer (%)	25.03	25.03	14.45	0.27	< 0.0001	0.00	1.0000
Open/other right hemicolectomy (4573)	15.92	15.92	8.71	0.22	< 0.0001	0.00	1.0000
Open/other resection of transverse colon (4574)	0.90	0.90	0.62	0.03	0.3485	0.00	1.0000
Open/other left hemicolectomy (4575)	3.47	3.47	1.67	0.11	0.0007	0.00	1.0000
Open/other sigmoidectomy (4576)	3.08	3.21	2.62	0.03	0.4212	-0.01	1.0000
Open/other unspecified excision of colon (4579)	1.16	1.03	0.57	0.05	0.0515	0.01	1.0000
Total intra-abdominal colectomy (458)	0.51	0.51	0.26	0.04	0.1620	0.00	1.0000
Colectomy not for cancer (%)	8.86	8.86	7.33	0.06	0.1220	0.00	1.0000
Open/other right hemicolectomy (4573)	1.93	1.93	0.63	0.12	0.0003	0.00	1.0000
Open/other resection of transverse colon (4,574)	0.00	0.00	0.05	-0.03	1.0000	0.00	1.0000
Open/other left hemicolectomy (4,575)	1.28	1.28	1.31	0.00	1.0000	0.00	1.0000
Open/other sigmoidectomy (4,576)	3.47	3.47	4.68	-0.06	0.1355	0.00	1.0000
Open/other unspecified excision of colon (4579)	1.03	1.03	0.44	0.07	0.0288	0.00	1.0000
Total intra-abdominal colectomy (458)	1.16	1.16	0.23	0.11	0.0003	0.00	1.0000
Thoracotomy (%)	16.05	16.05	15.89	0.00	0.9199	0.00	1.0000
Segmental resection of lung (323)	1.28	1.28	1.49	-0.02	0.7612	0.00	1.0000
Lobectomy (324)	9.88	9.88	8.63	0.04	0.2397	0.00	1.0000
Pneumonectomy (325)	0.64	0.64	0.50	0.02	0.5983	0.00	1.0000
Radical dissociation of thoracic structures (326)	0.00	0.00	0.06	-0.03	1.0000	0.00	1.0000
Other local excision or destruction of lesion or tissue of lung (3229)	4.24	4.24	5.21	-0.05	0.2790	0.00	1.0000
Other excision of lung (329)	0.00	0.00	0.00	.	.	.	.
Other excision of bronchus (321)	0.00	0.00	0.00	.	.	.	.
Other local excision or destruction of lesion or tissue of bronchus (3209)	0.00	0.00	0.00	.	.	.	.

