WVU Heart & Vascular Institute™

Save a Leg, Save a Life: Building an Amputation Prevention Program in West Virginia

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Disclosures

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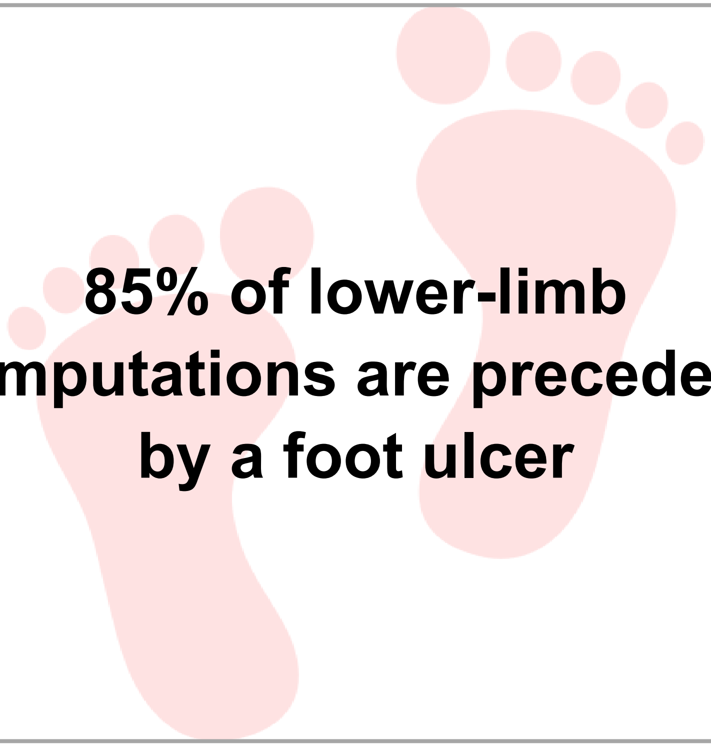
- The content is solely the responsibility of the author and does not necessarily represent the official views of the National Institutes of Health

Amputation is a devastating but preventable complication of diabetes (DM) and peripheral artery disease (PAD)



85% of lower-limb amputations are preceded by a foot ulcer

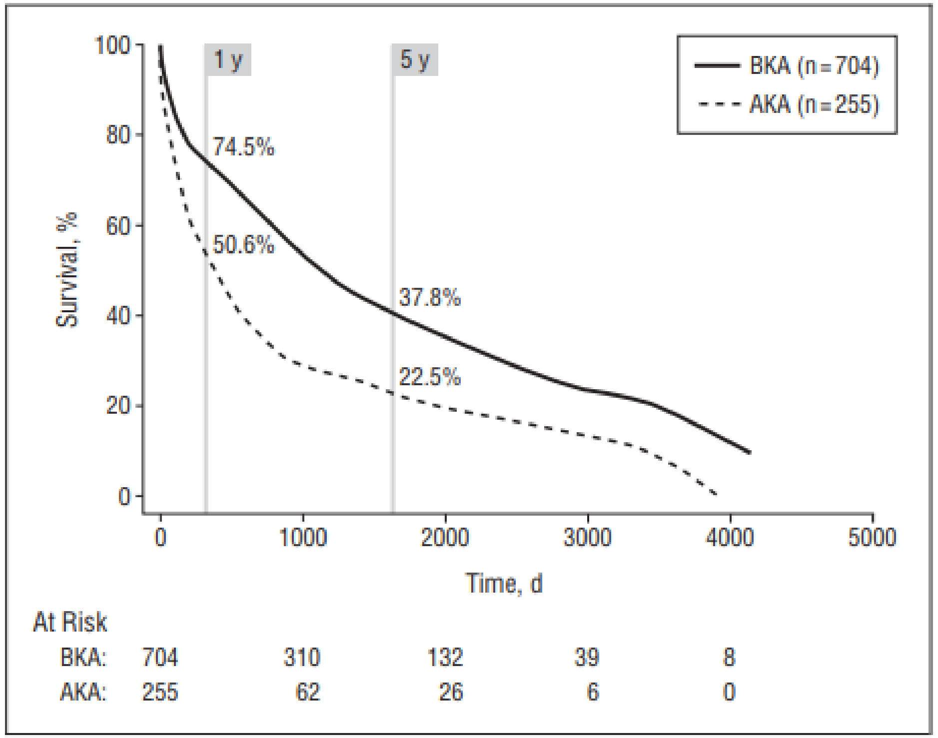
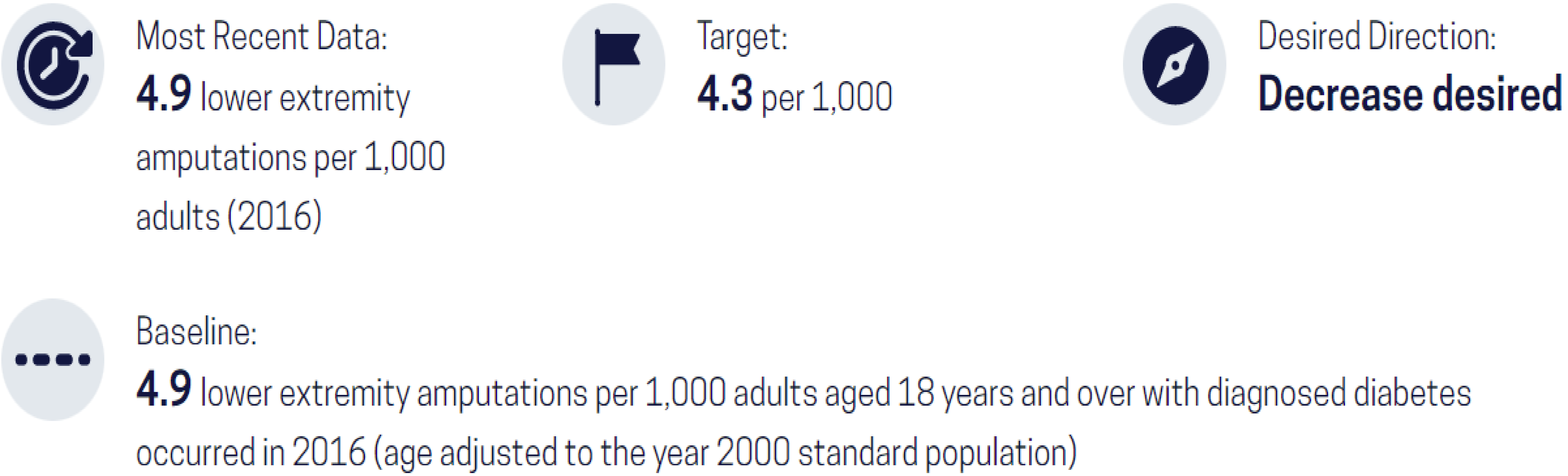


Figure 1. Actuarial survival in below-knee amputation (BKA) patients vs above-knee amputation (AKA) patients ($P<.001$).

Aulivola B, Hile CN, Hamdan AD, et al. Major lower extremity amputation: outcome of a modern series. Arch Surg. 2004;139(4):395-399; discussion 399.

Amputation is a marker for quality of care



Most Recent Data:

4.9 lower extremity amputations per 1,000 adults (2016)

Target:

4.3 per 1,000

Desired Direction:

Decrease desired

Baseline:

4.9 lower extremity amputations per 1,000 adults aged 18 years and over with diagnosed diabetes occurred in 2016 (age adjusted to the year 2000 standard population)

Healthy People 2030

https://health.gov/healthypeople/objectives-and-data/browse-objectives/diabetes/reduce-rate-foot-and-leg-amputations-adults-diabetes-d-08

Amputation disparities are a marker for inequities

Where you live MATTERS

Social Determinants of Health
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Healthy People 2030

“The conditions and environments in which people are born, live, learn, work, play, worship and age”

Comprise **75%** of the risk factors that affect our health

Lowry M. Want healthier communities? Address social factors. Voices 2018; http://www.publichealthnewswire.org/?p=address-social-factors
Bierman AS and Dunn JR. Swimming upstream. Access, health outcomes, and the social determinants of health. J Gen Intern Med 2006; 21: 99–100.

