The background features a blue ECG line at the top and bottom. Scattered throughout are various colored circles in shades of red, grey, and dark blue. The main title is centered in a large, bold, dark red font.

Monitor, Manage, Empower: Cardiac Telehealth

Nathan Carleton

On site Advisor: Floye Bradford, Director of Quality

BASIS Advisor: Dr. Amy Green

Internship: Northern Arizona Healthcare

7/17/24

Senior Project Proposal
Nathan Carleton
January 5th, 2024

I. Title of Project:

Monitor, Manage, Empower: Cardiac Telehealth Senior Research Project

I. Contact Information:

- Basis Advisor's Name: Dr. Amy G.
- Internship Location: Northern Arizona Healthcare (Flagstaff, Az)
- Off-Site Advisor's Name: Floye B.
 - Title: Director Quality

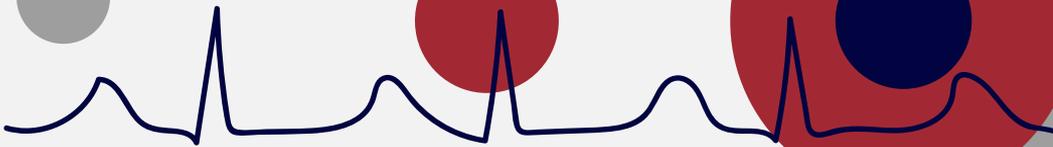
II. Statement of Purpose:

Whether chatting with friends over text or FaceTime or attending work meetings over Zoom, technology has made communication easier and more convenient than ever. But how can this technology support cardiac care? Can it reduce emergency room visits and trips to the doctor for heart failure patients? Can cardiac telehealth increase patient satisfaction and availability of care while decreasing costs? I plan to address these questions by joining Northern Arizona Healthcare's (NAH) pilot study on telecardiology and cardiac self-monitoring kits.

My research objective is to understand how the emergence of telehealth is changing patient care in cardiology. I also want to learn how the overall medical system works and determine if I wish to pursue a possible medical career utilizing telehealth. This research may also serve to help NAH better understand how telecardiology and telehealth could benefit the community.

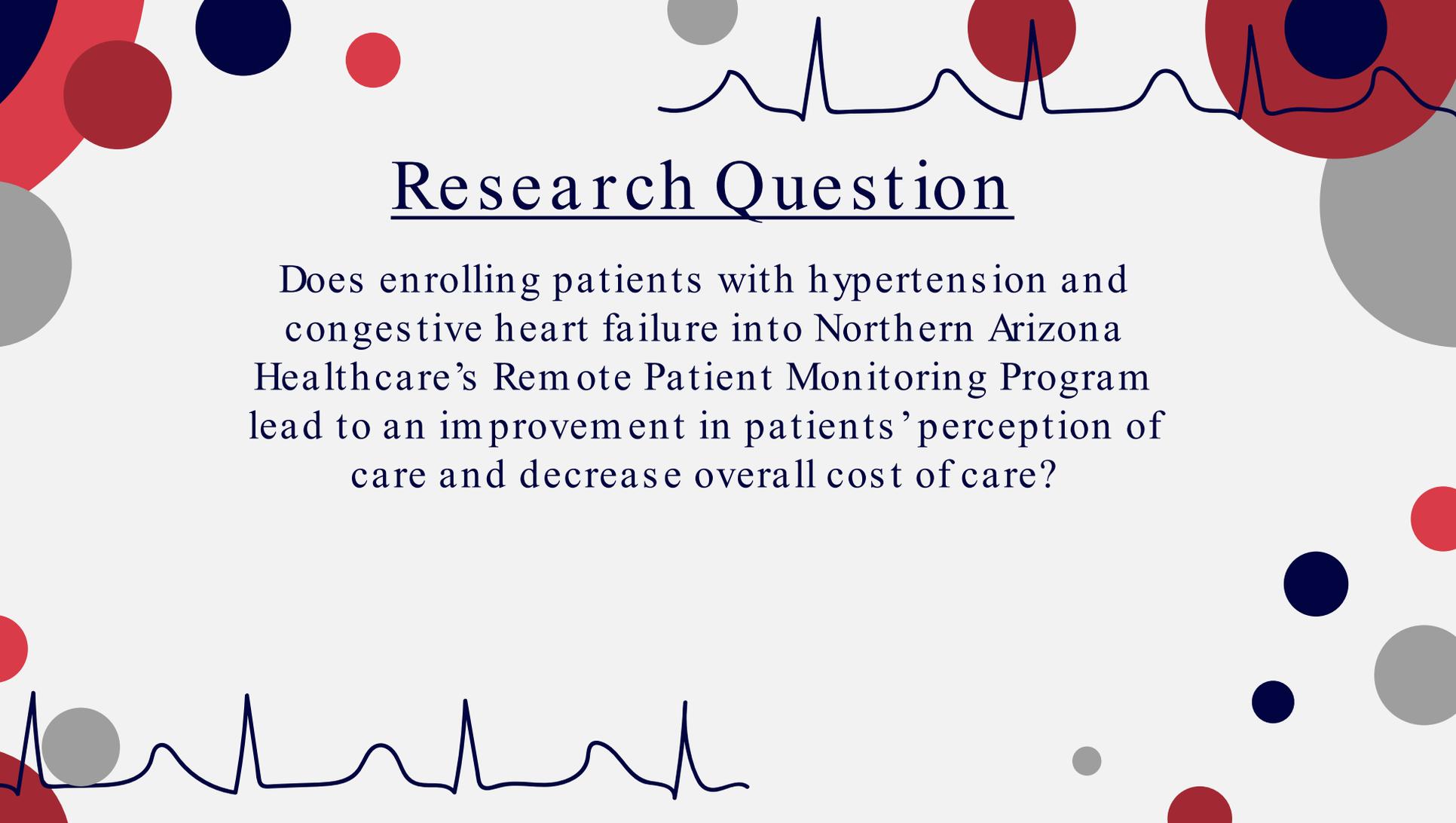
III. Background:

From the role of small proteins in cellular processes to the evolution and behavior of plants and animals, biology always provides something for me to wonder and marvel over. My love of biology, coupled with my desire for a career that lets me directly help people, makes a senior project in the medical field a no-brainer. I am excited to learn how the medical field operates due to my fascination with how diagnoses and treatments work. Cardiology is especially interesting to me, particularly because heart disease continues to be a significant health problem in the United States (U.S.) The telehealth part of the project, though, is by far the most exciting, in large part for personal reasons.



