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University of Mississippi Medical Center
Center for Telehealth

National Telehealth Center of Excellence

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UMMC Telehealth Timeline

1990s — Diagnostic test interpretation
Adult and Pediatric Cardiology

2003 — First videoconferencing of telemedicine
Emergency Medicine

2008 — TelePsychiatry underway

2011 — Full-time staff assigned to Telehealth

2013 — Center for Telehealth formed
24/7 Telehealth Call Center

TCOE Goals: Innovation and Research

- State & Federal Policies
- Technology/ Security/ Privacy
- Standards of Care
- Regulatory Boards
- Reimbursement
- Population Health
- Analytics/ Predictive modeling
- Awareness, Adoption, Sustainability

Examples

- TelEmergency
  - Rural and Critical Access Hospitals

- Remote Patient Monitoring
  - Diabetes, Hypertension, Heart Failure, Asthma, Prenatal

TelEmergency

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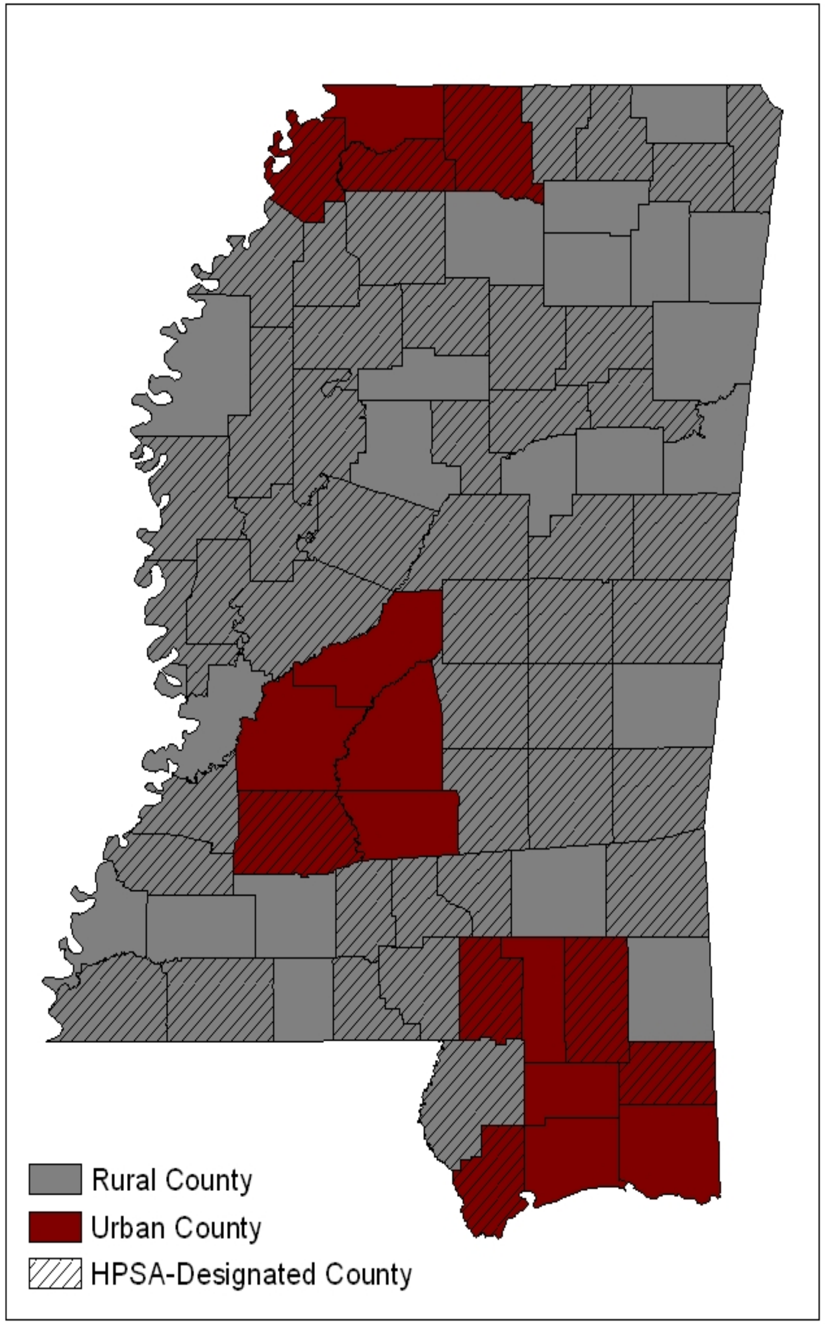
40 minutes → The average time for Mississippians in 53 out of 82 counties to drive to receive specialized medical care

- In 2002, estimates reported that 20% of Americans resided in rural areas with only 9% of physicians practicing in rural areas

