


Evidence Guiding Commercial Payer Coverage Criteria for Total Ankle Arthroplasty

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Abstract

Background: Total ankle arthroplasty (TAA), first developed as an alternative to ankle arthrodesis, has become an increasingly popular management option for end-stage ankle arthritis. Prior studies have shown commercial insurance payers base their coverage criteria on limited and low level of evidence research. This study aims to quantify and describe the evidence insurance companies use to support TAA coverage policies.

Methods: The top 11 national commercial health insurance payers for TAA were identified. A google search was performed to identify payer coverage policies. Policy documents were examined and cited references were classified by type of reference as well as reviewed for level of evidence (LOE). Specific coverage criteria for each individual payer were then extracted. Criteria were compared to assess for similarities among commercial payers. Finally, all references cited by each payer were examined to determine whether they mentioned the specific payer criteria.

Results: Six of the 11 payers had accessible coverage policies. The majority of cited references were primary journal articles (145, 60.9%) and the majority of references cited (179, 75.2%) were level III or level IV evidence. We found significant homogeneity in coverage criteria among payers. In addition, cited sources inconsistently mentioned specific payer coverage criteria.

Conclusion: This study demonstrates that commercial insurance payers rely on the relatively low level of currently available scientific evidence when formulating coverage policies for TAA use and adopt criteria that have not been thoroughly analyzed in the literature. More high level of evidence research is needed to help clinicians and insurance companies further refine indications for TAA so that patients who might benefit from the procedure are adequately covered.

Level of Evidence: Level IV, review.

Keywords: total ankle replacement, total ankle arthroplasty, commercial payer, coverage policy, coverage criteria, indications, references

Introduction

Total ankle arthroplasty (TAA) was first developed in the 1970s as an alternative to ankle arthrodesis for end-stage ankle arthritis.¹¹ Although early attempts at TAA had high complication rates, better implant design has led to improvements in outcomes.^{2,9,13} As such, utilization of TAA has

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continued to rise. Analysis of the Medicare database from 2005 to 2012 has shown a 16.37% annual growth rate in TAA utilization.⁸ As utilization of TAA increases, payment and coverage become increasingly important topics for surgeons, hospitals, and commercial payers.

A variety of strategies have been employed by commercial payers to control the costs of medical services. In 2006, the Tax Relief and Health Care Act allowed Centers for Medicare and Medicaid Services (CMS) to retrospectively review claims of medical necessity for services based on region-specific Local Coverage Determinations (LCDs).¹ If claims were retrospectively found to not fulfill LCD criteria, compensation could be demanded in the form of physician payments and/or deductions from future reimbursements.³ However, an analysis of LCD criteria for hip and knee arthroplasty in Florida found minimal and low level of evidence (LOE) references used to support criteria recommending conservative management and duration of conservative management.³

Current commercial payers are forced to prospectively utilize coverage policies to determine medical necessity of procedures. However, this can limit and/or delay treatment for patients with severe pain or loss of functionality. This is especially true as coverage criteria for arthroplasty almost always specify that patients must have failed a period of conservative treatment. Previous studies in the total joint arthroplasty (TJA) and total shoulder arthroplasty (TSA) literature have found that such requirements for attempted nonoperative management are poorly supported both by the references in the coverage policy document and by available literature on the subject.^{1,17} More generally, these same studies have shown that the references used to support all commercial insurance coverage criteria for TJA and TSA tend to be of low level of evidence.^{1,17}

The purpose of this study was to analyze commercial payer coverage policies for TAA in the United States and to characterize the references used to support these policies. To our knowledge, this is the first such study. We hypothesized that payer coverage documents would be supported by primarily low LOE references and would offer limited support for specific payer coverage criteria.

Materials and Methods

The top 11 national commercial health insurance payers for TAA were identified. A Google search was performed for each payer to find publicly available coverage policies pertaining to TAA. Search terms included “total ankle replacement” and “total ankle arthroplasty” followed by the individual payer name and the term “coverage policy.” For policies unable to be found through Google search, a phone call and email was sent to the company asking for coverage policy for TAA. A standardized review process was implemented for each policy. Policy documents were examined

for references supporting coverage policies. Supporting references were then screened by title and/or abstract for relevance to TAA (as policy documents may cover multiple procedures). Exclusion criteria for references were irrelevance to TAA, full-text unavailable, and not in English language. Selected references were then categorized into type of reference, reviewed for level of evidence (LOE) per accepted published criteria,¹⁹ and assessed for mention of specific coverage criteria. References were categorized into the following types of references: primary journal article, review article, expert opinion article, society guideline, governmental report or guideline, website, textbook, miscellaneous, or not found. Policy documents were analyzed for coverage criteria related to TAA, and a combined list of coverage criteria was created. The references were assessed for mention of criteria according to this combined list.

Results

Overall

The TAA coverage policies and associated references were obtained for 6 commercial payers (Aetna, Anthem, Cigna, Health Care Services Corporation, Highmark, United Healthcare). Coverage policies were not publicly accessible for the remaining 5 (Centene, Humana, Kaiser Permanente, The UPMC Health Plan, WellCare Health Plans). After screening of references and removal of duplicates, 278 unique references were analyzed, of which 40 full-texts were unavailable. One-hundred forty-five references (60.9%) were classified as primary journal articles, 65 (27.3%) were classified as review articles, 6 (2.5%) were classified as expert opinion, 7 (2.9%) were classified as society guidelines, 3 (1.3%) were classified as government reports/guidelines, 2 (0.8%) were classified as websites, and 10 (4.2%) were classified as miscellaneous (Table 1). LOE was level I in 4 references (1.7%), level II in 24 references (10.1%), level III in 71 references (29.8%), level IV in 108 references (45.4%), level V in 17 references (7.1%), and unable to be determined in 14 references (5.9%) (Table 2, Figure 1).

After analysis of all 6 commercial payer coverage criteria, the following combined list of coverage criteria was created: US Food and Drug Administration (FDA)-approved implant, skeletal maturity, failure of conservative management, severe pain, loss of function or mobility, advanced ankle arthritis, arthritis of adjacent joints, severe arthritis of contralateral ankle, arthrodesis of contralateral ankle, presence of inflammatory arthritis, and good lower extremity vascular perfusion. Table 3 displays the specific coverage criteria included by each commercial payer. References were examined for mention of these criteria. For failure of conservative management, references were examined for mention of duration of conservative management. Of the

Table 1. Reference Types by Payer and in Sum.

Commercial Payer	Total References	Primary Journal Articles	Review Articles	Expert Opinion	Society Guidelines	Government Report/ Guideline	Website	Miscellaneous
Aetna	115	71	33	2	0	2	1	6
Anthem	50	35	13	1	0	1	0	0
Cigna	59	33	17	2	2	0	2	3
HCSC	33	17	13	1	2	0	0	0
Highmark	15	12	2	0	0	0	0	1
United Healthcare	6	1	1	0	3	0	0	1
Totals, n (%)	238	145 (60.9)	65 (27.3)	6 (2.5)	7 (2.9)	3 (1.3)	2 (0.8)	10 (4.2)

Abbreviation: HCSC, Health Care Services Corporation.

Table 2. Reference Level of Evidence by Payer and in Sum.

Commercial Payer	LOE I	LOE II	LOE III	LOE IV	LOE V	Unable to be Determined
Aetna	1	9	36	55	8	6
Anthem	1	10	19	19	0	1
Cigna	2	6	22	20	6	3
HCSC	0	2	3	24	4	0
Highmark	1	1	2	10	0	1
United Healthcare	1	0	1	0	0	4
Totals, n (%)	4 (1.7)	24 (10.1)	71 (29.8)	108 (45.4)	17 (7.1)	14 (5.9)

Abbreviations: HCSC, Health Care Services Corporation; LOE, level of evidence.

