Prevention and Management of Diabetic Foot Ulcers and Amputations

Ranjita Misra, PhD, FASHA, FESG
Professor &
PhD Program Director
WVU School of Public Health
West Virginia University

Learning outcome

- ✓ Importance of primary and secondary prevention for addressing diabetes complications – DFUs and amputations.

- ✓Behavioral screenings

Overview

- ✓Prevalence, disability, and lower extremity amputation
- ✓Factors that impact behavior and wound healing
- ✓Education and clinical assessments to treat wounds
- ✓Behavioral tools - screening, education, referrals
- ✓Importance of prevention education and counseling
- ✓Multidisciplinary approach

Introduction

- ✓Diabetic foot ulcer (DFUs) is associated with 47% increased mortality and 85% diabetes-related amputations in patients.
- ✓Contributes to disability and reduced quality of life.
- ✓Many factors impede DFU healing.
- ✓DFU healing is not homogenous - minorities and rural patients have a higher rate of treatment failure and amputation.
- ✓Guide for clinicians to tailor patient treatment and educational programs.

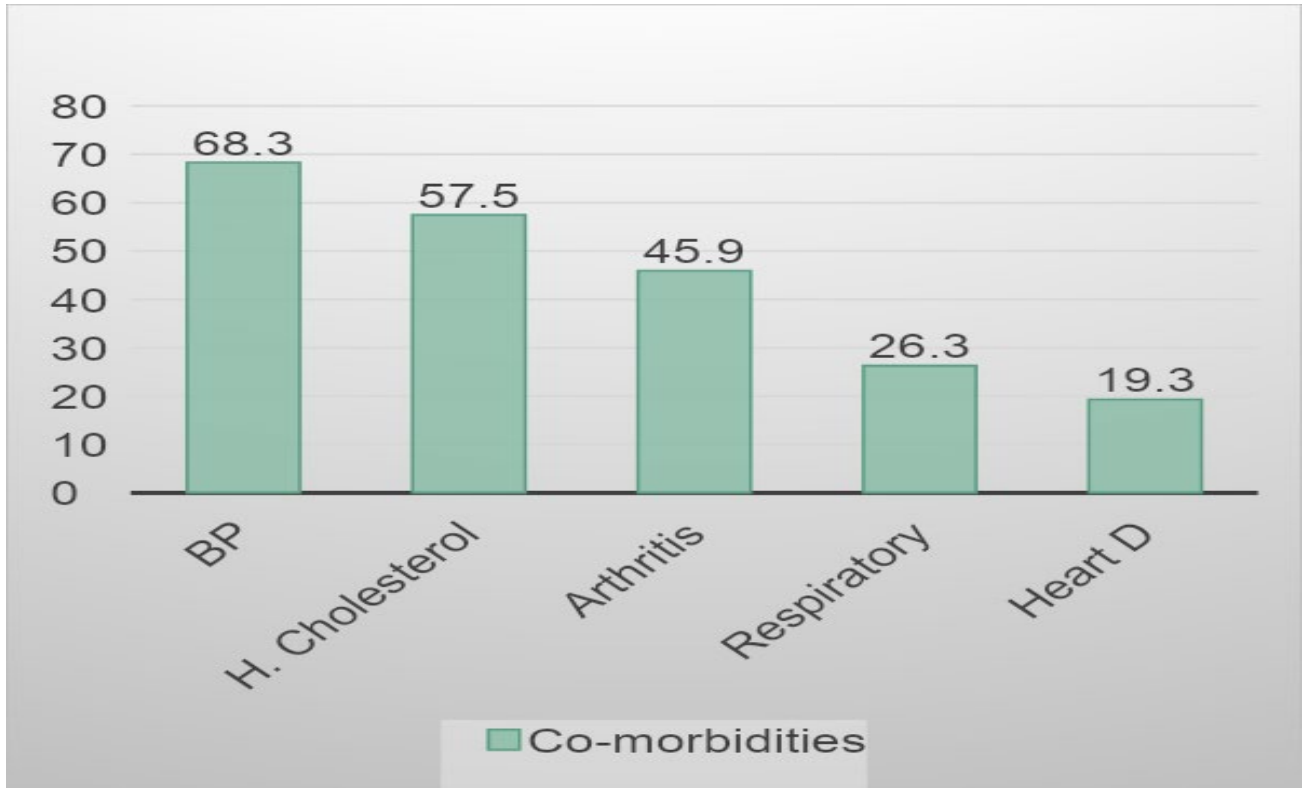
“We have become not a melting pot but a beautiful mosaic. Different people, different beliefs, different yearnings, different hopes, different dreams.”

(*Jimmy Carter, n.d.)*

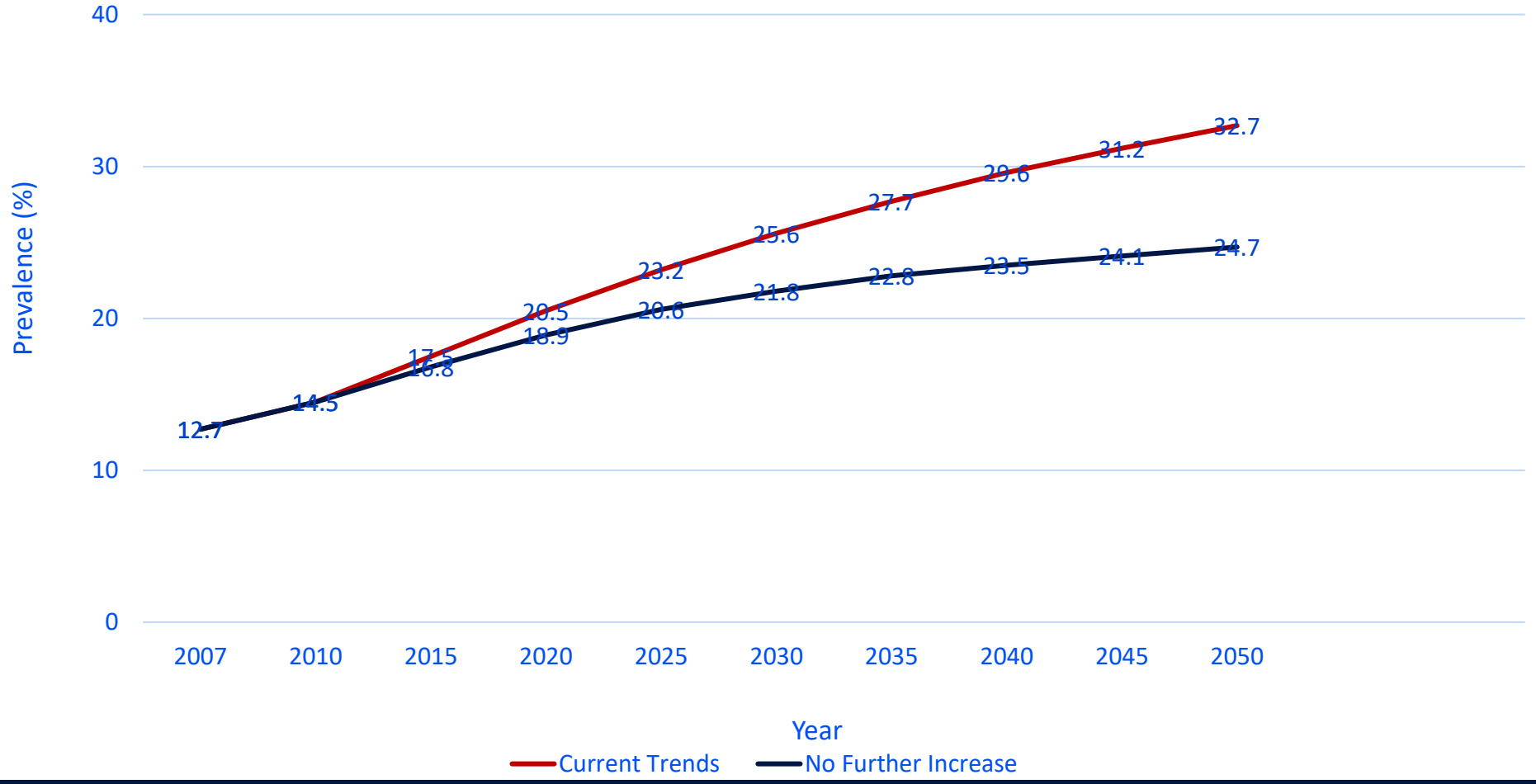
Chronic Diseases and Multimorbidity in WV

