A critical evaluation of the treatment of ankle fractures presenting to the emergency department of an urban Level-1 trauma center.

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Statement of Purpose and Literature Review

Ankle fractures are one of the most common traumatic lower extremity osseous injuries presenting to emergency departments in the US. As such, the diagnosis and treatment of ankle fractures forms an important aspect of the education of podiatric students and residents. It also represents a potential opportunity for the assessment of performance improvement/quality improvement initiatives for our profession [1-4].

The objective of this investigation was to determine which patient demographic factors might be associated with disparities in the treatment of rotational ankle fractures presenting for initial evaluation to the emergency department of an urban Level-1 trauma center.

Methodology

Following IRB approval, a retrospective chart review was performed of 100 consecutive subjects presenting to the emergency department of an urban US Level-1 trauma center with a rotational ankle fracture. The cohort was subsequently divided into those who underwent ORIF versus those who did not, and into those who were admitted for the ORIF versus those who underwent an outpatient procedure. Additional comparisons were performed of the inpatient subjects regarding factors potentially affecting time to operative intervention and total length of stay. Continuous data is reported as a mean ± standard deviation (range) and was compared with an unpaired students t-test. Categorical data is reported as a frequency count and was compared with the chi-square test and odds ratio analysis.

Demographic	ORIF (n = 41)	No ORIF (n = 54)	Statistical Comparison
Age (years)	47.68 ± 13.93 (21-82)	47.39 ± 15.33 (18-74)	P = 0.9235
Gender	24 (58.5) Female 17 (41.5) Male	34 (63) Female 20 (37) Male	P = 0.822; 0.830 (0.333-2.072)
Race	20 (48.8) Black 12 (29.3) White 9 (21.9) Other	26 (48.1) Black 8 (14.8) White 20 (37.1) Other	Black p = 1.000; 1.026 (0.420-2.504) White p = 0.145; 2.379 (0.783-7.350) Other p = 0.175; 0.478 (0.171-1.314)
Ethnicity	9 (21.9) Hispanic 32 (78.1) Not	19 (35.2) Hispanic 35 (64.8) Not	P = 0.241; 0.518 (0.185-1.431)
Insurance	27 (65.9) Medicaid 4 (9.76) Medicare 10 (24.3) Other	26 (48.1) Medicaid 6 (11.1) Medicare 22 (40.8) Other	Medicaid p = 0.130; 2.077 (0.830-5.243) Medicare p = 1.000; 0.865 (0.187-3.818) Other p = 0.147; 0.469 (0.173-1.252)
BMI	32.43 ± 8.02 (19.49-52.9) [n = 39]	30.43 ± 7.31 (17.8-49.53) [n = 53]	P = 0.2167