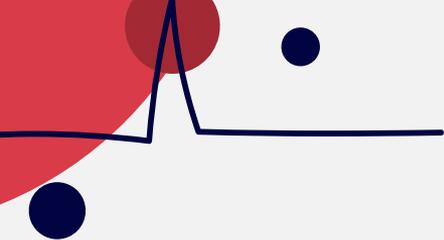
Brief Introduction

- BASIS Flagstaff Graduate
 - Senior Research Project
 - NAH Volunteer
 - U of A Neuroscience and Cognitive Science
- 



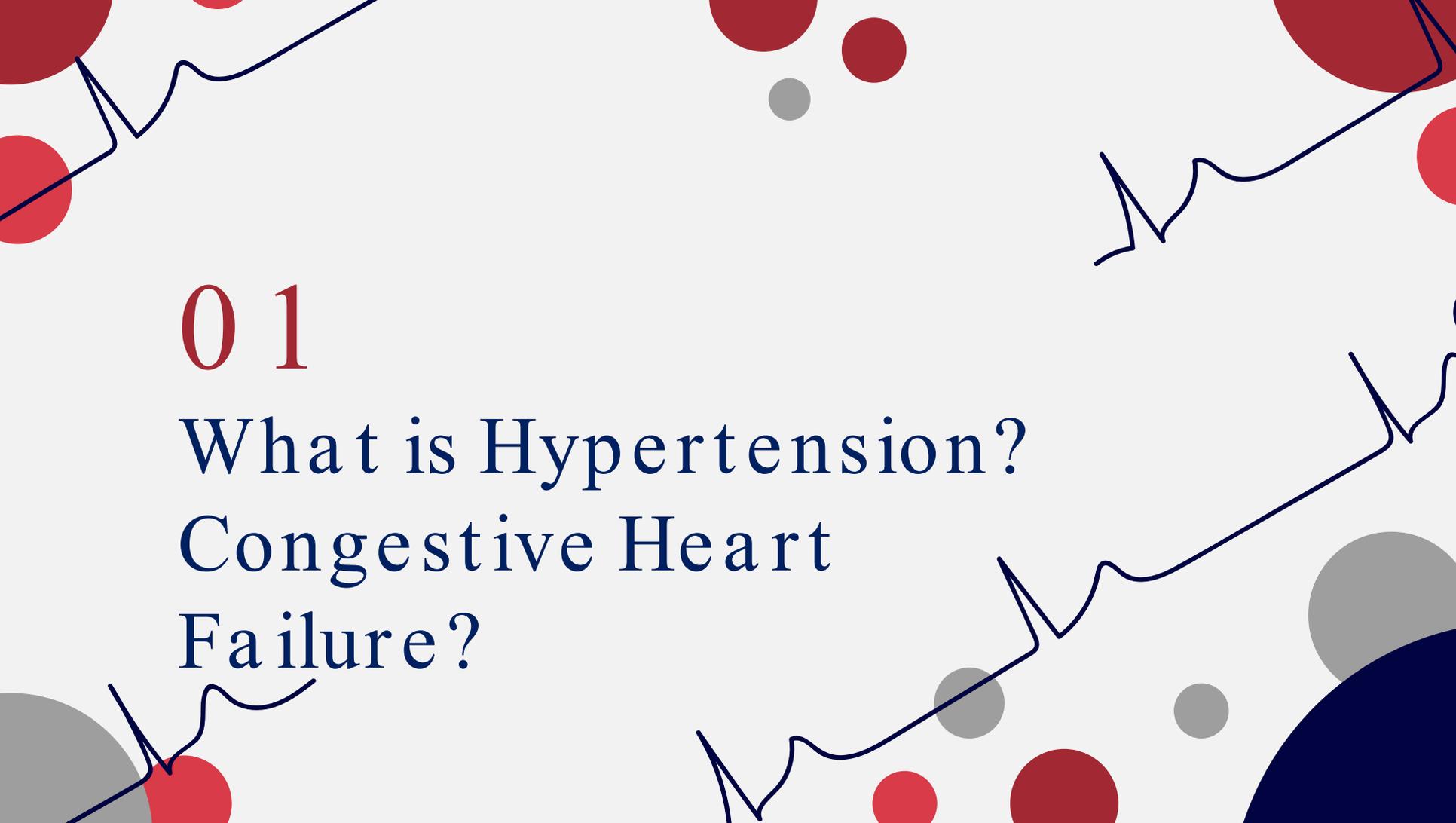
Research Question

Does enrolling patients with hypertension and congestive heart failure into Northern Arizona Healthcare's Remote Patient Monitoring Program lead to an improvement in patients' perception of care and decrease overall cost of care?



Glossary

- MME - Monitor, Manage, Empower
 - CHF - Congestive Heart Failure
 - HTN – Hypertension
 - NAH – Northern Arizona Healthcare
 - RPM – Remote Patient Monitoring
 - BP - Blood Pressure
- 
- 



01

What is Hypertension?
Congestive Heart
Failure?

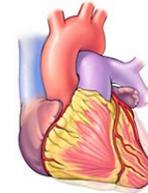
Hypertension (HTN)

- Major risk factor for Heart Disease
- Estimated 45% US adults¹

High Blood Pressure *Hypertension*



■ Force of blood on artery wall



≥ 130

Systolic number
is when the
heart contracts

≥ 80

Diastolic number
is when the
heart rests



Congestive

- Heart can
- 64 million
- Estimate
- 8.5 million



Self-Check Plan for HF Management

Excellent – Keep Up the Good Work!



No new or worsening shortness of breath



Physical activity level is normal for you



No new swelling, feet, ankles and legs look normal for you



Weight check stable
Weight: _____



No chest pain

GREAT! CONTINUE:



Daily Weight Check



Meds as Directed



Low-Sodium Eating



Follow-up Visits

Pay Attention – Use Caution!



Dry, hacking cough



Worsening shortness of breath with activity



Increased swelling of legs, ankles and feet



Sudden weight gain of more than 2-3 lbs in a 24-hour period (or 5 lbs in a week)



Discomfort or swelling in the abdomen



Trouble sleeping

CHECK IN! Your symptoms may indicate:



A need to contact your doctor or health care team



A need for a change in medications

Medical Alert - Warning!



Frequent dry, hacking cough



Shortness of breath at rest



Increased discomfort or swelling in the lower body



Sudden weight gain of more than 2-3 lbs in a 24-hour period (or 5 lbs in a week)



New or worsening dizziness, confusion, sadness or depression



Loss of appetite



Increased trouble sleeping; cannot lie flat

WARNING! You need to be evaluated right away.