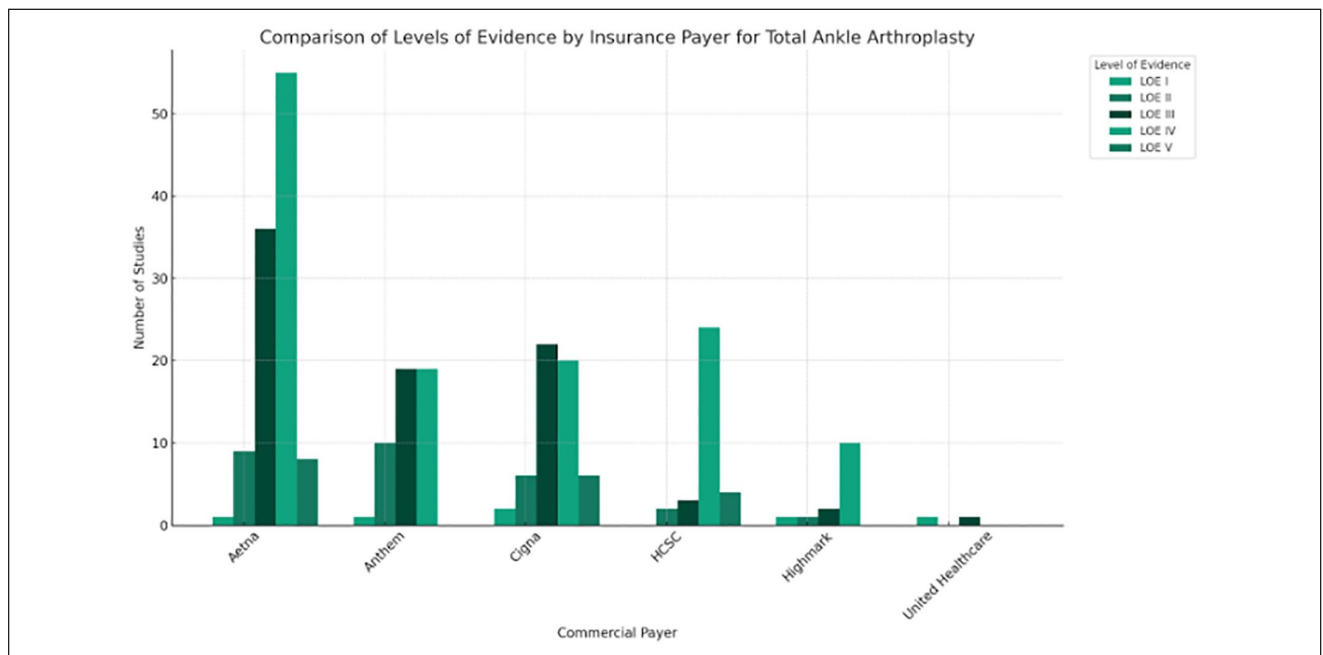


Figure 1. Reference level of evidence by payer.

238 references, 135 references (56.7%) mentioned an FDA-approved implant, 22 references (9.2%) mentioned skeletal maturity, 80 references (33.6%) mentioned severe pain, 74

references (31.1%) mentioned loss of function or mobility, 199 references (83.6%) mentioned advanced ankle arthritis, 22 references (9.2%) mentioned arthritis of adjacent joints,

Table 3. Inclusion of Common Coverage Criteria by Commercial Payer.

Criteria	FDA- Approved Implant	Skeletal Maturity	Failure of Conservative Management	Severe Pain	Loss of Function or Mobility	Advanced Ankle Arthritis	Arthritis of Adjacent Joints	Severe Arthritis of Contralateral Ankle	Arthrodesis (Fusion) of Contralateral Ankle	Presence of Inflammatory Arthritis
Aetna	✓	✓	6 mo	✓	✓	✓	✓	✓	✓	✓
Anthem	✓	✓	3 mo	✓	✓	✓				
Cigna	✓	✓	6 mo	✓	✓		✓	✓	✓	
HCSC	✓	✓	6 mo	✓	✓		✓	✓	✓	✓
Highmark	✓	✓	6 mo	✓	✓		✓	✓	✓	✓

Abbreviations: FDA, US Food and Drug Administration; HCSC, Health Care Services Corporation.

18 references (7.6%) mentioned severe arthritis of contralateral ankle, 23 references (9.7%) mentioned arthrodesis of contralateral ankle, 139 references (58.4%) mentioned presence of inflammatory arthritis, 86 references (36.1%) mentioned good lower extremity vascular perfusion, and 91 references (38.2%) specified surgical candidacy. Only 6 references (2.5%) mentioned the duration of conservative treatment. Four references (1.7%) specified 6 months as length of conservative treatment, whereas 2 references (0.8%) specified 12 weeks as length of conservative treatment (Table 4, Figure 2).

Aetna

Aetna had 115 references that were analyzed. Reference type and level of evidence can be found in Tables 1 and 2, respectively. Ten references (8.7%) mentioned arthritis of adjacent joints, 16 references (13.9%) mentioned severe arthritis of contralateral ankle, and 11 references (9.6%) mentioned arthrodesis of the contralateral ankle (Table 4, Figure 2). Two references (1.7%) mentioned the duration of conservative treatment, with both specifying 6 months (Table 4, Figure 2).

Anthem

Anthem had 50 references that were analyzed, none of which were cited within the text of the coverage policy. Five references (10.0%) mentioned arthritis of adjacent joints, 0 references (0%) mentioned severe arthritis of contralateral ankle, and 8 references (16.0%) mentioned arthrodesis of contralateral ankle (Table 4, Figure 2). One reference (2.0%) mentioned duration of conservative treatment of 6 months (Table 4, Figure 2).

Cigna

Cigna had 59 references that were analyzed, of which 10 were cited in the text of their coverage policy. Three references (5.1%) mentioned arthritis of adjacent joints, 4 references

(6.8%) mentioned severe arthritis of the contralateral ankle, and 2 references (3.4%) mentioned arthrodesis of the contralateral ankle (Table 4, Figure 2). Two references (3.4%) mentioned the duration of conservative treatment, with both specifying 6 months (Table 4, Figure 2).

Health Care Services Corporation

Health Care Services Corporation had 33 references that were analyzed. Eight of these references were cited in the full text of their coverage policy. Three references (9.1%) mentioned arthritis of adjacent joints, 3 references (9.1%) mentioned severe arthritis of contralateral ankle (Table 4, Figure 2). Two references (6.1%) mentioned the duration of conservative treatment, with both specifying 12 weeks (Table 4, Figure 2).

Highmark

Highmark had 15 references that were analyzed. None were cited in the full text of the coverage policy. The most recent reference was published in 2010. One reference (6.7%) mentioned arthritis of adjacent joints, 0 references (0%) mentioned severe arthritis of the contralateral ankle, and 0 references (0%) mentioned arthrodesis of the contralateral ankle (Table 4, Figure 2). One reference (6.7%) mentioned duration of conservative treatment of 6 months (Table 4, Figure 2).

United Healthcare

United Healthcare had 6 references that were analyzed, all of which were cited in the full text of the coverage policy. United Healthcare did not provide coverage criteria within their coverage policy. Rather, in their coverage policy, they referenced an independent contractor who provides their coverage criteria; however, this document was not publicly accessible. Two references (33.3%) mentioned arthritis of adjacent joints, 0 references (0%) mentioned severe arthritis of the contralateral ankle, and 0 references (0%) mentioned

Table 4. Number and Percentage of References Cited by Each Payer That Mention Their Specific Coverage Criteria.

