Racial Disparity Following Surgical Care for Patients Sustaining Gustilo Type III Tibial Fractures using Propensity-Score Matched Cohorts in a Medicaid Database

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OBJECTIVES

- Prior studies have suggested that racial disparities exist amongst patients treated for orthopedic conditions. (1)
- In a recent survey completed by 305 members of the American Orthopaedic Association, only 12% respondents believed that patients could receive different care based on race. (2)
- Our study compares patient demographics, diagnoses and healthcare utilization in patients following Gustilo III tibial fractures.

METHODS

- *Data Source*: IBM® MarketScan® Medicaid.
- *Study Population*:
  - Patients with an inpatient diagnosis of Gustilo III tibial fracture treated surgically between 10/1/2015 – 12/31/2020.
  - Date of surgery was defined as index.
  - All patients had continuous enrollment in the database for 180 days prior to index (baseline period).
  - Patients were excluded if there was a concurrent femur or humerus fracture, amputation at index, other fractures pre-index, and race other than Black or White.

METHODS (Continued)

- *Variables*: race, age, gender, year of procedure, Elixhauser Comorbidity Index (EI), procedural characteristics (surgery type, implant type used).
- *Outcomes*: post-index surgical treatment (medication use, reoperations) and complications (compartmental syndrome, deep infection, mechanical breakage, mechanical displacement, mechanical other, nonunion, malunion, delayed healing, device infection, other complications, necrosis, sequela) within 365 days post-index surgery.
- *Statistical Analysis*:
  - Surgically treated Black vs White cohorts were matched 1:1 on age, gender, and comorbidities (R package: MatchIt, distance: GLM, method: nearest).
  - Chi-square tests and survival analyses (Kaplan-Meier and Cox proportional hazard models) were built for reoperation and complications.
  - Descriptive analyses were performed on all variables.

RESULTS

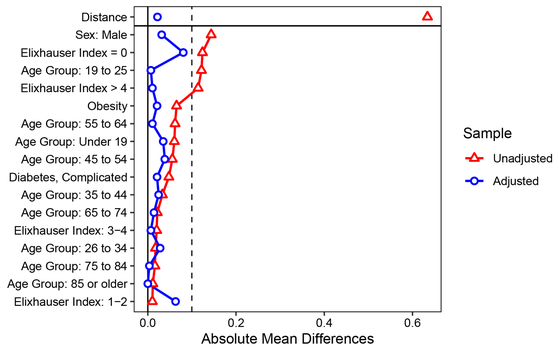
- Before matching: 347 Black patients and 421 White patients were identified.
- Major pre-matching imbalance included (Table 1):
  - Average age (standard deviation (SD)) for Black patients: 32.65 (16.56) vs average age (SD) for White patients: 40.09 (18.66).
  - Gender for Black patients: 66.86% were male vs gender for white patients: 52.49% were male.
  - Elixhauser Index (SD) for Black patients: 1.32 (2.04) vs Elixhauser Index (SD) for White patients: 2.25 (2.77).
  - Diabetes and Obesity had a greater prevalence in White vs Black patients.

Table 1. Pre-Matching, Patient Demographics for Tibial Fractures treated Surgically

Variables	Black		White	
	N	%	N	%
All	**347**	**100.00%**	**421**	**100.00%**
Gender				
Male	232	66.86%	221	52.49%
Age: mean (SD)	**32.65 (16.56)**		**40.09 (18.66)**	
under 19	86	24.78%	79	18.76%
19 to 25	62	17.87%	24	5.70%
26 to 34	58	16.71%	63	14.96%
35 to 44	52	14.99%	77	18.29%
45 to 54	45	12.97%	78	18.53%
55 to 64	28	8.07%	60	14.25%
65 to 74	14	4.03%	26	6.18%
75 to 84	1	0.29%	8	1.90%
85+	1	0.29%	6	1.43%
Elixhauser Index: mean (SD)	**1.32 (2.04)**		**2.25 (2.77)**	
0	179	51.59%	165	39.19%
1 or 2	100	28.82%	117	27.79%
3 or 4	40	11.53%	57	13.54%
5 or greater	28	8.07%	82	19.48%

- The pre- and post-matching balance is shown in Figure 1. The dotted line represents an absolute mean difference (AMD) of 0.1 used as a threshold for balance. After matching, all covariates had AMD <0.1.

Figure 1. Covariate Balance



- After matching, 572 patients were identified. Their demographic information is shown in Table 2.