Presence of diabetes mellitus	7 (17.1) Yes 34 (82.9) No	7 (12.9) Yes 47 (87.1) No	P = 0.789; 1.382 (0.389-4.925)
Most recent HbA1c	7.72 ± 2.25 (5.7-11.4) [n=5]	9.01 ± 1.03 (7.9-10) [n=4]	P = 0.3234
Smoking Status	22 (53.6) Yes 19 (46.4) No	30 (55.5) Yes 24 (44.5) No	P = 1.000; 0.926 (0.378-2.269)
Presence of cardiac disease	6 (14.6) Yes 35 (85.4) No	4 (7.4) Yes 50 (92.6) No	P = 0.424; 2.143 (0.485-9.910)
Presence of pulmonary disease	11 (26.8) Yes 30 (73.2) No	7 (12.9) Yes 47 (87.1) No	P = 0.149; 2.462 (0.771-8.027)
Presence of renal disease	3 (7.3) Yes 38 (92.7) No	2 (3.7) Yes 52 (96.3) No	P = 0.751; 2.053 (0.260-18.661)
Presence of peripheral arterial disease	3 (7.3) Yes 38 (92.7) No	2 (3.7) Yes 52 (96.3) No	P = 0.751; 2.053 (0.260-18.661)
History of intervention for peripheral arterial disease	1 (33.3) Yes 2 (66.7) No [n=3]	1 (50) Yes 1 (50) No [n=2]	P = 1.000; 0.500 (0.001-61.914)
Presence of psychiatric disorder	9 (21.9) Yes 32 (78.1) No	13 (24.1) Yes 41 (75.9) No	P = 1.000; 0.887 (0.302-2.578)
Presence of neurological disease	7 (17.1) Yes 34 (82.9) No	2 (3.7) Yes 52 (96.3) No	P = 0.064; 5.353 (0.931-39.971)
Method of Arrival	15 (36.6) EMS 26 (63.4) Walk-in	17 (31.5) EMS 37 (68.5) Walk-in	P = 0.762; 1.256 (0.489-3.227)
Associated Musculoskeletal Injury	5 (12.2) Yes 36 (87.8) No	6 (11.1) Yes 48 (88.9) No	P = 1.000; 1.111 (0.267-4.561)
Mechanism of Injury	35 (85.4) Fall 1 (2.4) Sports 5 (12.2) Other	47 (87) Fall 2 (3.7) Sports 5 (9.3) Other	Fall p = 1.000; 0.869 (0.234-3.251) Sports p = 1.000; 0.650 (0.023-9.636) Other p = 0.902; 1.361 (0.311-5.974)
Lauge Hansen Classification	11 (26.8) PER 30 (73.2) SER	6 (11.1) PER 45 (83.3) SER 1 (1.8) PAB 2 (3.8) SAD	PER p = 0.087; 2.933 (0.879-10.100) SER p = 0.343; 0.545 (0.180-1.638) PAB p = 1.000; (0.989-22.847) SAD p = 0.600; 0.0 (0.979-5.452)
Open vs. Closed Injury	2 (4.8) Open 39 (95.2) Closed	0 (0) Open 54 (100) Closed	----------
Podiatric vs. Orthopedic Consult	29 (70.7) Podiatric 12 (29.3) Orthopedic	31 (57.4) Podiatric 20 (42.6) Orthopedic	P = 0.438; 1.559 (0.595-4.117)
Podiatric vs. Orthopedic ORIF	28 (70) Podiatric 12 (30) Orthopedic [n=40]	----------	-----------
Inpatient vs. Outpatient Treatment	19 (46.3) Inpatient 22 (53.7) Outpatient	0 (0) Inpatient 54 (100) Outpatient	------------
Time to OR (days)	6.97 ± 6.84 (0-27) [n=36]	-----------	------------
Total length of stay (days)	3.17 ± 2.37 (1-9)	-----------	------------
Post-operative length of stay (days)	1.91 ± 1.56 (0-6)	-----------	------------
Disposition	7 (17.9) SNF 32 (82.1) Home [n=39]	2 (3.8) SNF 50 (96.2) Home [n=52]	P = 0.060; 5.469 (0.947-41.016)

