

Appendix

TABLE E-1 Noninfection Surgical Complications and Their Frequency

Complication	Frequency
Failure of fixation/reduction	10
Pulmonary embolus	7
Deep vein thrombosis	6
Nerve palsy	5
Hematoma	4
Tendon laceration/rupture	3
Wound dehiscence	3
Hardware loosening	2
Unrecovered loose body	2
Compartment syndrome	1
Delayed wound-healing	1
Dropped autograft	1
Failed intubation	1
Hardware failure	1
Intraventricular hemorrhage	1
Nonunion	1
Pin removal due to poor blood flow	1
Pin site skin discoloration	1
Pneumonia	1
Postop. fracture	1
Return to operating room	1
Septic joint	1

TABLE E-2 Association of Patient and Surgical Factors with the Outcome of SSI from Bivariate Analysis After ATT PS Weighting*

	SSI		P Value
	Yes (N = 27)	No (N = 10,368)	
Age (yr)	47.8 (22.8-53.9)	43.8 (25.2-55.5)	0.16
BMI (kg/m ²)	25.6 (23.3-32.2)	27.5 (24-31.6)	0.49
Tourniquet time (min)	61 (25-105)	24 (0-52)	<0.0001†
Operative time (min)	73 (46-113)	57 (34-89)	0.0027†
Anesthesia time (min)	107 (77-168)	95 (66-131)	0.011†
Surgery overlap time (min)	0 (0-5)	1 (0-8)	<0.0001†
Surgery overlap percent (%)	0 (0-10)	0 (0-15)	<0.0001†
Surgery overlap	13 (48.2)	5,185 (50.0)	0.99
Diabetes mellitus	3 (10.5)	688 (6.6)	0.68
Smoking history	8 (30.7)	3,107 (30.0)	0.88
Current smoker	4 (14.1)	1,208 (11.7)	0.94
BMI ≥30 kg/m ²	10 (37.6)	3,518 (33.9)	0.85
Age ≥70 yr	3 (9.8)	290 (2.8)	0.11
Preop. antibiotics	26 (95.5)	8,846 (85.3)	0.22
Fracture	3 (11.0)	768 (7.4)	0.73
Implant use	17 (62.8)	4,776 (46.1)	0.12
Male sex	13 (48.9)	6,046 (58.3)	0.43
Tourniquet used	23 (84.0)	6,867 (66.2)	0.081
Tourniquet duration			<0.001†
No tourniquet	4 (16.0)	3,502 (33.8)	
<1 hr	9 (32.1)	4,706 (45.4)	
≥1 hr	14 (52.0)	2,160 (20.8)	
Race			0.46
Black	1 (4.4)	844 (8.1)	
Caucasian	25 (93.7)	8,305 (80.1)	
Other	0 (1.1)	476 (4.6)	
Anatomic location			0.077
Shoulder	1 (3.4)	2,304 (22.2)	
Hand and elbow	8 (28.5)	2,514 (24.2)	
Hip	1 (3.7)	260 (2.5)	
Knee and leg	14 (50.4)	4,044 (39.0)	
Foot and ankle	3 (11.1)	402 (3.9)	
Multiple locations	1 (2.9)	817 (7.9)	
ASA score			0.051
1	8 (29.5)	3,483 (33.6)	
2	13 (46.7)	5,869 (56.6)	
≥3	6 (23.8)	1,014 (9.8)	
Insurance			0.92
Private	22 (80.5)	7,929 (76.5)	
Medicare	3 (10.8)	1,458 (14.1)	
Medicaid	2 (5.7)	431 (4.2)	
Uninsured	1 (3.0)	211 (2.0)	
Anesthesia			0.046†
General	17 (64.9)	8,159 (78.7)	
Regional	0 (0.0)	367 (3.5)	
Combined	9 (35.1)	1,843 (17.8)	
No. of overlapping cases			0.74
1	12 (44.5)	4,380 (42.2)	
2	1 (3.7)	803 (7.7)	
3	0 (0.0)	2 (0.0)	