- 60% of Mississippians live in rural areas

- 37% of Mississippians live in medically underserved areas



Background

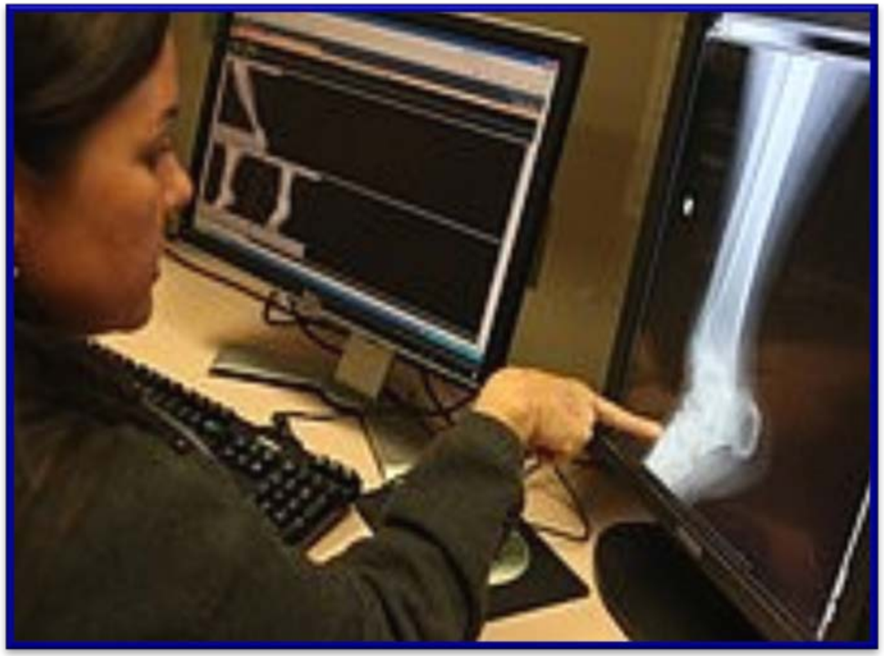
- Telehealth has been recognized as a vital aspect of health care improvement in rural areas with limited medical access
- Rural hospitals struggle with staffing EDs with EM trained and/or board certified physicians
- EDs are closing across the nation, leaving rural hospitals particularly vulnerable
- In 2003, TelEmergency was developed to improve access to quality emergency care

UMMC

Location of the specialist

Distant Site

Location of the patient



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TelEmergency Consult

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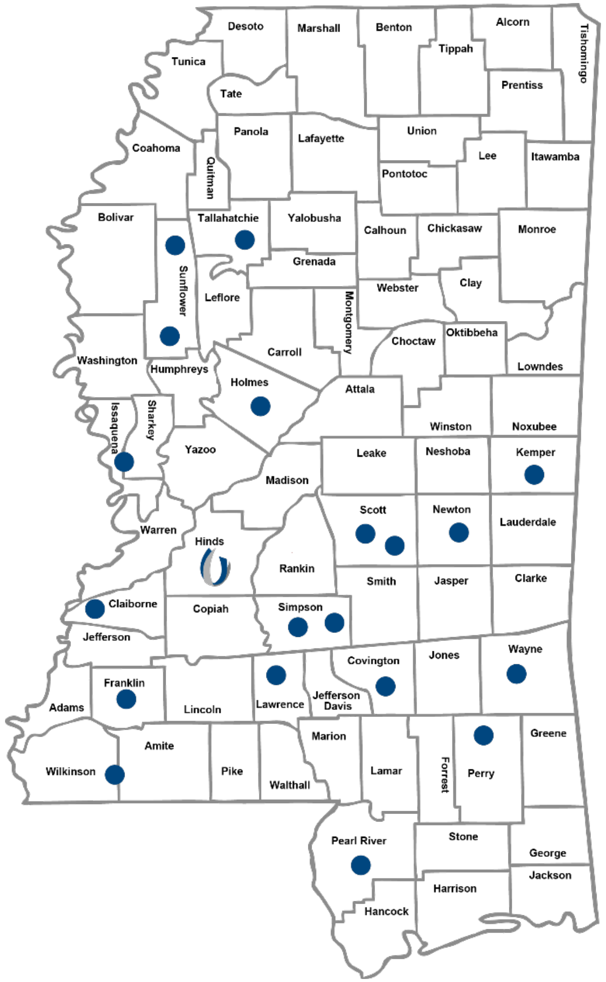
TelEmergency Sites in Mississippi

1. Claiborne County Medical Center
2. Covington County Hospital – Collins
3. Field Memorial Community Hospital
4. Franklin County Memorial Hospital
5. H.C. Watkins
6. Holmes County Hospitals & Clinics
7. John C. Stennis Memorial Hospital
8. Lackey Memorial Hospital
9. Laird Hospital
10. Lawrence County Hospital
11. Magee General Hospital
12. North Sunflower Medical Center
13. Pearl River County Hospital and Nursing Home
14. Perry County General Hospital
15. Scott Regional Hospital
16. Sharkey - Issaquena County Hospital
17. Simpson General Hospital
18. South Sunflower Hospital
19. Tallahatchie General Hospital



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RESEARCH/Original Article

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SAGE

The impact of the TelEmergency program on rural emergency care: An implementation study

Sarah A Sterling[1], Samantha R Seals[2], Alan E Jones[1], Melissa H King[1], Robert L Galli[1], Kristen C Isom[1], Richard L Summers[1] and Kristi A Henderson[1]

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Clinical Relevance

- Currently, there are no known large population analyses evaluating telemedicine in the ED
- UMMC’s TelEmergency program is one of the oldest and most developed programs in the country
- Though other programs have developed similar Tele-emergency programs, little is known about the average TelEmergency patient, their disposition, or their outcomes

