



# Risk Factors of Unplanned Higher-Level Re-Amputation and Death in Patients with Chronic Limb-Threatening Ischemia

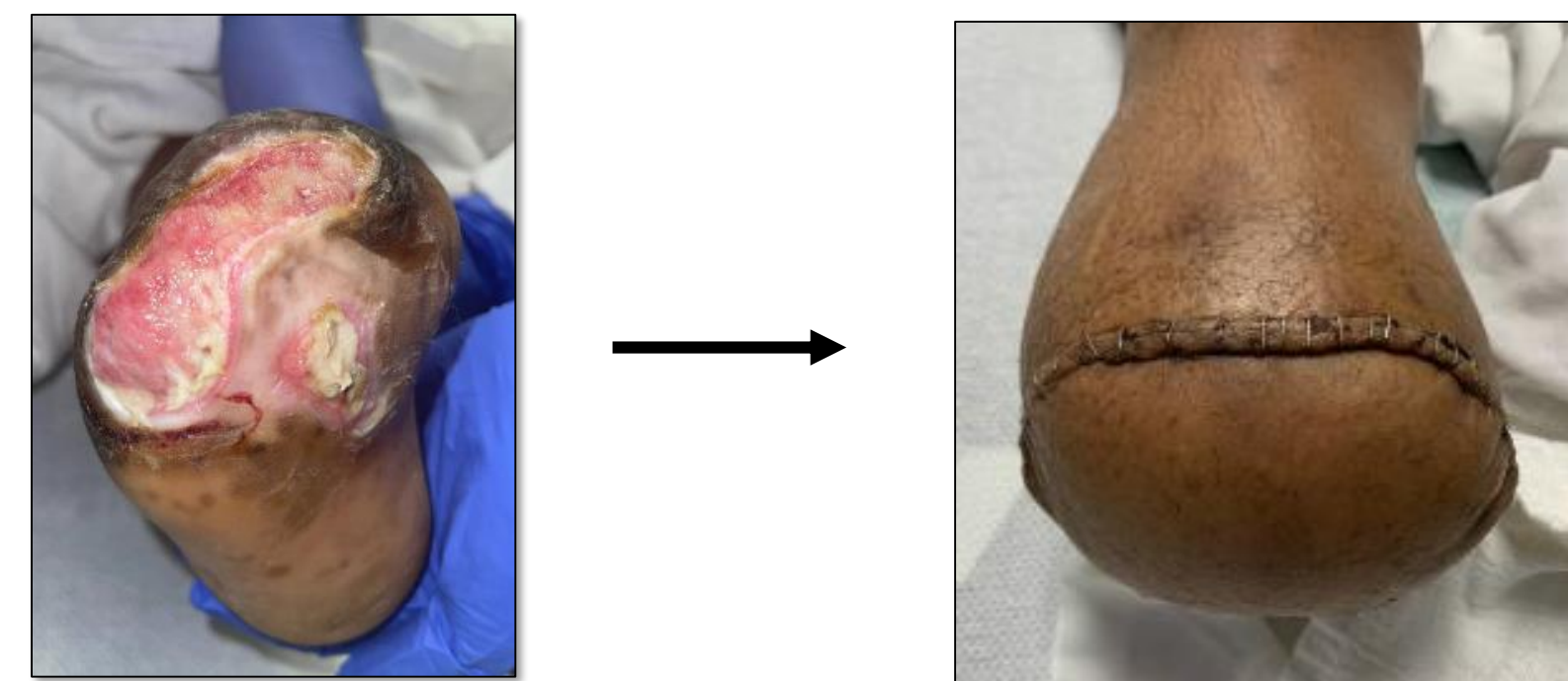
Andres Guerra, Michelle Guo, Riley Boyd, Marina Zakharevich, Andrew Hoel, Ashley Vavra, Jeanette W Chung, Karen J Ho

## Background

- Chronic limb threatening ischemia (CLTI), a severe form of peripheral arterial disease, is associated with a 30% risk of limb loss and 25% risk of mortality within one year<sup>1</sup>
- In patients with CLTI, the potential for limb salvage is determined in part by presence of infection, severity of tissue loss, hemodynamic parameters, comorbidities, and revascularization options (Figure 1)
- Rates of unplanned higher-level re-amputation (UHRA) and death are high after index lower extremity amputations for CLTI

## Hypothesis

There are patient and limb level characteristics that lead to UHRA and death within one year of index amputation for CLTI