- **Diabetes**
- Hypertension
- Heart disease
- Stroke
- Cancer
- Multimorbidity

WV Survey of 1850 Patients with Diabetes



Projected *Prevalence* of Diabetes (Diagnosed or Undiagnosed) Under Scenarios of No Further Increase Continued Increased Incidence Rate



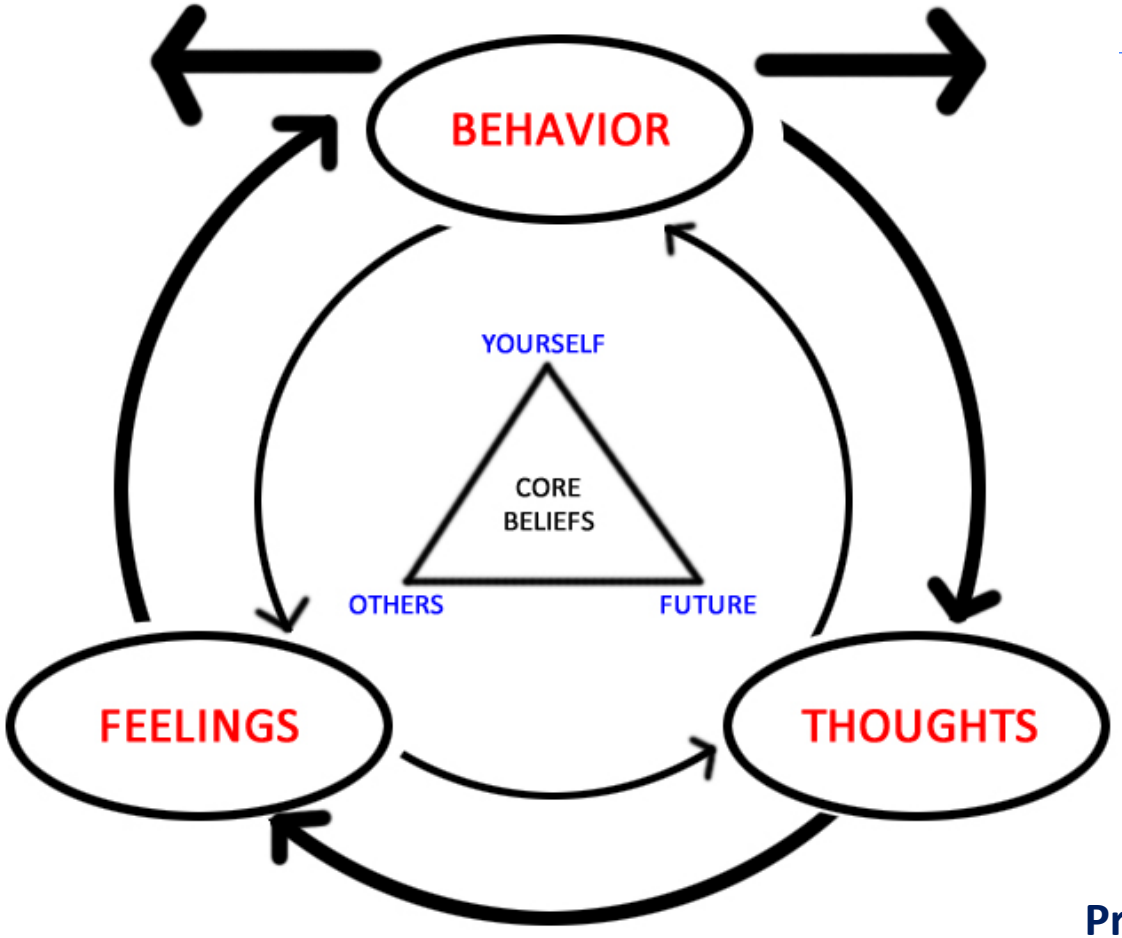
Boyle et al., Pop Health Metrics, 2010

Prevention and Management of Diabetic Foot Ulcers and Amputations

Challenges to Amputations

- Patient knowledge
- Beliefs, health literacy and self-care
- Social and psychological well-being
- Stress and distress
- Body image and self-esteem
- Social isolation and mental health issues
- Coping – stages of grief

Non-Healing Wounds, Self-Care & Amputation Prevention



Primary and Secondary Prevention:

Differential DFU healing rates
NHW vs African-American patients

- ✓ Two out-patient, hospital-affiliated, Comprehensive Wound Center that provides advanced outpatient wound care for 16 weeks.
- ✓ Data were abstracted from patient charts at the Ohio State University's Comprehensive Wound Center (CWC).
- ✓ N= 1003; 36% had DM; 108 DFU patients (without palliative care)