<b>I.B. Match with BMI</b>	<b>Blacks N = 779 (%)</b>	<b>Matched Whites N = 779 (%)</b>	<b>All Whites N = 14,596 (%)</b>	<b>DIFFAVE Before Matching (SD)</b>	<b>P-value</b>	<b>DIFFAVE After Matching (SD)</b>	<b>P-value</b>
<b>Variables (all matched)</b>							
Plication of emphysematous bleb (3221)	0.00	0.00	0.00	.	.	.	.
Lung volume reduction (3222)	0.00	0.00	0.00	.	.	.	.
Pneumonectomy	0.64	0.64	0.56	0.01	0.8051	0.00	1.0000
Lobectomy	10.91	11.17	10.12	0.03	0.5453	-0.01	0.9356
Wedge resection	4.49	4.24	5.21	-0.03	0.3646	0.01	0.9014
Thoracotomy with dx of cancer	14.89	14.63	14.27	0.02	0.7540	0.01	0.9431
Closed thoracotomy	2.70	3.21	3.29	-0.03	0.4093	-0.03	0.6539
Other thoracotomy	0.00	0.00	0.00	.	.	.	.
Transfer-In (%)	0.51	0.77	0.45	0.01	0.7811	-0.03	0.7531
Admission from ER (%)	13.35	12.32	6.28	0.24	<0.0001	0.03	0.3161
<b>Comorbidities</b>							
Hx Congestive Heart Failure (%)	19.64	18.49	10.71	0.25	<0.0001	0.03	0.6059
Hx Myocardial Infarction (%)	4.36	4.24	6.1	-0.08	0.0525	0.01	1.0000
Hx Arrhythmia (%)	20.41	22.85	21.91	-0.04	0.3499	-0.07	0.2680
Hx Angina (%)	4.75	4.24	3.27	0.08	0.0311	0.03	0.7140
Hx Unstable Angina (%)	1.03	1.16	1.05	0.00	1.0000	-0.02	1.0000
Hx Valvular Heart Disease (%)	14.25	13.35	12.5	0.05	0.1497	0.03	0.6595
Hx Chronic Lung Disease (%)	23.62	22.59	24.36	-0.02	0.6683	0.03	0.6740
Hx Asthma (%)	9.76	9.50	7.72	0.07	0.0467	0.01	0.9316
Hx Postinflammatory Pulmonary Fibrosis (%)	4.49	3.98	5.58	-0.05	0.2266	0.02	0.7062
Hx Cancer (%)	47.88	47.50	40.63	0.15	0.0001	0.01	0.9192
Hx Hypertension (%)	87.42	85.37	74.89	0.32	<0.0001	0.05	0.2677
Hx Diabetes (%)	38.38	36.20	22.5	0.35	<0.0001	0.05	0.4019
Hx Renal Dysfunction (%)	6.8	5.52	3.56	0.15	<0.0001	0.05	0.3431
Hx Renal Failure (%)	5.39	3.98	2.75	0.13	0.0001	0.03	0.2304
Hx Stroke (%)	6.42	4.75	5.08	0.06	0.1129	0.07	0.1852
Hx Paraplegia (%)	0.9	0.77	0.72	0.02	0.5144	0.01	1.0000
Hx Dementia (%)	4.49	2.95	3.53	0.05	0.1648	0.07	0.1404
Hx Seizures (%)	0.13	0.13	0.42	-0.06	0.3756	0.00	1.0000
Hx Hypothyroidism (%)	10.65	8.99	17.92	-0.21	<0.0001	0.05	0.3070
Hx Hepatic Abnormalities (%)	8.73	8.99	5.09	0.14	<0.0001	-0.01	0.9290
Hx Thrombocytopenia (%)	0.51	0.26	0.86	-0.04	0.4186	0.03	0.6869
Hx Coagulopathy (%)	0	0.26	0.27	-0.07	0.2674	-0.07	0.4997
Hx Hemophilia/Congenital Coagulopathy (%)	2.82	2.95	3.24	-0.02	0.6023	-0.01	1.0000
Hx Collagen Vascular Disease (%)	6.03	5.39	5.48	0.02	0.5186	0.02	0.6626
Hx Sleep Apnea (%)	0	0	0	.	.	.	.
Hx Smoking (%)	10.65	8.47	10.91	-0.01	0.8596	0.07	0.1679
Hx Weight Loss (%)	5.91	6.42	4.34	0.07	0.0483	-0.02	0.7521
Hx Electrolyte and Fluid Abnormality (%)	6.03	4.49	5.42	0.03	0.4655	0.08	0.2118
Hx Alcoholism (%)	1.54	0.90	1.01	0.05	0.1483	0.06	0.3563
30-day mortality (probability)	0.0227	0.0231	0.0158	0.18	<0.0001	-0.01	0.6128
Propensity to be black (probability)	0.1342	0.1308	0.047	0.95	<0.0001	0.01	0.7310

<b>I.B. Match with BMI</b>	<b>Blacks N = 779 (%)</b>	<b>Matched Whites N = 779 (%)</b>	<b>All Whites N = 14,596 (%)</b>	<b>DIFFAVE Before Matching (SD)</b>	<b>P-value</b>	<b>DIFFAVE After Matching (SD)</b>	<b>P-value</b>
<b>Variables (all matched)</b>							
Time Score (minutes)	163.60	163.59	160.65	0.11	0.0015	0.00	0.9193

“DIFFAVE” is the standardized difference in a variable between cases and controls, in units of standard deviations. A usual rule of thumb is to attempt to achieve DIFFAVES below 0.2 after matching (please see the manuscript for further details). If a variable never occurs in the case and control groups, there are no *p*-values and DIFFAVES; a period is put in their place.

## II. Quality of Matching on Hospital and Procedure: NOT ACTUAL NUMBERS

Numbers of patients inside hospitals have been randomized, but the marginal distributions (column totals) are the actual numbers to be compliant with our confidentiality responsibilities. The table demonstrates what we achieved, exact matching of blacks and whites inside hospital and procedure group.