Rural populations face unique challenges

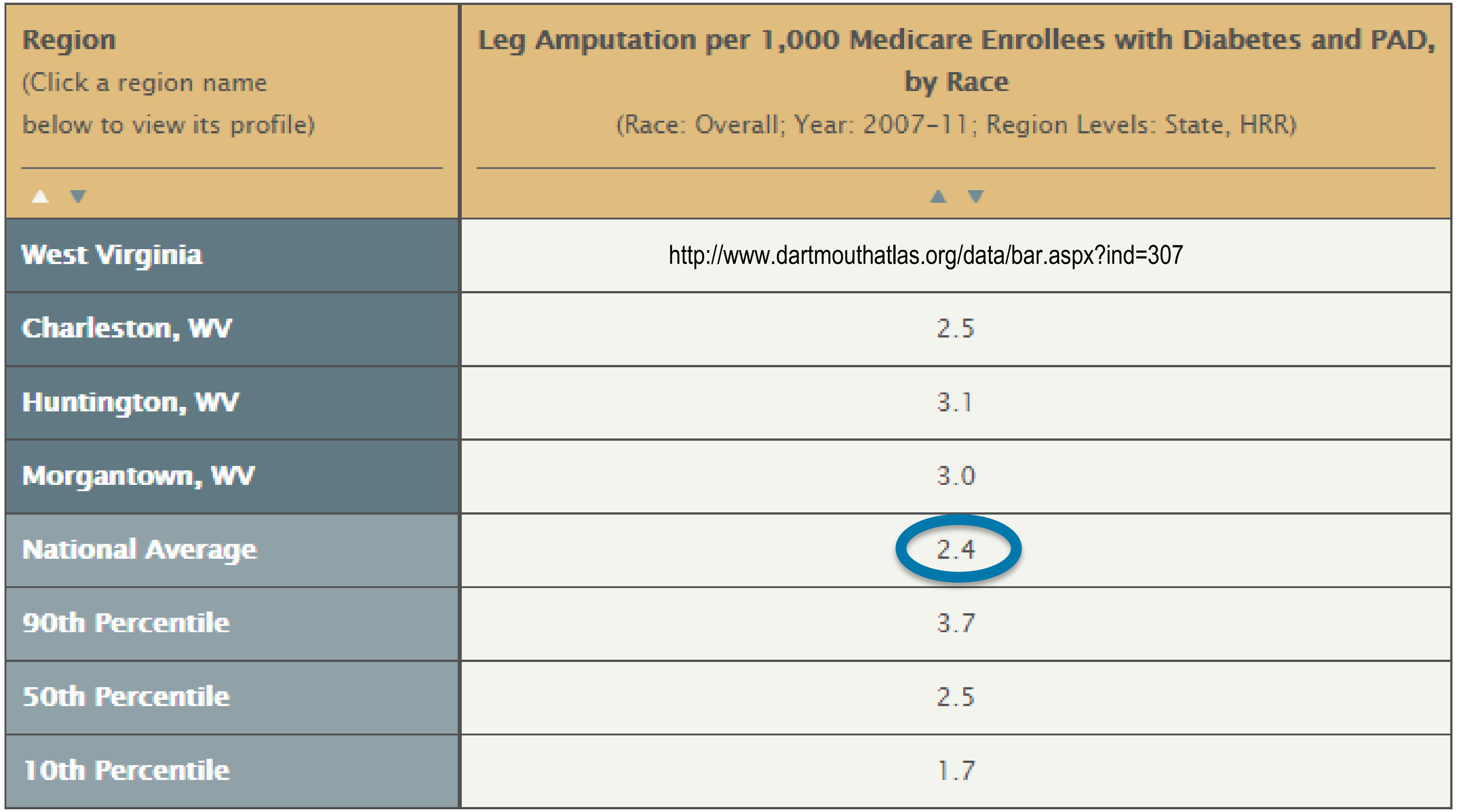

Welcome to
WEST VIRGINIA
Wild and Wonderful
STATE OF WEST VIRGINIA
MONTANI SEMPER LIBERI

Understanding amputation patterns in West Virginia

- 2018-2020 Study to both identify amputation hot spots across the state and gain a better understanding of why they occur
- Aim 1: Perform spatial and risk analysis
  - Source: HCUP dataset – all amputations for hospitalizations for peripheral artery disease (PAD) and diabetes (DM) admissions 2011-2016
  - GIS Bayesian analysis to map hotspots, Multivariable analysis to understand risk factors
- Aims 2: Focus groups of people with amputation and providers
  - Interviewed 64 patients, caregivers and providers (vascular surgeons, wound care and primary care)

Results

- 459,46
- 5679 a
  - 3530
  - 2248



Region (Click a region name below to view its profile) ▲ ▼	Leg Amputation per 1,000 Medicare Enrollees with Diabetes and PAD, by Race (Race: Overall; Year: 2007-11; Region Levels: State, HRR) ▲ ▼
West Virginia	http://www.dartmouthatlas.org/data/bar.aspx?ind=307
Charleston, WV	2.5
Huntington, WV	3.1
Morgantown, WV	3.0
National Average	2.4
90th Percentile	3.7
50th Percentile	2.5
10th Percentile	1.7

WV Amputation Prevalence

Major Amputation: 5/1000

Minor Amputation: 7/1000

Any Amputation: 12/1000

Variable	OR (95% CI)	p-value	AOR (95% CI)	p-value
Age	**0.98 (0.98-0.98)**	**<0.0001**	**0.98 (0.98-0.98)**	**<.0001**
Female	**0.45 (0.43-0.48)**	**<0.0001**	**0.54 (0.51-0.57)**	**<.0001**
Medicare	0.69 (0.65-0.73)	<0.0001	0.99 (0.92-1.08)	0.8768
Medicaid	**1.75 (1.64-1.87)**	**<0.0001**	**1.35 (1.23-1.47)**	**<.0001**
PAD alone (ref diabetes alone)	**5.17 (4.71-5.66)**	**<0.0001**	**8.04 (7.31-8.84)**	**<.0001**
PAD & Diabetes (ref diabetes alone)	**21.13 (19.58-22.81)**	**<0.0001**	**31.54 (29.11-34.18)**	**<.0001**
Obesity	0.95 (0.88-1.01)	0.1078	0.97 (0.9-1.04)	0.4183
Hyperchol	**0.76 (0.72-0.80)**	**<0.0001**	**0.77 (0.73-0.82)**	**<.0001**
Renal failure	**2.20 (2.02-2.39)**	**<0.0001**	**1.29 (1.17-1.42)**	**<.0001**
CKD	**1.72 (1.63-1.81)**	**<0.0001**	**1.41 (1.32-1.5)**	**<.0001**
COPD	**0.54 (0.51-0.58)**	**<0.0001**	**0.54 (0.5-0.58)**	**<.0001**
CAD	**0.80 (0.76-0.85)**	**<0.0001**	**0.41 (0.38-0.43)**	**<.0001**
CHF	**0.78 (0.73-0.83)**	**<0.0001**	**0.86 (0.8-0.92)**	**<.0001**
Rural	**1.00 (0.94-1.07)**	**0.9941**	**1.13 (1.05-1.21)**	**0.0007**