Methodist HEALTH SYSTEM

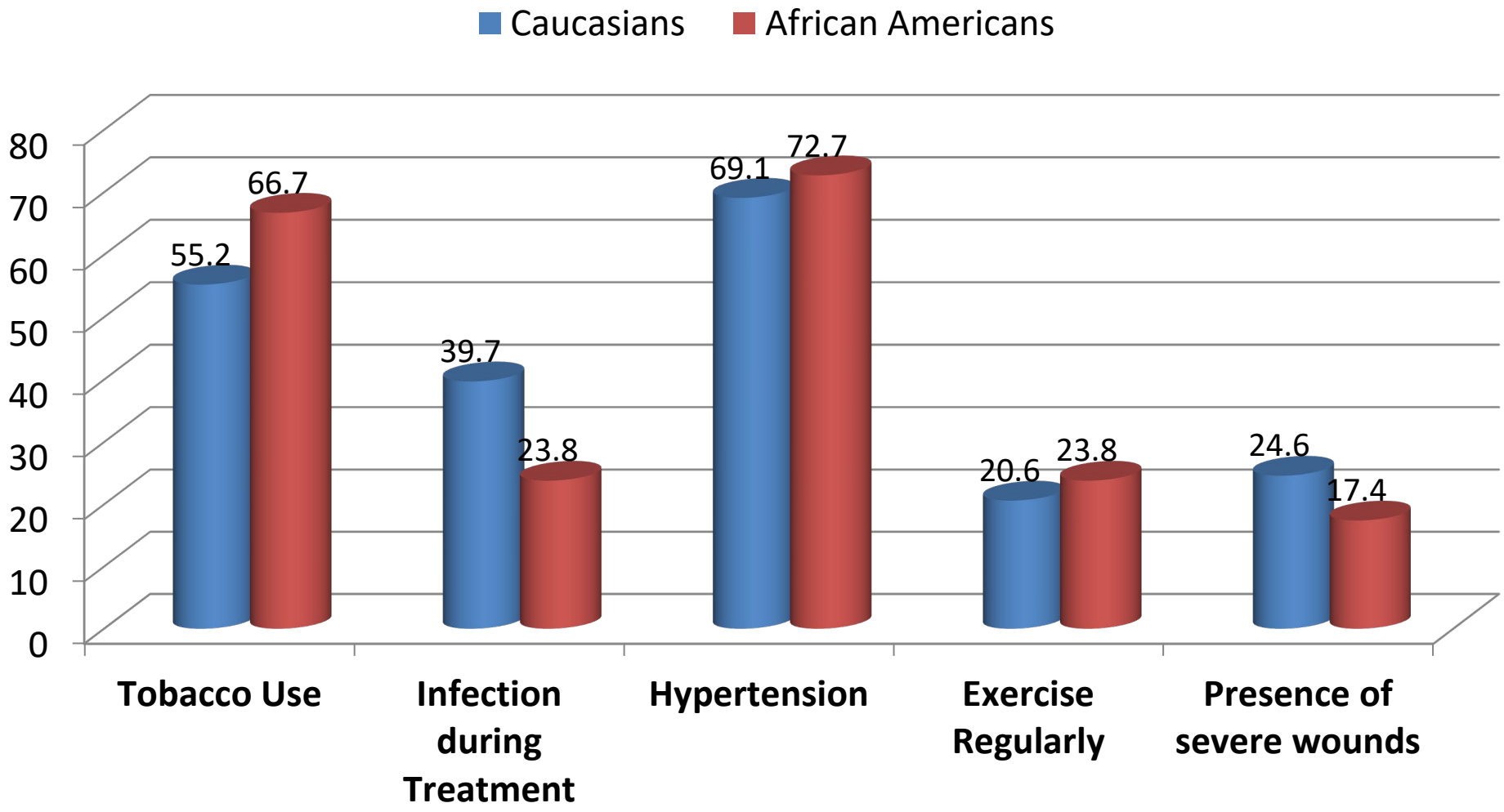
THE OHIO STATE UNIVERSITY

National Healing

Data

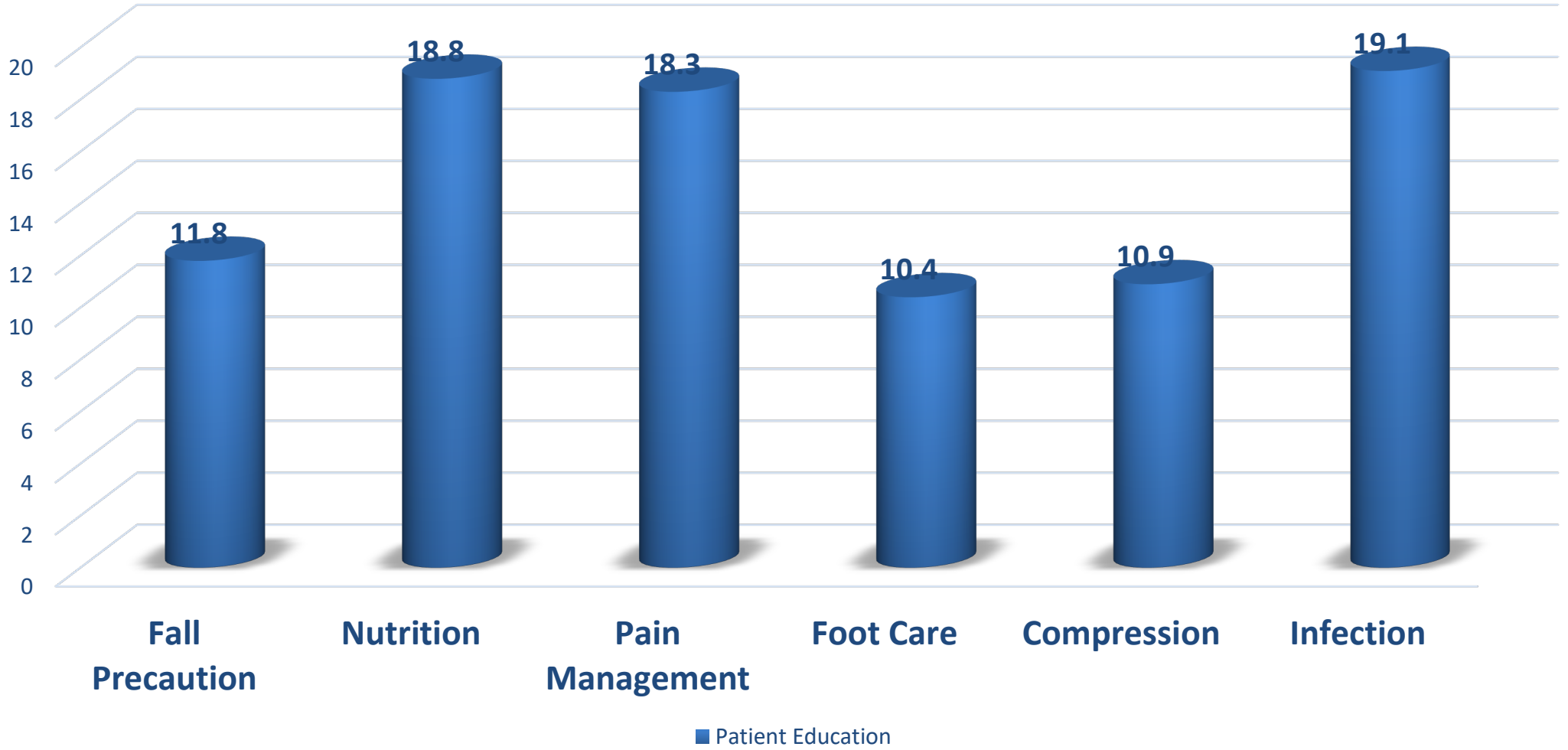
- ✓ **Patient demographics –** patient education provided during treatment.
- ✓ **Wound Healing rates** – percent of area/volume of the wound during the treatment period (4, 8, 12 and 16 weeks). Dichotomized into healed or not healed.
- ✓ **Clinical measures** – number of wounds, wound age, size of the wound, debridement frequency, stage/grade, pain, and infection.
- ✓ **Health behavior and knowledge**–tobacco use, diet and physical inactivity. Health knowledge and religious beliefs, health literacy.
- ✓ **Malnutrition** - pre-albumin, albumin
- ✓ **Metabolic control and inflammation** – HbA1c, CRP etc.
- ✓ **Comorbidities** – obesity, hypertension

Demographic Characteristics



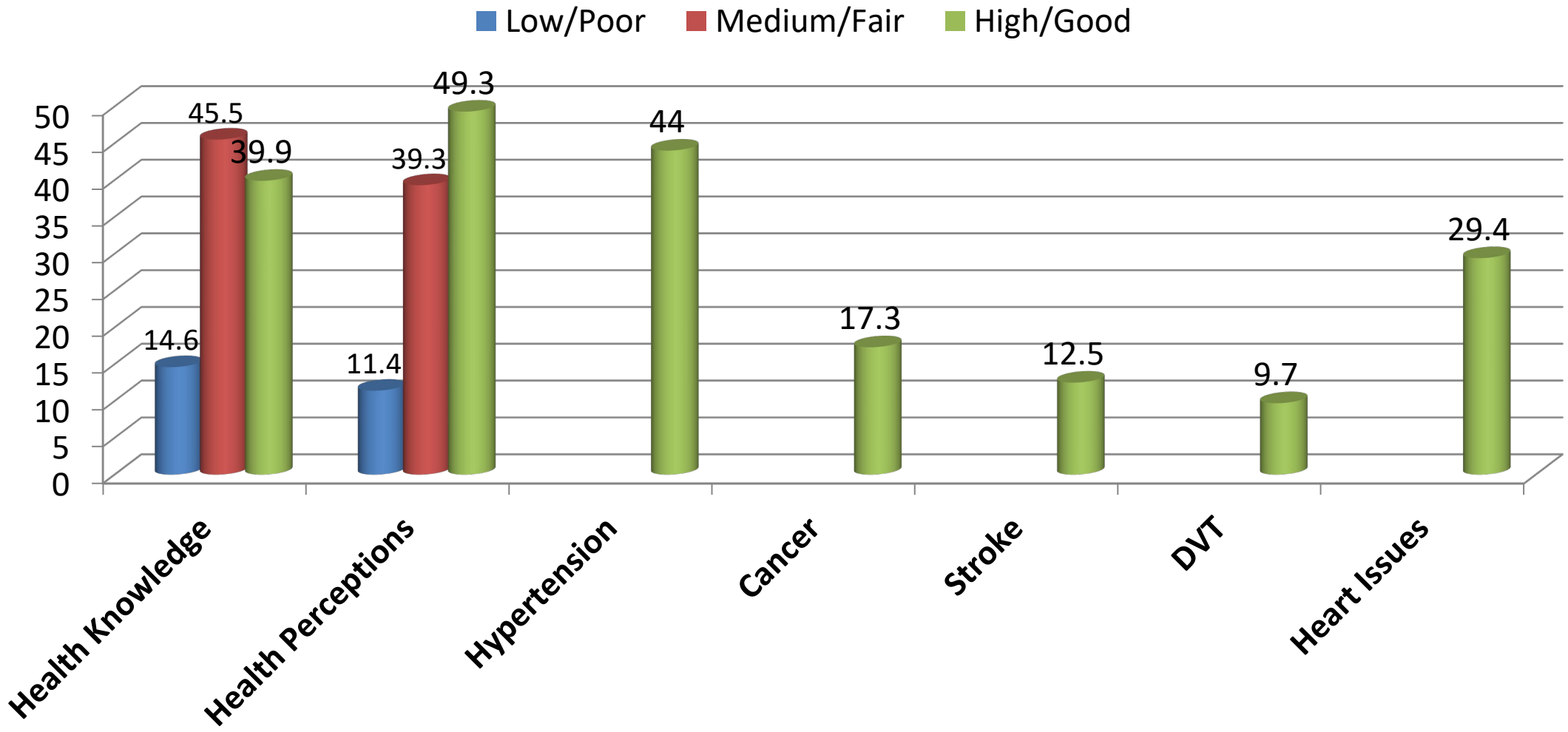
*** Number indicated percentages within Racial/Ethnic groups**