*SSI = surgical site infection, ATT PS weighting = average-treatment-effect-for-treated propensity-score weighting, BMI = body mass index, and ASA = American Society of Anesthesiologists. Continuous variables are given as the median, with the first and third quartiles in parentheses, and categorical variables are given as the number, with the percentage in parentheses. The

weighting process for the categorical variables resulted in “fractional” patients. Each category was thus rounded to the nearest patient for display in the table; the true, fractional value was used in the calculation of the percent of the total for each category as well as all analyses. †Significant.

TABLE E-3 Association of Patient and Surgical Factors with the Outcome of Noninfection Complication from Bivariate Analysis After ATT PS Weighting*

	Noninfection Complication		P Value
	Yes (N = 26)	No (N = 10,369)	
Age (yr)	37.9 (17.8-52)	43.8 (25.2-55.5)	0.76
BMI (kg/m ²)	27.9 (21.8-31.3)	27.5 (24-31.6)	0.29
Tourniquet time (min)	45 (0-75)	24 (0-52)	0.05
Operative time (min)	80 (58-121)	57 (34-89)	<0.0001†
Anesthesia time (min)	121 (95-157)	95 (66-131)	<0.001†
Surgery overlap time (min)	2 (0-7)	0 (0-8)	0.002†
Surgery overlap percent (%)	2 (0-10)	0 (0-15)	<0.001†
Surgery overlap	14 (53.1)	5,184 (50.0)	0.9
Diabetes mellitus	2 (7.6)	689 (6.6)	0.84
Smoking history	10 (37.3)	3,105 (29.9)	0.55
Current smoker	4 (14.3)	1,208 (11.7)	0.91
BMI ≥30 kg/m ²	8 (32.0)	3,519 (33.9)	1
Age ≥70 yr	0 (1.0)	292 (2.8)	0.99
Preop. antibiotics	25 (96.3)	8,846 (85.3)	0.19
Fracture	2 (7.3)	769 (7.4)	0.72
Implant use	20 (77.1)	4,773 (46.0)	0.0027†
Male sex	17 (63.4)	6,043 (58.3)	0.74
Tourniquet used	19 (71.9)	6,870 (66.3)	0.69
Tourniquet duration			0.16
No tourniquet	7 (28.1)	3,499 (33.7)	
<1 hr	9 (35.9)	4,705 (45.4)	
≥1 hr	9 (35.9)	2,165 (20.9)	
Race			0.55
Black	4 (13.8)	842 (8.1)	
Caucasian	20 (74.7)	8,310 (80.1)	
Other	2 (5.9)	475 (4.6)	
Anatomic location			0.28
Shoulder	5 (18.5)	2,300 (22.2)	
Hand and elbow	4 (16.2)	2,517 (24.3)	
Hip	0 (0.0)	261 (2.5)	
Knee and leg	10 (39.4)	4,047 (39.0)	
Foot and ankle	2 (6.9)	403 (3.9)	
Multiple locations	5 (19.0)	813 (7.8)	
ASA score			0.83
1	10 (37.6)	3,481 (33.6)	
2	13 (50.7)	5,868 (56.6)	
≥3	3 (11.7)	1,017 (9.8)	
Insurance			0.1
Private	15 (56.6)	7,936 (76.5)	
Medicare	6 (24.0)	1,454 (14.0)	
Medicaid	3 (10.7)	430 (4.1)	
Uninsured	0 (1.2)	211 (2.0)	
Anesthesia			0.26
General	19 (71.7)	8,157 (78.7)	
Regional	0 (0.0)	367 (3.5)	
Combined	7 (28.3)	1,845 (17.8)	
No. of overlapping cases			0.69
1	13 (49.3)	4,379 (42.2)	
2	1 (3.8)	803 (7.7)	
3	0 (0.0)	2 (0.0)	

*ATT PS weighting = average-treatment-effect-for-treated propensity-score weighting, BMI = body mass index, and ASA = American Society of Anesthesiologists. Continuous variables are given as the median, with the first and third quartiles in parentheses, and categorical variables are given as the number, with the percentage in parentheses. †Significant.