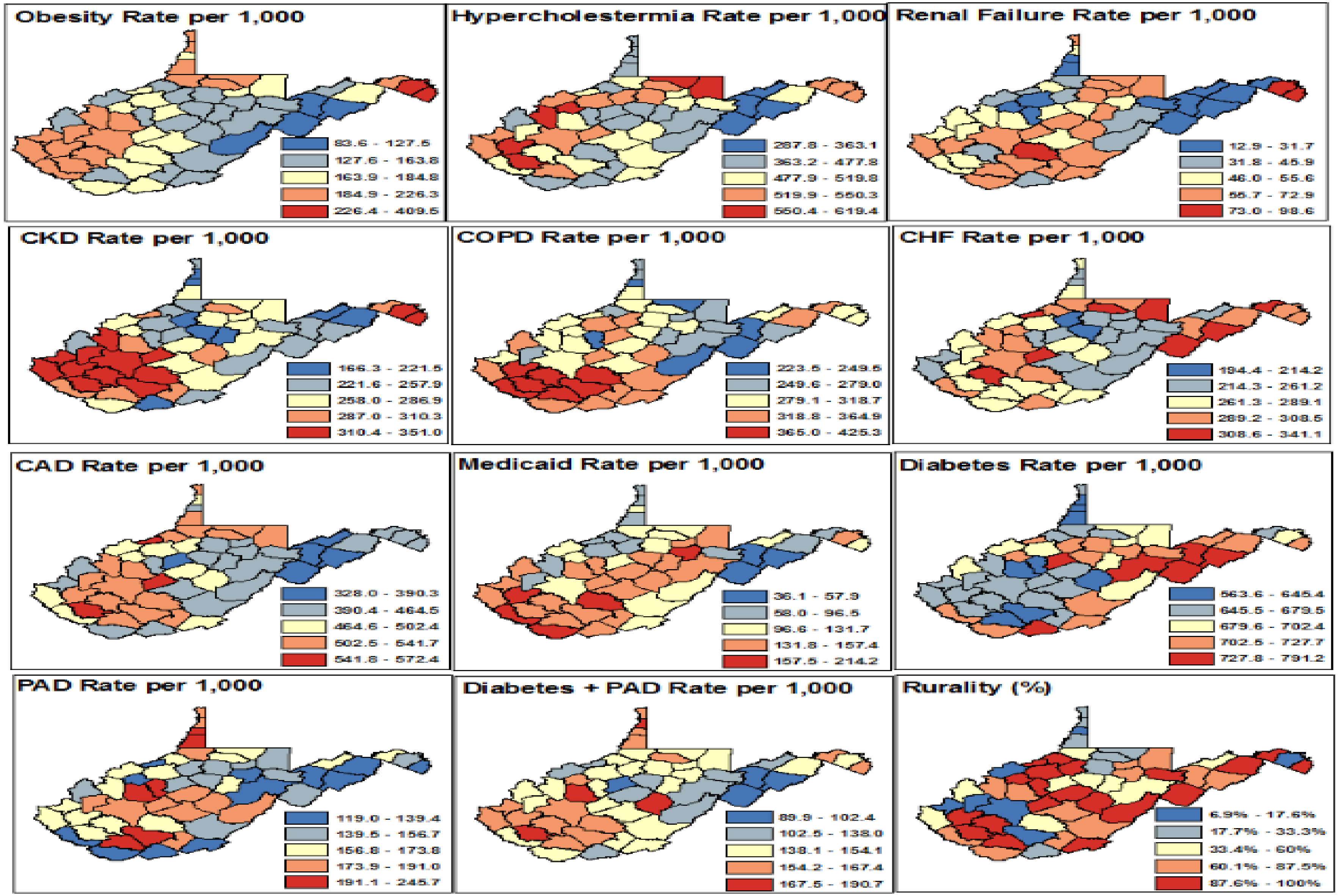


Figure 2. Choropleth maps of raw rate per 1,000 of comorbid conditions and percent rural census tracts at the county level

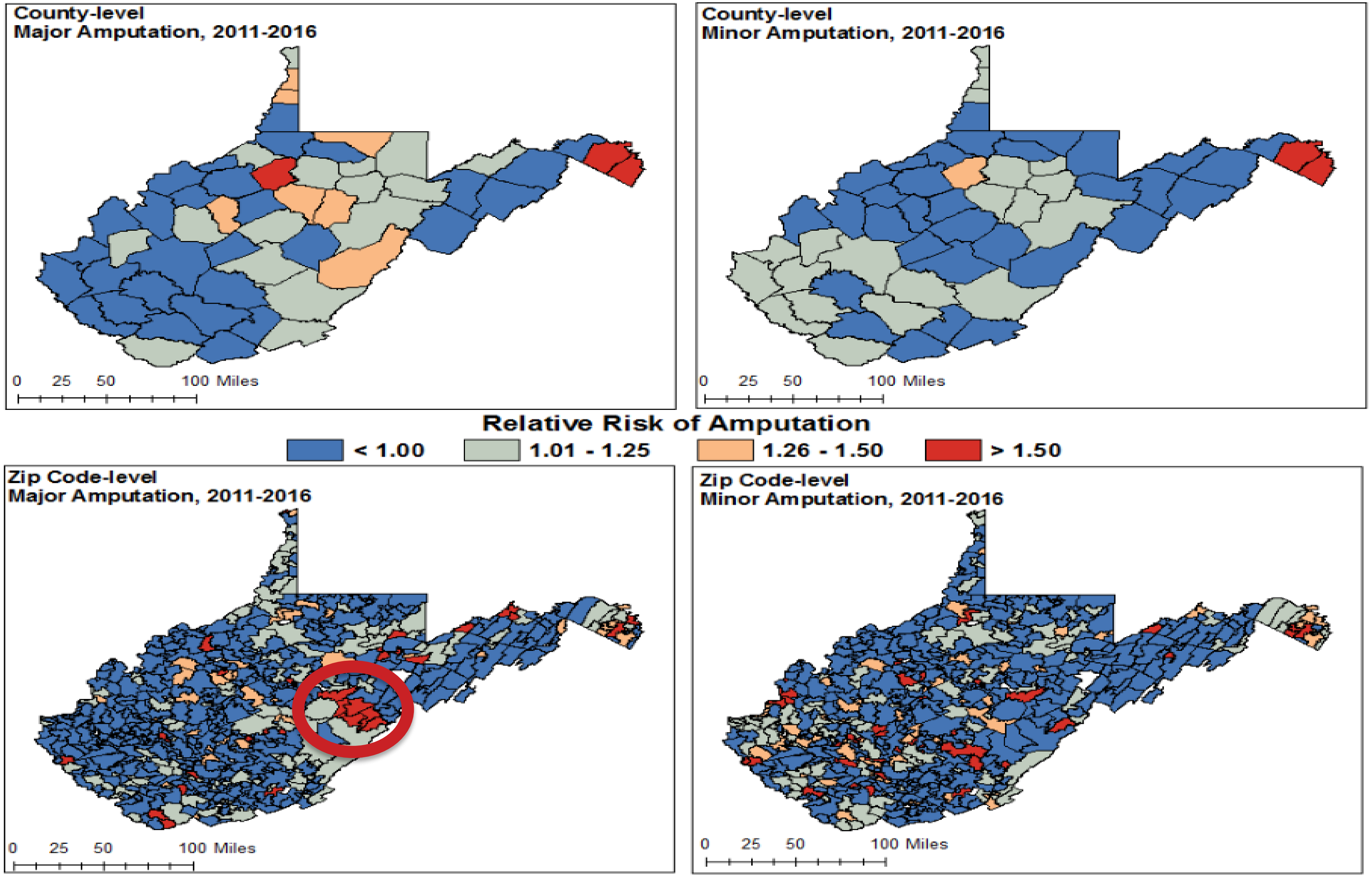


Figure 3. County and zip code level model-fitted relative risk estimates for major and minor amputation, adjusting for covariates.

Minc SD, Hendricks B, Misra R, Ren Y, Thibault D, Marone L, Smith GSS. **“Geographic variation in amputation rates among patients with diabetes and/or peripheral arterial disease in the rural state of West Virginia identifies areas for improved care”.** Journal of Vascular Surgery. 2020 May; 71(5):1708-1717.e5. DOI: 10.1016/j.jvs.2019.06.215.