Patient Education



** Number indicated percentages*

Patient Knowledge & Perceptions

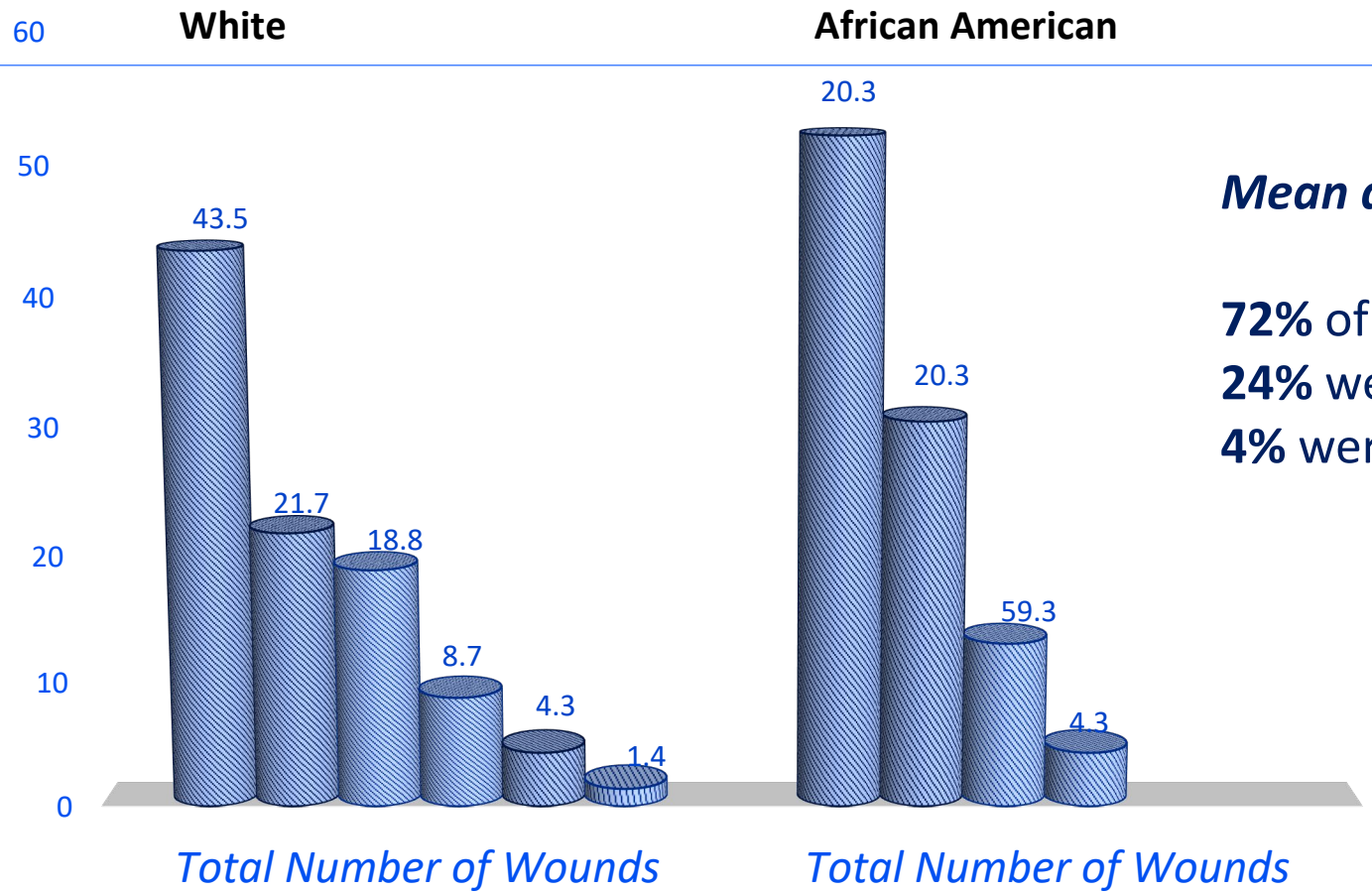


** Number indicated percentages within Racial/Ethnic groups*

Assessment of Malnutrition

- ✓ Low serum prealbumin level is an indicator of malnutrition and is associated with delayed healing, infection and inflammation.
- ✓ Mean serum prealbumin was 20.1±8.2mg/dL; 27.5% of patients had <16 mg/dL, a sign of malnutrition.
- ✓ Patient education included nutrition, foot care and infection.
- ✓ Health knowledge and religious beliefs, health literacy.
- ✓ Mean HbA1c was 7.5± 2.1
- ✓ **Inflammation** – 90.2% had high CRP levels of >10 mg/dL
- ✓ Patients with low prealbumin levels had significantly poor appetite, poor knowledge of their health problems, higher inflammation (CRP level) and infection ($p<0.05$).
- ✓ Patients with low prealbumin received nutrition education (P=.05).