Table 1: This table provides a comparison of demographic variables between subjects who underwent ORIF vs. those that did not. Interestingly, no statistically significant results were observed of the studied variables.

Demographic	Inpatient ORIF (n = 19)	Outpatient ORIF (n = 22)	Statistical Comparison
Age (years)	50.11 ± 12.51 (31-82)	45.59 ± 15.02 (21-71)	P = 0.3067
Gender	12 (63.1) Female 7 (36.9) Male	12 (54.5) Female 10 (45.5) Male	P = 0.810; 1.429 (0.342-6.059)
Race	12 (63.1) Black 4 (21) White 3 (15.9) Other	8 (36.3) Black 8 (36.3) White 6 (27.4) Other	Black p = 0.162; 3.000 (0.706-13.265) White p = 0.465; 0.467 (0.091-2.288) Other p = 0.611; 0.500 (0.080-2.876)
Ethnicity	3 (15.7) Hispanic 16 (84.3) Not	6 (27.2) Hispanic 16 (72.8) Not	P = 0.611; 0.500 (0.080-2.876)
Insurance	14 (73.6) Medicaid 1 (5.2) Medicare 4 (21.2) Other	13 (59.1) Medicaid 3 (13.6) Medicare 6 (27.3) Other	Medicaid p = 0.514; 1.938 (0.429-9.054) Medicare p = 0.709; 0.352 (0.013-4.468) Other p = 0.923; 0.711 (0.132-3.703)
BMI	33.33 ± 7.10 (23.4-52.9) [n = 18]	31.66 ± 8.83 (19.49-48.76) [n = 21]	P = 0.5238
Presence of diabetes mellitus	4 (21.1) Yes 15 (78.9) No	3 (13.6) Yes 19 (86.4) No	P = 0.831; 1.689 (0.258-11.603)
Most recent HbA1c	6.95 ± 1.20 (6.1-7.8) [n=2]	8.23 ± 2.90 (5.7-11.4) [n=3]	P = 0.6090
Smoking Status	10 (52.6) Yes 9 (47.4) No	12 (54.5) Yes 10 (45.5) No	P = 1.000; 0.926 (0.226-3.789)
Presence of cardiac disease	2 (10.5) Yes 17 (89.5) No	4 (18.2) Yes 18 (81.8) No	P = 0.804; 0.529 (0.057-4.099)
Presence of pulmonary disease	3 (15.7) Yes 16 (84.3) No	8 (36.4) Yes 14 (63.6) No	P = 0.259; 0.328 (0.055-1.783)
Presence of renal disease	1 (5.2) Yes 18 (94.8) No	2 (9.1) Yes 20 (90.9) No	P = 1.000; 0.556 (0.018-8.940)
Presence of peripheral arterial disease	2 (10.5) Yes 17 (89.5) No	1 (4.5) Yes 21 (95.5) No	P = 0.895; 2.471 (0.153-74.989)
History of intervention for peripheral arterial disease	1 (50) Yes 1 (50) No [n=2]	0 (0) Yes 1 (100) No [n=1]	------------
Presence of psychiatric disorder	4 (21.1) Yes 15 (78.9) No	5 (22.7) Yes 17 (77.3) No	P = 1.000; 0.907 (0.162-4.979)
Presence of neurological disease	4 (21.1) Yes 15 (78.9) No	3 (13.6) Yes 19 (86.4) No	P = 0.831; 1.689 (0.258-11.603)
Method of Arrival	8 (42.1) EMS 11 (57.9) Walk-in	7 (31.8) EMS 15 (68.2) Walk-in	P = 0.721; 1.558 (0.362-6.809)
Associated Musculoskeletal Injury	1 (5.3) Yes 18 (94.7) No	4 (18.2) Yes 18 (81.8) No	P = 0.434; 0.250 (0.010-2.845)
Mechanism of Injury	17 (89.5) Fall 0 (0) Sports 2 (10.5) Other	18 (81.8) Fall 1 (4.5) Sports 3 (13.7) Other	Fall p = 0.804; 1.889 (0.244-17.413) Sports p = 1.000; 0.00 (0.976-20.619) Other p = 1.000; 0.745 (0.075-6.548)
Lauge Hansen Classification	4 (21.1) PER 15 (78.9) SER	7 (31.8) PER 15 (68.2) SER	P = 0.672; 1.750 (0.348-9.165)
Open vs. Closed Injury	2 (10.5) Open 17 (89.5) Closed	0 (0) Open 22 (100) Closed	----------
Podiatric vs. Orthopedic Consult	17 (89.5) Podiatric 2 (10.5) Orthopedic	12 (54.5) Podiatric 10 (45.5) Orthopedic	P = 0.035; 7.083 (1.110-57.437)
Podiatric vs. Orthopedic ORIF	17 (89.5) Podiatric 2 (10.5) Orthopedic	11 (52.4) Podiatric 10 (47.6) Orthopedic	P = 0.027; 7.727 (1.195-63.201)
Time to OR (days)	1.53 ± 1.17 (0-5)	13.06 ± 5.13 (7-27) [n = 17]	P < 0.0001; (-13.99 - -9.08)
Total length of stay (days)	3.58 ± 2.41 (1-9)	1.25 ± 0.5 (1-2) (n=4)	P = 0.0727; (-0.23-4.89)
Post-operative length of stay (days)	2.05 ± 1.68 (0-6)	1.25 ± 0.5 (1-2) [n=4]	P = 0.3630; (-0.99-2.60)
Disposition	5 (26.3) SNF 14 (73.7) Home	2 (10) SNF 18 (90) Home	P = 0.363; 3.214 (0.440-28.592)

Table 2: This table evaluates those subjects who underwent ORIF with a comparison to those that did so as an outpatient vs. an inpatient procedure. Those who had the procedure performed on an inpatient basis were more likely to be treated by the Foot and Ankle Surgery Service (89.5% vs. 10.5%; p=0.035) and to have a lower mean time to the OR (1.53 vs. 13.06 days; p<0.0001).