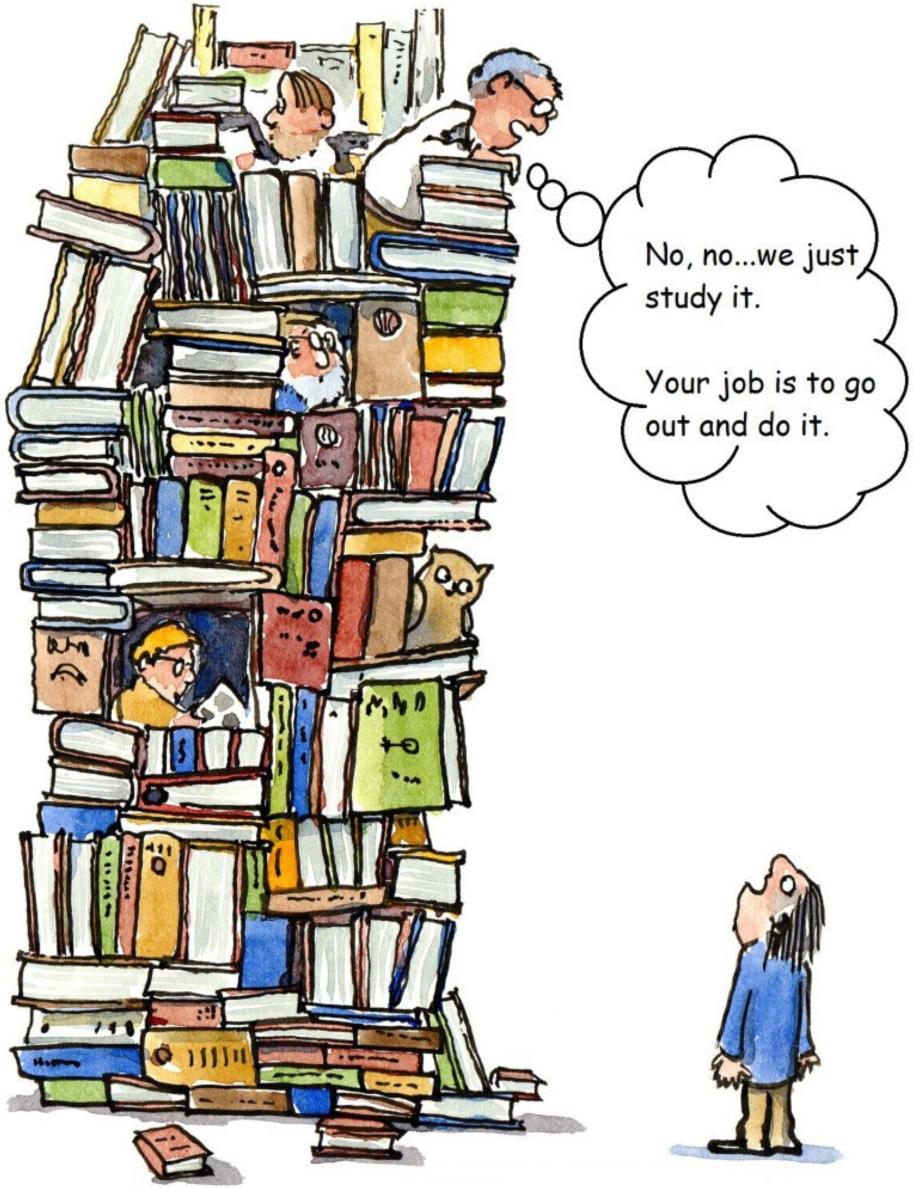
Focus group findings

- Education
  - Provider and patient disconnect
- Access to care
  - Rurality/geographic barriers
  - Care coordination
  - Socioeconomic status
- Non-adherence
  - Communication between patients and providers
  - Cultural barriers
  - Providers felt patients were non adherent due to “hopelessness”
  - Patients felt stigmatized by their disease and didn’t want to follow recommendations so they could feel “normal”

Study Conclusions

- West Virginians are at higher risk for amputation
- There are hot spots across the state that are at higher risk
- Education, geographic and cultural barriers and care coordination are important factors to address to reduce amputation risk in our state

Dissemination of findings and action



https://www.brookings.edu/blog/education-plus-development/2018/01/30/from-ivory-towers-to-the-classroom-how-can-we-make-academic-research-useful-in-the-real-world/

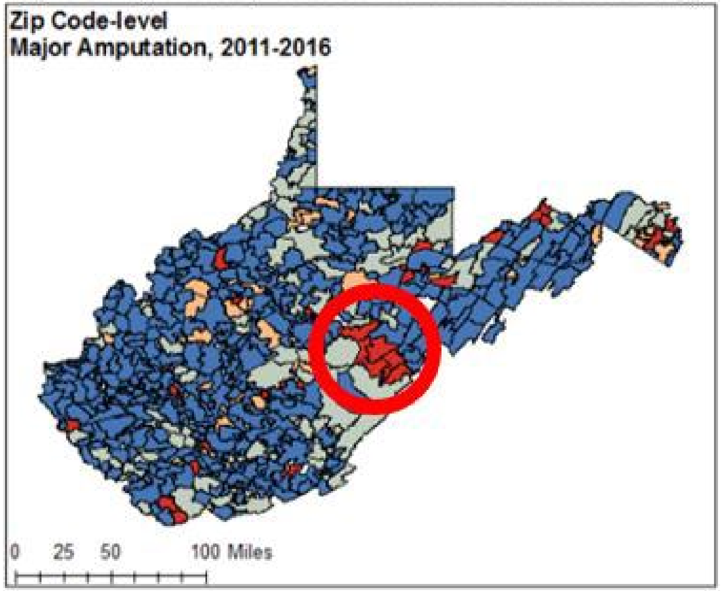
“If health is socially determined, then health issues are best addressed by engaging community partners who can bring their own perspectives and understandings of community life and health issues to a project.”

- McCloskey et al.

Principles of Community Engagement, 2nd edition 2011. Clinical and Translational Science Awards Consortium, Community Engagement Key Function Committee Task Force on the Principles of Community Engagement. Ch. 1. Community Engagement: Definitions and Organizing Concepts.

Pocahontas County (PC)

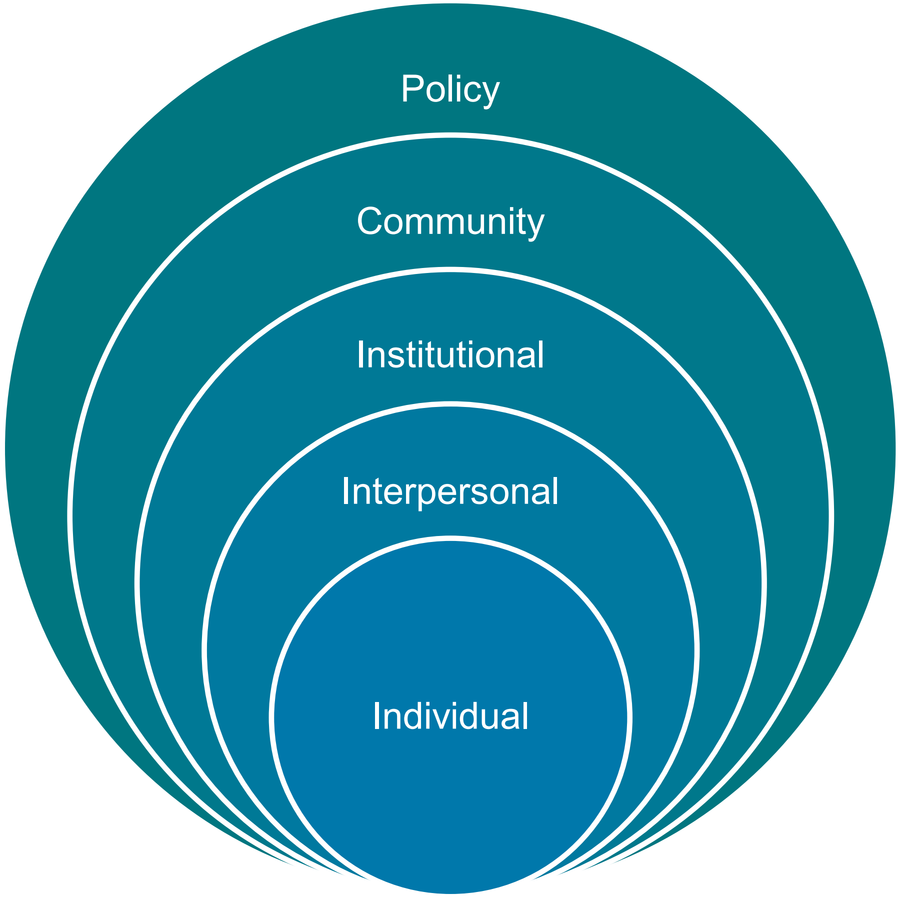
Figure 2. High-Risk Zip Code Cluster near Pocahontas County



- Rural area SE WV, 3.5 hours from tertiary care
- Highly mountainous, 8500 residents
- Higher poverty, CV and DM death rates than US
- Northern and Southern regions designated an MUA
- Healthcare providers
  - 25 bed critical access hospital with FQHC rural clinic, wound care clinic, visiting podiatrist
  - 2 additional FQHC clinics
  - One private practice clinic
- Findings disseminated to community stakeholders and clinicians to garner feedback and support for grant proposal to address amputation

Save a leg, Save a life: A program to prevent amputation in Pocahontas County, West Virginia