Satisfaction

- 98% of patients describe their overall care as “excellent” or “good”
- 99% of patients would likely come back and use the system again
- 97% of patients were comfortable with this type of care

TelEmergency

25% reduction in rural emergency room staffing costs

20% reduction in unnecessary transfers

Produces patient outcomes in rural hospital that are on par with those of the academic medical center

- Connects 19 emergency departments in rural hospitals with UMMC's Level One Trauma Center
- Uses real-time video and audio connections

Results

	Pre-implementation	Post-implementation	p-value
Total ED patient volume (SD)[a]	5563 (3371, 5761)	5174 (4123, 5899)	0.820
Discharge rate from ED (%)[a]	87.1 (85.3, 87.8)	80.0 (79.1, 84.4)	**0.004**
Rural hospital admission rate from ED (%)[a]	6.7 (5.9, 8.0)	8.1 (6.0, 10.0)	**0.023**
Transfer rate to another facility (%)[a]	6.3 (5.0, 7.0)	6.6 (5.8, 9.1)	0.098
Patient deaths in ED (%)[a]	0.3 (0.2, 0.4)	0.3 (0.25, 0.31)	0.844
Discharged AMA from ED rate (%)[a]	0.3 (0.2, 0.4)	1.1 (0.6, 1.4)	**0.004**

Results

Variable	Admit (n = 843)	Death (n = 65)	Discharge (n = 1516)	Transfer (n = 1237)	Left AMA (n = 30)	p value
Age (IQR)	64 (50,80)	62 (50,80)	36 (18,56)	53 (31, 70)	43 (33, 56)	< 0.0001
Gender						
Male	375 (45)	41 (64)	780 (52)	618 (51)	16 (55)	0.0031
Female	456 (55)	23 (36)	718 (48)	601 (49)	13 (45)	
Race						
Black	248 (42)	23 (38)	482 (44)	440 (47)	5 (23)	0.1167
White	340 (57)	38 (62)	607 (55)	484 (52)	17 (77)	
Other	5 (1)	0 (0)	14 (1)	8 (1)	0 (0)	
Attending vs Resident						
Attending	427 (51)	31 (48)	779 (51)	585 (47)	12 (40)	0.1895
Resident	416 (49)	34 (52)	737 (49)	652 (53)	18 (60)	
Type of Consult						
Phone	749 (91)	9 (14)	1291 (88)	900 (75)	20 (77)	< 0.0001
Video	74 (9)	55 (86)	183 (12)	294 (25)	6 (23)	

Table 2. Comparisons based on patient disposition

Relative Survivability of Cardiopulmonary Arrest in Rural Emergency Departments Utilizing Telemedicine

Kristi Henderson, DNP, NP-BC, FAEN; Kristen C. Isom, RN; Richard L. Summers, MD

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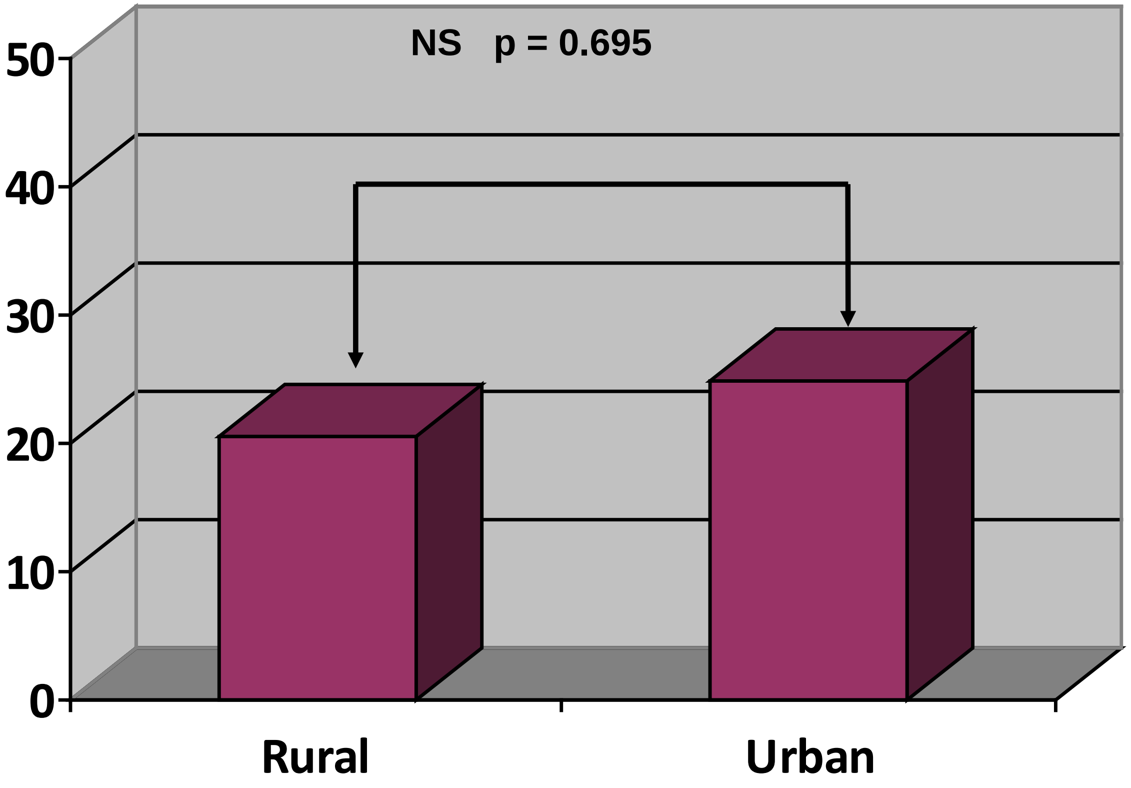
Keywords: rural, telemedicine, cardiopulmonary arrest