Demographic	Time to OR > 7 days (n = 15)	Time to OR ≤ 7 days (n = 21)	Statistical Comparison
Age (years)	43.67 ± 15.94 (21-68)	49.67 ± 11.98 (31-82)	P = 0.2055
Gender	6 (40) Female 9 (60) Male	14 (66.7) Female 7 (33.3) Male	P = 0.213; 0.333 (0.066-1.604)
Race	6 (40) Black 4 (26.7) White 5 (33.3) Other	13 (62) Black 4 (19) White 4 (19) Other	Black p = 0.338; 0.410 (0.083-1.939) White p = 0.893; 1.545 (0.249-9.742) Other p = 0.558; 2.125 (0.367-12.790)
Ethnicity	5 (33.3) Hispanic 10 (66.7) Not	4 (19) Hispanic 17 (81) Not	P = 0.558; 2.125 (0.367-12.790)
Insurance	9 (60) Medicaid 2 (13.3) Medicare 4 (26.7) Other	15 (71.4) Medicaid 1 (4.8) Medicare 5 (23.8) Other	Medicaid p = 0.720; 0.600 (0.117-3.009) Medicare p = 0.760; 3.077 (0.186-95.323) Other p = 1.000; 1.164 (0.198-6.765)
BMI	30.52 ± 8.20 (19.49-43.94) [n = 14]	32.94 ± 6.85 (23.4-52.9) [n = 20]	P = 0.3581
Presence of diabetes mellitus	1 (6.7) Yes 14 (93.3) No	4 (19) Yes 17 (81) No	P = 0.568; 0.304 (0.012-3.574)
Most recent HbA1c	7.6 (n=1)	6.95 ± 1.20 (6.1-7.8) (n=2)	------------
Smoking Status	8 (53.3) Yes 7 (46.7) No	10 (47.6) Yes 11 (52.4) No	P = 1.000; 1.257 (0.273-5.853)
Presence of cardiac disease	2 (13.3) Yes 13 (86.7) No	2 (9.5) Yes 19 (90.5) No	P = 1.000; 1.462 (0.124-17.371)
Presence of pulmonary disease	4 (26.7) Yes 11 (73.3) No	4 (19) Yes 17 (81) No	P = 0.893; 1.545 (0.249-9.742)
Presence of renal disease	1 (6.7) Yes 14 (93.3) No	1 (4.8) Yes 20 (95.2) No	P = 1.000; 1.429 (0.035-58.146)
Presence of peripheral arterial disease	0 (0) Yes 15 (100) No	2 (9.5) Yes 19 (90.5) No	P = 0.622; 0.00 (0.944-6.008)
History of intervention for peripheral arterial disease	(n=0)	1 (50) Yes 1 (50) No (n=2)	-----------
Presence of psychiatric disorder	1 (6.7) Yes 14 (93.3) No	4 (19) Yes 17 (81) No	P = 0.568; 0.304 (0.012-3.574)
Presence of neurological disease	1 (6.7) Yes 14 (93.3) No	4 (19) Yes 17 (81) No	P = 0.568; 0.304 (0.012-3.574)
Method of Arrival	5 (33.3) EMS 10 (66.7) Walk-in	8 (38.1) EMS 13 (61.9) Walk-in	P = 1.000; 0.813 (0.162-4.011)
Associated Musculoskeletal Injury	3 (20) Yes 12 (80) No	1 (4.8) Yes 20 (95.2) No	P = 0.370; 5.000 (0.381-139.228)
Mechanism of Injury	12 (80) Fall 1 (6.7) Sports 2 (13.3) Other	19 (90.5) Fall 0 (0) Sports 2 (9.5) Other	Fall p = 0.683; 0.421 (0.041-3.825) Sports ------------- Other p = 1.000; 1.462 (0.124-17.371)
Lauge Hansen Classification	4 (26.7) PER 11 (73.3) SER	6 (28.6) PER 15 (71.4) SER	P = 1.000; 1.100 (0.199-6.205)
Open vs. Closed Injury	0 (0) Open 15 (100) Closed	2 (9.5) Open 19 (90.5) Closed	P = 0.622; 0.00 (0.944-6.008)
Podiatric vs. Orthopedic Consult	6 (40) Podiatric 9 (60) Orthopedic	18 (85.7) Podiatric 3 (14.3) Orthopedic	P = 0.012; 0.111 (0.016-0.680)
Podiatric vs. Orthopedic ORIF	6 (40) Podiatric 9 (60) Orthopedic	18 (85.7) Podiatric 3 (14.3) Orthopedic	P = 0.012; 0.111 (0.016-0.680)
Inpatient vs. Outpatient Treatment	0 (0) Inpatient 15 (100) Outpatient	19 (90.5) Inpatient 2 (9.5) Outpatient	P = 0.000; 0.00 (0.472-0.070)
Time to OR (days)	13.87 ± 4.91 (8-27)	2.05 ± 1.99 (0-7)	P <0.0001
Total length of stay (days)	1.33 ± 0.58 (1-2) (n=3)	3.45 ± 2.42 (1-9) (n=20)	P = 0.1530
Post-operative length of stay (days)	1.33 ± 0.58 (1-2) (n=3)	2.0 ± 1.65 (0-6) (n=20)	P = 0.5040
Disposition	1 (6.7) SNF 14 (93.3) Home	5 (23.8) SNF 16 (76.2) Home	P = 0.365; 0.229 (0.009-2.528)

Table 3: This table evaluates those subjects who underwent ORIF, and compared those that did so greater than 7 days following injury vs. those who were treated in 7 days or less following injury. Those who had the procedure performed in ≤ 7 days were more likely to be treated by the Foot and Ankle Surgery Service (85.7% vs. 14.3%; p=0.012) and to have the procedure performed on an inpatient basis (90.5% vs. 9.5%; p=0.00) with a mean time to the OR of 2.05 days.