- 5 year (2021-2026) NIDDK funded project
- Applying the socioecological model to amputation prevention
  - Approaching the problem holistically
  - Engaging stakeholders and community members at each step


Policy
Community
Institutional
Interpersonal
Individual

Community and stakeholder engagement

- Community Care West Virginia (CCWV) – FQHC
- Pocahontas Memorial Hospital
- Pocahontas Family Resource Network
- Pocahontas Department of Public Health
- Local churches
- Parks and Recreation
- Local providers
- Formed two stakeholder groups – a **Project Advisory Board** of providers and a **Community Advisory Board** of community leaders

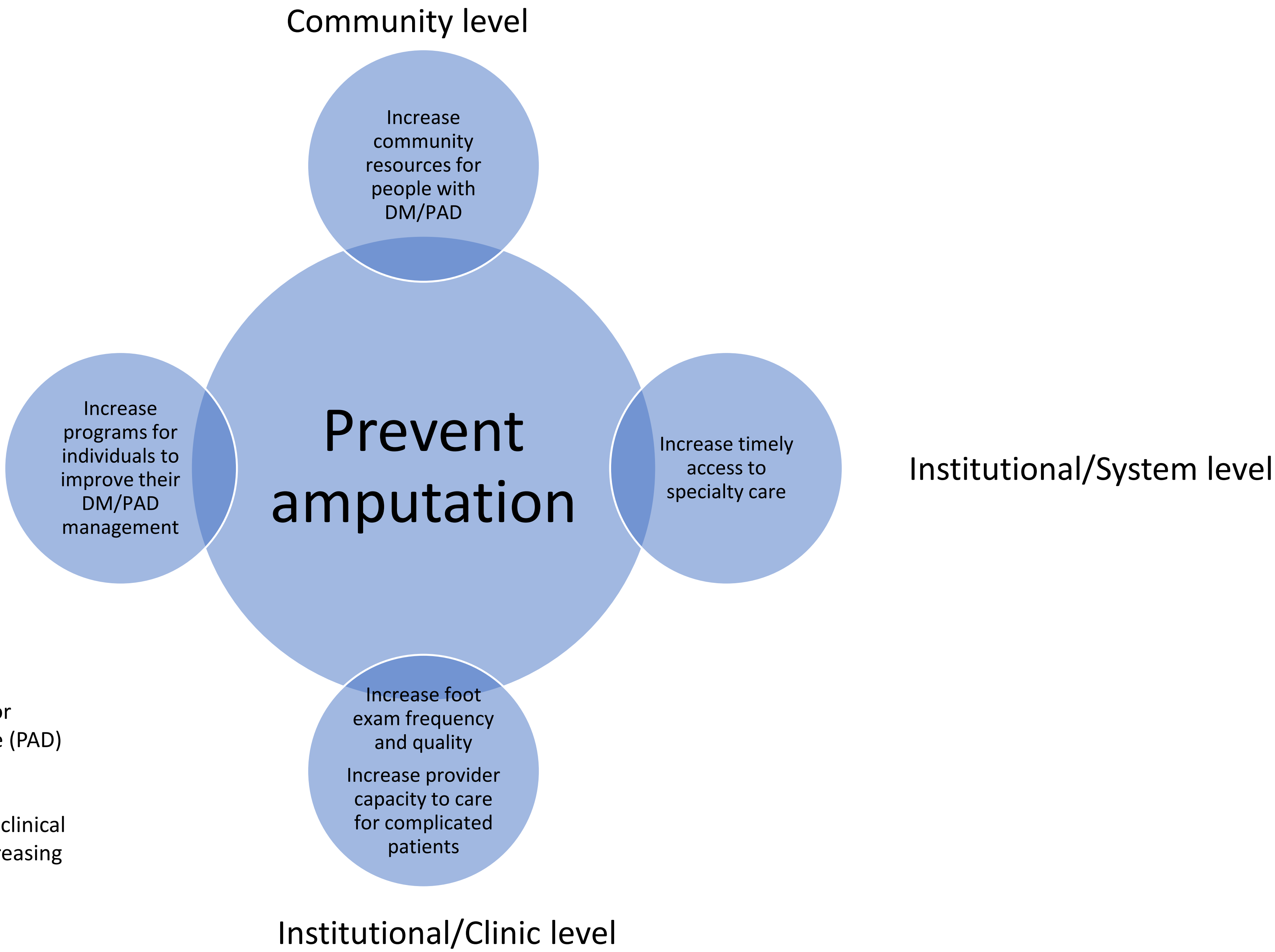
Project Advisory Board Activities

- Quarterly meetings
- Chart review, needs assessment, amputation M and Ms
- Identification and adaptation of current, evidence-based clinical intervention for amputation prevention to the rural clinic setting
- Informed data collection strategy and result interpretation for implementation metrics
- Dissemination guidance

Community Advisory Board Activities

- Monthly meetings
- Needs assessment at the community level
- Organically developed a Diabetes Complication Prevention Coalition focused on activities to enrich community resources for people with diabetes

Program Objectives


Community level

Increase community resources for people with DM/PAD

Individual/Intrapersonal level

Increase programs for individuals to improve their DM/PAD management

Prevent amputation

Increase timely access to specialty care

Institutional/System level

Increase foot exam frequency and quality

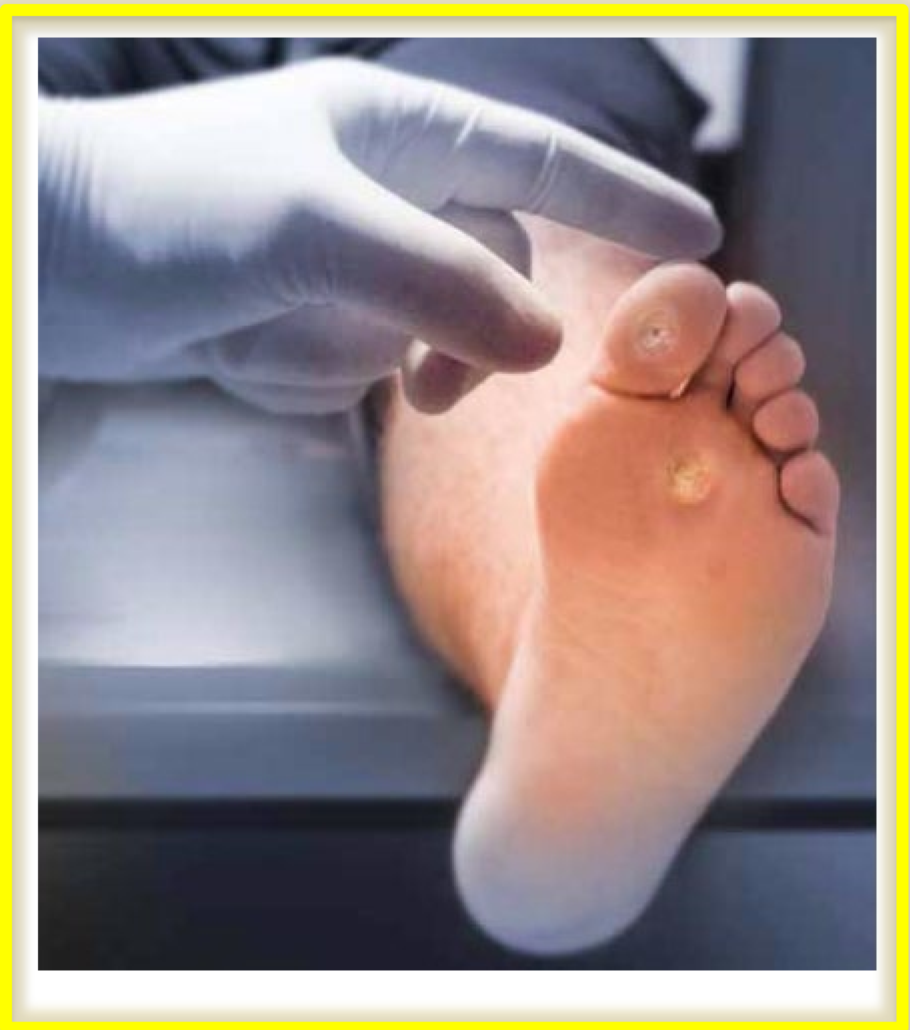
Increase provider capacity to care for complicated patients

Institutional/Clinic level

Long term objective: Decrease amputation rates for people with diabetes and Peripheral Artery Disease (PAD) in the community.