Procedure Category:	Hip			Knee			Colectomy w/ Cancer			Colectomy w/o Cancer			Thoracotomy		
	Black	Whites		Black	Whites		Black	Whites		Black	Whites		Black	Whites	
		No BMI	W/ BMI		No BMI	W/ BMI		No BMI	W/ BMI		No BMI	W/ BMI		No BMI	W/ BMI
Hospital															
1	4	4	4	8	8	8	2	2	2	2	2	2	2	2	2
2	1	1	1	4	4	4	6	6	6	4	4	4	2	2	2
3	0	0	0	1	1	1	2	2	2	0	0	0	0	0	0
4	6	6	6	4	4	4	1	1	1	1	1	1	3	3	3
5	3	3	3	4	4	4	8	8	8	3	3	3	4	4	4
6	5	5	5	7	7	7	4	4	4	1	1	1	2	2	2
7	2	2	2	6	6	6	5	5	5	2	2	2	4	4	4
8	2	2	2	3	3	3	8	8	8	2	2	2	1	1	1
9	0	0	0	3	3	3	6	6	6	5	5	5	2	2	2
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	1	1	1	4	4	4	5	5	5	2	2	2	3	3	3
12	3	3	3	6	6	6	3	3	3	1	1	1	2	2	2
13	4	4	4	7	7	7	4	4	4	1	1	1	5	5	5
14	2	2	2	3	3	3	6	6	6	0	0	0	1	1	1
15	3	3	3	9	9	9	1	1	1	0	0	0	1	1	1
16	4	4	4	4	4	4	0	0	0	0	0	0	3	3	3
17	6	6	6	6	6	6	7	7	7	3	3	3	6	6	6
18	5	5	5	2	2	2	8	8	8	0	0	0	4	4	4
19	4	4	4	10	10	10	3	3	3	1	1	1	1	1	1
20	5	5	5	2	2	2	6	6	6	1	1	1	5	5	5
21	5	5	5	6	6	6	4	4	4	0	0	0	5	5	5
22	5	5	5	4	4	4	2	2	2	0	0	0	2	2	2
23	1	1	1	6	6	6	5	5	5	4	4	4	2	2	2
24	5	5	5	9	9	9	6	6	6	0	0	0	4	4	4
25	2	2	2	6	6	6	4	4	4	3	3	3	2	2	2
26	4	4	4	6	6	6	3	3	3	2	2	2	1	1	1
27	3	3	3	6	6	6	5	5	5	1	1	1	3	3	3
28	1	1	1	6	6	6	8	8	8	0	0	0	2	2	2
29	4	4	4	2	2	2	3	3	3	2	2	2	5	5	5
30	6	6	6	4	4	4	2	2	2	2	2	2	3	3	3
31	4	4	4	3	3	3	5	5	5	0	0	0	5	5	5
32	2	2	2	12	12	12	5	5	5	3	3	3	4	4	4
33	2	2	2	4	4	4	7	7	7	2	2	2	3	3	3
34	2	2	2	7	7	7	7	7	7	0	0	0	3	3	3
35	4	4	4	5	5	5	3	3	3	3	3	3	4	4	4
36	3	3	3	6	6	6	2	2	2	1	1	1	1	1	1
37	5	5	5	5	5	5	3	3	3	1	1	1	2	2	2
38	9	9	9	7	7	7	3	3	3	1	1	1	1	1	1
39	1	1	1	5	5	5	4	4	4	2	2	2	4	4	4
40	1	1	1	8	8	8	4	4	4	4	4	4	1	1	1
41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
42	5	5	5	5	5	5	4	4	4	0	0	0	3	3	3
43	4	4	4	5	5	5	4	4	4	2	2	2	3	3	3
44	5	5	5	2	2	2	4	4	4	2	2	2	3	3	3
45	3	3	3	5	5	5	7	7	7	2	2	2	0	0	0
46	4	4	4	6	6	6	3	3	3	1	1	1	4	4	4
47	2	2	2	5	5	5	3	3	3	2	2	2	4	4	4
<b>TOTAL</b>	152	152	152	238	238	238	195	195	195	69	69	69	125	125	125



**III. Quality of matching on principal procedure:** Here we demonstrate the matching quality for individual ICD-9 principal procedures. Overall, more than 95% of pairs in each match are exact matched on principal procedure, and blacks and whites each contribute the same number of patients for nearly every principal procedure.

