

Benefit of revascularization Is the juice worth the squeeze?

SOCIETY FOR VASCULAR SURGERY DOCUMENT

The Society for Vascular Surgery Lower Extremity Threatened Limb Classification System: Risk stratification based on Wound, Ischemia, and foot Infection (WIFI)

h. Estimate likelihood of benefit of/requirement for revascularization (assuming infection can be controlled first)

	Ischemia - 0			Ischemia - 1			Ischemia - 2			Ischemia - 3					
W-0	VI	VI	VI	VI	L	L	M	L	L	M	M	H	H		
W-1	VI	VI	VI	L	M	M	M	H	H	H	H	H	H		
W-2	VI	VI	VI	M	M	H	H	H	H	H	H	H	H		
W-3	VI	VI	VI	M	M	H	H	H	H	H	H	H	H		
I-0	I-	I-	I-	I-	I-	I-	I-	I-	I-	I-	I-	I-	I-		
	1	2	3	0	1	2	3	0	1	2	3	0	1	2	3

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Using the Society for Vascular Surgery Wound, Ischemia, and foot infection classification to identify patients most likely to benefit from revascularization

Obs-Pred 1 year LEA Rate

Cluster Analysis

Revasc Benefit Quartiles

Highest Benefit Moderate Benefit Low Benefit

Questionable Benefit

Percent Change

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Benefit from revascularization Q4: questionable benefit

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Table 1. Change in lower extremity amputation (LEA) risk after revascularization using staging based on estimated likelihood of benefit of revascularization

Risk difference quartile	WIFI score
Q1 - Highest benefit	W1 I2 R2, W1 I3 R3, W2 I1 R1, W3 I2 R3, W1 I2 R1, W1 I3 R3, W2 I2 R3, W2 I2 R1, W1 I3 R2, W3 I2 R3, W1 I3 R1, W2 I1 R2
Q2 - Moderate benefit	W2 I3 R3, W2 I2 R2, W3 I3 R1, W2 I3 R1, W3 I2 R1, W1 I1 R1, W2 I2 R3, W3 I3 R3, W1 I2 R3, W2 I1 R1, W3 I1 R1, W3 I1 R3
Q3 - Low benefit	W2 I1 R3, W3 I2 R2, W3 I1 R1, W2 I2 R1, W2 I2 R3, W3 I2 R1, W1 I1 R1, W2 I1 R1, W3 I1 R1, W3 I1 R3
Q4 - Questionable benefit	W3 I1 R3, W3 I2 R1, W3 I2 R3, W3 I3 R1, W3 I3 R3, W3 I3 R3, W3 I3 R1, W3 I3 R3, W3 I3 R1, W3 I3 R3

Questionable Benefit

- Grade 3 wounds
- No ischemia

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Fig 5. One year observed lower extremity amputation (LEA) rate stratified by k-means clustering. Clusters were able to mathematically refine the original Wound Ischemia foot Infection (WIFI) stages, avoid discrete stages of LEA risk without overlap. The x-axis represents each of the 49 WIFI combinations studied.

Accumulation Rate

11.2%

28.1%

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Should we be attempting limb preservation in Q4 (not stage 4) limbs or Should we be considering PRIMARY AMPUTATION?

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Benefit from revascularization Q4: questionable benefit

Evaluation of revascularization benefit quartiles using the Wound, Ischemia, and foot Infection classification system for diabetic patients with chronic limb-threatening ischemia

Table II. Description of treated diabetic limbs stratified by quartile of estimated likelihood of benefit of revascularization

Variable	Overall	Q1 (highest benefit)	Q2 (moderate benefit)	Q3 (low benefit)	Q4 (questionable benefit)	P value
Limits treated, No.	187 (100)	51 (27.3)	59 (31.6)	58 (20.3)	59 (20.9)	NA
WIFI stage						<.001
1	12 (6.4)	0 (0)	0 (0)	11 (29.0)	1 (2.6)	
2	18 (9.6)	0 (0)	7 (11.9)	9 (23.7)	2 (5.1)	
3	45 (24.1)	18 (35.3)	10 (17.0)	16 (42.1)	1 (2.6)	
4	112 (59.9)	33 (64.7)	42 (71.2)	2 (5.3)	35 (89.7)	
Revascularization approach						.09
Endovascular	125 (66.8)	37 (72.6)	32 (54.2)	29 (76.3)		
Open surgery	62 (33.2)	14 (27.5)	27 (45.8)	9 (23.7)		

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Cashin W, Hicks MD, MS^{1*}, Joseph K, Carter, MD², Ronald L, Sherman, DVM^{1*}, James H, Black III MD^{1*}, Ying Wei Lum, MD^{1*} and Christopher J. Abolmage MD^{1*}, *Arterioscler Thromb Vasc Biol* 2023;74:1022-9.

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Table III. Cox proportional hazards models for 1-year complete foot healing and limb salvage outcomes stratified by quartile of estimated benefit of revascularization

Outcome		HR (95% CI)			
		Q1 (highest benefit)	Q2 (moderate benefit)	Q3 (low benefit)	Q4 (questionable benefit)
Major amputation	Reference	0.65 (0.11-3.91)	1.03 (0.17-6.15)	4.26 (1.15-15.7)	
Complete foot healing	Reference	1.06 (0.67-1.67)	1.34 (0.80-2.25)	0.61 (0.35-1.05)	
Loss of patency	Reference	1.04 (0.55-2.11)	1.59 (0.54-4.76)	2.43 (0.87-6.90)	
Loss of amputation-free survival	Reference	0.89 (0.36-2.19)	0.46 (0.13-1.66)	1.44 (0.60-3.47)	

CI: Confidence Interval; HR, hazard ratio; Q, quartile.

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Table IV. Patency of diabetic limbs requiring major amputation at 1 year stratified by quartile of estimated benefit of revascularization*

Quartile	1-year Major amputation	Revascularization patient at major amputation
Overall	16/37 (11.7)	9/16 (56.3)
Q1 (highest benefit)	3/54 (8.8)	1/5 (33.3)
Q2 (moderate benefit)	2/42 (4.8)	2/2 (100)
Q3 (low benefit)	2/39 (6.7)	0/2 (0)
Q4 (questionable benefit)	9/51 (29.0) (51.2%)	6/9 (66.7)

Q, Quartile.
Data presented as number per total (%).
*Total number of patients was 137 because those without 1 year of follow-up were excluded from the subanalysis.

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Conclusions

- The Q4 quartile of revascularization benefit has the greatest risk of 1 year
 - Major amputation
 - Poor wound healing
- Q4 limbs should be carefully scrutinized before offering a revascularization
 - Patients should be counseled that they may still lose their leg even if the revascularization is a success
 - If the clinical benefit is unlikely to be achieved, primary amputation should be offered
- Multidisciplinary teams continue to show improved outcomes in limb preservation
 - Showing decreased risk of major amputation to 29% even in Q4 limbs

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