Introduction

In 2008 the Agency for Healthcare Research and Quality reported that as many as 20% of the population in the United States (U.S.) lives in what would be considered rural communities while only 9% of all physician's practice in these same designated areas.[1] There is even a greater scarcity of medical specialists within these underserved areas.[1] This intrinsic disparity along with geographic isolation and socioeconomic conditions has resulted in a significant gap in access to healthcare and often requires citizens of rural areas to commute long distances to receive medical attention. The situation is particularly problematic when the medical condition demands emergent attention. Access to timely emergency medical care is critical in the face of common health conditions such as myocardial infarctions, trauma, and acute ischemic strokes. However, regional disparities in access to emergency care have been noted to exist mostly in rural areas.[2]

Comparison of percent survival of urban and telemergency rural patients with cardiopulmonary arrest (NS = not significantly different $p > 0.05$).



Integration of Telestroke Services into an Established Telemedicine System

Kristen C. Isom, RN[1], Richard L. Summers, MD[2], Kristi Henderson, DNP, NP-BC[2], Rebecca Sugg, MD
[1]Anderson Regional Hospital, Meridian, Mississippi
[2]University of Mississippi Medical Center, Jackson, Mississippi

BACKGROUND AND PURPOSE

Most acute stroke patients first present to the emergency department. Emergency personnel are often encouraged to maintain a low threshold for stroke activations to capture all potential candidates for early treatment options. However, a national shortage of neurologists has placed a strain on the stroke specialists providing oversight for all these activations. Our stroke team faced a situation in which there were a limited number of neurologists and consistent coverage was not possible to satisfy stroke center qualifications. We report on the development of a hybrid system in which neurology oversight was provided by telemedicine consultation for times in which our neurologists were not available.

STROKES IN MISSISSIPPI

MS % of Stroke Thrombolysis

University Hospital Comprehensive Stroke Center– **3.9%**

Anderson Regional – **3.34%**

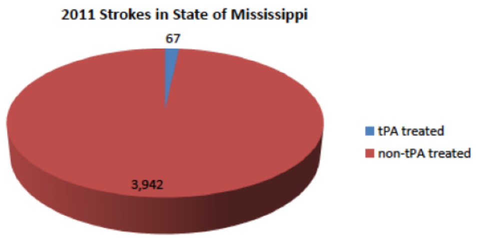
Total MS State Average –**1.7%**

Unique Challenges to Treatment

- Primary Rural Population
  – Long distance to travel to hospital
- Late Presentation to Hospital
  – Poor public awareness/education
- Higher % Hemorrhagic Stroke
  – Lead nation in % hemorrhagic stroke
- Frequent Contraindications
  – Leads Nation in Hypertension
  – Prior Stroke < 3 months – Common
  – Leads nation in advanced CA
- Stroke Mimics Common
  – Leads Nation in Diabetes
  – Drug and ETOH intoxication common
  – Seizure Disorders > national average

Source: Truven Medicare Discharges 2011MS – DRGs 21–27, 61-66

2011 Strokes in Mississippi



Of the 4,009 Strokes in Mississippi only 67 (1.7%) were treated with tPA.

Source: Truven Medicare Discharges 2011
MS-DRGs 61-66

METHODS

Telestroke services were integrated into an established telemedicine system already servicing 17 EDs for general emergency consultations. The system has been in operation for ten years seeing over 425,000 patients with a technical failure rate of 0.00025%. In this protocol, the client ED is considered an extension of the ED of the comprehensive stroke center and activations are simultaneously initiated at both the telemedicine and consultant sites to engage the stroke specialists. After activation, the neurologist is video-conferenced into the telemedicine consultation by way of a personal ipad. Neuroimages are available to the neurologist at the telemedicine consulting site by cloud technology.