	FDA Approved Implant, n (%)	Mentions Skeletal Maturity, n (%)	Failure of Conservative Management, n (%)	Severe Pain, n (%)	Loss of Function or Mobility, n (%)	Advanced Ankle Arthritis, n (%)	Arthritis of Adjacent Joints, n (%)	Severe Arthritis of Contralateral Ankle, n (%)	Arthrodesis (Fusion) of Contralateral Ankle, n (%)	Presence of Inflammatory Arthritis (eg, Rheumatoid), n (%)	Adequate Lower-Extremity Vascular Perfusion, n (%)
Aetna	61 (53.0)	10 (8.7)	2 (1.7)	44 (38.3)	35 (30.4)	104 (90.4)	10 (8.7)	16 (13.9)	11 (9.6)	81 (70.4)	35 (30.4)
Anthem	31 (62.0)	5 (10.0)	1 (2.0)	7 (14.0)	11 (22.0)	37 (74.0)	5 (10.0)	0 (0.0)	8 (16.0)	18 (36.0)	19 (38.0)
Cigna	38 (64.4)	7 (11.9)	2 (3.4)	16 (27.1)	20 (33.9)	46 (78.0)	3 (5.1)	4 (6.8)	2 (3.4)	25 (42.4)	26 (44.1)
HCSC	23 (69.7)	0 (0.0)	2 (6.1)	13 (39.4)	10 (30.3)	25 (75.8)	3 (9.1)	3 (9.1)	5 (15.2)	26 (78.8)	12 (36.4)
Highmark	4 (26.7)	1 (6.7)	1 (6.7)	6 (40.0)	4 (26.7)	14 (93.3)	1 (6.7)	0 (0.0)	0 (0.0)	12 (80.0)	3 (20.0)
United	0 (0.0)	2 (33.3)	1 (16.7)	6 (100.0)	5 (83.3)	6 (100.0)	2 (33.3)	0 (0.0)	0 (0.0)	1 (16.7)	1 (16.7)
Total	135 (56.7)	22 (9.2)	6 (2.5)	80 (33.6)	74 (31.1)	199 (83.6)	22 (9.2)	18 (7.6)	23 (9.7)	139 (58.4)	86 (36.1)

Abbreviations: FDA, US Food and Drug Administration; HCSC, Health Care Services Corporation.

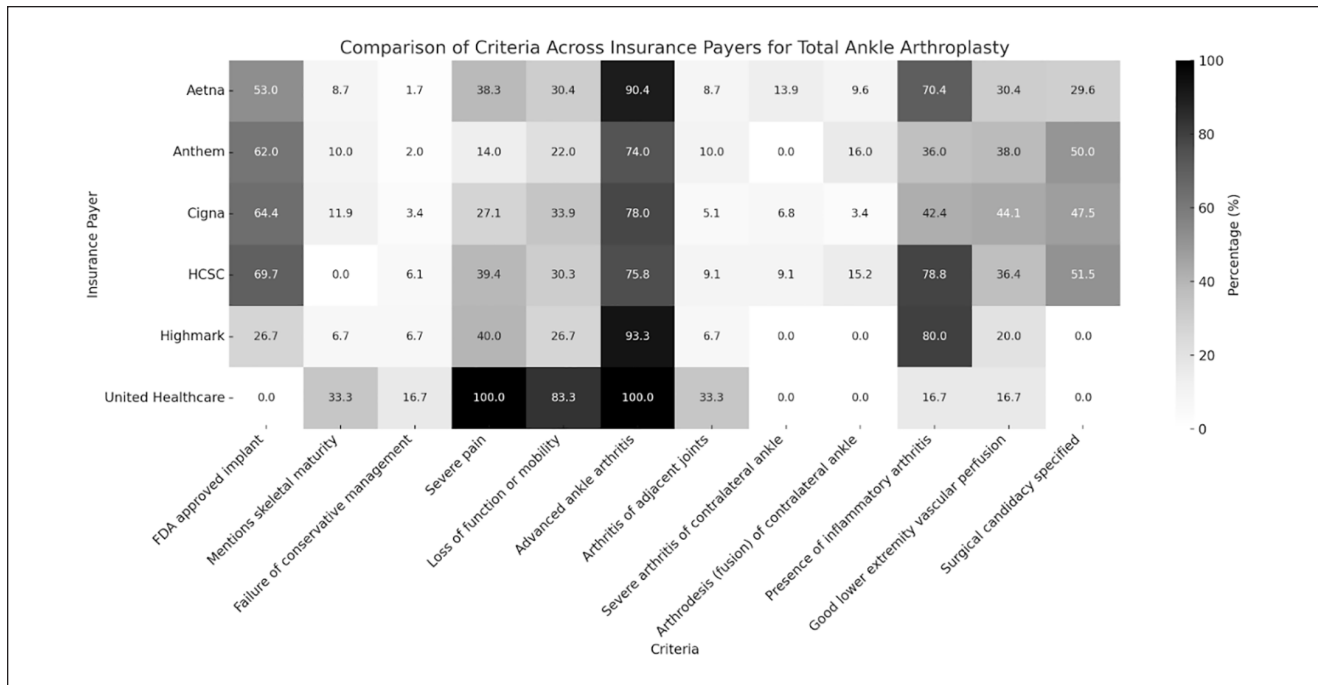


Figure 2. Number and percentage of references cited by each payer that mention their specific coverage criteria.

arthrodesis of the contralateral ankle (Table 4, Figure 2). One reference (16.7%) mentioned duration of conservative treatment of 6 months (Table 4, Figure 2).

Discussion

The results of this study demonstrate that in their coverage policies for TAA, commercial insurance payers cite poor quality references, occasionally cite their references improperly in the policy document, and are forced to rely on low-level of evidence studies to formulate their specific coverage criteria. This study found that of the 238 unique articles screened, most (60.9%) were primary journal articles and only 11.8% were level I or level II evidence. Analysis of payer coverage criteria demonstrated a high degree of homogeneity among payers. Finally, this study found that the references cited by commercial payers rarely investigate their specific coverage criteria.

Our results show that insurance companies cite primary journal articles most frequently in their coverage policies for TAA and that they most frequently cite studies of level IV evidence (45.4%). Our findings are consistent with prior studies in the total joint arthroplasty (TJA) and total shoulder arthroplasty (TSA) literature. In a 2021 study by Austin et al¹ examining commercial insurance payer coverage policies for TJA, the authors found that of the 282 documents reviewed, 45.8% were primary journal articles, 14.2% were level I or II evidence, and only 41.2% of sources were applicable to patients who were candidates for TJA. Sudah et al

conducted a similar study in the TSA literature. They also found that primary journal articles (n=70; 59.3%) were the most frequently cited and that most references were of level IV evidence (n=60; 52.2%).¹⁷ Only 6 (5.2%) of the sources they analyzed were level I or II evidence.¹⁷ Of the 238 unique references analyzed in our study, only 4 (1.7%) were level I evidence and 24 (10.1%) were level II. Thus, it appears that commercial payers tend to support their coverage policies for TAA with low level evidence. Although there have been several recent high-level of evidence studies,^{5,6,12,14,16} level I and II studies on TAA do remain relatively scarce, which could explain this finding.

By examining coverage criteria among the 6 payers analyzed, this study demonstrated close similarities across the different commercial insurance payers. This could be ascribed to a common consensus on indications for the procedure; however, given the lack of high-level of evidence studies on TAA, there is some concern that insurance companies may not have the necessary information to justify both their specific indications and such broad consensus. These adopted criteria have the potential to perpetuate inaccurate indications for TAA; nevertheless, the solution to this problem lies in more high-level of evidence studies on the subject.

As in hip, knee, and shoulder arthroplasty, osteoarthritis is the most common condition requiring TAA. Analysis of insurance coverage criteria for these arthroplasty procedures reveals they are closely related and all require some period of conservative treatment before insurance companies with coverage arthroplasty.^{1,17} Previous research has

shown that this period of conservative management is not well supported in the hip, knee, and shoulder arthroplasty literature.^{1,17} The same appears to be true for TAA.

All of the payers analyzed included a criterion specifying the need to have failed conservative management. Four payers (Aetna, Cigna, HCSC, Highmark) require patients to have failed 6 months of conservative management and 1 payer (Anthem) requires they fail 3 months. However, there is little support for the efficacy of conservative management in severe ankle arthritis. A 2013 paper by Labib et al⁷ found, after an extensive review of the literature, that there were no articles specifically investigating the nonoperative management of ankle arthritis. A review of literature for this study also revealed a lack of studies on conservative management of ankle arthritis. The results of our study also support the notion that failure of conservative management is not a common consideration when investigating ankle arthritis, because among the 238 articles analyzed for this study, only 6 mentioned that patients included in the study had failed nonoperative management. Four of these articles had a time period of 6 months and two a time period of 3 months.

Another common coverage criterion required patients to have documented severe arthritis of the contralateral ankle or arthrodesis of the contralateral ankle; however, this criterion is rarely mentioned in the text of coverage policy references. In combination with the fact that around 70% of ankle arthritis cases are posttraumatic, this criterion makes it seem as if patients with unilateral posttraumatic ankle arthritis will not be covered for TAA¹⁰ and instead forced to undergo arthrodesis of the affected joint. Although, in reality, many of these patients end up receiving TAA, this criterion remains somewhat misleading.