<b>Principal Procedure</b>	<b>Black</b>	<b>Matched White (no BMI)</b>	<b>Matched White (with BMI)</b>
<b>Hip</b>			
Total hip replacement (8151)	137	137	137
Partial hip replacement (8152)	4	4	4
Revision of hip (8153)	11	11	11
TOTAL	152	152	152
<i>Percent of pairs exactly matched:</i>		<b>100</b>	<b>100</b>
<b>Knee</b>			
Total knee replacement (8154)	227	227	227
Revision of knee (8155)	11	11	11
TOTAL	238	238	238
<i>Percent of pairs exactly matched:</i>		<b>100</b>	<b>100</b>
<b>Colectomy for cancer</b>			
Open/other right hemicolectomy (4573)	124	124	124
Open/other resection of transverse colon (4574)	7	7	7
Open/other left hemicolectomy (4575)	27	27	27
Open/other sigmoidectomy (4576)	24	25	25
Open/other unspecified excision of colon (4579)	9	8	8
Total intra-abdominal colectomy (458)	4	4	4
TOTAL	195	195	195
<i>Percent of pairs exactly matched:</i>		<b>99.49</b>	<b>99.49</b>
<b>Colectomy not for cancer</b>			
Open/other right hemicolectomy (4573)	15	15	15
Open/other resection of transverse colon (4574)	0	0	0
Open/other left hemicolectomy (4,575)	10	10	10
Open/other sigmoidectomy (4576)	27	27	27
Open/other unspecified excision of colon (4579)	8	8	8
Total intra-abdominal colectomy (458)	9	9	9
TOTAL	69	69	69
<i>Percent of pairs exactly matched:</i>		<b>73.91</b>	<b>49.28</b>
<b>Thoracotomy</b>			
Segmental resection of lung (323)	10	10	10
Lobectomy (324)	77	77	77
Pneumonectomy (325)	5	5	5
Radical dissociation of thoracic structures (326)	0	0	0
Other excision of lung (329)	0	0	0
Other excision of bronchus (321)	0	0	0
Other local excision or destruction of lesion or tissue of bronchus (3209)	0	0	0
Other local excision or destruction of lesion or tissue of lung (3229)	33	33	33
Plication of emphysematous bleb (3221)	0	0	0
Lung volume reduction (3222)	0	0	0
TOTAL	125	125	125
<i>Percent of pairs exactly matched:</i>		<b>98.40</b>	<b>98.40</b>
<b>All Procedures</b>	<b>779</b>	<b>779</b>	<b>779</b>
<i>Percent of pairs exactly matched:</i>		<b>97.30</b>	<b>95.10</b>

#### IV. Description of Time Score Algorithm

To better match patients on their expected procedure time, we created a time score that predicts anesthesia claim time for each procedure. The time score was calculated on Medicare claims from Illinois, Texas, and New York who were **not** in the 47 study hospitals. For each procedure group, two time score models were initially developed: a simple model with principal procedures and secondary procedures (sorted into five categories by scope and time performed), and a complex model that contained all the principal and secondary procedure variables in the simple model, plus patient characteristics including age, sex, and comorbidities. Predicted times and model  $R^2$  did not differ between the simple and complex models, therefore the simpler algorithm was applied to the study subjects for the final matches and analyses. We used a single model for all surgical groups, using interaction terms between principal procedures and secondary procedure groups to achieve procedure-specific model estimates. The intercept and weights given by this model were used to predict anesthesia claim times for the 779 cases and 14,596 controls in the study matching population. Model details are shown below.

	Time Score Model
Variables	<p><b>Principal Procedures</b>            Hip codes: 8151, 8152, 8153            Knee codes: 8154 (8155 as model reference)            Colectomy for cancer codes: 4573, 4574, 4575, 4576, 4579, 458            Colectomy not for cancer codes: 4573, 4574, 4575, 4576, 4579, 458            Thoracotomy codes: 3209, 321, 3221, 3222, 3229, 323, 324, 325, 326, 329</p> <p><b>Secondary Procedures</b>            Same-day, operative, major            Same-day, operative, other            Same-day, operative, minor            Same-day, non-operative            (Secondary procedure on different day or no secondary procedure as reference)</p> <p><b>Interaction Terms (Secondary procedure on different day as main effect reference)</b>            Same-day, operative, major x Hip procedure            Same-day, operative, major x Knee procedure            Same-day, operative, major x Colectomy for cancer procedure            Same-day, operative, major x Colectomy not for cancer procedure            Same-day, operative, major x Thoracotomy procedure (as group reference)            Same-day, operative, other x Hip procedure            Same-day, operative, other x Knee procedure            Same-day, operative, other x Colectomy for cancer procedure            Same-day, operative, other x Colectomy not for cancer procedure            Same-day, operative, other x Thoracotomy procedure (as group reference)            Same-day, operative, minor x Hip procedure            Same-day, operative, minor x Knee procedure            Same-day, operative, minor x Colectomy for cancer procedure            Same-day, operative, minor x Colectomy not for cancer procedure            Same-day, operative, minor x Thoracotomy procedure (as group reference)            Same-day, nonoperative x Hip procedure            Same-day, nonoperative x Knee procedure            Same-day, nonoperative x Colectomy for cancer procedure            Same-day, nonoperative x Colectomy not for cancer cancer procedure            Same-day, nonoperative x Thoractomy procedure (as group reference)</p>
Model N	143,635 patients in Illinois, Texas, and New York who were not in 47 study hospitals
Model $r^2$ (m-estimation)	0.1082
Mean time score	155.293 minutes (SD 21.804 minutes)