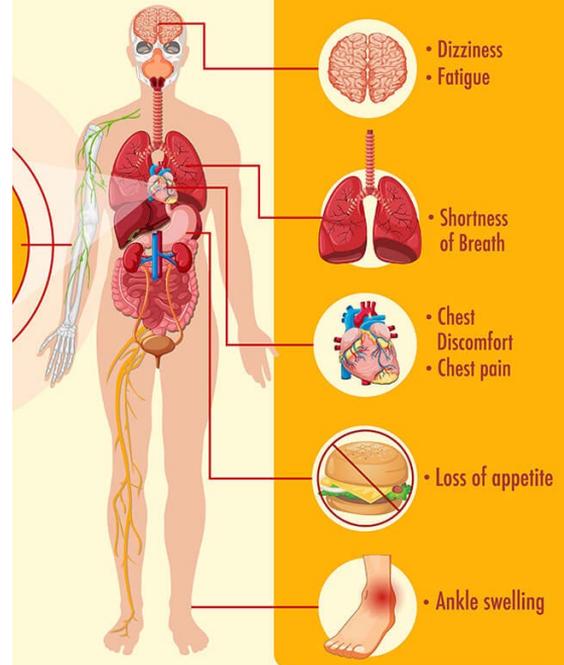
Call your physician or call **911**

heart.org/HF

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(CHF)

HEART FAILURE SYMPTOMS





02

Telecardiology &
Northern Arizona

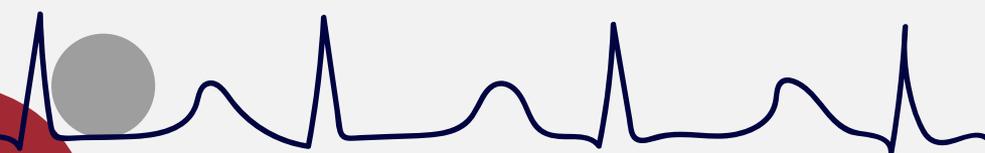


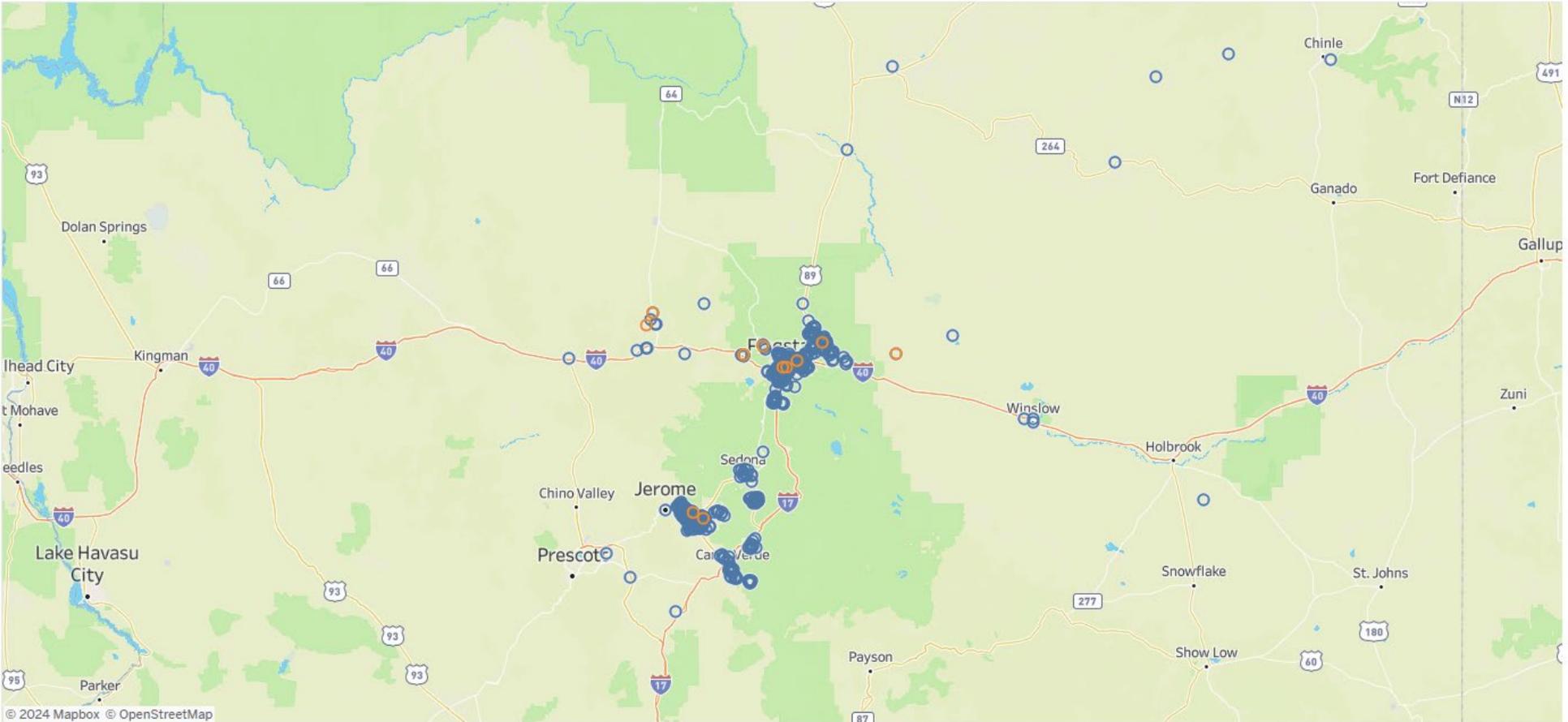
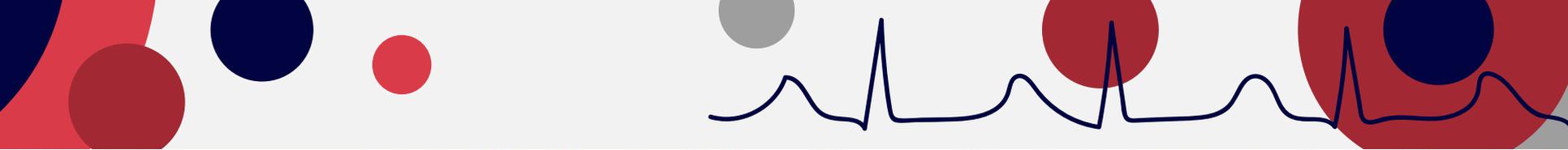
Source: NAH

Colorado

Telemedicine & Cardiac Care

An ECG (heart rate) line graphic in dark blue, positioned in the upper right quadrant of the slide. It shows several distinct peaks and troughs, representing a cardiac rhythm.

- “the use of video, electronic, or other telecommunication information to monitor patients and transmit data related to patient health status at a distance”⁴
 - Found to significantly lower BP when used to adjust medication⁵
 - Study found 71% telemedicine patients achieving target vs. 31%⁶
 - Reduce cost of CHF by approximately 30% (\$15.6 billion annually)²
- 
- An ECG (heart rate) line graphic in dark blue, positioned at the bottom left of the slide. It shows several distinct peaks and troughs, representing a cardiac rhythm.





Tablet, S5E

Subgroup: Ambulatory Care Management
Conditions: Hypertension, CHF

Non-Reviewed	In Progress	Reviewed
--------------	-------------	----------

Last marked In Progress by Nicole Bullard on 01/02/2024 1:23:53 PM

305

Day Count

Media control icons: play/pause, stop, next.