Research comparing outcomes between ankle arthrodesis and TAA have demonstrated similar patient-reported outcomes between the two with slightly high rates of reoperation in TAA patients.^{6,18} However, TAA does appear to offer certain advantages that may be beneficial for some patients. A 2020 study by Sanders et al¹⁵ comparing gait and stair ascent between patients with TAA and arthrodesis found sagittal ankle range of motion during level walking, forefoot-tibia motion, and hindfoot-tibia motion were significantly greater in the TAA group (all $P < .05$). During stair ascent, sagittal ankle ROM, forefoot-tibia, and hindfoot-tibia motion were also all significantly greater (all $P < .05$) in the TAA group.¹⁵ Analyzing gait in TAA patients and ankle arthrodesis patients, Flavin et al⁴ found TAA patients had better sagittal dorsiflexion ($P = .001$) and vertical ground force reaction curve more similar to controls; however, arthrodesis had superior coronal plane eversion ($P = .01$). Given the apparent biomechanical differences produced by the 2 procedures, patients and physicians

should be able to choose between the two and select the better procedure for each individual patient.

This study had several limitations. The first was that we were only able to access the coverage policy document for 6 of the 11 investigated payers. Nevertheless, the 6 included payers cover more than 100 million patients in the United States, which makes the results of this study relevant to a substantial proportion of the population. We also believe it is possible, given the homogeneity of criteria among payers, that findings for the payers analyzed may be representative of those payers we did not analyze. Another limitation is that we were unable to access the specific coverage criteria for United Healthcare. United Healthcare contracts its coverage criteria to an independent contractor and the criteria were thus locked behind a paywall and not accessible to the public. Given the relative lack of level I and II studies investigating TAA, we were also limited in our ability to draw conclusions based on study level of evidence referenced by commercial payers. Finally, we were unable to access the full texts for 40 of the sources found in the references of the commercial payer documents; however, the majority of these sources were either published prior to 1990 or not published in English.

This study demonstrates that commercial insurance payer coverage policies for TAA cite primarily low-level evidence and must rely on these studies when formulating their coverage criteria for the procedure. This study also shows that coverage criteria are highly similar among the included payers. Our analysis highlights the importance of continuing to pursue high-level of evidence research on TAA in order to allow physicians and insurance companies to make better-informed decisions as to the appropriate indications for the procedure. Given the improved success of third-generation ankle implants, it is key that we both identify appropriate candidates and work to ensure their insurance covers the procedure.

Ethical Approval

Ethical approval was not sought for the present study because this manuscript did not involve human subjects research.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article. Disclosure forms for all authors are available online.

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Appendix I.

Commercial Payer	Reference (Title)	Year	Type of Reference
Aetna	Total ankle arthroplasty	2010	Expert opinion
Aetna	Design comparison of the INBONE I versus INBONE II total ankle system	2013	Expert opinion
Aetna	Total ankle replacements: clinical effectiveness and a review of the guidelines	2008	Government guideline
Aetna	Eclipse total ankle implant: summary of safety and effectiveness	2006	Government report
Aetna	Scandinavian Total Ankle Replacement System: summary of safety and effectiveness	2009	Miscellaneous
Aetna	Topez total ankle replacement	2005	Miscellaneous
Aetna	Salto Talaris total ankle prosthesis	2009	Miscellaneous
Aetna	Inbone II Total Ankle System: summary of safety and effectiveness	2010	Miscellaneous
Aetna	Infinity total ankle replacement	2014	Miscellaneous
Aetna	Zimmer trabecular metal total ankle	2012	Miscellaneous
Aetna	The INBONE II total ankle system	2013	Primary journal article
Aetna	Comparison of total ankle arthroplasty and ankle arthrodesis in end-stage hemophilic arthropathy	2020	Primary journal article

(continued)

Appendix I. (continued)

Commercial Payer	Reference (Title)	Year	Type of Reference
Aetna	Total ankle arthroplasty: new concepts and approaches	1991	Primary journal article
Aetna	Total ankle replacement in obese patients: component stability, weight change, and functional outcome in 118 consecutive patients	2011	Primary journal article
Aetna	The Agility total ankle arthroplasty: a concise follow-up at a minimum of 20 years	2021	Primary journal article
Aetna	Functional outcome of meniscal-bearing total ankle replacement: a gait analysis study	2008	Primary journal article
Aetna	Long-term follow-up of Bologna-Oxford (BOX) total ankle arthroplasty	2021	Primary journal article
Aetna	The Salto total ankle arthroplasty: survivorship and analysis of failures at 7 to 11 years	2011	Primary journal article
Aetna	Ankle function and sports activity after total ankle arthroplasty	2009	Primary journal article
Aetna	The impact of obesity on the outcome of total ankle replacement	2015	Primary journal article
Aetna	Ten-year evaluation of cementless Buechel-Pappas meniscal bearing total ankle replacement	2003	Primary journal article
Aetna	New Jersey low contact stress total ankle replacement: Biomechanical rationale and review of 23 cementless cases	1988	Primary journal article
Aetna	Radiostereometric analysis of the double-coated STAR total ankle prosthesis: a 3-5 year follow-up of 5 cases with rheumatoid arthritis and 5 cases with osteoarthritis	2005	Primary journal article
Aetna	The surgical treatment for degenerative disease of the ankle	2000	Primary journal article
Aetna	Complications of total ankle replacement	2002	Primary journal article
Aetna	Relationship between body mass index and complications in total ankle arthroplasty: A single surgeon's experience in ninety-seven replacements	2018	Primary journal article
Aetna	Quality of life in bilateral vs. unilateral end-stage ankle arthritis and outcomes of bilateral vs. unilateral total ankle replacement	2017	Primary journal article
Aetna	Evaluation of the early result of Smith total ankle replacement	1980	Primary journal article
Aetna	Total ankle replacement versus ankle arthrodesis for patients aged 50-85 years with end-stage ankle osteoarthritis: the TARVA RCT	2023	Primary journal article
Aetna	The effect of obesity on functional outcomes and complications in total ankle arthroplasty	2015	Primary journal article
Aetna	Ankle arthroplasty with preoperative coronal plane deformity: short-term results	2004	Primary journal article
Aetna	Patient-specific instrumentation vs standard referencing in total ankle arthroplasty: a comparison of the radiologic outcome	2022	Primary journal article
Aetna	Long-term results of total ankle replacement	1986	Primary journal article
Aetna	The Swedish Ankle Arthroplasty Register: an analysis of 531 arthroplasties between 1993 and 2005	2006	Primary journal article
Aetna	HINTEGRA revision arthroplasty for failed total ankle prostheses	2013	Primary journal article
Aetna	A New Zealand national joint registry review of 202 total ankle replacements followed for up to 6 years	2007	Primary journal article
Aetna	Clinical outcomes of total ankle arthroplasty with total talar prosthesis	2019	Primary journal article
Aetna	The Scandinavian Total Ankle Replacement: survivorship at 5 and 8 years comparable to other series	2010	Primary journal article
Aetna	Revision of STAR total ankle replacement to hybrid AES-STAR total ankle replacement - a report of two cases	2009	Primary journal article
Aetna	Ankle arthroplasty in patients younger and older than 50 years: a prospective series with long-term follow-up	2000	Primary journal article
Aetna	Severe periprosthetic osteolytic lesions after the Ankle Evolutive System total ankle replacement	2009	Primary journal article
Aetna	Total ankle arthroplasty incorporating a total talar prosthesis: a comparative study against the standard total ankle arthroplasty	2019	Primary journal article
Aetna	Revision rates after total ankle arthroplasty in sample-based clinical studies and national registries	2011	Primary journal article
Aetna	Total ankle replacement in rheumatoid arthritis	1984	Primary journal article

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Appendix I. (continued)