TABLE E-4 Association of Patient and Surgical Factors with the Outcome of Hospitalization from Bivariate Analysis After ATT PS Weighting*

	Hospitalization		P Value
	Yes (N = 7)	No (N = 10,388)	
Age (yr)	49.9 (40.6-60.1)	43.8 (25.1-55.5)	0.0033†
BMI (kg/m ²)	31.3 (25.9-36.5)	27.5 (24-31.6)	0.083
Tourniquet time (min)	0 (0-35)	24 (0-52)	0.26
Operative time (min)	78 (38-93)	57 (34-89)	0.2
Anesthesia time (min)	122 (89-170)	95 (66-131)	0.0018†
Surgery overlap time (min)	0 (0-0)	1 (0-8)	<0.001†
Surgery overlap percent (%)	0 (0-0)	0 (0-15)	0.0013†
Surgery overlap	1 (14.4)	5,197 (50.0)	0.13
Diabetes mellitus	2 (24.0)	690 (6.6)	0.29
Smoking history	4 (52.1)	3,111 (29.9)	0.4
Current smoker	2 (22.9)	1,211 (11.7)	0.75
BMI ≥30 kg/m ²	4 (51.1)	3,524 (33.9)	0.58
Age ≥70 yr	0 (4.3)	292 (2.8)	0.36
Preop. antibiotics	6 (84.8)	8,866 (85.3)	0.62
Fracture	0 (5.1)	771 (7.4)	0.62
Implant use	3 (46.4)	4,790 (46.1)	0.71
Male sex	4 (54.3)	6,055 (58.3)	0.86
Tourniquet used	2 (28.0)	6,887 (66.3)	0.083
Tourniquet duration			0.078
No tourniquet	5 (72.0)	3,501 (33.7)	
<1 hr	1 (8.5)	4,714 (45.4)	
≥1 hr	1 (19.5)	2,173 (20.9)	
Race			0.83
Black	1 (10.3)	845 (8.1)	
Caucasian	6 (82.9)	8,324 (80.1)	
Other	0 (0.0)	477 (4.6)	
Anatomic location			0.54
Shoulder	4 (52.9)	2,301 (22.2)	
Hand and elbow	1 (8.5)	2,521 (24.3)	
Hip	0 (0.0)	261 (2.5)	
Knee and leg	2 (28.3)	4,055 (39.0)	
Foot and ankle	0 (2.5)	405 (3.9)	
Multiple locations	1 (7.8)	817 (7.9)	
ASA score			0.04†
1	1 (10.1)	3,490 (33.6)	
2	4 (52.8)	5,878 (56.6)	
≥3	3 (37.1)	1,017 (9.8)	
Insurance			0.19
Private	4 (53.9)	7,947 (76.5)	
Medicare	3 (37.6)	1,458 (14.0)	
Medicaid	0 (0.0)	433 (4.2)	
Uninsured	1 (8.5)	211 (2.0)	
Anesthesia			0.7
General	5 (71.8)	8,171 (78.7)	
Regional	0 (0.0)	367 (3.5)	
Combined	2 (28.2)	1,851 (17.8)	
No. of overlapping cases			0.91
1	1 (14.4)	4,391 (42.3)	
2	0 (0.0)	804 (7.7)	
3	0 (0.0)	2 (0.0)	

*ATT PS weighting = average-treatment-effect-for-treated propensity-score weighting, BMI = body mass index, and ASA = American Society of Anesthesiologists. Continuous variables are given as the median, with the first and third quartiles in parentheses, and categorical variables are given as the number, with the percentage in parentheses. †Significant.