Table 2. Post-Matching, Patient Demographics for Tibial Fractures treated Surgically

Variables	Black		White	
	N	%	N	%
All	**286**	**100.00%**	**286**	**100.00%**
Gender				
Male	175	61.19%	184	64.34%
Age: mean (SD)	**34.62 (16.63)**		**35.64 (16.80)**	
under 19	70	24.48%	60	20.98%
19 to 25	24	8.39%	22	7.69%
26 to 34	55	19.23%	63	22.03%
35 to 44	52	18.18%	59	20.63%
45 to 54	45	15.73%	34	11.89%
55 to 64	28	9.79%	31	10.84%
65 to 74	10	3.50%	14	4.90%
75 to 84	1	0.35%	2	0.70%
85+	1	0.35%	1	0.35%
Elixhauser Index: mean (SD)	**1.48 (2.16)**		**1.69 (2.12)**	
0	138	48.25%	115	40.21%
1 or 2	85	29.72%	103	36.01%
3 or 4	35	12.24%	37	12.94%
5 or greater	28	9.79%	31	10.84%

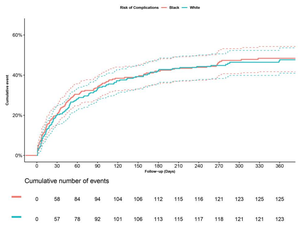
- Table 3 displays the different surgical intervention types post-matching by race. Common treatments overall were external fixation (39.86%), internal fixation (36.36%), and intramedullary nails (29.90%).

Table 3. Post-Matching, Surgical Intervention Types at Index Surgery for Patients with Tibial Fractures

Variables	Black		White	
	N	%	N	%
All	**286**	**100.00%**	**286**	**100.00%**
External Fixation	114	39.86%	114	39.86%
Internal Fixation	102	35.66%	106	37.06%
Intramedullary	82	28.67%	89	31.12%
Uniplane	45	15.73%	44	15.38%
Percutaneous	36	12.59%	42	14.69%
multiplane	36	12.59%	39	13.64%
Ring	18	6.29%	16	5.59%
Monoplanar	6	2.10%	2	0.70%
Endoscopic	1	0.35%	2	0.70%

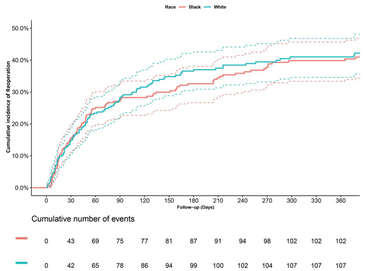
- Figure 2 shows the survival analysis for any complication 365 days post-index surgery for the post-matched cohort.

Figure 2.



- Figure 3 shows the survival analysis for reoperation 365 days post-index surgery for the post-matched cohort.

Figure 3.



- After matching, at 30 days post-index surgery, White patients were significantly more likely to be prescribed benzodiazepines, antidepressants, anticonvulsants, and CNS agents (Table 4).

Table 4. Post-Matching, 30 Days Post-Index Surgery Prescriptions for Patients with 30-day continuous enrollment and Tibial Fractures

Variables	Black		White		Chi.sq
	N	%	N	%	p-value
All	**240**	**100.00%**	**244**	**100.00%**	
Benzodiazepines	14	5.83%	30	12.30%	.013
Antidepressants	31	12.92%	63	25.82%	.000
Anticonvulsants	59	24.58%	85	34.84%	.014
NSAIDS	50	20.83%	49	20.08%	.838
Muscle Relaxants	69	28.75%	88	36.07%	.086
CNS Agents	2	0.83%	9	3.69%	.035
Analgesics	61	25.42%	53	21.72%	.338
Other Drugs	174	72.50%	178	72.95%	.911
Opiate Agonists (strong)	11	4.58%	10	4.10%	.793
Opiate Agonists (mild/mod)	182	75.83%	192	78.69%	.454
Antibiotics	63	26.25%	79	32.38%	.139

- After matching, at 365 days post-index surgery, White patients were significantly more likely to be prescribed benzodiazepines, antidepressants, CNS agents, and antibiotics (Table 5).

Table 5. Post-Matching, 365 Days Post-Index Surgery Prescriptions for Patients with 365-day continuous enrollment and Tibial Fractures

Variables	Black		White		Chi.sq
	N	%	N	%	p-value
All	**158**	**100.00%**	**151**	**100.00%**	
Benzodiazepines	20	12.66%	36	23.84%	.011
Antidepressants	47	29.75%	67	44.37%	.008
Anticonvulsants	60	37.97%	70	46.36%	.136
NSAIDS	70	44.30%	72	47.68%	.551
Muscle Relaxants	58	36.71%	67	44.37%	.170
CNS Agents	4	2.53%	16	10.60%	.004
Analgesics	63	39.87%	49	32.45%	.175
Other Drugs	140	88.61%	141	93.38%	.144
Opiate Agonists (strong)	15	9.49%	17	11.26%	.611
Opiate Agonists (mild/mod)	145	91.77%	135	89.40%	.475
Antibiotics	90	56.96%	109	72.19%	.005

CONCLUSIONS

- In the unmatched cohort, Black patients were younger, with fewer comorbidities, compared to White patients.
- Although outcomes for reoperation and complications were similar between Black and White patients, Black patients were significantly less likely to receive benzodiazepines, antidepressants, antibiotics, anticonvulsants, and CNS agents.

REFERENCES

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2. Adelani MA, O'Connor MI. *Perspectives of Orthopedic Surgeons on Racial/Ethnic Disparities in Care.* J Racial Ethn Health Disparities 2017;4(4):758-62. doi: 10.1007/s40615-016-0279-z [published Online First: 2016/08/31]