Mean anesthesia times (minutes) predicted by time score model, by principal procedure and for secondary procedure interactions	Secondary Procedure Groups				
	Different day, or no spx	Major, same-day	Other, same-day	Minor, same-day	Non-operative, same-day
<b>Principal Procedure (ICD-9)</b>					
<b>Hip</b>					
Total hip replacement (8151)	147.031	185.393	158.112	160.625	147.254
Partial hip replacement (8152)	143.429	181.791	154.510	157.023	143.652
Revision of hip (8153)	192.157	230.519	203.328	205.751	192.380
<b>Knee</b>					
Total knee replacement (8154)	140.965	187.977	156.305	152.224	144.153
Revision of knee (8155)	165.124	212.136	180.464	176.384	168.313
<b>Colectomy for cancer</b>					
Left colectomy for cancer (4575)	172.204	200.600	195.737	188.199	187.851
Right colectomy for cancer (4573)	135.948	164.344	159.481	151.943	151.595
Other resection of transverse colon for cancer (4574)	144.471	172.866	168.003	160.465	160.117
Open sigmoidectomy for cancer (4576)	157.029	185.424	180.561	173.023	172.675
Other, unspecified excision of colon for cancer (4579)	166.283	194.679	189.816	182.278	181.930
Total intraabdominal colectomy for cancer (458)	208.918	237.314	232.451	224.913	224.565
<b>Colectomy not for cancer</b>					
Left colectomy not for cancer (4575)	178.331	190.701	197.613	212.186	195.687
Right colectomy not for cancer (4573)	143.524	155.894	162.807	177.379	160.880
Other resection of transverse colon not for cancer (4574)	154.637	167.007	173.919	171.992	154.637
Open sigmoidectomy not for cancer (4576)	164.310	176.680	183.593	198.165	181.666
Other, unspecified excision of colon not for cancer (4579)	173.913	186.283	193.195	207.767	191.269
Total intraabdominal colectomy not for cancer (458)	198.929	211.299	218.212	232.784	216.285
<b>Thoracotomy</b>					
Segmental resection of lung (323)	168.134	206.943	200.239	193.463	179.426
Lobectomy(324)	187.312	226.120	219.416	212.640	198.603
Pneumonectomy (325)	218.419	257.227	250.523	243.748	229.710
Radical dissection of thoracic structures (326)	201.338	240.146	233.442	226.667	212.630
Other excision of lung (329)	159.566	198.375	191.671	184.895	170.858
Other excision of bronchus (321)	257.546	296.355	289.651	282.875	268.838
Other local excision or destruction of lesion or tissue of bronchus (3209)	137.790	176.599	169.895	163.119	149.082
Other local excision or destruction of lesion or tissue of lung (3229)	135.974	174.782	168.078	161.302	147.265
Plication of emphysematous bleb (3221)	135.174	173.982	167.278	160.502	146.465
Lung volume reduction (3222)	213.005	251.813	245.109	238.333	224.296

## V. Definitions and Groupings of Secondary Procedures

To derive a time score for each principal procedure, secondary procedures were categorized into the following mutually exclusive groups (ICD-9-CM codes shown).

### Same-day Secondary Procedure, Operative, Major

These secondary procedures are "valid OR procedures" as indicated by ICD-9 definitions, are of significant clinical complexity, and are within procedure groups of interest to our study (*e.g.*, primary procedure of common bile duct exploration with secondary procedure of cholecystectomy).