Demographic	Total LOS > 3 days (n=6)	Total LOS ≤ 3 days (n=17)	Statistical Comparison
Age (years)	58.33 ± 12.29 (48-82)	44.71 ± 13.57 (23-68)	P = 0.424
Gender	4 (66.7) Female 2 (33.3) Male	10 (58.8) Female 7 (41.2) Male	P = 1.000; 1.400 (0.144-15.309)
Race	5 (83.3) Black 1 (16.7) White 0 (0) Other	9 (53) Black 4 (23.5) White 4 (23.5) Other	Black p = 0.410; 4.444 (0.340-122.979) White p = 1.000; 0.650 (0.022-9.900) Other p = 0.496; 0.00 (0.826-4.852)
Ethnicity	0 (0) Hispanic 6 (100) Not	4 (23.5) Hispanic 13 (76.5) Not	P = 0.496; 0.00 (0.826-4.852)
Insurance	4 (66.7) Medicaid 1 (16.7) Medicare 1 (16.7) Other	11 (64.7) Medicaid 0 (0) Medicare 6 (35.3) Other	Medicaid p = 1.000; 1.091 (0.109-12.091) Medicare ----------- Other p = 0.736; 0.367 (0.013-5.001)
BMI	31.7 ± 3.03 (29.1-36.02) [n = 5]	33.55 ± 7.76 (23.4-52.9) [n = 16]	P = 0.6146
Presence of diabetes mellitus	2 (33.3) Yes 4 (66.7) No	2 (11.8) Yes 15 (88.2) No	P = 0.567; 3.750 (0.256-60.813)
Most recent HbA1c	[n=0]	6.95 ± 1.20 (6.1, 7.8) [n=2]	------------
Smoking Status	4 (66.7) Yes 2 (33.3) No	7 (41.2) Yes 10 (58.8) No	P = 0.549; 2.857 (0.300-31.763)
Presence of cardiac disease	1 (16.7) Yes 5 (83.3) No	1 (5.9) Yes 16 (94.1) No	P = 1.000 3.200 (0.070-151.484)
Presence of pulmonary disease	1 (16.7) Yes 5 (83.3) No	3 (17.6) Yes 14 (82.4) No	P = 1.000; 0.933 (0.030-15.806)
Presence of renal disease	1 (16.7) Yes 5 (83.3) No	0 (0) Yes 17 (100) No	-----------
Presence of peripheral arterial disease	2 (33.3) Yes 4 (66.7) No	0 (0) Yes 17 (100) No	-----------
History of intervention for peripheral arterial disease	1 (50) Yes 1 (50) No [n=2]	[n=0]	-----------
Presence of psychiatric disorder	1 (16.7) Yes 5 (83.3) No	3 (17.6) Yes 14 (82.4) No	P = 1.000; 0.933 (0.030-15.806)
Presence of neurological disease	1 (16.7) Yes 5 (83.3) No	2 (11.8) Yes 15 (88.2) No	P = 0.567; 3.750 (0.256-60.813)
Method of Arrival	2 (33.3) EMS 4 (66.7) Walk-in	8 (47.1) EMS 9 (52.9) Walk-in	P = 0.918; 0.563 (0.052-5.380)
Associated Musculoskeletal Injury	0 (0) Yes 6 (100) No	1 (5.9) Yes 16 (94.1) No	P = 1.000; 0.00 (0.957-56.859)
Mechanism of Injury	6 (100) Fall 0 (0) Sports 0 (0) Other	14 (82.4) Fall 1 (5.9) Sports 2 (11.7) Other	Fall ----------- Sports p = 1.000; 0.00 (0.957-56.859) Other p = 0.971; 0.00 (0.913-14.070)
Lauge Hansen Classification	0 (0) PER 6 (0) SER	6 (35.3) PER 11 (64.7) SER	P = 0.250; 0.00 (0.739-2.524)
Open vs. Closed Injury	0 (0) Open 6 (100) Closed	2 (11.7) Open 15 (88.3) Closed	P = 0.971; 0.00 (0.913-14.070)
Podiatric vs. Orthopedic Consult	6 (100) Podiatric 0 (0) Orthopedic	12 (70.6) Podiatric 5 (29.4) Orthopedic	P = 0.355; 0.00 (0.783-3.411)
Podiatric vs. Orthopedic ORIF	6 (100) Podiatric 0 (0) Orthopedic	12 (70.6) Podiatric 5 (29.4) Orthopedic	P = 0.355; 0.00 (0.783-3.411)
Inpatient vs. Outpatient Treatment	6 (100) Inpatient 0 (0) Outpatient	13 (76.5) Inpatient 4 (23.5 Outpatient	P = 0.496; 0.00 (0.826-4.852)
Time to OR (days)	2.67 ± 1.37 (1-5)	3.24 ± 4.44 (0-15)	P = 0.7636
Total length of stay (days)	6.5 ± 2.07 (5-9)	2 ± 0.79 (1-3)	P < 0.0001
Post-operative length of stay (days)	3.83 ± 1.94 (1-6)	1.24 ± 0.56 (0-2)	P < 0.0001
Disposition	4 (66.7) SNF 2 (33.3) Home	2 (11.7) SNF 15 (88.3) Home	P = 0.036; 15 (1.122-325.452)