Commercial Payer	Reference (Title)	Year	Type of Reference
Aetna	Analysis of ankle range of motion and functional outcome following total ankle arthroplasty	2010	Primary journal article
Aetna	Total ankle arthroplasty versus ankle arthrodesis—a comparison of outcomes over the last decade	2017	Primary journal article
Aetna	Comparison of intermediate-term outcomes of total ankle arthroplasty in patients younger and older than 55 years	2019	Primary journal article
Aetna	Transfibular total ankle arthroplasty: a new reliable procedure at five-year follow-up	2022	Primary journal article
Aetna	Malleolar fracture after total ankle arthroplasty: a comparison of two designs	2004	Primary journal article
Aetna	Total ankle replacement by the Ankle Evolution System: medium-term outcome	2010	Primary journal article
Aetna	Clinical-radiological outcomes and complications after total ankle replacement through a lateral transfibular approach: a retrospective evaluation at a mid-term follow-up	2021	Primary journal article
Aetna	Safety of outpatient total ankle arthroplasty vs traditional inpatient admission or overnight observation	2017	Primary journal article
Aetna	Total ankle replacement: early experiences with STAR prosthesis.	2005	Primary journal article
Aetna	Habitual physical activity and sports participation after total ankle arthroplasty	2008	Primary journal article
Aetna	Total ankle arthroplasty versus ankle arthrodesis: a comparative analysis of arc of movement and functional outcomes	2016	Primary journal article
Aetna	Ankle replacement versus arthrodesis: a comparative gait analysis study	2008	Primary journal article
Aetna	Trends in the use of total ankle replacement and ankle arthrodesis in the United States Medicare population	2013	Primary journal article
Aetna	Total ankle arthroplasty: a unique design. Two to twelve-year follow-up	1998	Primary journal article
Aetna	Trends in treatment of advanced ankle arthropathy by total ankle replacement or ankle fusion	2014	Primary journal article
Aetna	Prospective controlled trial of STAR total ankle replacement versus ankle fusion: initial results	2009	Primary journal article
Aetna	Effect of Obesity on Total Ankle Arthroplasty Outcomes	2016	Primary journal article
Aetna	Total ankle arthroplasty using biological fixation components compared to ankle arthrodesis	1987	Primary journal article
Aetna	Perioperative complications of the Agility total ankle replacement in 50 initial, consecutive cases	2006	Primary journal article
Aetna	Total ankle arthroplasty versus ankle arthrodesis. Comparison of sports, recreational activities and functional outcome	2011	Primary journal article
Aetna	Short-term results of our first 49 Scandinavian Total Ankle Replacements (STAR)	2008	Primary journal article
Aetna	Early prospective clinical results of a modern fixed-bearing total ankle arthroplasty	2013	Primary journal article
Aetna	Polyethylene fracture following STAR ankle arthroplasty: a report of three cases	2009	Primary journal article
Aetna	Preference-based quality of life of end-stage ankle arthritis treated with arthroplasty or arthrodesis	2010	Primary journal article
Aetna	Cost-effectiveness analysis of total ankle arthroplasty	2004	Primary journal article
Aetna	Comparison of reoperation rates following ankle arthrodesis and total ankle arthroplasty	2007	Primary journal article
Aetna	Complications and failure after total ankle arthroplasty	2004	Primary journal article
Aetna	Intermediate to long-term clinical outcomes and survival analysis of the Salto Mobile Bearing total ankle prosthesis	2022	Primary journal article
Aetna	Reoperation and patient satisfaction after the Mobility total ankle arthroplasty	2012	Primary journal article
Aetna	Ankle arthroplasty: a comparative study of cemented metal and uncemented ceramic prostheses	1990	Primary journal article

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Appendix I. (continued)

Commercial Payer	Reference (Title)	Year	Type of Reference
Aetna	Total ankle arthroplasty in rheumatoid arthritis: a long-term follow-up study	1988	Primary journal article
Aetna	Clinical and radiological outcomes of transfibular total ankle arthroplasty	2019	Primary journal article
Aetna	Sports and recreation activity of ankle arthritis patients before and after total ankle replacement	2006	Primary journal article
Aetna	The feasibility of total ankle prosthesis for severe arthropathy in hemophilia and prothrombin deficiency	2006	Primary journal article
Aetna	Total ankle replacement: medium-term results in 200 Scandinavian total ankle replacements	2008	Primary journal article
Aetna	A randomized, controlled trial of two mobile-bearing total ankle replacements	2009	Primary journal article
Aetna	Clinical comparison of two total ankle replacements	2000	Primary journal article
Aetna	Long-term follow-up of the Conaxial (Beck-Steffee) total ankle arthroplasty	1992	Primary journal article
Aetna	A systematic review of intermediate-term outcomes and failure rates for total ankle replacements: an Asian perspective	2013	Review
Aetna	Surgical procedures in patients with hemophilic arthropathy of the ankle	2016	Review
Aetna	Total ankle replacement	2015	Review
Aetna	Total ankle arthroplasty in France	2010	Review
Aetna	Current concepts in the management of ankle osteoarthritis: a systematic review	2015	Review
Aetna	Total ankle arthroplasty: a long-term review of the London Hospital experience	1985	Review
Aetna	Total ankle replacement: why, when and how	2010	Review
Aetna	Efficacy of total ankle replacement with meniscal-bearing devices: a systematic review and meta-analysis	2006	Review
Aetna	Cost-effectiveness analysis of total ankle arthroplasty	2005	Review
Aetna	High revision and reoperation rates using the Agility™ total ankle system	2012	Review
Aetna	Revision total ankle replacement: An early look at agility to INBONE	2011	Review
Aetna	Total ankle arthroplasty in the rheumatoid patient	2010	Review
Aetna	Management of failures of total ankle replacement with the agility total ankle arthroplasty	2013	Review
Aetna	Ankle arthritis: review of diagnosis and operative management	2014	Review
Aetna	Current concepts review: total ankle arthroplasty	2008	Review
Aetna	Total ankle replacement	2003	Review
Aetna	Total ankle arthroplasty versus ankle arthrodesis for the treatment of end-stage ankle arthritis: a meta-analysis of comparative studies	2016	Review
Aetna	Total ankle arthroplasty with the Agility prosthesis: Clinical and radiographic evaluation	2006	Review
Aetna	Modern total ankle arthroplasty versus ankle arthrodesis: a systematic review and meta-analysis	2020	Review
Aetna	Posttraumatic ankle arthritis: an update on conservative and surgical management	2007	Review
Aetna	Patient-specific instrumentation in total ankle arthroplasty	2022	Review
Aetna	Post-operative management after total ankle arthroplasty: a systematic review of the literature	2022	Review
Aetna	Total ankle arthroplasty	2011	Review
Aetna	Avoiding and managing complications of the Agility Total Ankle Replacement system	2006	Review
Aetna	Total ankle replacement revisited	2000	Review
Aetna	Physical therapy management of patients with total ankle replacement	1980	Review
Aetna	Efficacy of total ankle replacement with meniscal-bearing devices: a systematic review and meta-analysis	2005	Review
Aetna	Total ankle replacement. Design evolution and results	2010	Review
Aetna	The mid-term outcome of total ankle arthroplasty and ankle fusion in rheumatoid arthritis: a systematic review	2013	Review

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Appendix I. (continued)