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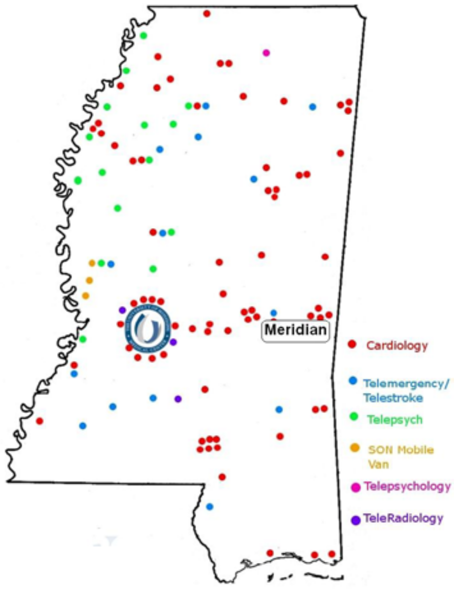
> "Telestroke networks should be deployed wherever a lack of readily available stroke expertise prevents patients in a given community from accessing a primary stroke center (or center of intravenous thrombolytic therapy."[23]
>
> –*ASA Recommendations for the implementation of telemedicine within stroke systems of care, 2013*

RESULTS

This telemedicine system is experienced in remotely assisting in stroke management. There is a first line triage of stroke patients by emergency physicians at a comprehensive stroke center with input from a stroke neurologist. If the case requires a neurointerventionalist then rapid transport to the comprehensive stroke center is facilitated by having routed the consultation through an emergency telemedicine system. By integrating with an established system, the telestroke service was operational within 45 days of the agreement.

CONCLUSIONS

By using this innovative hybrid approach which utilizes a combination of both local neurologists and telemedicine consultations we were able to meet the coverage requirements for stroke center certification.



Remote Patient Monitoring

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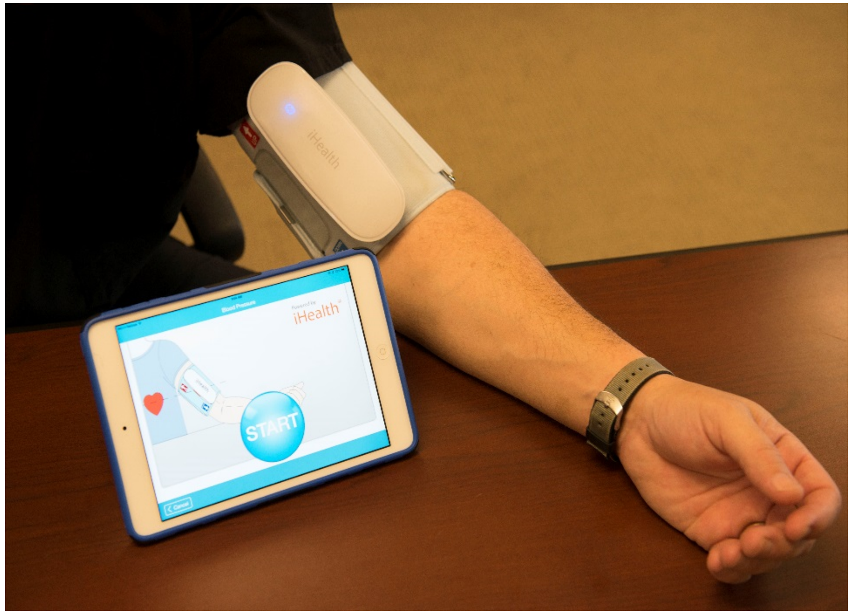
Remote Patient Monitoring (RPM)

Chronic disease management in the patient's home including:



Daily Health Sessions	Personalized Interventions	Targeted Education
Health Coach	Behavior Modification	Patient Empowerment

MS Diabetes Telehealth Network

HbA1c ↓ 1.7%	Medication Compliance 96%	Health Session Compliance 83%
Retinopathy Found 9 cases	Weight Loss 71 pounds	Miles Saved 9,454.11

No Hospitalizations or ER visits for DM

Preliminary results on first 100 patients

Empowering Patients with Technology

"Education is not a building…it is learning and I've learned so much!"

"This program works. I have learned more in this program than I did when I was in a hospital."

"I never thought to look into my shoes"

"I have learned more in the few months of being in this program than I have in 17 years of having diabetes"

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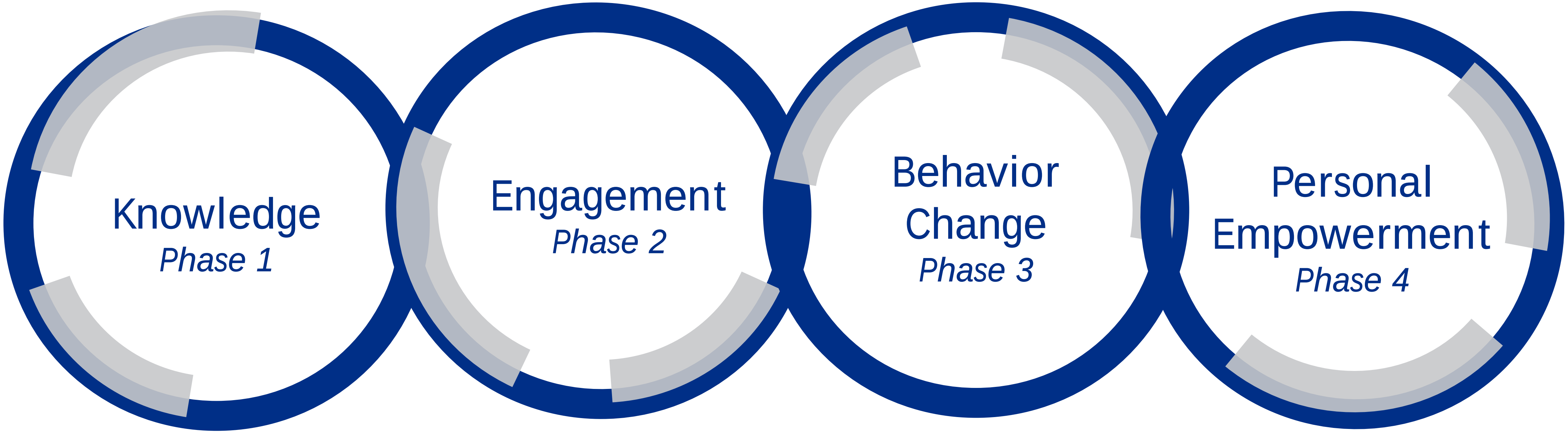
Sustainable Change: Engaging the Patient