Table 4: This table evaluates subjects who underwent ORIF, and compared those that had a total length of stay greater than 3 days versus those with a total length of stay ≤ 3 days. Those who had a total length of stay ≤ 3 days were more likely to have a shorter post-operative length of stay (1.24 vs. 3.83 days; p<0.0001) and were less likely to be discharged to a SNF (11.7% vs. 66.7%; p=0.036).

Demographic	Total Post-Op LOS > 2 days (n=5)	Total Post-Op LOS ≤ 2 days (n=18)	Statistical Comparison
Age (years)	53.6 ± 4.56 (48-58)	46.78 ± 15.83 (24-82)	P = 0.3588
Gender	4 (80) Female 1 (20) Male	10 (55.5) Female 8 (44.5) Male	P = 0.636; 3.200 (0.232-90.998)
Race	4 (80) Black 1 (20) White 0 (0) Other	10 (55.6) Black 4 (22.2) White 4 (22.2) Other	Black p = 0.636; 3.200 (0.232-90.998) White p = 1.000; 0.875 (0.029-14.394) Other p = 0.622; 0.00 (0.826-6.544)
Ethnicity	0 (0) Hispanic 5 (100) Not	4 (22.2) Hispanic 14 (77.8) Not	P = 0.622; 0.00 (0.826-6.544)
Insurance	4 (80) Medicaid 0 (0) Medicare 1 (20) Other	11 (61.2) Medicaid 1 (5.5) Medicare 6 (33.3) Other	Medicaid p = 0.800; 2.545 (0.181-72.787) Medicare p = 1.000; 0.00 (0.957-75.061) Other p = 0.981; 0.500 (0.017-7.253)
BMI	31.70 ± 3.03 (29.1-36.02)	33.54 ± 7.76 (23.4-52.9) [n = 16]	P = 0.6146
Presence of diabetes mellitus	1 (20) Yes 4 (80) No	3 (16.7) Yes 15 (83.3) No	P = 1.000; 1.250 (0.039-23.062)
Most recent HbA1c	[n=0]	6.95 ± 1.20 (6.1-7.8) [n=2]	----------
Smoking Status	3 (60) Yes 2 (40) No	8 (44.4) Yes 10 (55.6) No	P = 0.913; 1.875 (0.179-22.018)
Presence of cardiac disease	1 (20) Yes 4 (80) No	1 (5.5) Yes 17 (94.5) No	P = 0.907; 4.250 (0.090-212.957)
Presence of pulmonary disease	1 (20) Yes 4 (80) No	3 (16.7) Yes 15 (83.3) No	P = 1.000; 1.250 (0.039-23.062)
Presence of renal disease	0 (0) Yes 5 (100) No	1 (5.5) Yes 17 (94.5) No	P = 1.000; 0.00 (0.957-75.061)
Presence of peripheral arterial disease	1 (20) Yes 4 (80) No	1 (5.5) Yes 17 (94.5) No	P = 0.907; 4.250 (0.090-212.957)
History of intervention for peripheral arterial disease	1 (100) Yes 0 (0) No [n=1]	0 (0) Yes 1 (100) No [n=1]	-----------
Presence of psychiatric disorder	1 (20) Yes 4 (80) No	3 (16.7) Yes 15 (83.3) No	P = 1.000; 1.250 (0.039-23.062)
Presence of neurological disease	2 (40) Yes 3 (60) No	2 (11.1) Yes 16 (88.9) No	P = 0.401; 5.333 (0.339-101.781)
Method of Arrival	2 (40) EMS 3 (60) Walk-in	8 (44.4) EMS 10 (55.6) Walk-in	P = 1.000; 0.833 (0.072-8.834)
Associated Musculoskeletal Injury	0 (0) Yes 5 (100) No	1 (5.5) Yes 17 (94.5) No	P = 1.000; 0.00 (0.957-75.061)
Mechanism of Injury	5 (100) Fall 0 (0) Sports 0 (0) Other	15 (83.3) Fall 1 (5.6) Sports 2 (11.1) Other	Fall ----------- Sports p = 1.000; 0.00 (0.957-75.061) Other p = 1.000; 0.00 (0.913-18.905)
Lauge Hansen Classification	0 (0) PER 5 (100) SER	6 (33.3) PER 12 (66.7) SER	P = 0.355; 0.00 (0.739-3.411)
Open vs. Closed Injury	0 (0) Open 5 (100) Closed	2 (11.1) Open 16 (88.9) Closed	P = 1.000; 0.00 (0.913-18.905)
Podiatric vs. Orthopedic Consult	5 (100) Podiatric 0 (0) Orthopedic	13 (72.2) Podiatric 5 (27.8) Orthopedic	P = 0.472; 0.00 (0.783-4.601)
Podiatric vs. Orthopedic ORIF	5 (100) Podiatric 0 (0) Orthopedic	13 (72.2) Podiatric 5 (27.8) Orthopedic	P = 0.472; 0.00 (0.783-4.601)
Inpatient vs. Outpatient Treatment	5 (100) Inpatient 0 (0) Outpatient	14 (77.8) Inpatient 4 (22.2) Outpatient	P = 0.622; 0.00 (0.826-6.544)
Time to OR (days)	2.6 ± 1.52 (1-5)	3.22 ± 4.31 (0-15)	P = 0.7572
Total length of stay (days)	7.0 ± 1.87 (5-9)	2.11 ± 0.90 (1-4)	P < 0.0001
Post-operative length of stay (days)	4.44 ± 1.52 (3-6)	1.22 ± 0.55 (0-2)	P < 0.0001
Disposition	4 (80) SNF 1 (20) Home	2 (11.1) SNF 16 (88.9) Home	P = 0.012; 32 (1.657-1425.712)

