The Incidence of Secondary Disabilities, Residual Limb Complications, and Mortality following Lower Limb Amputations in the United States: A Multicenter Database Analysis

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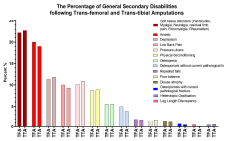
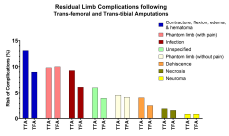
INTRODUCTION: Primary surgical and functional outcomes are well-documented following transfemoral (TFA) and transtibial amputations (TTA). While extensive research has been conducted on secondary disabilities (low back pain, arthritis, osteopenia), chronic residual limb complications and mortality rates following these types of amputations are not well-documented. This study aims to analyze the incidence of secondary conditions and mortality rates of both TFA and TTA using a multicenter database of International Classification of Diseases (ICD) codes.

METHODS: A retrospective analysis was conducted using a federated database called TriNetx, containing over 69 million records. Patients who underwent TFA and TTA were identified using the Current Procedural Terminology (CPT) and ICD codes. Participants were included if they had their amputations in the United States, regardless of etiology. Patient demographics, mortality, and epidemiology of chronic residual limb complications, including phantom limb syndrome, joint contractures, cutaneous issues, and neuroma, were identified. Additionally, approximately 30 relevant secondary disabilities were examined in both TFA and TTA cohorts.

RESULTS: Our study included a total of 150,038 patients who underwent either TFA (n= 59,472 patients) or TTA (n=90,566 patients) from 2016 to 2022. Sixty-seven percent of the total cohort was male, and the average age was 59.7 ± 15.4 years. Overall, the 5-year and 20-year mortality rates were higher among people with TFA (24.2% and 27.7%, respectively), compared to TTA (21.9% and 25.9%, respectively). Analysis of the data revealed that patients with TTA had a slightly higher incidence of residual limb complications (49.7%) compared to TFA patients (38.0%). The most prevalent residual limb complications observed in both TFA and TTA cohorts were phantom limb pain (10.0%) and flexion contracture (13.1%), respectively. Soft tissue disorders such as panniculitis, myalgia, neuralgia, residual limb pain, fibromyalgia, and rheumatism were the most common secondary disabilities and physical conditions in both TFA (22.2%) and TTA (22.7%). Both TFA and TTA cohorts experienced anxiety (20.0% versus 19.0%), joint pain (14.7% versus 15.4%), depression (11.3% versus 11.8%), low back pain (10% versus 9.3%), pressure ulcers (10.1% versus 10.9%), physical deconditioning (8.7% versus 8.7%), and osteopenia (5.5% versus 5.5%). People with TFA had a slightly higher incidence of both unilateral (3.5%) and bilateral hip osteoarthritis (OA) (1.3%), while people with TTA experienced higher unilateral knee (3.5%) and contralateral ankle OA (2.1%). Both cohorts had varying incidences of osteoporosis (with or without pathological fracture), disuse atrophy, repeated falls, joint stiffness, and poor balance.

DISCUSSION AND CONCLUSION: Following TTA and TFA, patients may develop secondary disabilities or complications that can substantially impact their activities of daily life. This study highlights the need for further research and improvements in post-amputation care to reduce the incidence of secondary disabilities and enhance the overall quality of life of amputees.





Demographics & complications of amputation stump	Trans-femoral amputations (N= 59,472 patients)	Trans-tibial amputations (N= 90,566 patients)
Average current age	60.5 ± 15.5	58.8 ± 15
Average age at index	60.0 ± 15.8	58.7 ± 15.1
Sex		
• Male	37,945 (64%)	62,704 (69%)
• Female	21,520 (36%)	27,848 (31%)
Ethnicity		
• Not Hispanic or Latino	39,830 (67%)	56,662 (63%)
• Hispanic or Latino	1,956 (3%)	2,903 (3%)
• Unknown Ethnicity	15,736 (26%)	29,934 (33%)
Race		
• White	36,794 (62%)	59,438 (66%)
• Black or African American	13,309 (22%)	19,475 (22%)
• Unknown Race	8,201 (14%)	13,758 (15%)
• American Indian or Alaska Native	290 (1%)	477 (1%)
• Asian	699 (1%)	1,050 (1%)
• Native Hawaiian or Other Pacific Islander	79 (0.001%)	149 (0.001%)
Complications of amputation stump (%tofl)	38%	49.7%
• Phantom limb (with pain)	10%	9.8%
• Contractures, flexion, edema, N		
• Necrosis	9%	13.1%
• Infection	6.2%	9.2%
• Phantom limb (without pain)	4.2%	4.6%
• Unspecified complications	4%	6%
• Dehiscence	2.4%	4.1%
• Necrosis	1.2%	2%
• Neuroma	1%	0.8%
Mortality		
• 20-year mortality rate	27.7%	25.9%
• 5-year mortality	24.2%	21.9%

The incidence of Secondary disabilities following amputation	Trans-femoral amputations (N= 59,472 patients)	Trans-tibial amputations (N= 90,566 patients)
Soft tissue disorders (Panniculitis, Myalgia, Neuralgia, residual limb pain, Fibromyalgia, Rheumatism)	22.2%	22.7%
Anxiety	20.0%	19.0%
Joint Pain (in general)	14.7%	15.4%
Depression	11.3%	11.8%
Low Back Pain	10%	9.3%
Pressure ulcers (back, gluteal, sacral, hip, surrounding)	10.1%	10.9%
• Stage 1	1.4%	1.2%
• Stage 2	2.5%	2.2%
• Stage 3	1.2%	1.2%
• Stage 4	1.0%	1.3%
• Unstageable or unspecified	5.0%	4.0%
Physical deconditioning	8.7%	8.9%
Knee Pain	8.5%	7.6%
Hip Pain	5.4%	5%
Osteopenia	5.5%	5.5%
Osteoporosis without current pathological fx	4.4%	3.8%
Unilateral osteoarthritis of Hip	3.5%	1.3%
Unilateral Knee	3.5%	1.7%
Ankle pain	2.2%	2.5%
Repeated falls	1.9%	1.4%
Joint Contracture	1.9%	3%
Contralateral Ankle OA	1.4%	2.1%
Bilateral OA Hip	1.3%	1%
Poor balance	1.4%	1.8%
Joint Stiffness	1.3%	1.7%
Disuse atrophy	1.1%	1.2%
Osteoporosis with current pathological fracture	0.7%	0.5%
Leg Length Discrepancy	0.5%	0.1%
Heterotopic Ossification	0.3%	0.6%
Secondary multiple arthritis	0.2%	0.1%