Racial Disparities in the Utilization of Ankle Arthroplasty and Arthrodesis in the United States: National Trends from 2002 to 2017

Kevin Xavier Farley, Jannat Khan, Megan Audet, Michael Brandon Gottschalk, Eric R Wagner

INTRODUCTION:

Recent reports have highlighted unimproved and potentially worsening racial disparities in orthopaedic care. This study aims to thoroughly examine racial disparities in the utilization of total ankle arthroplasty (TAA) and arthrodesis.

METHODS:

From 2002 to 2017, the National Inpatient Sample was queried for all patients undergoing total ankle arthroplasty and ankle arthrodesis. White, black, and Hispanic patients were identified. Yearly crude and standardized incidence rates were calculated and stratified by race. For patients undergoing primary TAA, binomial logistic regression was performed to assess the relationship between race and perioperative resource utilization.

RESULTS:

Age-and-sex standardized utilization rates of primary TAA in white patients increased from 4.44 per 1,000,000 in 2002 to 17.88 in 2017, a 303% increase. Black patients saw an increase from 2.52 to 4.79 in 2017, a 90% increase. Hispanic patients saw a 96% increase, rising from 2.43 in 2002 to 4.78 in 2017. When compared to white patients, this represented a 76% disparity in 2002 and a 273% disparity in 2017 for black patients and an 82% disparity in 2002 and a 274% disparity in 2017 for Hispanic patients (**Table 1**). Differences in utilization of arthrodesis between white and black or Hispanic patients were less pronounced compared to TAA, with disparities ranging from 16%-73% and from 40%-111%, respectively (**Table 2**). Black patients undergoing TAA had an increased risk of both non-home discharge (OR: 1.92, CI: 1.31-2.81, p<0.001) and an extended hospital length of stay (>2 days, OR: 1.38, CI: 1.10-1.74, p<0.001) when compared to white patients (**Table 3, Table 4**).

DISCUSSION AND CONCLUSION:

Persistent and worsening racial disparities were present for black and Hispanic patients, indicating that access to TAA is inequitable. In addition, the observed racial disparities in utilization of arthrodesis versus primary arthroplasty were disproportionate, suggesting that minority groups may have reduced access to novel therapeutic technologies such as TAA. Orthopaedic leadership should continue to support initiatives for increasing access to care for minority patients.

Table 1. Procedural Volume and Incidence of Total Ankle Arthroplasty by Race

	White		Black			Hispanic		
Year	Volume	Standardized Incidence	Volume	Standardized Incidence	Disparity	Volume	Standardized Incidence	Disparity
2002	1015 (527-1502)	4.44 (1.18-7.87)	75 (33-116)	2.52 (0.24-6.26)	76%	46 (24-67)	2.43 (0.64-5.33)	82%
2003	916 (705-1127)	3.81 (1.67-6.02)	40 (8-73)	1.24 (0.19-3.21)	207%	35 (4-66)	1.44 (0-3.66)	165%
2004	1291 (705-1878)	5.34 (1.92-8.79)	61 (16-106)	2.17 (0-5.34)	145%	62 (28-97)	2.7 (0.25-6.23)	97%
2005	683 (452-913)	2.75 (0.94-4.68)	39 (7-71)	1.16 (0.17-2.67)	137%	34 (21-47)	1.69 (1.1-2.6)	62%
2006	735 (536-934)	2.93 (1.12-4.83)	27 (6-48)	0.85 (0.18-2.19)	244%	52 (21-83)	2.33 (0.28-5.86)	26%
2007	861 (592-1131)	3.34 (1.3-5.44)	37 (14-61)	1.3 (0.28-2.9)	157%	44 (9-78)	2.05 (0.22-4.69)	63%
2008	1314 (863-1766)	4.98 (2.14-7.88)	60 (33-87)	1.62 (0.11-4.14)	208%	58 (0-118)	2.37 (0.21-6.31)	110%
2009	1395 (1070-1719)	5.14 (2.37-8.05)	74 (43-106)	2.19 (0.26-5.19)	134%	39 (9-68)	1.39 (0.32-3.54)	269%
2010	2220 (1572-2869)	9.66 (4.95-14.48)	71 (15-126)	2.2 (0.17-5.61)	338%	111 (73-149)	3.75 (0.59-7.81)	158%
2011	2665 (1905-3424)	11.2 (6.04-16.41)	142 (67-218)	4.14 (0.15-10.2)	171%	99 (35-163)	3.07 (0-7.89)	265%
2012	3140 (2750-3530)	13.07 (8.53-17.69)	135 (79-191)	3.94 (0.08-8.95)	232%	165 (101-229)	5.35 (0-12.37)	144%
2013	3550 (3146-3954)	14.51 (9.69-19.38)	135 (89-181)	3.75 (0.47-8.64)	287%	165 (103-227)	5.08 (0.46-11.22)	186%
2014	3840 (3421-4259)	15.2 (10.36-20.19)	120 (76-164)	3.31 (0.29-7.8)	359%	220 (137-303)	6.89 (0.48-14.9)	121%
2015	4475 (3980-4970)	17.54 (12.22-22.96)	145 (89-201)	3.78 (0.37-8.15)	364%	220 (148-292)	6.24 (0.45-13.24)	181%
2016	4370 (3847-4893)	16.73 (11.43-22.09)	180 (124-236)	4.73 (0.45-10)	254%	210 (138-282)	5.92 (0.36-12.38)	182%
2017	4775 (4294-5256)	17.88 (12.66-23.17)	180 (113-247)	4.79 (0.14-10.67)	273%	190 (128-252)	4.78 (0.49-10.56)	274%
% Change*	303%		90%			96%		