Commercial Payer	Reference (Title)	Year	Type of Reference
Aetna	A brief history of total ankle replacement and a review of the current status	2007	Review
Aetna	Patient-specific instrumentation (PSI) in total ankle arthroplasty: a systematic review	2021	Review
Aetna	Total ankle arthroplasty: a modern perspective	2009	Review
Aetna	A systematic review of outcome and failure rate of uncemented Scandinavian total ankle replacement	2011	Review
Aetna	Salvage after complications of total ankle arthroplasty		Unable to access
Aetna	Total ankle arthroplasty: indications, results, and biomechanical rationale		Unable to access
Aetna	Computer assisted surgery for total knee arthroplasty		Unable to access
Aetna	Posttraumatic ankle arthrosis		Unable to access
Aetna	Perspective on total ankle replacement		Unable to access
Aetna	Total ankle arthroplasty: a procedural review		Unable to access
Aetna	Mobile- and fixed-bearing total ankle prostheses: is there really a difference?		Unable to access
Aetna	Our experience with AES total ankle replacement		Unable to access
Aetna	Total ankle arthroplasty	2002	Unable to access
Aetna	Uncemented STAR total ankle prostheses	2004	Unable to access
Aetna	The effect of body mass index on outcomes after total ankle replacement	2009	Unable to access
Aetna	Preliminary report of a hybrid total ankle arthroplasty combining a stemmed intramedullary tibial component with chamfer-cut talar dome	2021	Unable to access
Aetna	Infinity ankle arthroplasty early Latin-America experience and patient outcomes	2023	Unable to access
Aetna	Survivorship and clinical evaluation of cementless, meniscal-bearing total ankle replacements	1992	Unable to access
Aetna	Osteoarthritis of the ankle: the role of arthroplasty	2008	Unable to access
Aetna	Design features of current total ankle replacements: implants and instrumentation	2008	Unable to access
Aetna	Total ankle arthroplasty: a review of 37 cases	1988	Unable to access
Aetna	Biomechanics of the ankle joint: a perspective on total ankle replacement	2000	Unable to access
Aetna	Clinical study of total ankle replacement with gait analysis: a preliminary report	1979	Unable to access
Aetna	Total ankle replacement: a surgical discussion. Part I: Replacement systems, indications, and contraindications	2000	Unable to access
Aetna	Total ankle replacement: a surgical discussion. Part II: The clinical and surgical experience	2000	Unable to access
Aetna	Clinical and radiographic outcomes of revision total ankle arthroplasty using the INBONE II prosthesis	2022	Unable to access
Aetna	Total ankle replacement in rheumatoid arthritis: a preliminary review of 28 arthroplasties in 24 patients	1983	Unable to access
Aetna	Survivorship analysis of the Mayo total ankle arthroplasty	1994	Unable to access
Aetna	Clinical results of the Mayo total ankle arthroplasty	1996	Unable to access
Aetna	Fusion techniques for failed total ankle arthroplasty	1992	Unable to access
Aetna	Salvage of nonunion following ankle arthrodesis for failed total ankle arthroplasty	1991	Unable to access
Aetna	The Agility total ankle arthroplasty: seven to sixteen-year follow-up	2004	Unable to access
Aetna	Rheumatoid arthritis of the ankle: the role of total ankle arthroplasty.		Unable to access
Aetna	Total ankle arthroplasty: indications, techniques, and results.		Unable to access
Aetna	Total ankle arthroplasty: state of the art		Unable to access
Aetna	How effective are ankle replacement operations? What is the expected lifespan of a new ankle?		Unable to access
Aetna	Total ankle arthroplasty [summary]		Unable to access
Aetna	Ankle & foot (acute & chronic)		Unable to access
Aetna	Total joint replacement for severe rheumatoid arthritis	2017	Website
Anthem	Total ankle replacement or ankle fusion in painful advanced hemophilic arthropathy of the ankle	2015	Expert opinion

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Appendix I. (continued)

Commercial Payer	Reference (Title)	Year	Type of Reference
Anthem	Colorado Division of Workers' Compensation, lower extremity injury medical treatment guidelines	2016	Government report
Anthem	Total ankle arthroplasty outcome comparison for post-traumatic and primary osteoarthritis	2010	Primary journal article
Anthem	The Salto total ankle arthroplasty survivorship and analysis of failures at 7 to 11 years	2010	Primary journal article
Anthem	Are our expectations bigger than the results we achieve? A comparative study analyzing potential advantages of ankle arthroplasty over arthrodesis	2014	Primary journal article
Anthem	The Scandinavian Total Ankle Replacement long-term, eleven to fifteen-year, survivorship analysis of the prosthesis in seventy-two consecutive patients	2013	Primary journal article
Anthem	The impact of diabetes on the short- to midterm outcome of total ankle replacement	2014	Primary journal article
Anthem	Management of ankle arthritis after severe ankle trauma	2020	Primary journal article
Anthem	Intermediate to long-term outcomes of total ankle replacement with the Scandinavian total ankle replacement (STAR)	2015	Primary journal article
Anthem	The AES total ankle arthroplasty analysis of failures and survivorship at ten years	2017	Primary journal article
Anthem	Comparative study of the quality of life between arthrodesis and total arthroplasty substitution of the ankle	2011	Primary journal article
Anthem	Results at a minimum follow-up of 5 years of a ligaments-compatible total ankle replacement design	2017	Primary journal article
Anthem	The effect of obesity on functional outcomes and complications in total ankle arthroplasty	2015	Primary journal article
Anthem	Comparative gait analysis of ankle arthrodesis and arthroplasty: initial findings of a prospective study	2012	Primary journal article
Anthem	Performance of total ankle arthroplasty and ankle arthrodesis on uneven surfaces, stairs, and inclines: a prospective study	2014	Primary journal article
Anthem	Comparison of the outcome of total ankle arthroplasty for osteoarthritis with moderate and severe varus malalignment and that with neutral alignment	2017	Primary journal article
Anthem	Long-term functional and radiographic outcome of a mobile bearing ankle prosthesis	2016	Primary journal article
Anthem	Risk factors for periprosthetic ankle joint infection: a case-control study	2012	Primary journal article
Anthem	Comparison of ankle arthroplasty and arthrodesis: a prospective series with long-term follow-up	1994	Primary journal article
Anthem	Impact of complications in total ankle replacement and ankle arthrodesis analyzed with a validated outcome measurement	2011	Primary journal article
Anthem	Comparison of intermediate to long-term outcomes of total ankle arthroplasty in ankles with preoperative varus, valgus, and neutral alignment	2018	Primary journal article
Anthem	STAR ankle: long-term results	2011	Primary journal article
Anthem	Frequency and impact of adverse events in patients undergoing surgery for end-stage ankle arthritis	2018	Primary journal article
Anthem	Total ankle arthroplasty versus ankle arthrodesis: a comparative analysis of arc of movement and functional outcomes	2016	Primary journal article
Anthem	Ankle replacement versus arthrodesis: a comparative gait analysis study	2008	Primary journal article
Anthem	Differences in outcomes following total ankle replacement in patients with neutral alignment compared with tibiotalar joint malalignment	2013	Primary journal article
Anthem	Multi-segment foot kinematics after total ankle replacement and ankle arthrodesis during relatively long-distance gait	2012	Primary journal article
Anthem	Treatment of isolated ankle osteoarthritis with arthrodesis or the total ankle replacement: a comparison of early outcomes	2010	Primary journal article
Anthem	Prospective controlled trial of STAR total ankle replacement versus ankle fusion: initial results	2009	Primary journal article

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Appendix I. (continued)