Assumptions: Improving the quality of community clinical care, streamlining access to specialty care, and increasing community access to resources to enable DM/PAD management, will decrease amputation rates.

Clinic and System Level interventions



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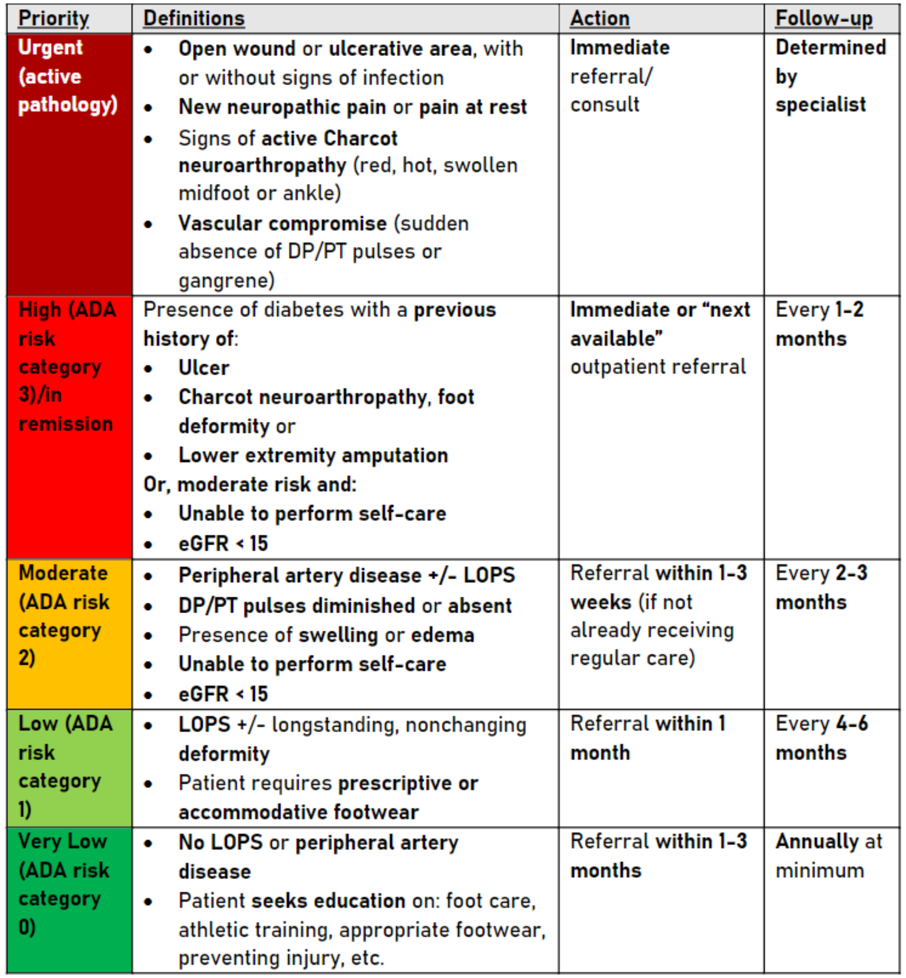
HOTLINE

Foot exam implementation

- Intervention and implementation strategy shaped by chart review findings, guided by Project Advisory Board
- Pre-implementation focus groups performed to individualize strategies to clinics
- In person foot exam/risk stratification teaching sessions
- Fidelity check 2 weeks after roll out
- Careful prospective tracking of implementation metrics
- Meetings with clinic to discuss results at 6 weeks then q3 months
- Post-implementation focus groups at 6 months
- Sustainability tracking 12-18 months

Implementation – Foot exams

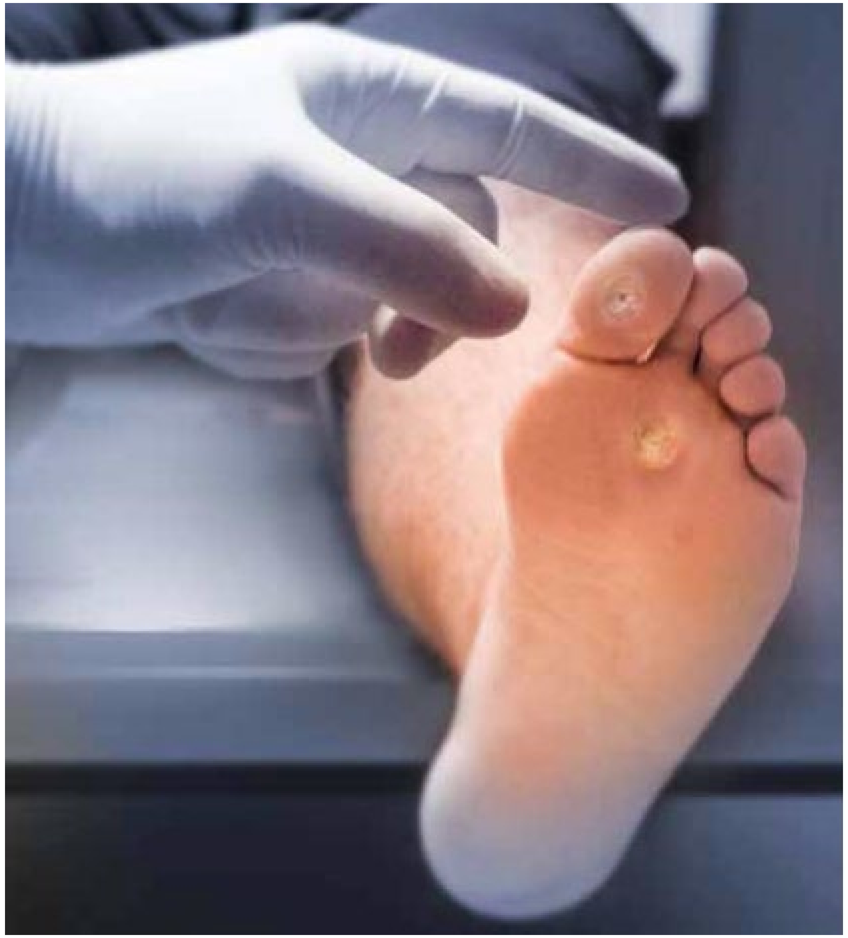


Priority	Definitions	Action	Follow-up
Urgent (active pathology)	• **Open wound** or **ulcerative area**, with or without signs of infection • **New neuropathic pain** or **pain at rest** • Signs of **active Charcot neuroarthropathy** (red, hot, swollen midfoot or ankle) • **Vascular compromise** (sudden absence of DP/PT pulses or gangrene)	**Immediate** referral/ consult	**Determined by specialist**
High (ADA risk category 3)/in remission	Presence of diabetes with a **previous history of**: • **Ulcer** • **Charcot neuroarthropathy, foot deformity** or • **Lower extremity amputation** **Or, moderate risk and:** • **Unable to perform self-care** • **eGFR < 15**	**Immediate or "next available"** outpatient referral	Every **1-2 months**
Moderate (ADA risk category 2)	• **Peripheral artery disease +/- LOPS** • **DP/PT pulses diminished** or **absent** • Presence of **swelling** or **edema** • **Unable to perform self-care** • **eGFR < 15**	Referral within **1-3 weeks** (if not already receiving regular care)	Every **2-3 months**
Low (ADA risk category 1)	• **LOPS** +/- longstanding, nonchanging **deformity** • Patient requires **prescriptive or accommodative footwear**	Referral within **1 month**	Every **4-6 months**
Very Low (ADA risk category 0)	• **No LOPS** or **peripheral artery disease** • Patient **seeks education** on: foot care, athletic training, appropriate footwear, preventing injury, etc.	Referral within **1-3 months**	**Annually** at minimum