0070	3422	436	4593	485	5302	5539	603	6839	7765	7932	8147
0071	343	437	4594	4862	5303	554	605	684	7766	7935	8151
0072	344	4389	4595	4863	5304	5551	623	6849	7767	7936	8152
0073	3451	4399	4601	4869	5305	562	6241	6859	7785	7939	8153
0080	3806	4438	4603	4875	5310	5640	6529	686	7786	8005	8154
0081	3807	4439	4610	4876	5311	5641	6531	688	7787	8006	8155
0082	3808	4442	4611	4879	5316	5651	6539	704	7795	8021	8183
0083	3818	4466	4613	5022	5317	5674	6541	7050	7796	8026	8184
0309	3836	4469	4620	5029	5321	5718	6549	7051	7805	8051	8197
0353	3838	4561	4621	503	5329	5719	6551	7052	7806	806	835
062	3844	4562	4622	504	5341	5734	6552	7072	7807	8076	8363
064	3848	4563	4623	5122	5349	5759	6553	7073	7852	8081	8364
0722	3926	4571	4639	5123	5351	576	6554	7074	7855	8085	8523
3222	3927	4572	4642	5132	5359	5771	6561	7075	7857	8086	8541
3229	3929	4573	4651	5136	5361	5783	6562	7077	7862	8103	8543
323	3949	4574	4652	5137	5369	5789	6563	7079	7863	8105	
324	3956	4575	4673	5141	537	5791	6564	708	7865	8107	
325	3957	4576	4674	5151	5380	585	6581	7091	7866	8108	
326	3958	4579	4675	5252	5381	586	6589	7092	7867	8111	
329	3979	458	4679	5259	5451	594	664	7639	7869	8116	
3328	415	4590	4701	526	5459	595	6651	7747	7925	8122	
3409	4241	4591	4709	5300	5493	5979	6652	7756	7926	8140	
3421	4342	4592	4849	5301	5502	6029	6831	7762	7931	8144	

### Same-day Secondary Procedure, Operative, Other

These secondary procedures are "valid OR procedures" as indicated by ICD-9 definitions, are of significant clinical complexity but are outside the procedure groups of interest to our study (*e.g.*, 539 other hernia repair).

0214	0782	3339	3483	3867	4054	4503	4719	5411	5787	7825	8121
0243	1879	3341	3484	3869	4059	4511	4791	5419	5844	7827	8145
036	286	3343	3493	387	4064	4515	481	5421	5899	7835	8146
0403	2939	3348	3499	3880	412	4521	4821	5524	5900	7839	8171
0407	3169	3349	3712	3885	4133	4526	4825	5587	5902	7853	8309
0412	3171	3399	3724	3952	4142	4531	4864	560	5903	7856	8411
0443	3174	3402	3749	4021	4143	4532	4874	5631	5911	7859	8419
0449	3179	341	3775	4022	4195	4533	4946	5652	593	7930	8585
0475	3209	3426	3780	4023	4199	4541	5121	5679	7761	7955	8606
0479	321	3427	3786	4024	4225	4643	5142	5682	7769	7985	864
0492	3221	3429	3787	4029	4284	4650	5172	5684	7770	7986	8661
0493	331	3459	3791	403	4289	4672	5179	5689	7775	7988	8670
0612	3325	346	3795	4040	4403	4676	5193	5712	7776	8008	8671
0712	3327	3473	3799	4050	4411	4693	5212	5722	7777	8095	8672

0721	3329	3479	3865	4052	4415	4694	5253	5782	7781	8096	8674
0781	3334	3481	3866	4053	4502	4711	539	5784	7815	8099	8753

**Same-day Secondary Procedure, Operative, Minor**

These secondary procedures are "valid OR procedures" as indicated by ICD-9 definitions, but were identified to be of less clinical complexity (e.g., 4911 anal fistulotomy).