Commercial Payer	Reference (Title)	Year	Type of Reference
Anthem	Total ankle arthroplasty versus ankle arthrodesis: comparison of sports, recreational activities and functional outcome	2012	Primary journal article
Anthem	Early prospective clinical results of a modern fixed-bearing total ankle arthroplasty	2013	Primary journal article
Anthem	Ankle arthroplasty and ankle arthrodesis: gait analysis compared with normal controls	2013	Primary journal article
Anthem	Preference-based quality of life of end-stage ankle arthritis treated with arthroplasty or arthrodesis	2010	Primary journal article
Anthem	Midterm results of the Salto Talaris total ankle arthroplasty	2017	Primary journal article
Anthem	Short-term results of total ankle arthroplasty for end-stage ankle arthritis with severe varus deformity	2014	Primary journal article
Anthem	Outcomes of ankle arthroplasty with preoperative coronal-plane varus deformity of 10 degrees or greater	2013	Primary journal article
Anthem	Total ankle arthroplasty and coronal plane deformities	2012	Primary journal article
Anthem	Surgical procedures in patients with hemophilic arthropathy of the ankle	2016	Review
Anthem	Total ankle arthroplasty: what are the risks? A guide to surgical consent and a review of the literature	2018	Review
Anthem	The effect of tobacco use on incision healing in total ankle arthroplasty: a review of 114 patients	2019	Review
Anthem	Influence of preoperative tibiotalar alignment in the coronal plane on the survival of total ankle replacement: a systematic review	2019	Review
Anthem	Ankle arthrodesis after failed total ankle replacement a systematic review of the literature	2015	Review
Anthem	Total ankle arthroplasty versus ankle arthrodesis for the treatment of end-stage ankle arthritis: a meta-analysis of comparative studies	2016	Review
Anthem	Is it worth discriminating against patients who smoke? A systematic literature review on the effects of tobacco use in foot and ankle surgery	2017	Review
Anthem	Investigating the relationship between ankle arthrodesis and adjacent-joint arthritis in the hindfoot: a systematic review	2015	Review
Anthem	Outcome of ankle arthrodesis and ankle prosthesis: a review of the current status	2017	Review
Anthem	Outcome after total ankle arthroplasty with a minimum of five years follow-up: a systematic review and meta-analysis	2019	Review
Anthem	Effect of obesity on total ankle arthroplasty: A systematic review of postoperative complications requiring surgical revision	2017	Review
Anthem	Risk factors for periprosthetic joint infection following total ankle replacement	2019	Review
Anthem	Positive and negative factors for the treatment outcomes following total ankle arthroplasty? A systematic review	2018	Review
Cigna	Total ankle replacement options	2019	Expert opinion
Cigna	Consensus statement of the American College of Foot and Ankle Surgeons: diagnosis and treatment of ankle arthritis	2020	Expert opinion
Cigna	Centers for Medicare and Medicaid Services (CMS). Local coverage determinations (LCDs) alphabetical index	2022	Government report
Cigna	Centers for Medicare and Medicaid Services (CMS). National Coverage Determinations (NCDs) alphabetical index	2022	Government report
Cigna	US Food and Drug Administration (FDA). Center for Devices and Radiological Health (CDRH). Humanitarian Device Exemption (HDE) database. H200001. Patient specific talus spacer	2020	Miscellaneous
Cigna	US Food and Drug Administration (FDA). Center for Devices and Radiological Health (CDRH). Premarket approval (PMA). P050050. Scandinavian Total Ankle Replacement System (STAR Ankle)	2005	Miscellaneous
Cigna	US Food and Drug Administration (FDA). Center for Devices and Radiological Health (CDRH). Premarket Approval (PMA). P160036. The Hintermann Series H3™ total ankle replacement system	2016	Miscellaneous

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Commercial Payer	Reference (Title)	Year	Type of Reference
Cigna	Early clinical and radiographic outcomes of trabecular metal total ankle replacement using a transfibular approach	2018	Primary journal article
Cigna	Trends and reported complications in ankle arthroplasty and ankle arthrodesis in the state of New York, 2009-2018	2018	Primary journal article
Cigna	Fixed-bearing trabecular metal total ankle arthroplasty using the transfibular approach for end-stage ankle osteoarthritis: an international non-designer multicenter prospective cohort study	2022	Primary journal article
Cigna	Intermediate-term results of total ankle replacement and ankle arthrodesis: a COFAS multicenter study	2014	Primary journal article
Cigna	Outcomes of total ankle arthroplasty in moderate and severe valgus deformity	2018	Primary journal article
Cigna	A controlled, comparative study of a fixed-bearing versus mobile-bearing ankle arthroplasty	2013	Primary journal article
Cigna	Clinical outcome results of total ankle replacement and ankle arthrodesis: a pilot randomized controlled trial	2020	Primary journal article
Cigna	Clinical outcomes of total ankle arthroplasty with total talar prosthesis	2019	Primary journal article
Cigna	Early outcomes and radiographic alignment of the Infinity total ankle replacement with a minimum of two-year follow-up data	2018	Primary journal article
Cigna	The Salto total ankle arthroplasty—clinical and radiological outcomes at five years	2019	Primary journal article
Cigna	Total ankle arthroplasty incorporating a total talar prosthesis: a comparative study against the standard total ankle arthroplasty	2019	Primary journal article
Cigna	Incidence and predictors of early complications following primary and revision total ankle arthroplasty	2018	Primary journal article
Cigna	Total ankle arthroplasty versus ankle arthrodesis—a comparison of outcomes over the last decade	2017	Primary journal article
Cigna	Comparison of intermediate-term outcomes of total ankle arthroplasty in primary and ligamentous post-traumatic osteoarthritis	2019	Primary journal article
Cigna	Comparison of intermediate-term outcomes of total ankle arthroplasty in patients younger and older than 55 years	2019	Primary journal article
Cigna	STAR™ ankle: long-term results	2011	Primary journal article
Cigna	Mid-term prospective clinical and radiographic outcomes of a modern fixed-bearing total ankle arthroplasty	2019	Primary journal article
Cigna	Patient-specific instrumentation in total ankle arthroplasty	2022	Primary journal article
Cigna	Comparison of 25 ankle arthrodesis and 25 replacements at 67 months' follow-up	2019	Primary journal article
Cigna	Application of a customized total talar prosthesis for revision total ankle arthroplasty	2020	Primary journal article
Cigna	Effectiveness and safety of ankle arthrodesis versus arthroplasty: a prospective multicenter study	2019	Primary journal article
Cigna	Scandinavian total ankle replacement: 15-year follow-up	2018	Primary journal article
Cigna	Are there differences in gait mechanics in patients with a fixed versus mobile bearing total ankle arthroplasty? A randomized trial	2017	Primary journal article
Cigna	Prospective controlled trial of STAR total ankle replacement versus ankle fusion: initial results	2009	Primary journal article
Cigna	A three-year prospective comparative gait study between patients with ankle arthrodesis and arthroplasty	2018	Primary journal article
Cigna	3D printed total talar replacement: a promising treatment option for advanced arthritis, avascular osteonecrosis, and osteomyelitis of the ankle	2018	Primary journal article
Cigna	Age, race, comorbidity, and insurance payer type are associated with outcomes after total ankle arthroplasty	2019	Primary journal article
Cigna	An alumina ceramic total talar prosthesis for osteonecrosis of the talus	2015	Primary journal article
Cigna	An alumina ceramic total talar prosthesis for avascular necrosis of the talus	2018	Primary journal article
Cigna	Total ankle replacement: is pre-operative varus deformity a predictor of poor survival rate and clinical and radiological outcomes?	2018	Primary journal article

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Appendix I. (continued)

Commercial Payer	Reference (Title)	Year	Type of Reference
Cigna	Outcomes of total ankle replacement, arthroscopic ankle arthrodesis, and open ankle arthrodesis for isolated non-deformed end-stage ankle arthritis	2019	Primary journal article
Cigna	Effect of total ankle arthroplasty and ankle arthrodesis for ankle osteoarthritis: a comparative study	2019	Primary journal article
Cigna	A randomized, controlled trial of two mobile-bearing total ankle replacements	2009	Primary journal article
Cigna	Current concepts in the management of ankle arthritis	2020	Review
Cigna	Complications following total ankle arthroplasty: a systematic literature review and meta-analysis	2022	Review
Cigna	Outcomes following total ankle arthroplasty: a review of the registry data and current literature	2019	Review
Cigna	Outcomes following total talus replacement: a systematic review	2022	Review
Cigna	Total ankle arthroplasty versus ankle arthrodesis for the treatment of end-stage ankle arthritis: a meta-analysis of comparative studies	2016	Review
Cigna	Modern total ankle arthroplasty versus ankle arthrodesis: a systematic review and meta-analysis	2020	Review
Cigna	Comparison of the efficiency and safety of total ankle replacement and ankle arthrodesis in the treatment of osteoarthritis: an updated systematic review and meta-analysis	2020	Review
Cigna	Outcome of ankle arthrodesis and ankle prosthesis: a review of the current status	2017	Review
Cigna	Total ankle arthroplasty survivorship: a meta-analysis	2020	Review
Cigna	Comparing 30-day all-cause readmission rates between tibiotalar fusion and total ankle replacement	2019	Review
Cigna	Outcome after total ankle arthroplasty with a minimum of five years follow-up: A systematic review and meta-analysis	2019	Review
Cigna	A systematic review and meta-analysis of total ankle arthroplasty or ankle arthrodesis for treatment of osteoarthritis in patients with diabetes	2022	Review
Cigna	Better implant survival with modern ankle prosthetic designs: 1,226 total ankle prostheses followed for up to 20 years in the Swedish Ankle Registry	2020	Review
Cigna	Patient selection for total ankle arthroplasty	2017	Review
Cigna	Total talus replacement: case series and literature review	2020	Review
Cigna	The outcome of total ankle replacement: a systematic review and meta-analysis	2013	Review
Cigna	Quality measures for total ankle replacement, 30-day readmission and reoperation rates within 1 year of surgery: a data linkage study using the NJR data set	2016	Review
Cigna	Position statement on total ankle replacement surgery	2020	Society guideline
Cigna	Position statement: the use of total ankle replacement for the treatment of arthritic conditions of the ankle	2022	Society guideline
Cigna	Total talar replacements short medium term case series, South Africa 2019	2019	Unable to access
Cigna	Patient reported outcome measures in ankle replacement versus ankle arthrodesis—a systematic review	2022	Unable to access
Cigna	Outcomes of total ankle arthroplasty in ankles with >20° of coronal plane deformity	2019	Unable to access
Cigna	Transfibular total ankle arthroplasty: a new reliable procedure at five-year follow-up	2022	Unable to access
Cigna	The long-term clinical results of total talar replacement at 10 years or more after surgery	2022	Unable to access
Cigna	Total ankle replacement outcome in patients with inflammatory versus noninflammatory arthritis: a systematic review and meta-analysis	2022	Unable to access
Cigna	Prospective randomized trial comparing mobile bearing and fixed-bearing total ankle replacement	2019	Unable to access
Cigna	Comparing 4-year changes in patient-reported outcomes following ankle arthroplasty and arthrodesis	2021	Unable to access