Knowledge + Engagement + Support



Remote Hypertension Management Using Home Blood Pressure Telemonitoring and a Standardized Treatment Protocol

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Assistant Professor of Medicine
Division of Cardiology

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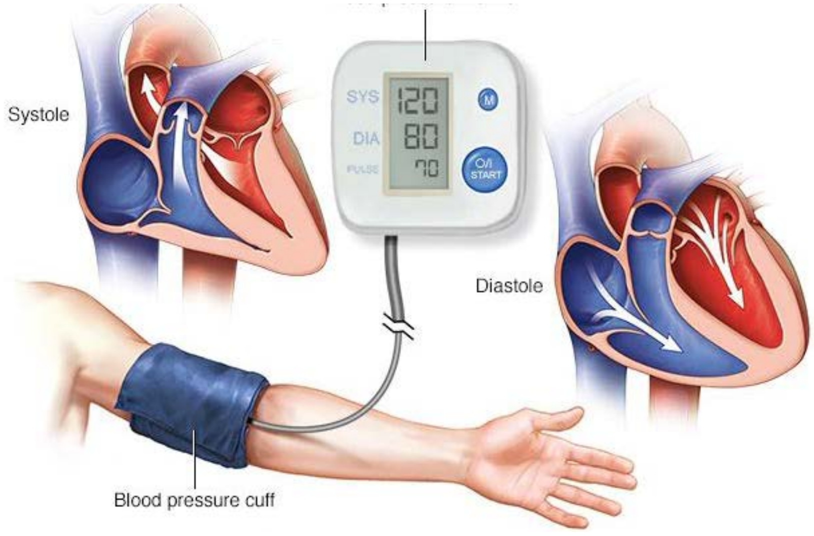
Outline

- Hypertension is common and important to treat
- Hypertension management & 20th century medicine
- Our project:
  - *Remote Hypertension Management Using Home Blood Pressure Telemonitoring and a Standardized Treatment Protocol*

Hypertension

- Blood pressure is the force of blood against your artery walls as it circulates through the body
- Hypertension is high blood pressure which can lead to heart disease and stroke
- Normal BP <120/80 mm Hg
- Elevated 120-129/70-79 mm Hg
- Hypertension >130/80 mm Hg



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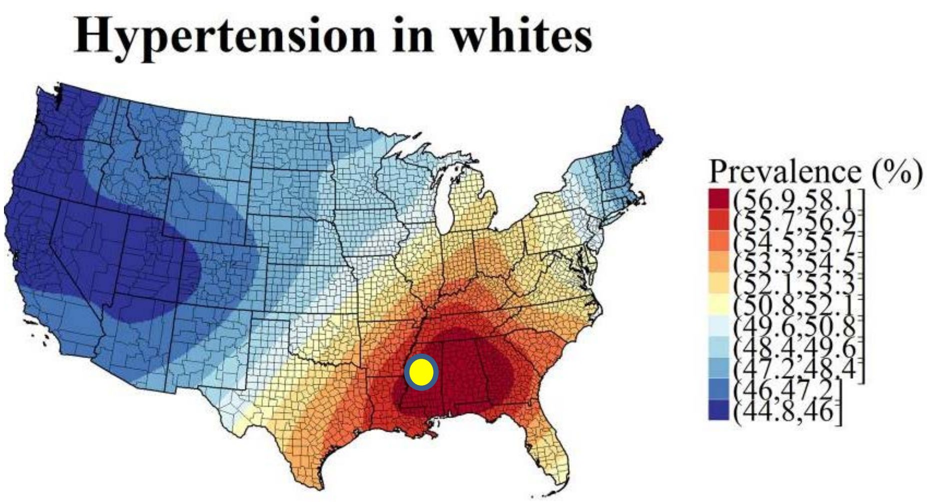
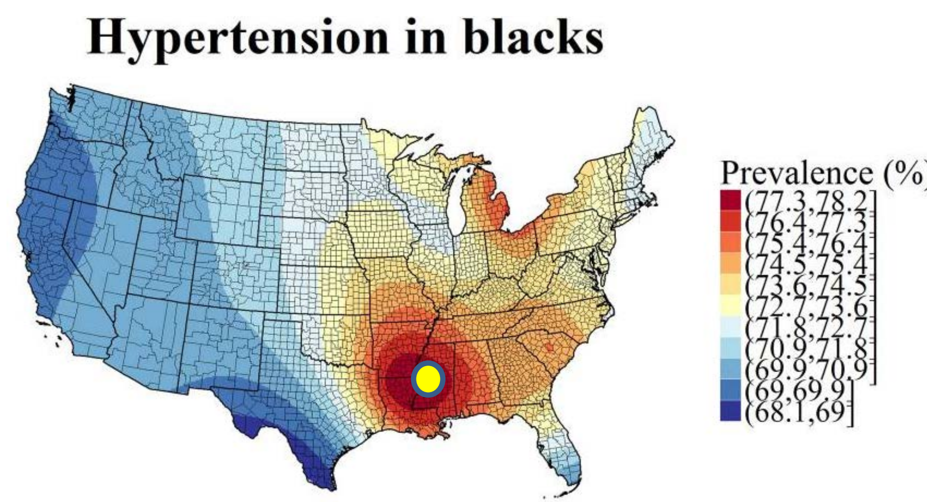
Hypertension