Total Number of Wounds



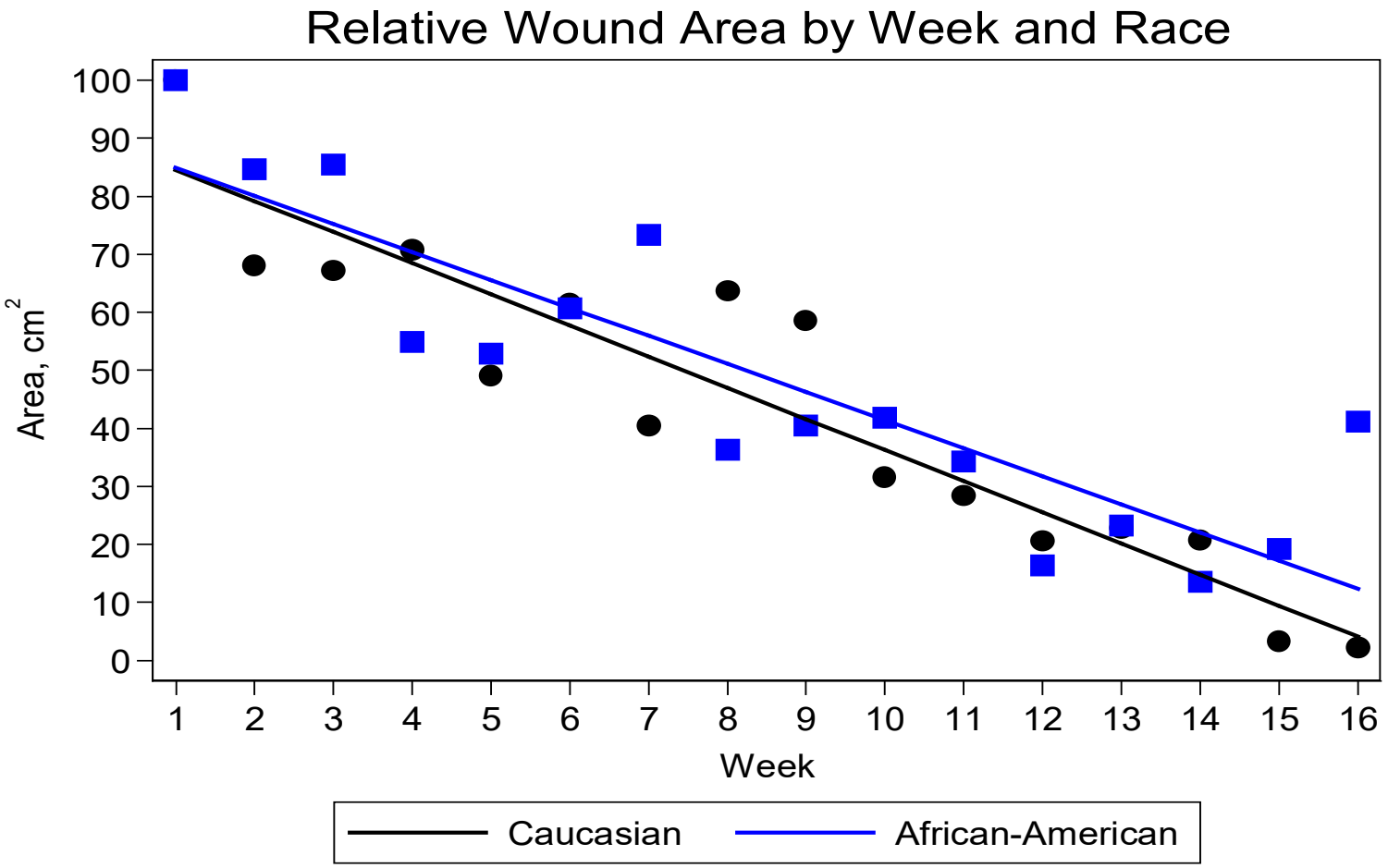
Mean = 2.29±1.8

1.7± 0.9

Mean age = 58.1±11.5 years

72% of the wounds were diabetic neuropathic
24% were diabetic non-neuropathic wounds
4% were Pressure/trauma wounds

Figure: AUC (Wound Area) by Race



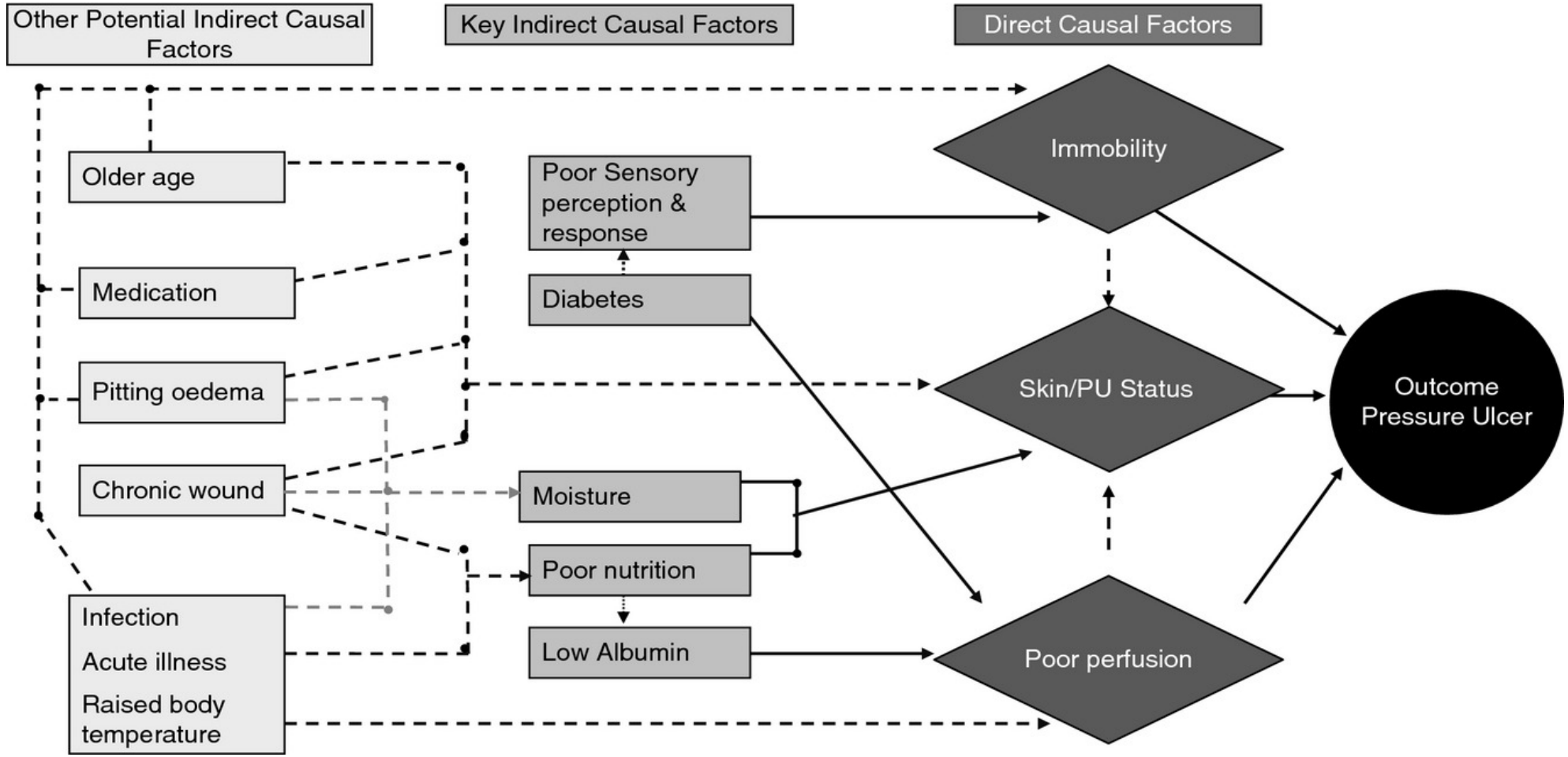
- ✓ Wound age and stage were associated with wound healing rate (r=0.24, p=.002 and r=.18, p=.05).
- ✓ African Americans had a slower healing rate than NHWs (*p*-value=0.20)

Takeaway Message

- ✓ Differential healing patterns of DFU patients.
- ✓ Healing rates were dependent on underlying patient factors: compliance, knowledge, malnutrition, inflammation, infection, pain, comorbid conditions, and older age that could contribute to the disparity in wound healing and amputation rates.
- ✓ Practical significance - tailored patient education/treatment.
- ✓ Patient education can improve health knowledge, and understanding of disease treatment and wound self-care among high-risk individuals.