TABLE E-5 Association of Patient and Surgical Factors with the Outcome of Morbidity from Bivariate Analysis After ATT PS Weighting*

	Morbidity		P Value
	Yes (N = 59)	No (N = 10,336)	
Age (yr)	42.7 (20.9-53.9)	43.8 (25.2-55.5)	0.1
BMI (kg/m ²)	26.8 (22.8-32.2)	27.5 (24-31.6)	0.79
Tourniquet time (min)	47 (0-89)	23 (0-52)	<0.0001†
Operative time (min)	78 (50-113)	57 (34-89)	<0.0001†
Anesthesia time (min)	121 (84-166)	95 (66-131)	<0.0001†
Surgery overlap time (min)	0 (0-6)	1 (0-8)	<0.0001†
Surgery overlap percent (%)	0 (0-10)	0 (0-15)	<0.0001†
Surgery overlap	28 (47.2)	5,170 (50.0)	0.76
Diabetes mellitus	6 (10.9)	685 (6.6)	0.29
Smoking history	21 (35.1)	3,094 (29.9)	0.49
Current smoker	9 (14.9)	1,203 (11.6)	0.58
BMI ≥30 kg/m ²	21 (36.2)	3,506 (33.9)	0.81
Age ≥70 yr	3 (5.4)	289 (2.8)	0.42
Preop. antibiotics	56 (94.5)	8,816 (85.3)	0.068
Fracture	5 (8.9)	766 (7.4)	0.86
Implant use	40 (67.7)	4,753 (46.0)	0.0013†
Male sex	33 (56.2)	6,026 (58.3)	0.84
Tourniquet used	43 (72.9)	6,846 (66.2)	0.35
Tourniquet duration			<0.001†
No tourniquet	16 (27.1)	3,490 (33.8)	
<1 hr	18 (31.0)	4,696 (45.4)	
≥1 hr	25 (41.8)	2,150 (20.8)	
Race			0.82
Black	6 (9.3)	840 (8.1)	
Caucasian	50 (83.9)	8,280 (80.1)	
Other	2 (3.1)	475 (4.6)	
Anatomic location			0.32
Shoulder	9 (14.9)	2,296 (22.2)	
Hand and elbow	12 (20.6)	2,509 (24.3)	
Hip	1 (1.7)	260 (2.5)	
Knee and leg	26 (43.7)	4,031 (39.0)	
Foot and ankle	5 (8.4)	400 (3.9)	
Multiple locations	6 (10.7)	811 (7.8)	
ASA score			0.034†
1	19 (31.3)	3,473 (33.6)	
2	29 (48.9)	5,852 (56.6)	
≥3	12 (19.8)	1,008 (9.8)	
Insurance			0.3
Private	40 (67.0)	7,911 (76.5)	
Medicare	12 (19.9)	1,449 (14.0)	
Medicaid	4 (7.3)	428 (4.1)	
Uninsured	1 (2.4)	210 (2.0)	
Anesthesia			0.015†
General	41 (69.2)	8,135 (78.7)	
Regional	0 (0.0)	367 (3.5)	
Combined	18 (30.8)	1,834 (17.7)	
No. of overlapping cases			0.47
1	26 (43.8)	4,366 (42.2)	
2	2 (3.4)	802 (7.8)	
3	0 (0.0)	2 (0.0)	

*ATT PS weighting = average-treatment-effect-for-treated propensity-score weighting, BMI = body mass index, and ASA = American Society of Anesthesiologists. Continuous variables are given as the median, with the first and third quartiles in parentheses, and categorical variables are given as the number, with the percentage in parentheses. †Significant.

TABLE E-6 Hosmer-Lemeshow and C-Statistics for the Final Multivariable Logistic Regression Models

	Hosmer-Lemeshow	C-Statistic
Surgical-site infection (SSI)	0.178101532	0.790359976
Noninfection complication	0.261148587	0.721303648
Hospitalization	0.084750371	0.750607488
Morbidity	0.087969253	0.705492912