Last activity: 09/27/2023 12:30:34 pm

PID
000005

Name
S5E Tablet

DOB
03/04/2003

Gender
Phone
Clinician
Nicole Bullard

Subgroup
Ambulatory Care Management

Hospitalization
09/27/2023

Conditions
Hypertension CHF

Status
Activated

Start Date
03/06/2023

Day Count
305

Quick Notes

Add a quick note

[Save](#)

- Overview
- Historical Data
- Notes
- Imaging Files
- Communication
- Care Plan
- Mobile Management
- Settings

1 Day | 7 Days | 14 Days

Risk
High

- DETAILS
- ⚠ No Blood Pressure taken for 2 Days
 - ⚠ No Pulse Ox taken for 2 Days
 - ⚠ No Essential Medication taken for 1 Day
 - ⚠ No Survey taken for 2 Days
 - ⚠ No Activity taken for 3 Days

Activity
- mins

LAST READING

Blood

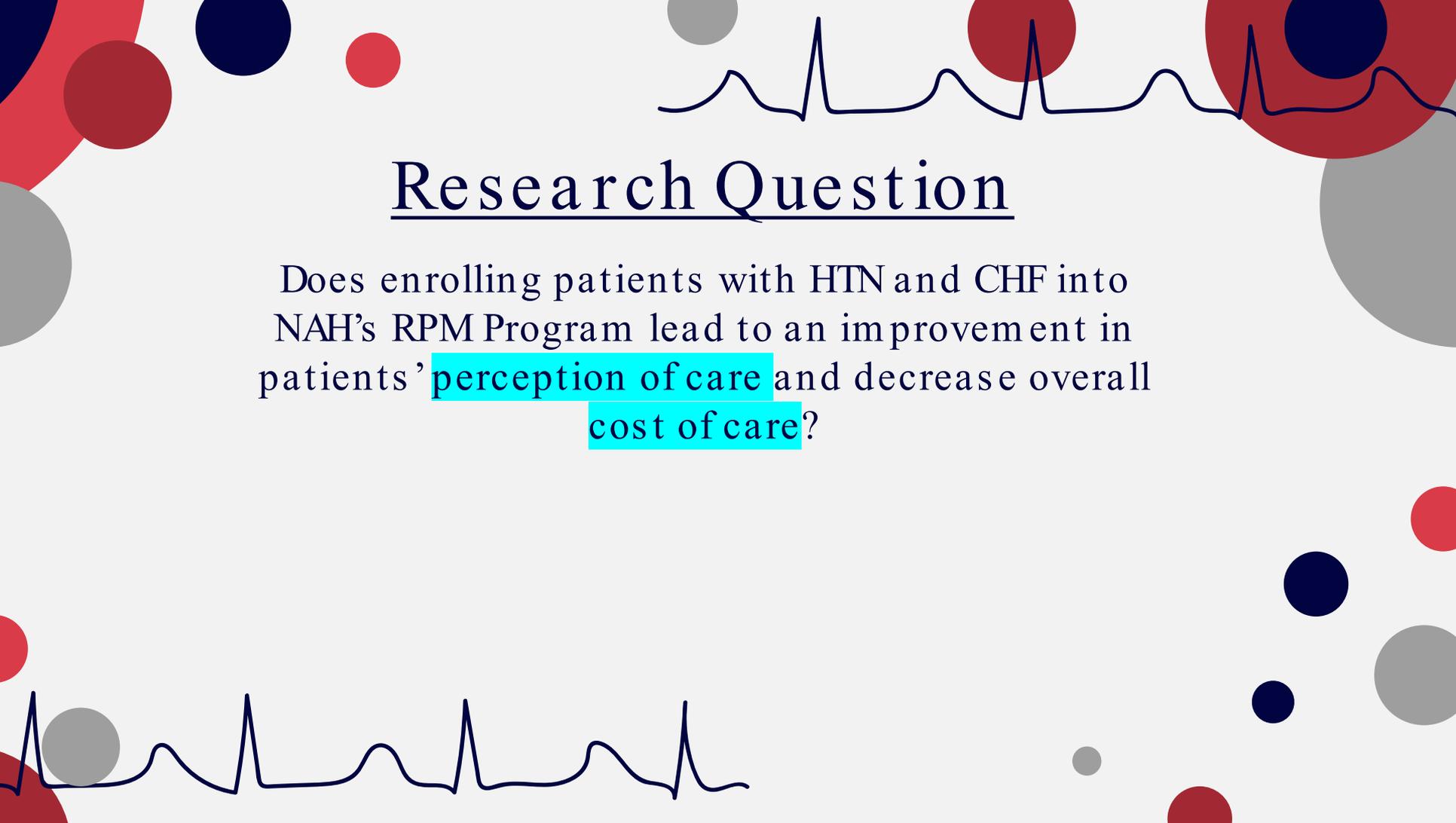
[Consent Form](#)