Joint display of amputation prevention intervention implementation metrics

Implementation metrics	Baseline n=220	12 Months n=392	% Increase	Qualitative themes	Interview quotes	Meta-inferences
Increase foot exams (anticipated increase 20%)	48.6%	74%	**52%**	Clinic-level Process Changes	“Just the flow is really easy, we’ve made it easy…the team effort is really good…”(S14) "It's in the water now."(S6)	Convergent
				Encountering and addressing patient refusals	"I don’t think [the patients are] as shy now." (S8) “They don’t fight back as much whenever we started laying out wipes... for people to wipe their feet off.”(S11)	
Increase identification of foot abnormalities (anticipated increase 50%)	37.4%	73.8%	**97.4%**	Clinic-level Process Changes	“Prior I hadn't really... framed any of my thinking around...the ADA scale....I like having that structure and that little reference card—I think we all keep it around.” (S6)	Convergent
Increase referrals to specialists (anticipated increase 50%)	6.5%	26.6%	**306%**	Rurality/isolation/lack of specialists	“We have a real problem with travel and people havin’ money and cars…[to] get to specialty appointments” (S1) "We don’t have the specialties here… we can only do so much.“ (S14)	Divergent
				Encountering and addressing patient refusals	“I’ve been a little bit surprised by…the nervousness of people literally to just cross the mountain” (S6)	

Clinic and System Level interventions



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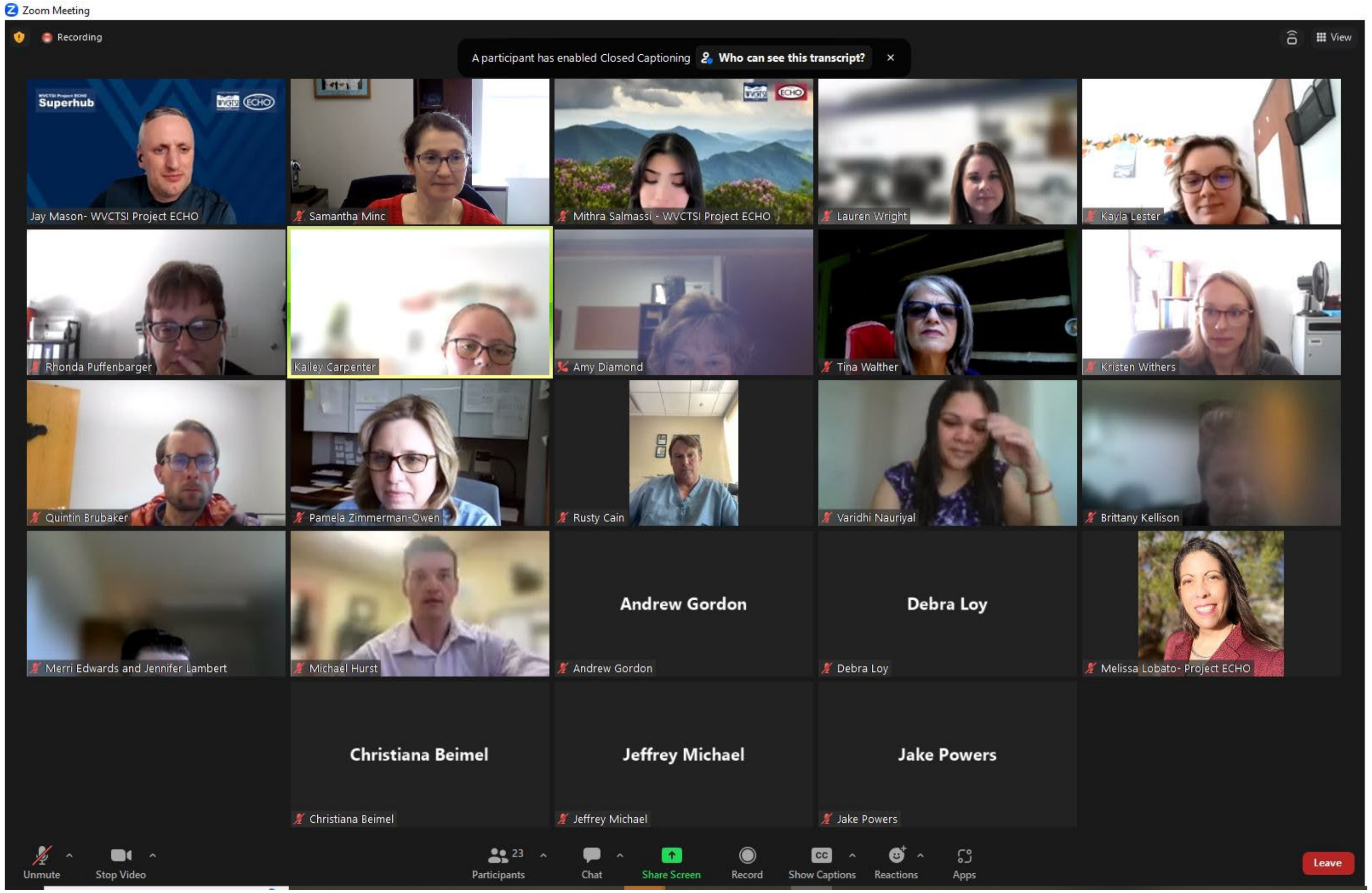
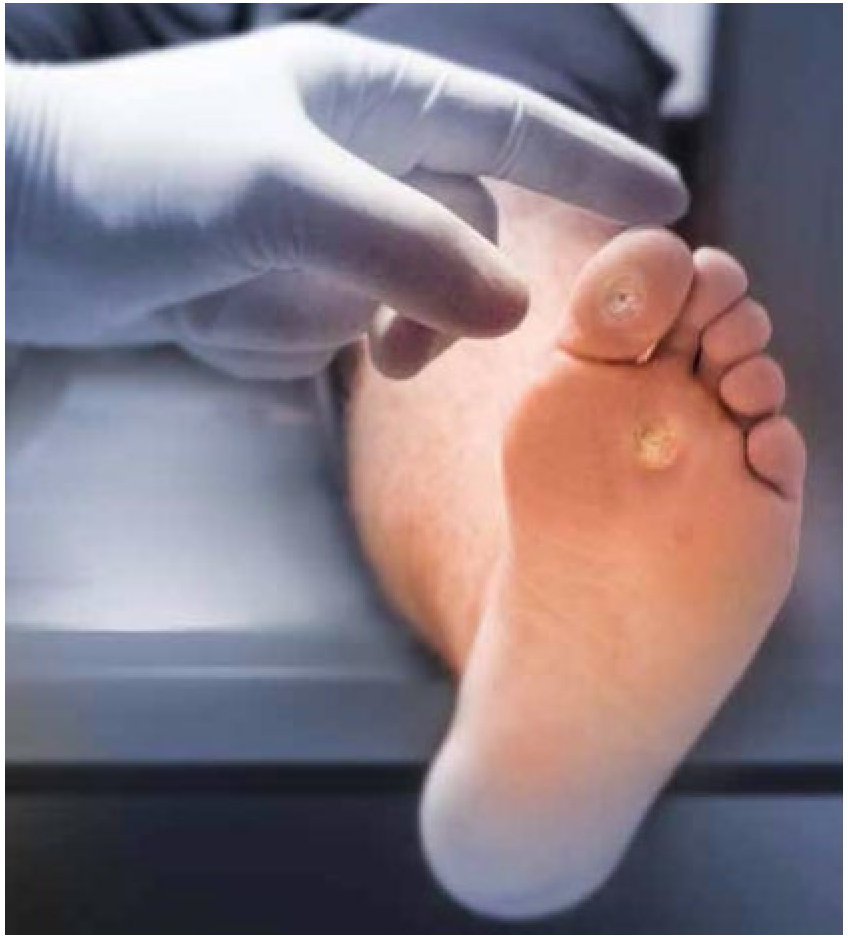
Project ECHO – improve PCP capacity to manage complex limb patients – bring multidisciplinary care to the community


A participant has enabled Closed Captioning

Date	Speaker	Topic
7/18/2023	Samantha Minc	Intro to Project ECHO and Overview of Project
8/15/2023	Kathryn Bosia	Podiatry: The Diabetic Foot, Diabetic Neuropathy, and the Etiology of Diabetic Foot Wounds
9/19/2023	Samantha Minc	PAD Basics for the Primary Care Provider
10/17/2023	Ranjita Misra	Behavioral Tools for the Primary Care Provider
11/14/2023	Amy Diamond	The Basics of Assessing a Foot Wound with a Focus on Diabetes and PAD
12/19/2023	Michael Hurst	Diabetic Foot Ulcers—Conservative and Surgical Treatment
1/16/2024	Pamela Zimmerman	The Role of Vascular Surgery in Limb Preservation
2/20/2024	Amy Diamond	Managing Complex Diabetic Foot Wounds
3/19/2024	Varidhi Nauriyal	Infectious Disease Considerations when Managing a Chronic Foot Wound
4/16/2024	Addison and Jennifer Michael	Complex Limb Reconstructions: Amputation Planning and Level
5/21/2024	Josette Batsenikos	Recipes for Managing Venous Ulcers and Other Common Wounds in a Primary Care Setting
6/18/2024	SME Hub	Multidisciplinary Limb Preservation Team