031	3732	4232	4873	5211	5733	6661	7711	7801	8045	8321	8401
0394	3733	4381	4881	5222	5749	6669	7715	7809	8046	8331	8448
043	3761	4461	4882	5295	5781	6671	7717	7819	8048	8332	8512
0529	3821	4464	4911	540	5793	6712	7719	7845	8049	8339	8520
0695	3835	4465	4912	5412	5799	6739	7725	7846	8070	8341	8521
0780	3845	4500	4939	5422	5841	674	7727	7847	8074	8342	8524
0820	3859	4534	4945	5423	5919	6813	7728	7849	8075	8343	8622
0822	3860	4549	4951	543	5921	6816	7731	7860	8083	8344	8666
2262	3886	4550	4959	544	5971	6821	7735	7861	8084	8345	8669
2263	3887	4551	496	5461	5972	6829	7736	7864	8087	8349	8683
2502	3888	4552	4973	5462	5991	6909	7737	7868	8088	8361	8684
2743	3889	4602	4979	5463	600	6919	7739	7895	8128	8362	8689
2749	3930	4640	500	5464	6073	6922	7741	7896	8159	8365	8691
2811	3931	4641	5012	5472	6095	6941	7742	7897	8195	8371	8695
282	3932	4662	5019	5473	6099	6949	7745	7915	8196	8372	8949
3009	3941	4663	5021	5474	631	7012	7746	7965	8199	8373	9227
3145	3950	4664	5023	5475	633	7014	7749	7966	8201	8375	
315	3959	4671	5025	5492	640	7023	7751	8015	8211	8377	
3403	3990	4680	5026	5494	642	7024	7753	8016	8221	8379	
3489	3991	4681	5061	5495	6493	7029	7757	8017	8233	8381	
3522	3993	4682	5103	5501	6501	7032	7758	8018	8301	8382	
3611	3998	4699	5104	5511	6509	7033	7759	8023	8302	8385	
3612	400	480	5149	5531	6511	7071	7768	8025	8303	8386	
3614	4011	4835	5159	5581	6512	7109	7779	8035	8312	8387	
3615	4019	4836	5171	5661	6525	7111	7788	8036	8313	8388	
3699	4041	4871	5199	5675	6591	713	7789	8040	8314	8392	
3731	4193	4872	5209	5699	6611	7179	7791	8041	8319	8399	

**Same-day Secondary Procedure, nonoperative**

These secondary procedures are not considered "valid OR procedures" by ICD-9 definitions (e.g., 9917 injection of insulin).

0010	2102	3492	4311	5425	7975	8749	8874	8966	9344	9659	9916
0011	2131	3601	4319	5491	7976	8754	8875	8967	9346	966	9917
0013	2132	3604	4341	5496	8162	8759	8876	8968	9353	9670	9918
0014	222	3605	4413	5497	8191	8763	8877	9002	9354	9671	9919
0017	2309	3606	4443	5498	8192	8764	8879	9059	9356	9672	9920
0031	2319	3607	4462	5499	8295	8773	8891	9182	9357	9702	9921
0032	2370	370	4513	5523	8394	8774	8893	9204	9359	9704	9922
0033	2501	3721	4516	5592	8395	8777	8897	9205	9361	9723	9923
0034	2611	3722	4519	5691	8396	8779	8898	9214	9383	9729	9924
0035	2724	3723	4522	570	8397	8801	8903	9215	9390	9741	9925
0039	2911	3726	4523	5717	8398	8804	8904	9223	9391	9749	9926
0040	2912	3729	4524	5732	8451	8809	8908	9224	9393	9755	9927
0042	310	374	4525	5792	8452	8819	8921	9226	9394	9762	9928

0045	311	3771	4530	5794	8455	8826	8922	9228	9396	9771	9929
0052	3129	3772	4542	5795	8456	8827	8926	9229	9399	9782	9939
0066	313	3778	4543	5822	8457	8832	8929	9301	9438	9786	9952
0074	3142	3781	4614	598	850	8838	8934	9304	9462	9788	9955
0075	3143	3783	4631	5994	8511	8839	8937	9305	9465	9789	9959
0076	3144	3891	4632	5995	8602	8840	8938	9308	9604	9804	9960
0077	3201	3893	4685	6011	8604	8841	8939	9311	9605	9815	9961
0331	3228	3894	4696	610	8605	8842	8941	9312	9607	9821	9962
0390	3321	3895	4822	613	8607	8843	8944	9314	9608	9829	9963
0391	3322	3898	4823	6191	8609	8847	8945	9316	9609	9900	9969
0392	3323	3899	4824	6491	8611	8848	8946	9317	9622	9901	9971
042	3324	3961	4829	6691	8623	8849	8947	9319	9623	9902	9974
0480	3326	3964	4903	6812	8627	8851	8948	9321	9624	9903	9977
0481	3332	3995	4921	683	8628	8853	8951	9322	9627	9904	9979
0489	3333	3997	4922	6959	863	8854	8952	9324	9633	9905	9984
0531	3391	4131	4923	7021	8659	8855	8954	9326	9636	9906	9985
0539	3401	4132	4931	7696	8703	8856	8959	9327	9638	9907	9991
0611	3404	4223	5011	7901	8724	8861	8960	9329	9639	9908	9992
0711	3423	4224	5091	7902	8737	8866	8961	9332	9646	9909	9995
1809	3424	4229	5099	7903	8739	8871	8962	9336	9648	9910	9999
1829	3425	4233	5111	7905	8741	8872	8964	9338	9649	9911	
2101	3491	4292	5424	7971	8744	8873	8965	9339	9656	9915	

## VI. Likelihood of Longer Surgical Time in Black-White Matched Pairs (logarithmic transformation)

To ensure that the significant differences in likelihood of longer surgical time were not an artifact of variance in baseline procedure length, the differences in time were recalculated as differences in logarithmic time between blacks and whites:  $\log(\text{black time}) - \log(\text{white time})$ , or  $\log(\text{black time}/\text{white time})$ , with  $e$  as the logarithmic base.