Pre- and Post-Amputation Management Considerations – Role of providers

- Helping patients with preparation
- Acceptance (e.g., body image) to reduce the distress
- Pain management and infection control
- How to cope with stress and distress
- Counseling for self-care (diet, PA, medication adherence, A1c)
- Interdisciplinary team approach
- Referrals (e.g., psychologist) if necessary



Pressure Ulcer - Theoretical Framework

Journal of Advanced Nursing, Volume: 70, Issue: 10, Pages: 2222-2234, First published: 31 March 2014

Behavioral Assessments - Patients with Chronic Wounds

"You need to incorporate some stretching into your fitness routine, so I glued all of your snacks to the ceiling!"

- ✓ Psychosocial factors and health behavior
- ✓ Where do people get their health knowledge and information?
- ✓ Clinic visits to address patient issues pre- and post-surgery/ treatment/amputation
- ✓ Barriers to adherence and social support.
- ✓ Assessments of nutrition, self-care & health literacy – patient counseling can be tailored.
- ✓ Compliance with diabetes and wound self-care.

Compliance with Diabetes Self-Care

- ✓ ***Summary of Diabetes Self-Care Activities*** *(diet, PA, BG monitoring, medication adherence).*
- ✓ The eight-point scale (0-7) assessed weekly core self-care activities.
- ✓ Diabetes self-care (Diet) = 3.6±1.7; Exercise = 2.4±2.1 (range 0-7 days). **Interpretation**: Better dietary adherence than exercise behavior. However, both need improvement.
- ✓ Participants reported **greater adherence to BG monitoring** followed by diet and exercise.
- ✓ **Multivariate analysis** showed HCP dietary advice and BG monitoring recommendation was positively associated with participant's adherence to a healthy diet (p =.05) and regular monitoring of their BG (p=.003).

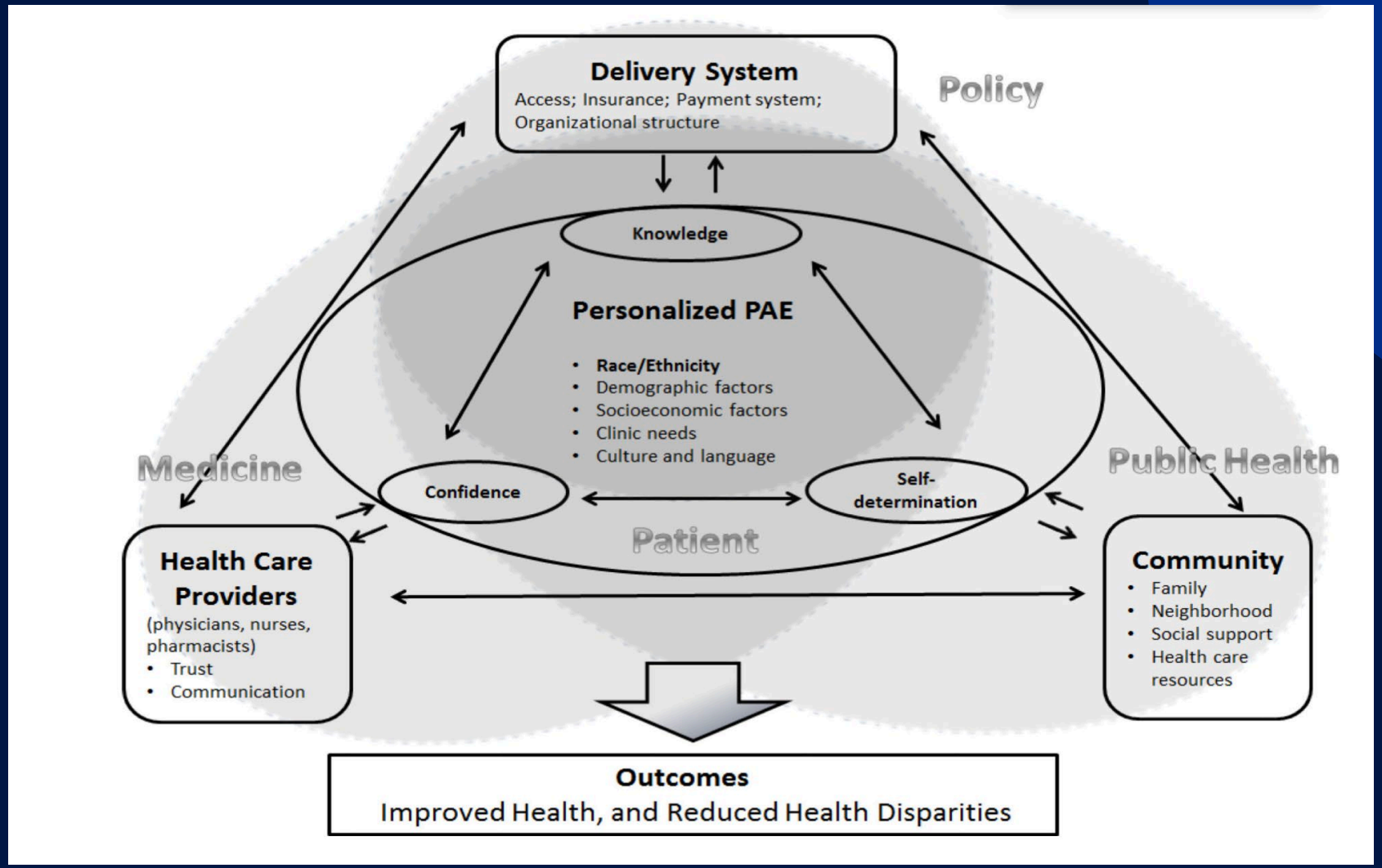
Misra et al (2022). *Relationship Among Diabetes Distress, Health Literacy, Diabetes Education, Patient-Provider Communication and Diabetes Self-Care*. American Journal of Health Behavior 2022; 46(5):528-540.

Five-year Trend Diabetes Clinical Care and Self-Management 2010-2014

- ✓ ***BRFSS -*** Five-year trend in recommended diabetes clinical care, diabetes self-management activities, and diabetes education.
- ✓ A significant increase in the percentage of adults with 2 or more A1C tests was noted from 2010 (63.6%) to 2014 (76.4%) in WV.
- ✓ However, annual eye exams decreased by 7% (71.1% to 63.1%) and no statistically significant changes were noted in annual foot exams (~ 69%), number of physician visits and diabetes self-management behaviors.
- ✓ Diabetes education was 44% and 49% in both years.
- ✓ Need to identify barriers and strategies to overcome these barriers.

Misra et al (2019). *Five-year Trend in Diabetes Clinical Care and Self-Management among Adults with Diabetes in West Virginia: 2010-2014*. Journal of Health Disparities Research and Practice. Volume 12, Issue 1, Spring 2019, pp. 19.