Table 5: This table evaluates subjects who underwent ORIF, and compared those that had a total post-operative length of stay greater than 2 days versus those with a total post-operative length of stay ≤ 2 days. Those who had a total post-operative length of stay ≤ 2 days were more likely to have a shorter total length of stay (2.11 vs. 7 days; p<0.0001) and were less likely to be discharged to a SNF (11.1% vs. 80%; p=0.012).

Demographic	Podiatry ORIF (n = 28)	Orthopedic ORIF (n = 12)	Statistical Comparison
Age (years)	48.57 ± 14.08 (24-82)	45.67 ± 14.56 (21-68)	P = 0.5575
Gender	18 (64.3) Female 10 (35.7) Male	6 (50) Female 6 (50) Male	P = 0.622; 1.800 (0.374-8.814)
Race	15 (53.6) Black 7 (25) White 6 (21.4) Other	5 (41.7) Black 4 (33.3) White 3 (25) Other	Black p = 0.730; 1.615 (0.339-7.874) White p = 0.878; 0.667 (0.122-3.690) Other p = 1.000; 0.818 (0.133-5.316)
Ethnicity	6 (21.4) Hispanic 22 (78.6) Not	3 (25) Hispanic 9 (75) Not	P = 1.000; 0.818 (0.133-5.316)
Insurance	19 (67.9) Medicaid 3 (10.7) Medicare 6 (21.4) Other	7 (58.4) Medicaid 1 (8.3) Medicare 4 (33.3) Other	Medicaid p = 0.828; 1.508 (0.302-7.551) Medicare p = 1.000; 1.320 (0.100-36.490) Other p = 0.690; 0.545 (0.096-3.110)
BMI	34.37 ± 8.06 (20.9-52.9) [n = 27]	28.55 ± 6.27 (19.49-40.36) [n = 11]	P = 0.0392; (0.3046-11.3376)
Presence of diabetes mellitus	6 (21.4) Yes 22 (78.6) No	0 (0) Yes 12 (100) No	-----------
Most recent HbA1c	6.8 ± 1.06 (5.7-7.8) [n=4]	[n=0]	------------
Smoking Status	14 (50) Yes 14 (50) No	7 (58.3) Yes 5 (41.7) No	P = 1.000; 0.926 (0.378-2.269)
Presence of cardiac disease	5 (17.9) Yes 23 (82.1) No	1 (8.3) Yes 11 (91.7) No	P = 0.424; 2.143 (0.485-9.910)
Presence of pulmonary disease	7 (25) Yes 1 (75) No	4 (33.3) Yes 8 (66.7) No	P = 0.149; 2.462 (0.771-8.027)
Presence of renal disease	3 (10.7) Yes 25 (89.3) No	0 (0) Yes 12 (100) No	-------------
Presence of peripheral arterial disease	3 (10.7) Yes 25 (89.3) No	0 (0) Yes 12 (100) No	------------
History of intervention for peripheral arterial disease	1 (33.3) Yes 2 (66.7) No [n=3]	(n=0)	------------
Presence of psychiatric disorder	6 (21.4) Yes 22 (778.6) No	2 (16.7) Yes 10 (83.3) No	P = 1.000; 1.364 (0.188-11.907)
Presence of neurological disease	6 (21.4) Yes 22 (778.6) No	0 (0) Yes 12 (100) No	-------------
Method of Arrival	9 (32.1) EMS 19 (67.9) Walk-in	6 (50) EMS 6 (50) Walk-in	P = 0.476; 0.474 (0.095-2.306)
Associated Musculoskeletal Injury	2 (7.1) Yes 26 (92.9) No	3 (25) Yes 9 (75) No	P = 0.297; 0.231 (0.022-2.129)
Mechanism of Injury	25 (89.3) Fall 0 (0) Sports 3 (10.7) Other	9 (75) Fall 1 (8.3) Sports 2 (16.7) Other	Fall p = 0.499; 2.778 (0.354-22.398) Sports p = 0.658; 0.00 (0.975-7.490) Other p = 1.000; 0.600 (0.065-6.152)
Lauge Hansen Classification	8 (28.6) PER 20 (71.4) SER	3 (25) PER 9 (75) SER	P = 1.000; 0.833 (0.135-4.799)
Open vs. Closed Injury	2 (7.1) Open 26 (92.9) Closed	0 (0) Open 12 (100) Closed	----------
Inpatient vs. Outpatient Treatment	17 (60.7) Inpatient 11 (39.3) Outpatient	2 (16.7) Inpatient 10 (83.3) Outpatient	P = 0.027; 7.727 (1.195-63.201)
Time to OR (days)	4.42 ± 4.96 (0-15) [n=24]	12.08 ± 7.40 (1-27)	P = 0.0008
Total length of stay (days)	3.61 ± 2.45 (1-9) [n=18]	1.06 ± 0.89 (1-3) [n=5]	P = 0.0904; (-0.35-4.37)
Post-operative length of stay (days)	2.11 ± 1.71 (0-6) [n=18]	1.02 ± 0.45 (1-2) [n=5]	P = 0.2585; (-0.72-2.54)
Disposition	6 (22.2) SNF 21 (77.8) Home [n=27]	1 (8.3) SNF 11 (91.7) Home	P = 0.554; 3.143 (0.295-77.042)