Loop MS, et al. *Circ Cardiovasv Qual Outcomes* 2017

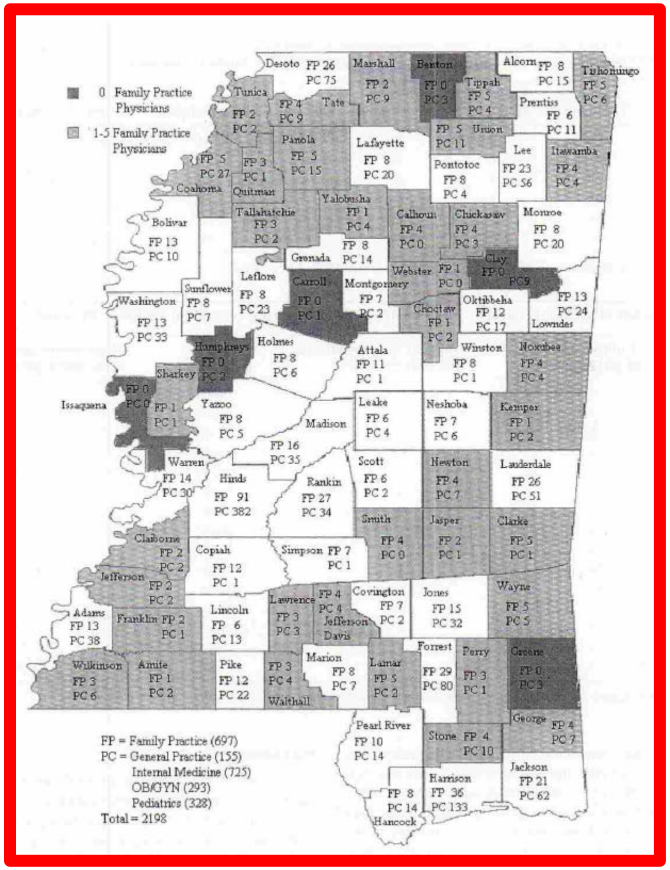
Important to treat

- CVD is the leading cause of death in the US
- Hypertension is the leading contributor to CVD
- Effective hypertension control could save more lives than any other <u>clinical</u> intervention

Farley TA, et al. *Am J Prev Med* 2010

Can our system handle this?

- ~75-100M in US have hypertension
- Strict BP control can be difficult to achieve
  - 6 clinic visits per year
- In MS, half of PCPs are in 7 out of 82 counties



Hypertension is not all…

- Busy PCP practice, 100s quality indicators
  - Diabetes, CAD, CVD, CHF
  - Asthma, headache, depression, back pain, substance abuse, preventive care, screening
- <50% recommendations met during usual care

McGlynn EA, et al. *N Engl J Med* 2003

Not easy for patients

- Average clinic visit in US takes 2 hours
  - 20 minutes face-to-face physician time
  - Travel, wait time, ancillary tasks (billing, paperwork)
- $52B annual lost opportunity costs
- Indirect cost to families, worse for minorities