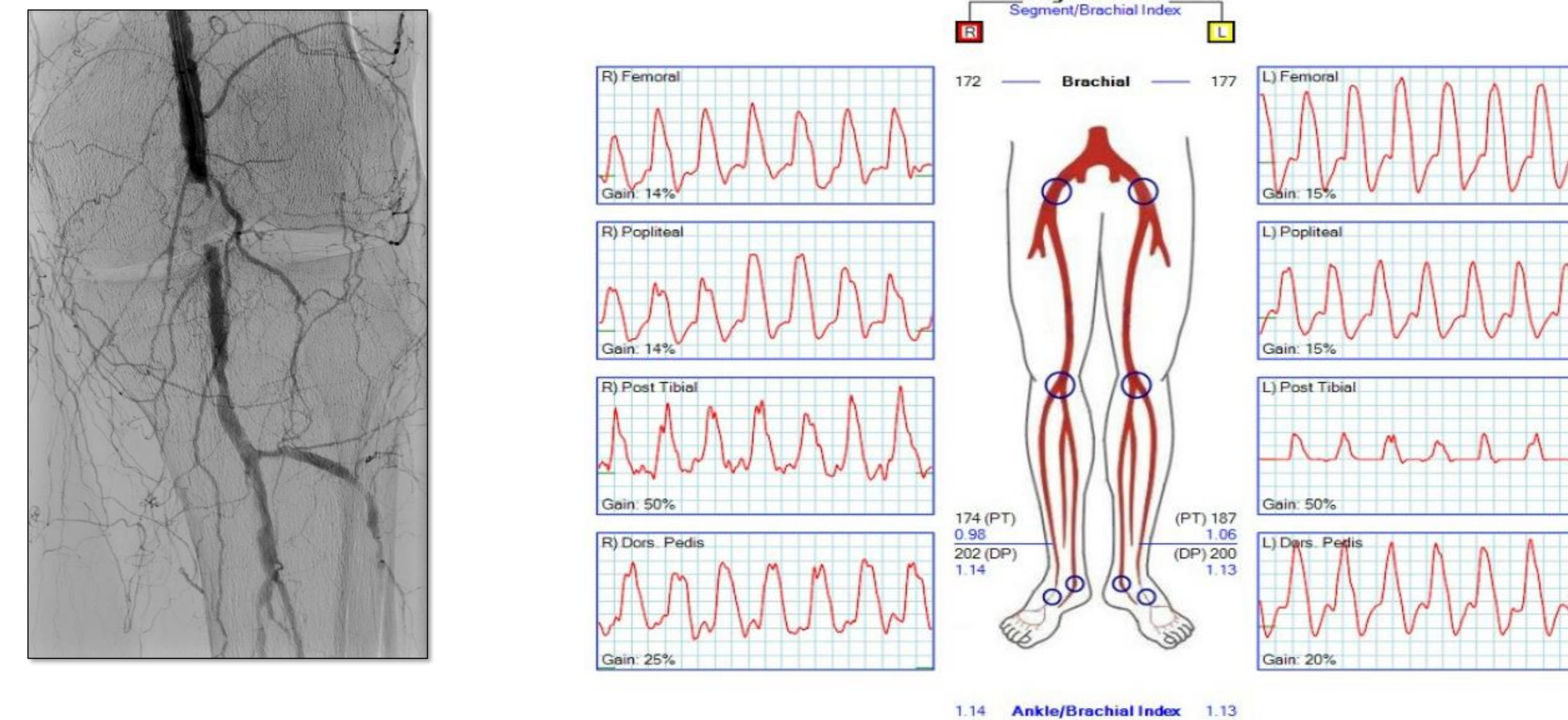


**Figure 2.** \*Non-healing transmetatarsal amputation (left) requiring below knee amputation (right) in patient with CLTI.

## Methods

- Single-center retrospective review of patients who underwent index lower extremity amputation for CLTI between January 2014 and December 2017
  - Inclusion:** any patient who underwent an index lower extremity amputation for CLTI at Northwestern Medicine
  - Exclusion:** acute limb ischemia, claudication and ankle disarticulation
- Statistical analysis:
  - Unadjusted bivariate associations between risk factors and outcomes
  - Estimated adjusted associations (AOR) between risk factors and outcomes adjusting for index amputation type, patient age, race and sex