Table 6: This table evaluates subjects who underwent ORIF, and compared those that were operated on by the Foot and Ankle Surgery Service vs. the Orthopedic Surgery Service. Those who were operated on by the Foot and Ankle Surgery Service were more likely to have a higher BMI (34.37 vs. 28.55; p=0.0392), more likely to have been treated on an inpatient basis (60.7% vs. 16.7%; p=0.027), and have a shorter time to OR (4.42 vs. 12.08 days; p=0.0008).

Results

Results are displayed in the adjacent tables. Subjects who were treated on an inpatient basis were more likely to have been operated on by the Foot and Ankle Surgery service and have a time to OR of less than 7 days. Subjects with a total length of stay greater than 3 days were more likely to be discharged to a skilled nursing facility. No other substantial clinical differences were observed with any comparison with respect to type of fracture, subject demographic information and subject co-morbidities.

Discussion

As with any scientific investigation, critical readers are encouraged to review the study design and results and reach their own conclusions, while the following represents our interpretation of the specific results. As scientists, we also never consider data to be definitive, but do think that these results are worthy of attention and future investigation.

Subjects who underwent ORIF were more frequently evaluated and managed by the Foot and Ankle Surgery Service. Those patients who underwent ORIF by the Foot and Ankle Surgery Service were statistically significantly more likely to have been managed on an inpatient basis and with an overall shorter time to OR as compared to those managed by the Orthopedic Surgery Service. This may speak to different management paradigms between services or individual physician preference based on severity of patient injury, comorbidities, or insurance limitations. This descriptive and comparative information might be beneficial for the development of quality improvement and/or performance improvement initiatives at hospitals in the US with respect to the treatment of ankle fractures, especially as it pertains to health care costs and patient functional outcomes.

References

[1] Stull JD, Bhat SB, Kane JM, Raikin SM. Economic burden of inpatient admission of ankle fractures. Foot Ankle Int. 2017 Sep; 38(9):997-1004.
[2] Naumann MG, Sigurdsen U, Utvag SE, Stavem K. Associations of timing of surgery with postoperative length of stay, complications, and functional outcomes 3-6 years after operative fixation of closed ankle fractures. Injury. 2017 Jul; 48(7):1662-1669.
[3] Lovy AJ, Dowdell J, Keswani A, Koehler S, Kim J, Weinfeld S, Joseph D. Nonoperative versus operative treatment of displaced ankle fractures in diabetics. Foot Ankle Int. 2017 Mar; 38(3):255-260.
[4] Qin C, Dekker RG, Blough JT, Kadakia AR. Safety and outcomes of inpatient compared with outpatient surgical procedures for ankle fractures. J Bone Joint Surg Am. 2016 Oct 19; 98(20): 1699-1705.