* % Change and p-value calculated with incidence estimates adjusted for subgroup population; standardized incidence represented as per 1,000,000 population

Table 2. Procedural Volume and Incidence of Ankle Arthrodesis by Race

	White		Black			Hispanic		
Year	Volume	Standardized Incidence	Volume	Standardized Incidence	Disparity	Volume	Standardized Incidence	Disparity
2002	5447 (4642-6252)	23.03 (15.64-30.46)	567 (437-697)	18.33 (3.55-34.55)	26%	378 (279-477)	15.54 (1.77-31.55)	48%
2003	5656 (4949-6364)	23.73 (16.19-31.32)	633 (496-770)	19.43 (5.2-34.79)	22%	298 (217-380)	12.63 (0.8-26.86)	88%
2004	6471 (5420-7522)	26.86 (18.35-35.41)	492 (364-619)	15.55 (2.43-30.46)	73%	430 (324-535)	15.47 (1.7-31.22)	74%
2005	6238 (5111-7366)	25.38 (17.05-33.78)	489 (330-648)	15.19 (2.39-29.28)	67%	403 (273-532)	14.85 (1.58-30.29)	71%
2006	6418 (5012-7825)	25.84 (16.89-34.81)	640 (465-816)	19.74 (4.88-35.51)	31%	420 (272-567)	13.83 (1.01-28.5)	87%
2007	6216 (4886-7546)	24.55 (15.94-33.2)	571 (408-735)	16.48 (4.34-29.57)	49%	550 (417-682)	17.48 (2.33-34.13)	40%
2008	6143 (5122-7164)	23.87 (16.12-31.71)	564 (415-713)	15.71 (2.78-29.88)	52%	489 (355-622)	15.53 (1.92-30.37)	54%
2009	6462 (5489-7435)	24.91 (17.13-32.75)	627 (483-771)	17.38 (4.15-31.9)	43%	432 (316-549)	11.83 (1.76-23.12)	111%
2010	5762 (4751-6773)	25.86 (16.93-34.97)	647 (490-804)	18.58 (4.97-33.82)	39%	490 (360-619)	13.67 (2.22-26.6)	89%
2011	5376 (4630-6122)	23.81 (15.83-31.9)	589 (471-706)	16.53 (3.93-30.85)	44%	416 (285-547)	11.6 (1.67-23.47)	105%
2012	5115 (4737-5493)	22.24 (15.41-29.13)	480 (380-580)	13.09 (2.08-25.05)	70%	510 (399-621)	14.63 (3.17-28.18)	52%
2013	4880 (4484-5276)	21.37 (14.43-28.47)	515 (401-629)	14.18 (2.46-27.3)	51%	515 (398-632)	14.15 (2.95-26.6)	51%
2014	4340 (3996-4684)	18.55 (12.09-25.19)	555 (440-670)	15.41 (3.08-29.4)	20%	360 (282-438)	9.2 (1.17-18.56)	102%
2015	3940 (3608-4272)	16.96 (10.76-23.44)	520 (418-622)	13.68 (3.09-25.55)	24%	405 (318-492)	9.84 (1.3-20.04)	72%
2016	4590 (4206-4974)	19.66 (12.5-27.08)	650 (542-758)	17.01 (4.78-30.31)	16%	515 (413-617)	11.35 (2.27-21.38)	73%
2017	4290 (3977-4603)	17.88 (11.48-24.44)	480 (376-584)	12.04 (2.79-22.77)	48%	490 (383-597)	11.06 (1.57-22.02)	62%
% Change*	-29%		-52%			-41%		

* % Change and p-value calculated with incidence estimates adjusted for subgroup population; standardized incidence represented as per 1,000,000 population

Table 3. Univariate Analysis of Perioperative Healthcare Utilization in Primary TAA Patients

Characteristic	White	Black	Hispanic	P-Value
Total (n [%])	37244 (91.92)	1522 (3.76)	1750 (4.32)	-
Cost (>20,000 USD)	19489 (55.10)	749 (54.78)	845 (51.82)	0.033
Non-Home Discharge	4595 (13.12)	234 (16.50)	203 (12.27)	<0.001
Extended LOS (>3 Days)	11215 (30.11)	584 (38.34)	570 (32.57)	<0.001

LOS: Length of Stay

Table 4. Multivariate Analysis of Healthcare Utilization Outcomes in Primary TAA Patients

	Non-home Discharge		Extended LOS (>3 Days)		Cost (>20,000 USD)	
	OR [95% CI]	P-value	OR [95% CI]	P-value	OR [95% CI]	P-value
White	[ref]	-	[ref]	-	[ref]	-
Black	**1.92 (1.31-2.81)**	<0.001	**1.38 (1.10-1.74)**	0.006	1.10 (0.85-1.41)	0.483
Hispanic	1.30 (0.93-1.83)	0.130	1.23 (0.97-1.56)	0.091	0.85 (0.67-1.08)	0.178

LOS: Length of Stay; Controlled for hospital characteristics, and patient comorbidities