Support



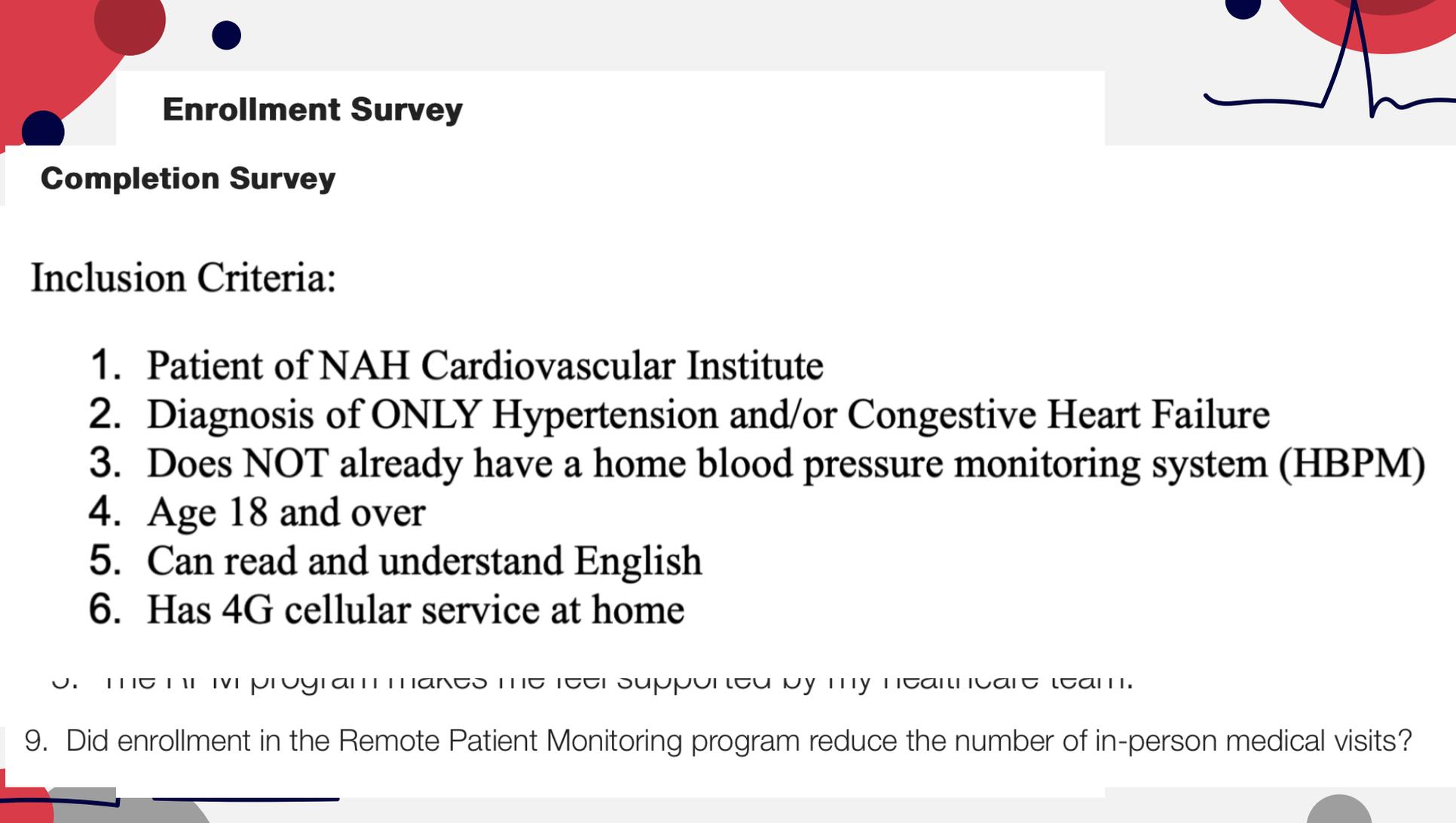
03

MME Pilot Study



Research Question

Does enrolling patients with HTN and CHF into NAH's RPM Program lead to an improvement in patients' **perception of care** and decrease overall **cost of care**?



Enrollment Survey

Completion Survey

Inclusion Criteria:

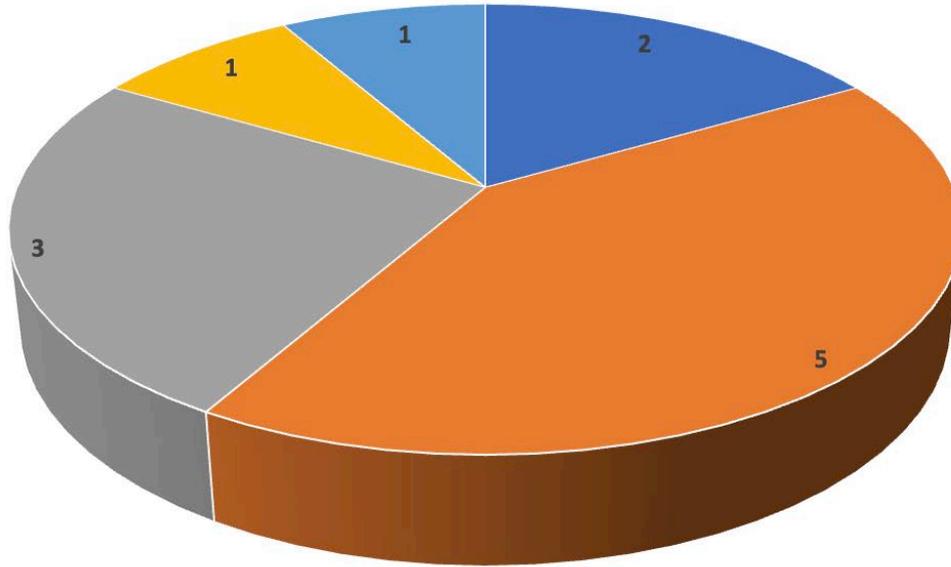
- 1. Patient of NAH Cardiovascular Institute**
- 2. Diagnosis of ONLY Hypertension and/or Congestive Heart Failure**
- 3. Does NOT already have a home blood pressure monitoring system (HBPM)**
- 4. Age 18 and over**
- 5. Can read and understand English**
- 6. Has 4G cellular service at home**

8. The RPM program makes me feel supported by my healthcare team.

9. Did enrollment in the Remote Patient Monitoring program reduce the number of in-person medical visits?

Results: Demographics

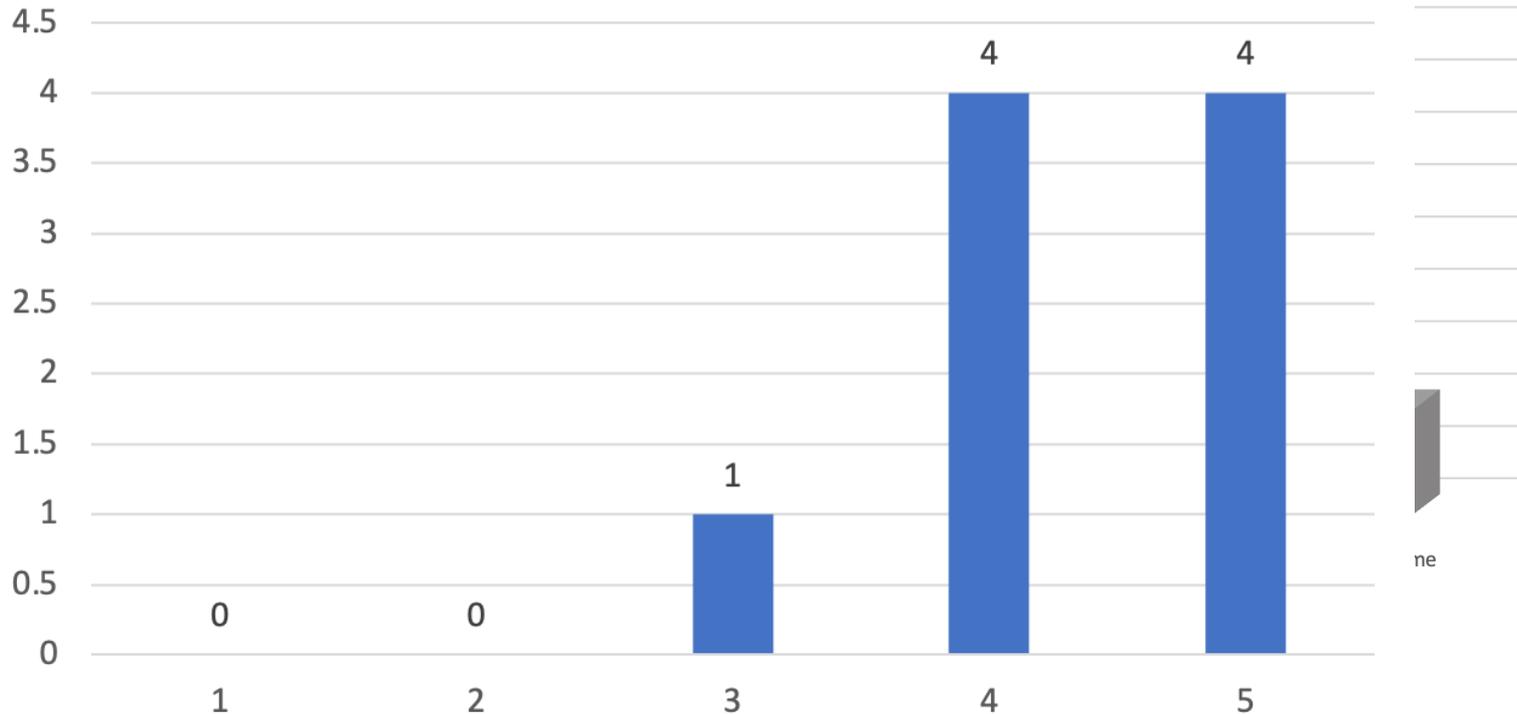
Education Level



■ College Graduate ■ Some College ■ High School Diploma/GED ■ Did not Complete ■ No Response