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Commercial Payer	Reference (Title)	Year	Type of Reference
Cigna	DT MedTech. Products, USA. ©2016-2022 Vilex LLC	2022	Website
Cigna	Total joint replacement for severe rheumatoid arthritis	2022	Website
HCSC	Current and emerging insight on total ankle replacement	2018	Expert opinion
HCSC	Custom 3D-printed total talar prostheses restores normal joint anatomy throughout the hindfoot	2018	Primary journal article
HCSC	Intermediate and long-term outcomes of total ankle arthroplasty and ankle arthrodesis. A systematic review of the literature	2007	Primary journal article
HCSC	Comparison of reoperation rates following ankle arthrodesis and total ankle arthroplasty	2007	Primary journal article
HCSC	Complications and failure after total ankle arthroplasty	2004	Primary journal article
HCSC	Are there differences in gait mechanics in patients with a fixed versus mobile bearing trial	2017	Primary journal article
HCSC	Total ankle replacement: the results in 200 ankles	2003	Primary journal article
HCSC	Total ankle replacement: medium term results: in 200 Scandinavian total ankle replacements	2008	Primary journal article
HCSC	STAR Ankle: long-term results	2011	Primary journal article
HCSC	257 ankle arthroplasties performed in Norway between 1994 and 2005	2007	Primary journal article
HCSC	Early clinical results of the BOX ankle replacement are satisfactory: a multicenter feasibility study of 158 ankles	2011	Primary journal article
HCSC	Total ankle replacement: the results of 100 mobility total ankle replacements	2010	Primary journal article
HCSC	High rate of osteolytic lesions in medium-term follow-up after the AES total ankle replacement	2011	Primary journal article
HCSC	Medium term follow-up of the AES ankle prosthesis: High rate of asymptomatic osteolysis	2009	Primary journal article
HCSC	Ten-year evaluation of cementless BuechelPappas meniscal bearing total ankle replacement	2003	Primary journal article
HCSC	Twenty-year evaluation of cementless mobile-bearing total ankle replacements	2004	Primary journal article
HCSC	Total ankle arthroplasty in inflammatory joint disease with use of two mobile-bearing designs	2006	Primary journal article
HCSC	Clinical outcomes of total ankle arthroplasty with total talar prosthesis	2019	Primary journal article
HCSC	Advances in ankle replacement: a review	2014	Review
HCSC	Current concepts review: total ankle arthroplasty	2008	Review
HCSC	How successful are current ankle replacements? A systematic review of the literature	2009	Review
HCSC	Incidence of revision after primary implantation of the Agility total ankle replacement system: a systematic review	2012	Review
HCSC	Total ankle arthroplasty with the Agility prosthesis: clinical and radiographic evaluation	2006	Review
HCSC	A systematic review of outcome and failure rate of uncemented Scandinavian total ankle replacement	2011	Review
HCSC	Intermediate to long-term outcomes of the STAR Total Ankle Replacement: the patient perspective	2012	Review
HCSC	10-year survival of total ankle arthroplasties: a report on 780 cases from the Swedish Ankle Register	2011	Review
HCSC	The Scandinavian total ankle replacement: long-term, eleven to fifteen-year, survivorship analysis of the prosthesis in seventy-two consecutive patients	2013	Review
HCSC	Ankle arthroplasty in patients younger and older than 50 years: a prospective series with long-term follow-up	1999	Review
HCSC	The Salto Total Ankle Arthroplasty: survivorship and analysis of failures at 7 to 11 years	2011	Review
HCSC	Total ankle replacement with use of a new three component implant	2011	Review
HCSC	Eight-year results of a minimally constrained total ankle arthroplasty	2006	Review
HCSC	American College of Foot and Ankle Surgeons (ACFAS). position statement on total ankle replacement surgery	2021	Society guideline

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Commercial Payer	Reference (Title)	Year	Type of Reference
HCSC	American Orthopaedic Foot & Ankle Society (AOFAS) position statement: the use of total ankle replacement for the treatment of arthritic conditions of the ankle	2021	Society guideline
HCSC	Total ankle arthroplasty: a unique design. Two to twelve-year follow-up	1998	Unable to access
Highmark	Position statement. The use of total ankle replacement for the treatment of arthritic conditions of the ankle.	2022	Miscellaneous
Highmark	Perioperative complications of HINTEGRA total ankle replacement: our initial 50 cases	2008	Primary journal article
Highmark	Short-term results of our first 49 Scandinavian total ankle replacements (STAR)	2008	Primary journal article
Highmark	Total ankle replacement: medium-term results in 200 Scandinavian total ankle replacements	2008	Primary journal article
Highmark	Clinical evaluation and radiographic assessment of bone lysis of the AES total ankle replacement	2009	Primary journal article
Highmark	Intermediate term outcome of the agility total ankle arthroplasty	2009	Primary journal article
Highmark	Long-term follow-up on 33 TPR ankle joint replacements in 26 patients with rheumatoid arthritis	2009	Primary journal article
Highmark	Total ankle replacement in moderate to severe varus deformity of the ankle	2009	Primary journal article
Highmark	Prospective controlled trial of STAR total ankle replacement versus ankle fusion: initial results	2009	Primary journal article
Highmark	A randomized, controlled trial of two mobile-bearing total ankle replacements	2009	Primary journal article
Highmark	The Scandinavian total ankle replacement: survivorship at 5 and 8 years comparable to other series	2010	Primary journal article
Highmark	Total ankle replacement by the Ankle Evolution System: medium-term outcome	2010	Primary journal article
Highmark	Wound breakdown after total ankle arthroplasty	2010	Primary journal article
Highmark	Evidence-based classification of complications in total ankle arthroplasty	2009	Review
Highmark	How successful are current ankle replacements? A systematic review of the literature	2010	Review
Highmark	Blue Cross Blue Shield Association Medical Policy		Unable to access
Highmark	InterQual Level of Care Criteria 2010		Unable to access
United Healthcare	Position statement: the use of total ankle replacement for the treatment of arthritic conditions of the ankle.	2022	Miscellaneous
United Healthcare	Total ankle replacement versus arthrodesis for end-stage ankle osteoarthritis: a randomized controlled trial	2022	Primary journal article
United Healthcare	Comparing the results of total ankle arthroplasty vs tibiotalar fusion (ankle arthrodesis) in patients with ankle osteoarthritis since 2006 to 2020—a systematic review	2022	Review
United Healthcare	Osteoarthritis in over 16s: diagnosis and management	2022	Society guideline
United Healthcare	Osteoarthritis: care and management	2020	Society guideline
United Healthcare	Joint distraction for ankle osteoarthritis	2015	Society guideline

Abbreviation: HCSC, Health Care Services Corporation.