As an example, for the time stratum  $0.10 \leq \log(B/W) < 0.30$ , the odds ratio answers the following question: if one patient in a matched pair had an operative time between 10.5% and 34.9% longer than the other, what are the odds that the patient who took longer was black?

<b>Match 1: No BMI: Absolute Difference in Anesthesia Time (minutes)</b>	<b>Pairs where Black Patient had Longer Time</b>	<b>Pairs where White Patient had Longer Time</b>	<b>Odds of Black Patient Taking Longer than White Patient</b>	<b>95% CI</b>	<b>P-Value</b>
$0 \leq \log(B/W) < 0.10$	85	80	1.0625	(0.783,1.442)	0.6971
$0.10 \leq \log(B/W) < 0.30$	157	125	1.2560	(0.993,1.589)	0.0572
$0.30 \leq \log(B/W)$	177	139	1.2734	(1.020,1.590)	0.0330
Overall	419	344	1.2180	(1.056,1.405)	0.0067
*11 pairs with ties were excluded (1.41% of 779 matched pairs); number of pairs in final analysis = 763					
<b>Match 2: w/ BMI: Absolute Difference in Anesthesia Time (minutes)</b>	<b>Pairs where Black Patient had Longer Time</b>	<b>Pairs where White Patient had Longer Time</b>	<b>Odds of Black Patient Taking Longer than White Patient</b>	<b>95% CI</b>	<b>P-Value</b>
$0 \leq \log(B/W) < 0.10$	91	81	1.1235	(0.833,1.516)	0.4460
$0.10 \leq \log(B/W) < 0.30$	146	126	1.1587	(0.913,1.471)	0.2257
$0.30 \leq \log(B/W)$	181	133	1.3609	(1.088,1.702)	0.0070
Overall	418	340	1.2294	(1.065,1.419)	0.0047
*16 pairs with ties were excluded (2.05% of 779 matched pairs); number of pairs in final analysis = 758					

## VII. Glossary of Matching Terminology

1. **Exact Matching:** Matching cases to controls requiring the same value of a nominal covariate.<sup>1,2</sup>
2. **Optimal Matching:** matching cases and controls such that the total distance of all covariates between matched pairs is minimized.<sup>2</sup>
3. **Near-exact Matching:** matching cases and controls such that a specified covariate is always matched within a pair whenever possible, with minimal deviation from marginal balance.<sup>2</sup>
4. **Fine Balance:** Constraining a match to be balanced on a given nominal variable, without restricting matching on the variable within pairs.<sup>2</sup>
5. **Near-fine Balance:** where fine balance is not feasible, attempting to attain a specified imbalance between cases and controls for a nominal covariate.
6. **Propensity Score:** The propensity score used in this analysis was the propensity to be black. We fit a logistic regression model on all black and white patients in our matching data set (779 blacks and 14,597 whites), and with their patient covariates. The dependent variable was race (black vs. white). The independent variables were patient covariates. Black patients generally had a higher propensity to be black, but white patients may have had a set of covariates that also gave them a high propensity to be black.<sup>3</sup>
7. **Risk Score:** The risk score (or prognostic score) for death was a logit model that predicts mortality based on patient characteristics. We did not place race in the risk score, as we matched on the risk score (and we found whites who had a similar risk of death to blacks). Unlike the propensity score that is computed with the study data, the risk score must be computed with an independent sample of patients outside the study population, in order to be able compare outcomes after the matching process.<sup>4</sup>

Abbreviation definitions: BMI = body mass index; B/W =Black/White; CI = confidence interval; IFFAVE = standardized difference in a variable; ER = emergency room; Hx =history; ICD-9 = International Classification of Diseases, Ninth Revision; ICD-9-CM = International Classification of Diseases, Ninth Revision, Clinical Modification; N = number; SD = standard deviation; SPX = secondary procedure; W/ = with.



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