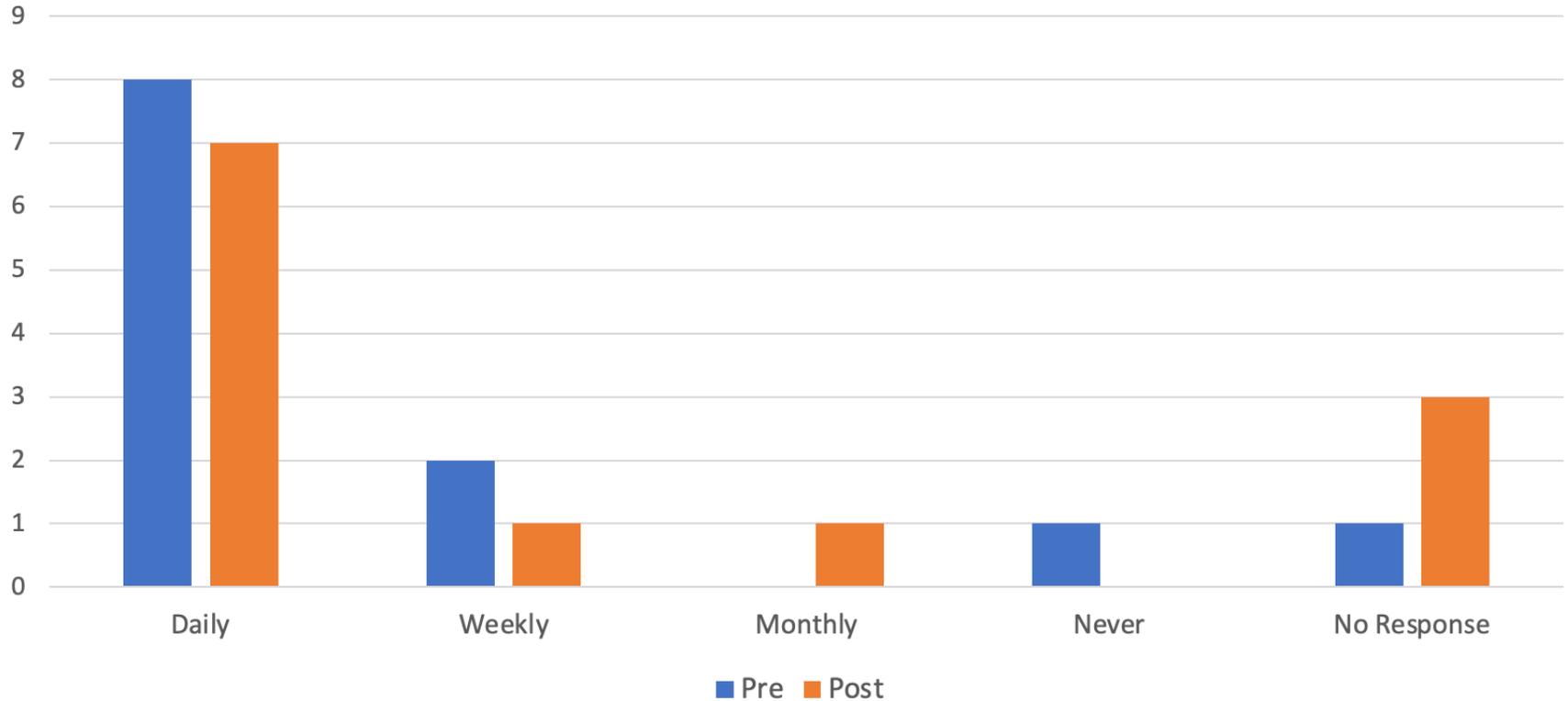
Results: Patient Satisfaction

Satisfied With RPM Program 1-5 Scale



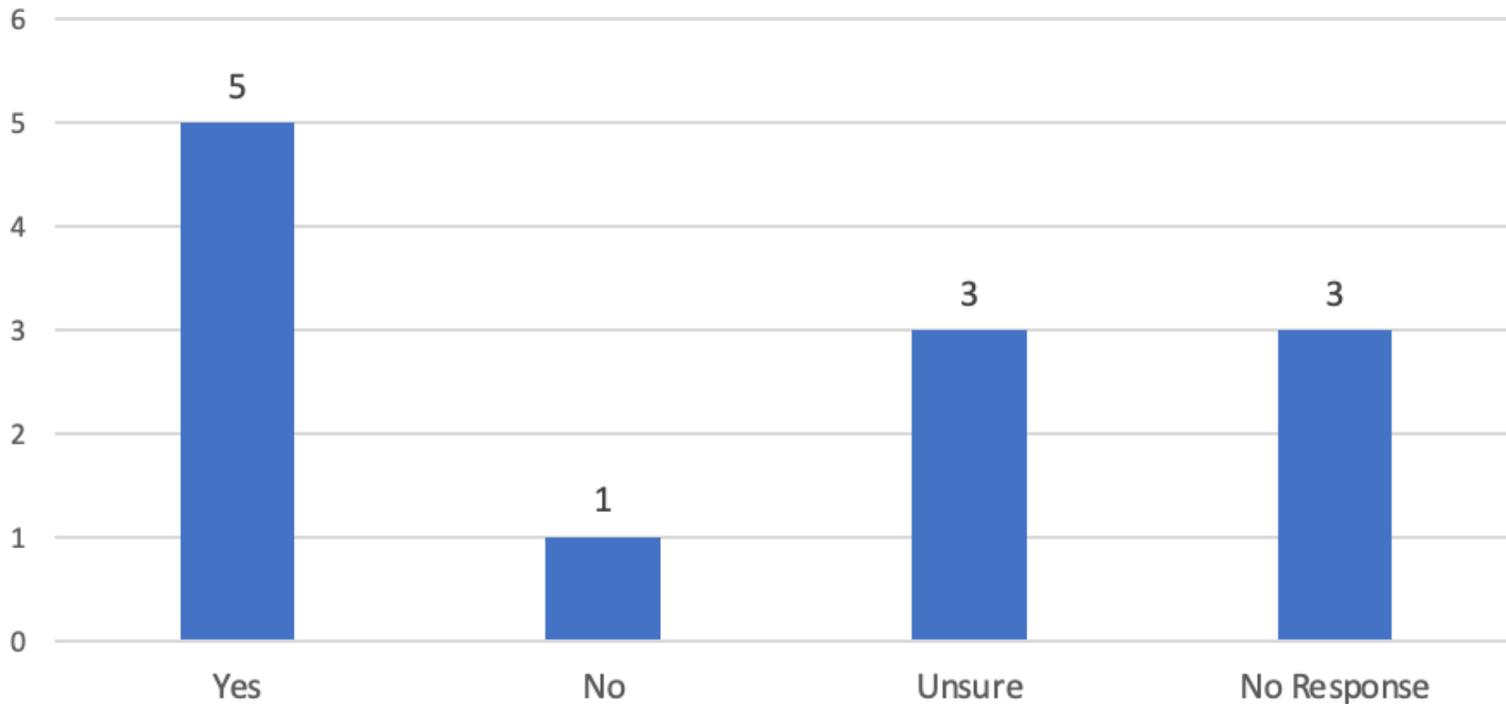
Results: Habits

Q: How often do you check your blood pressure?

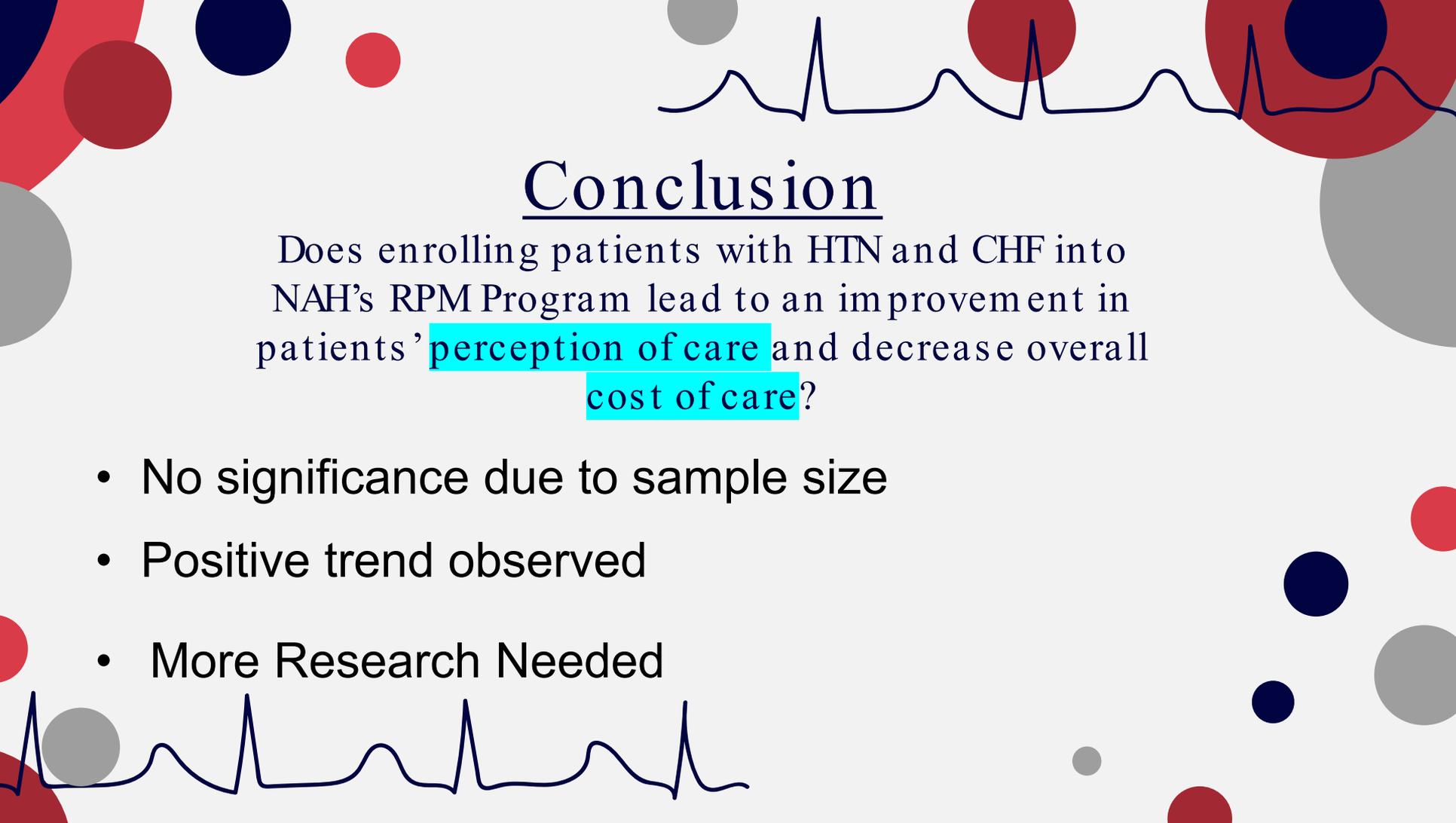


Results: Alternatives

Did enrollment in the RPM program reduce the number of in-person medical visits?

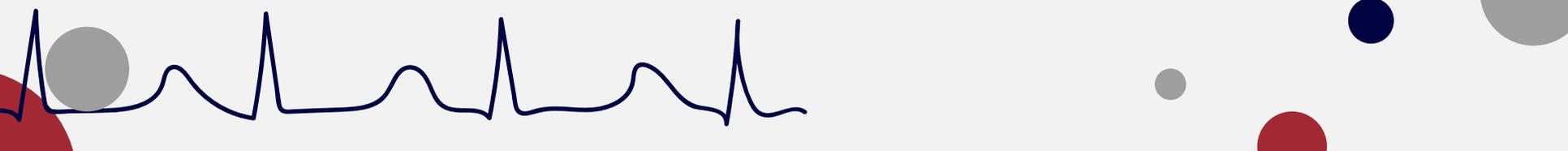


Participant #	Location	Number of telehealth visits completed during RPM program enrollment	Average gas money saved	Average time saved travelling
MME 001	Page	1	\$46.68	4hr 30min
MME 002	Flagstaff	1	\$0.71	0hr 15min
MME 003	Flagstaff	0		
MME 004	Williams	2	\$22.28	2hr 8min
MME 005	Flagstaff	3	\$2.13	0hr 45min
MME 006	Winslow	0		
MME 007	Chinle	1	\$60.11	5hr 54min
MME 008	Winslow	3	\$63.33	5hr 48min
MME 009	Window Rock	0		
MME 010	Holbrook	0		
MME 011	Grand Canyon	7	\$215.11	20hr 32min
MME 012	Munds Park	1	\$7.14	0hr 48min



Conclusion

Does enrolling patients with HTN and CHF into NAH's RPM Program lead to an improvement in patients' **perception of care** and decrease overall **cost of care**?