Clinic and System Level interventions



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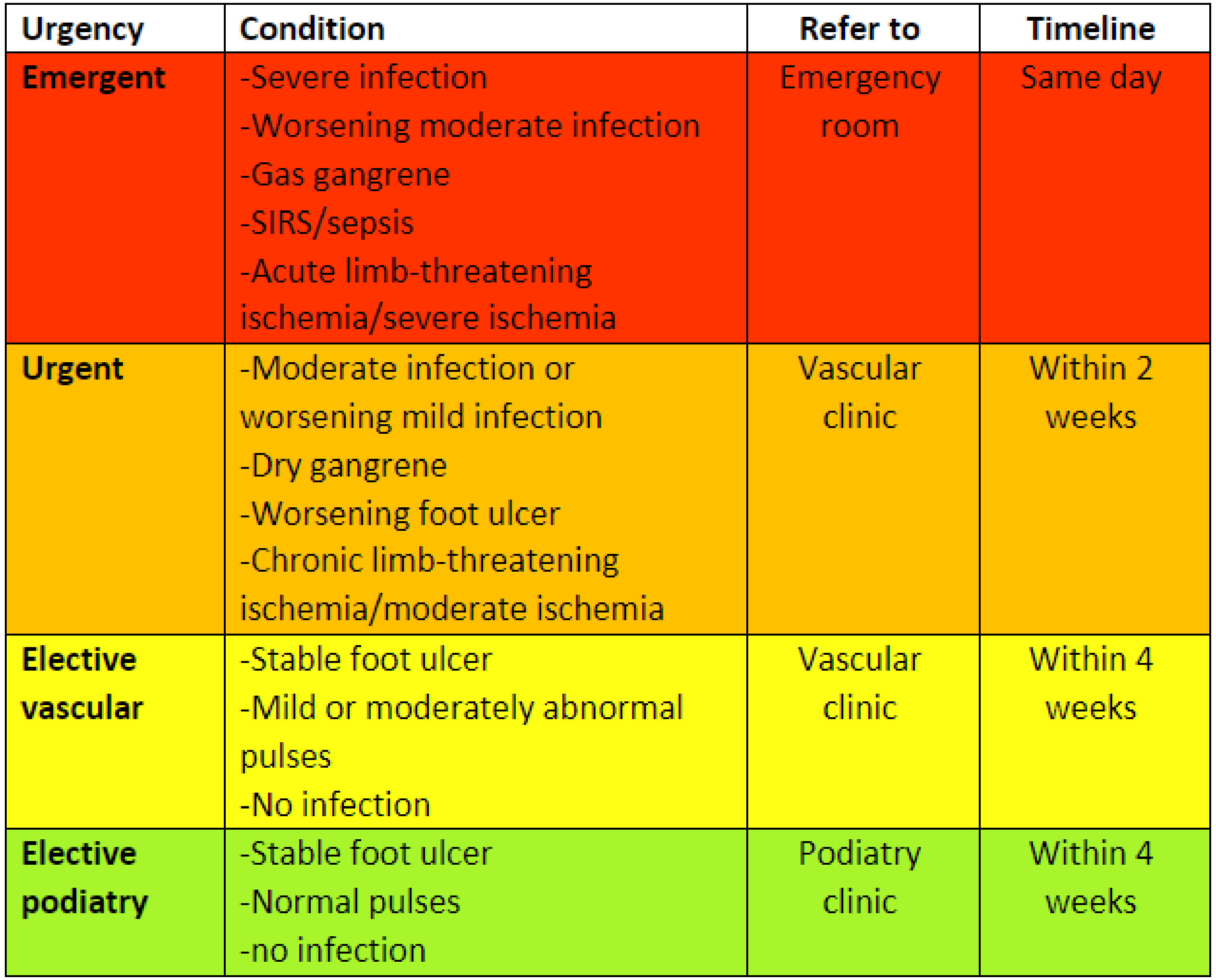
HOTLINE

Hot foot Hotline

- Specialty nurse “script”/smartphrase
- Based on WIfI criteria
- Triage algorithm based on models created during COVID



Urgency	Condition	Refer to	Timeline
Emergent	-Severe infection -Worsening moderate infection -Gas gangrene -SIRS/sepsis -Acute limb-threatening ischemia/severe ischemia	Emergency room	Same day
Urgent	-Moderate infection or worsening mild infection -Dry gangrene -Worsening foot ulcer -Chronic limb-threatening ischemia/moderate ischemia	Vascular clinic	Within 2 weeks
Elective vascular	-Stable foot ulcer -Mild or moderately abnormal pulses -No infection	Vascular clinic	Within 4 weeks
Elective podiatry	-Stable foot ulcer -Normal pulses -no infection	Podiatry clinic	Within 4 weeks

Community Coalition Activities

Needs identified:

- Access to specialists, diabetes education and awareness of community resources, medication costs, transportation to clinic, food accessibility

Outputs:

- Community diabetes resource guide
- Diabetes support group – 20-40 members meet monthly
- Eye event– 89 eye exams 41 at risk patients for foot complications identified – foot screening planned for April 2024
- Food insecurity screen, Project FARMacy – funding and set up
- Church exercise group

Board leadership being transitioned fully to the community

Food insecurity project

Summer Menu

What can I cook for my family that is healthy and affordable?

A menu made for you:
Pocahontas County residents,
with affordability, accessibility,
and health in mind.

Made by: Jordyn O'Dell
In partnership with WVU Medicine

Farmacy

Culinary medicine program partnership with diabetes support group

Next steps: Disseminate and Size up!

- Dissemination plan – both academic and community level
- Identify additional partners in high-risk areas across the state
- Identify additional environments and communities experiencing amputation disparities to implement the project framework

Conclusions

- Amputations are a marker for inequities related to access to care, quality of care and the social drivers of health
- West Virginians face significant health disparities that increase their risk for amputation
- A limb preservation program that focuses on empowering communities and improving care at multiple levels is most likely to be successful
- Engaging community members and stakeholders at all steps of a program is critical for effective, sustainable initiatives

Acknowledgments

PARTNERING FOR BETTER HEALTH

WVCTSI

West Virginia
Clinical and Translational Science Institute

West Virginia University
SCHOOL OF PUBLIC HEALTH

Community Care
of West Virginia

Pocahontas County
family
Support Center

THANK YOU!

Questions?

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Twitter: @SamanthaMinc

Getty Images

Discussion topics

- What are the most significant barriers you face in trying to prevent amputation in your patient populations?
- If you could be given anything you wanted to prevent amputation, what would it be?

Pocahontas County Amputation Prevention Program Summary

Program Objective	Level of Focus	Activity	Process Measure	Outcome Measure
1. Increased foot exam frequency and quality	Clinical	Foot exam implementation	QUAN Number of foot exams performed, Number of complete foot exams performed, number of abnormalities identified, number of referrals to specialists	Number of ED visits for foot complications, Number of hospitalizations for foot complications, Number of foot ulcers occurring, Number of amputations occurring
2. Increased provider capacity to care for complicated patients	Clinical	Project ECHO Hot Foot hotline	QUAN Evaluation/survey QUAL Clinic focus groups	
3. Increased timely access to specialty care	Clinical	Project ECHO Hot Foot Hotline	QUAN Increased referrals to specialists Decreased time from referral to specialist visit	
4. Increased community resources for people with DM/PAD	Community	Community coalition	QUAN Number of resources available QUAL Focus groups discussing perceptions of available resources and what are available that weren't before	Numbers of ED visits and hospitalizations for DM-related complications in the community
5. Increased local programs for individual DM/PAD management	Individual	Community coalition	QUAN Number of DM management programs QUAL Focus groups of program users to discuss quality of programs and usefulness	