Personalized Patient Activation and Empowerment (P-PAE) Framework



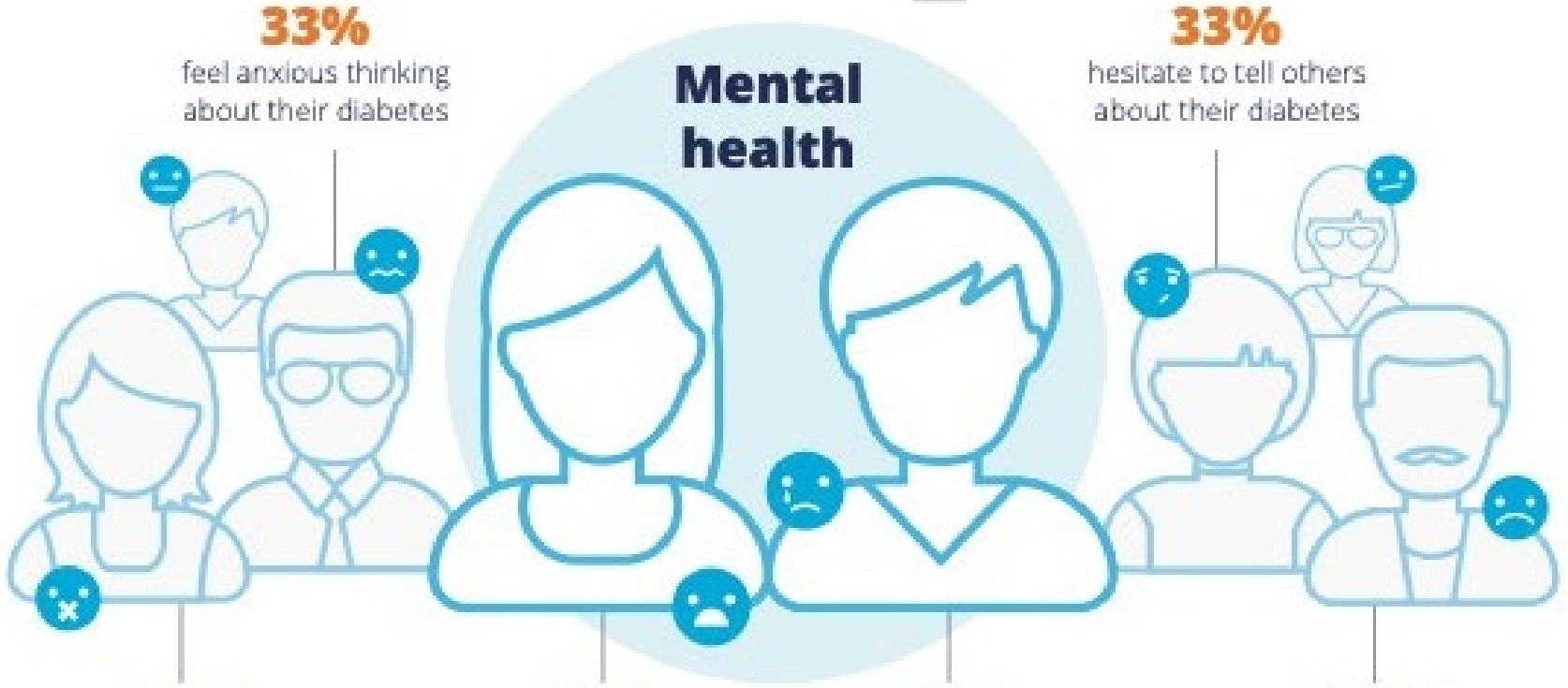
Considers patient activation and empowerment as a cyclical process of patient accumulation of knowledge, confidence/self-efficacy, and self-determination in their own health and health care

Patient-Provider Communication

- ✓ ***Supportive Provider*** *–"My primary care physician is unusually attentive from what you find from most doctors. He's so patient and so thorough. He's like, 'Let's try something else.' And I'm looking around and I said, 'Well, what about this, this, or this?'....So, he kind of listens to me." – P13.*
- ✓ ***Patient Empowerment*** *through Diabetes Education*- "I didn't really used to talk to [my providers] about my A1c levels and all that. I didn't talk about sugar and things like that. So, [the DHSMP] helped me to ask more questions… Like, why am I taking this drug? Or should I be changing to a different drug?" – P8
- ✓ ***Providers' Focus on 'Numbers' Rather than Patient Concerns*** *- "[Providers] work on "get your numbers down," that's all they do. You go see a doctor and it's diabetes, what do I got to do? 'Oh, you got to have Metformin, you got to have insulin, get your numbers down, lose some weight.' That doesn't do it. They really don't know how to fix the disease and they don't want to admit it…They just think, "Oh, her numbers' okay, I don't need to go on about researching it." – P9*

Diabetes and mental health are connected.

Being diagnosed with diabetes and then living with its demands often leads to anxiety and stress. People with diabetes experience stigma and discrimination at work, school and in public places. Those with mental health conditions are also at higher risk for developing diabetes.

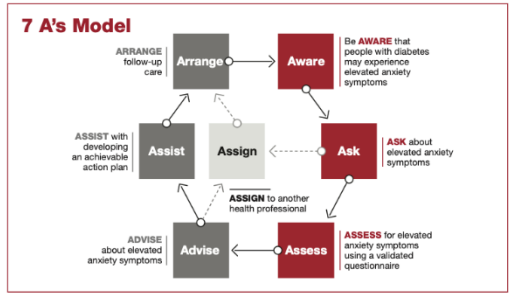


Behavioral/Mental Assessments

- ✓ Psychosocial factors - *Diabetes Distress* – (*DDS-17; regimen, physician, interpersonal, emotional; Acceptance (outlook, confidence, and inhibitor)*
- ✓ Diabetes self-management - *Summary of Diabetes Self-Care Activities (diet, PA, BG monitoring, medication adherence).*
- ✓ Health literacy - *Health Literacy Survey;* 3-item
- ✓ Self-reported physical and mental health status (1 item each)
- ✓ Self-efficacy – 6-item scale
- ✓ Depression – *Patient Health Questionnaire* (PHQ9)
- ✓ Social determinants of health; QoL (SF-12; PROMIS)
- ✓ Cognitive screening - Mini-Mental State Exam (MMSE) or Montreal Cognitive Assessment (MoCA)

Anxiety Disorders

7 A's Model



Be AWARE that people with diabetes may experience elevated anxiety symptoms

- An anxiety disorder is a diagnosable mental condition characterized by frequent, intense, and excessive anxiety symptoms (for minimum six months).
- Look for signs: frequent, intense, and excessive nervousness or worry, irritability, restlessness, trembling, dizziness, muscle tension, sleep disturbance, or panic attacks.

ASK about elevated anxiety symptoms

- When to ask:
  - when the person reports symptoms or when you have noted signs (see **AWARE**)
  - in periods of significant diabetes-related challenge or adjustment (e.g., following diagnosis of diabetes or complications, hospitalization, or severe hypoglycemia with loss of consciousness)
  - during or after stressful life events
  - if the individual has a history of anxiety disorder(s) or other mental health problems
  - and in line with clinical practice guidelines.
- Use open-ended questions or the Generalized Anxiety Disorder Two (GAD-2):
  - *"Over the last two weeks, how often have you been bothered by feeling nervous, anxious, or on edge?"*
  - *"Over the last two weeks, how often have you been bothered by not being able to stop or control worrying?"*
  - Response options are scored: "Not at all" (0), "Several days" (1), "More than half the days" (2), "Nearly every day" (3). Add the responses to form a total score.

Diabetes Distress Scale (DDS-17)

Instructions: Living with diabetes can sometimes be tough. There may be many problems and hassles concerning diabetes and they can vary greatly in severity. Problems may range from minor hassles to major life difficulties. Listed below are 17 potential problem areas that people with diabetes may experience. Consider the degree to which each of the 17 items may have distressed or bothered you DURING THE PAST MONTH and circle the appropriate number.

Please note that we are asking you to indicate the degree to which each item may be bothering you in your life, NOT whether the item is merely true for you. If you feel that a particular item is not a bother or a problem for you, you would circle 1. If it is very bothersome to you, you might circle 6.

		Not a problem	Slight problem	Moderate problem	Somewhat serious problem	Serious problem	Very serious problem
1	Feeling that diabetes is taking up too much of my mental and physical energy every day.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
2	Feeling that my doctor doesn't know enough about diabetes and diabetes care.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
3	Not feeling confident in my day-to-day ability to manage diabetes.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
4	Feeling angry, scared, and/or depressed when I think about living with diabetes.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
5	Feeling that my doctor doesn't give me clear enough directions on how to manage my diabetes.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
6	Feeling that I am not testing my blood sugars frequently enough.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
7	Feeling that I will end up with serious long-term complications, no matter what I do.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
8	Feeling that I am often failing with my diabetes routine.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
9	Feeling that friends or family are not supportive enough of self-care efforts (e.g., planning activities that conflict with my schedule, encouraging me to eat the "wrong" foods).	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
10	Feeling that diabetes controls my life.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
11	Feeling that my doctor doesn't take my concerns seriously enough.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
12	Feeling that I am not sticking closely enough to a good meal plan.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
13	Feeling that friends or family don't appreciate how difficult living with diabetes can be.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
14	Feeling overwhelmed by the demands of living with diabetes.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
15	Feeling that I don't have a doctor who I can see regularly enough about my diabetes.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
16	Not feeling motivated to keep up my diabetes self management.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6
17	Feeling that friends or family don't give me the emotional support that I would like.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6

Adjusting to Life with Diabetes

The diagnosis of diabetes can come as a shock. First reactions may be disbelief, sadness, anger, or self-blame. Usually, these feelings ease after a while and diabetes becomes part of life. Sometimes, these feelings don't go away easily. If you feel this way, you are not alone. There are many things you can do to fit diabetes into your life.