- No significance due to sample size
 - Positive trend observed
 - More Research Needed
- 



04

Next Steps & Final Thoughts



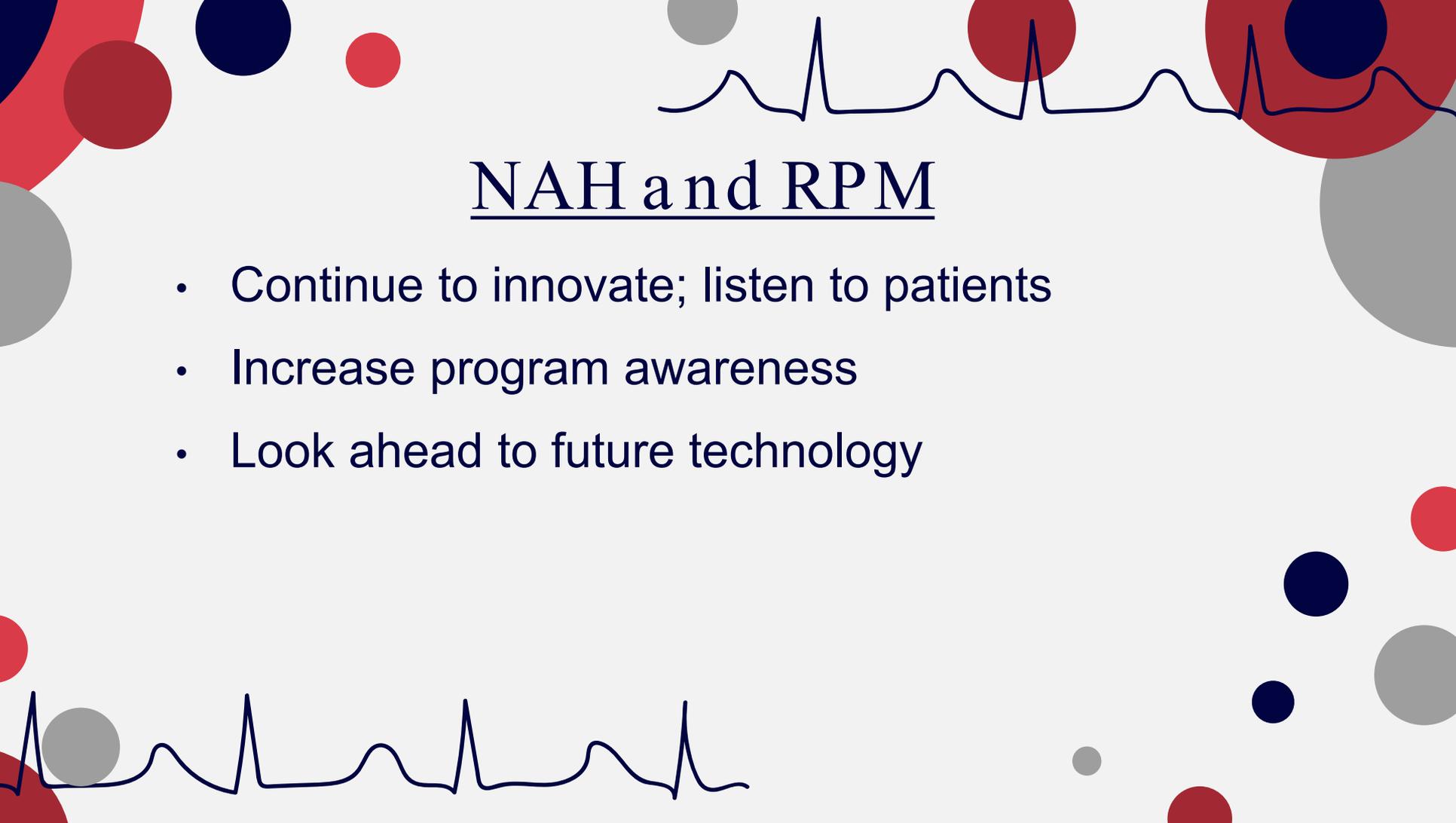
Next Steps



- 
- More research
 - Bigger sample
 - Control group
 - Education changes
 - Broaden Access/Awareness
- 
- 
- 



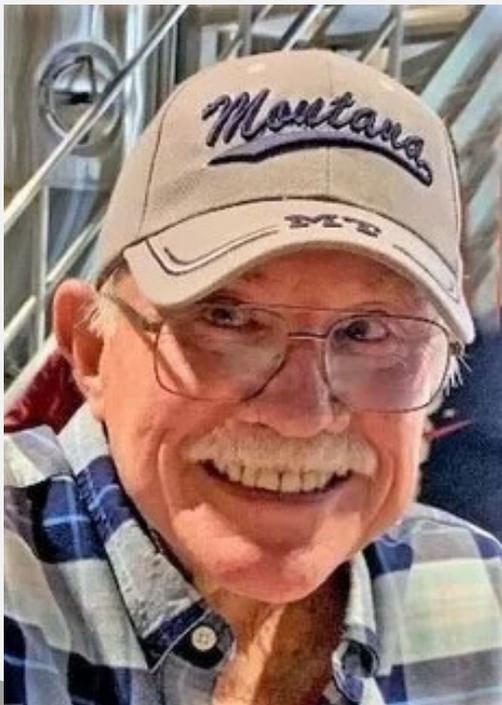
Final Thoughts



NAH and RPM

- Continue to innovate; listen to patients
- Increase program awareness
- Look ahead to future technology

Personal Thoughts





Thanks!

Ms. Cohen – Ms. Bradford – Dr. Green - Senior Project
Committee – Sarah S. - Keli O. – Paula M. – Julie K. –
Nicole B. – Alejandra F. – Travis B. – Jennifer M. - Dani O.
And Everyone Else!

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Sources



1. Krist AH, Davidson KW, Mangione CM, Cabana M, Caughey AB, Davis EM, Donahue KE, Doubeni CA, Kubik M, Li L, et al.; US Preventive Services Task Force. Screening for hypertension in adults: US preventive services task force reaffirmation recommendation statement. *JAMA*. 2021;325:1650–1656. doi: 10.1001/jama.2021.498
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3. [https://onlinejcf.com/article/S1071-9164\(23\)00264-6/abstract](https://onlinejcf.com/article/S1071-9164(23)00264-6/abstract)
4. Liu SX, Xiang R, Lagor C, Liu N, Sullivan K. Economic Modeling of Heart Failure Telehealth Programs: When Do They Become Cost Saving?. *Int J Telemed Appl*. 2016;2016:3289628. doi:10.1155/2016/3289628
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6. Milani, R. V., Lavie, C. J., Bober, R. M., Milani, A. R., Ventura, H. O. (2017). Improving hypertension control and patient engagement using digital tools. *The American Journal of Medicine*. 130, 14-20.