**Figure 1.** Abnormal lower extremity angiogram and non-invasive arterial flow study in patient with CLTI

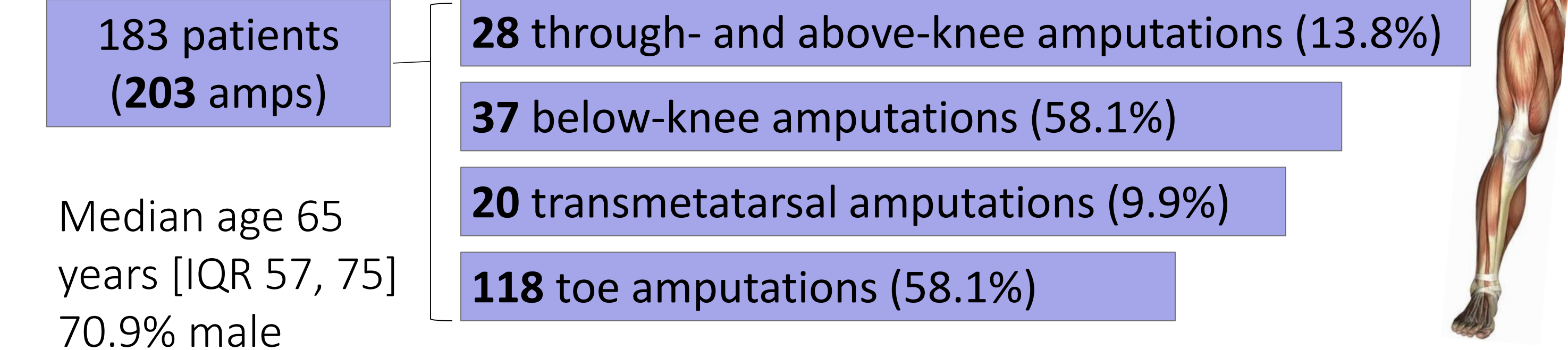


**Table. Risk Factors of UHRA and Death Within 1 Year**

Risk Factors	UHRA (n=36; 17.7%)	Death within 1 Year (n=33; 18.0%)
Coronary Artery Disease (Ref: No)	2.00 (0.88-4.58)	3.93 (1.56-9.87)**
Congestive Heart Failure (Ref: No)	1.36 (0.61-3.04)	4.90 (1.96-12.29)**
End-Stage Renal Disease (Ref: No)	1.07 (0.46-2.48)	7.54 (3.10-18.34)***
Diabetes (Ref: No)	0.78 (0.32-1.94)	1.05 (0.41-2.69)
Anticoagulant (Ref: No)	3.33 (1.43-7.72)**	0.70(0.26-1.93)
Ambulation status at index amputation (Ref: Ambulatory)		
Needs Assistance	2.36 (0.86-6.51)†	4.31 (1.20-15.49)*
Non-Ambulatory	6.74 (1.74-26.18)**	4.13 (0.80-21.39)†
Toe Pressure (Ref: TP ≥ 30 mm Hg)		
TP < 30 mm Hg	4.90 (1.52-15.78)**	2.82 (0.75-10.66)
TP = 0	1.16 (0.36-3.73)	3.34 (0.98-11.36)
Monophasic/Absent Ankle Waveform	3.12 (1.30-7.46)*	1.59 (0.67-3.77)
Profunda Femoris Patency (Ref: 0)	0.05 (0.01-0.57)*	-----
Ankle-Brachial Index (Ref 0.8 – 1.4)		
0.5 – 0.8	2.88 (0.79-10.48)	1.82 (0.45-7.39)
≤ 0.5	2.76 (0.50-15.16)	0.87 (0.17-4.44)
Non-Compressible	0.97 (0.33-2.80)	4.69 (1.44-15.29)*
Ipsilateral Leg Revasc Prior to Index Amp	2.19 (0.88-5.49)†	0.81 (0.35-1.86)

†p<0.10 \*p<0.05 \*\*p<0.01 \*\*\*p<0.001

## Results



- Indications: infection (n=88; 43.4%), tissue loss (n=107; 52.7%), rest pain (n=8; 3.9%).
- Majority of UHRA occurred after index toe amputation (n=26, **22.0% of toe amputations**) or TMA (n=6, **30% of TMAs**), p=0.03; adjusted rates of UHRA and death within one year noted in Table
- Limbs **revascularized** during or prior to index amputation had **increased frequency of UHRA** (25.29% versus 12.50%, p=0.03)
- Males had lower odds of 1-year mortality (AOR 0.37, CI 0.15 – 0.89; p=0.03)
- No association between UHRA and death within one year

## Limitations

- Retrospective study design with limited sample size
- Only measured covariates can be controlled for in our study

## Conclusions

- UHRA rates** after toe amputations and TMA **are high despite revascularization**
- Patients with CLTI requiring amputation, regardless of subsequent UHRA, are at **high risk of 1-year mortality**
- Larger multi-center datasets and hierarchical modeling of surgeon, patient, and limb-level factors may reveal further insights on determining which patients would be better served with higher level index amputations

References: Norgren, et al. J Vasc surg 2006