"It was really scary because I didn't know much about it, I just had this whole perception that, 'Oh, it's really bad, it's a life long thing,' and I remember asking myself, 'Why me?'"

—Sandra, 27, person with diabetes

Life with Diabetes

It is common for people to go through emotional "ups and downs" after diabetes is diagnosed. People may experience disbelief, grief, guilt, anger, fear, and sadness. Others may have a sense of relief that they now have an explanation for how they have been feeling, both physically and emotionally.

At first you may feel down about having diabetes and uncertain or fearful about how it is going to change your life. That is natural. It takes time to learn how to manage diabetes and to adapt your lifestyle.

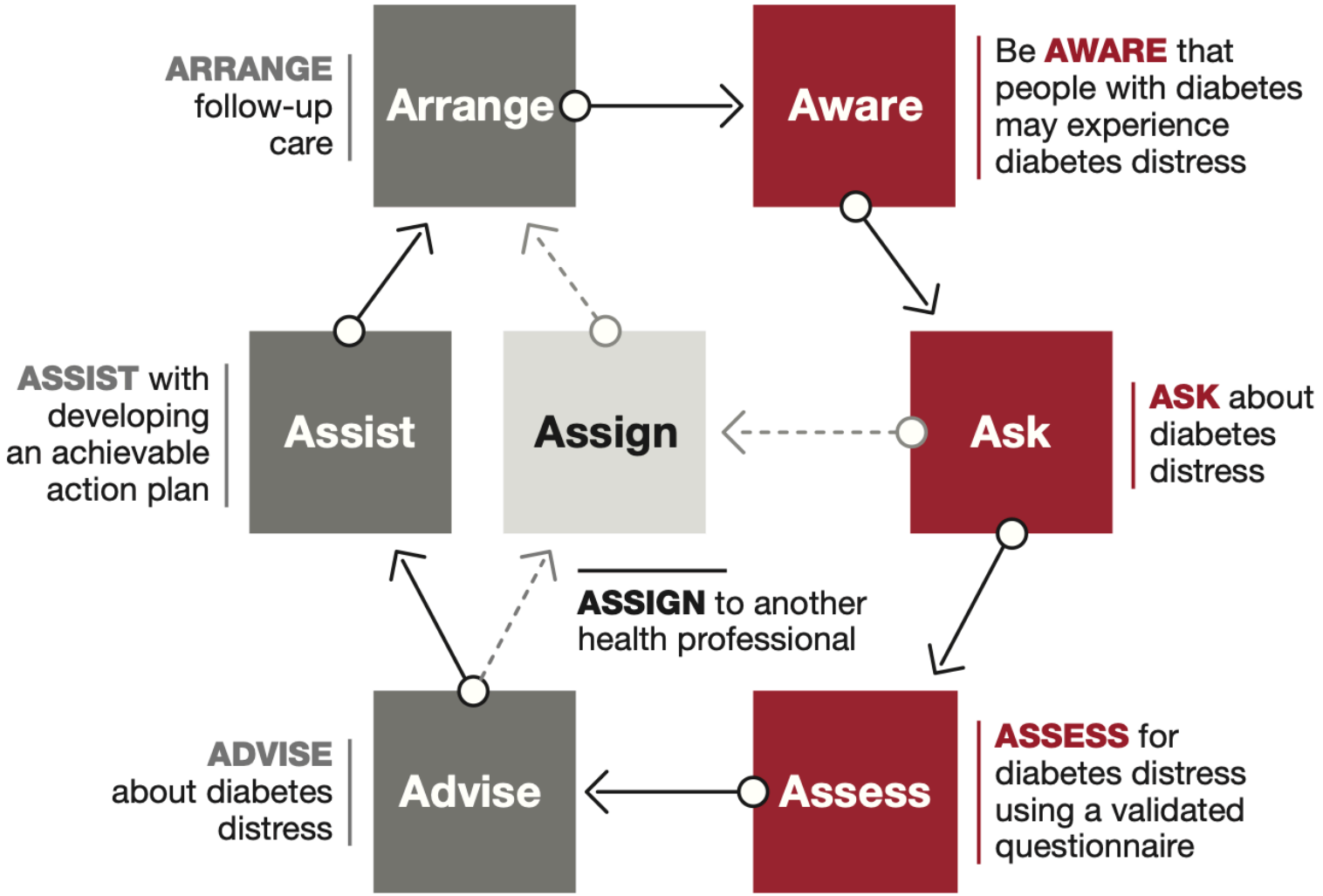
However, it becomes a serious problem when these emotions start to affect daily life or diabetes management, for example, if you are:

- avoiding medical appointments because you can't cope with the diagnosis
- checking blood glucose levels excessively (or not checking) due to worries
- or blaming yourself (or others) for your diabetes or when things don't go well.

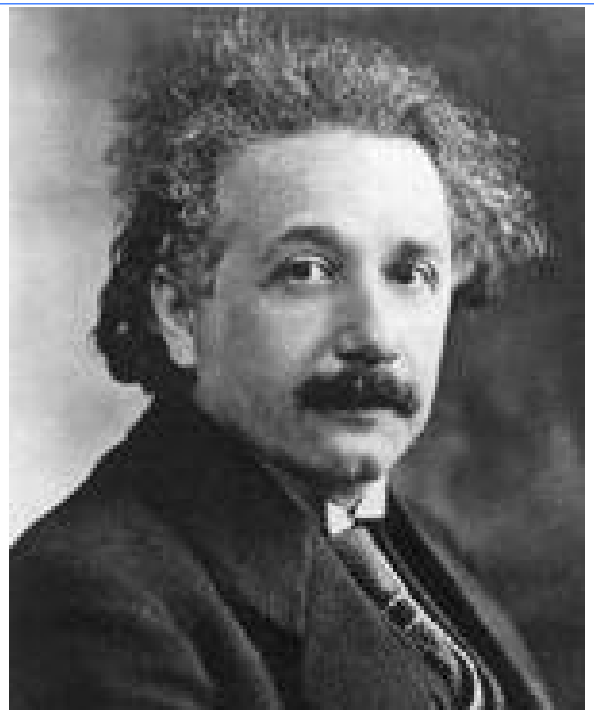
If you think you are having problems adjusting to life with diabetes, talk with your health professional. They will assess the problem and help you work out strategies for living well with diabetes.

(800) DIABETES (342-2383) **diabetes.org**

7 A's Model


ARRANGE follow-up care
Arrange
Aware
Be AWARE that people with diabetes may experience diabetes distress
ASSIST with developing an achievable action plan
Assist
Assign
Ask
ASK about diabetes distress
ASSIGN to another health professional
ADVISE about diabetes distress
Advise
Assess
ASSESS for diabetes distress using a validated questionnaire

"Not everything that counts can be counted, and not everything that can be counted counts."



Ranjita Misra, PhD, MS, FASHA, FESG

304-293-4168

ramisra@hsc.wvu.edu

https://www.linkedin.com/in/ranjita-misra-22b3ab29/

Professor & PhD Program Director

School of Public Health, West Virginia University

THANK YOU!