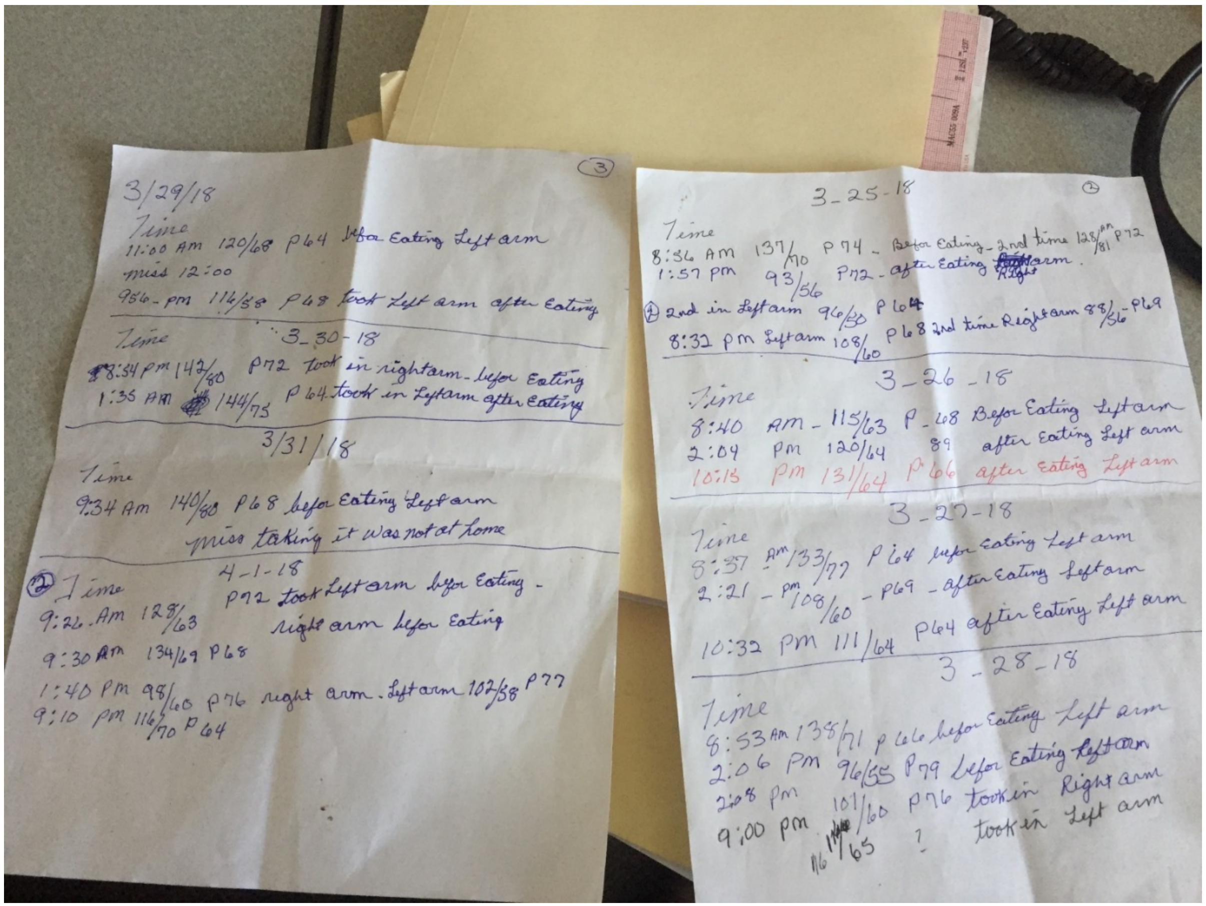
Ray KN, et al. *Am J Manag Care 2015 & JAMA Intern Med* 2015

20^{th} century medicine

- Antibiotics! X-ray!
- Intermittent, reactive care for acute conditions (often ID)
  - Sick? "Go to the doctor"
- Chronic diseases are <u>chronic</u>
  - 1 to 4 clinic visits per year is not ideal approach
  - Chronic disease subject to environmental & behavior influences
  - Require real-time monitoring, feedback, intervention

Milani, et al. *Prog Cardiovasc Dis* 2016

“BP log” – 20th century medicine



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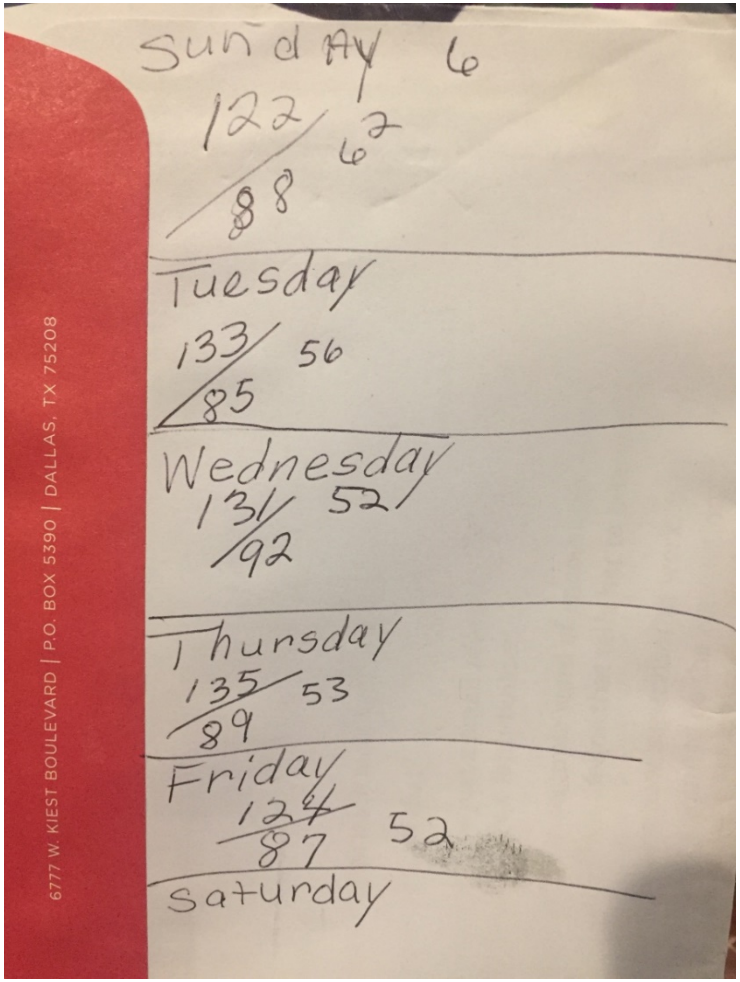
Junk mail envelope



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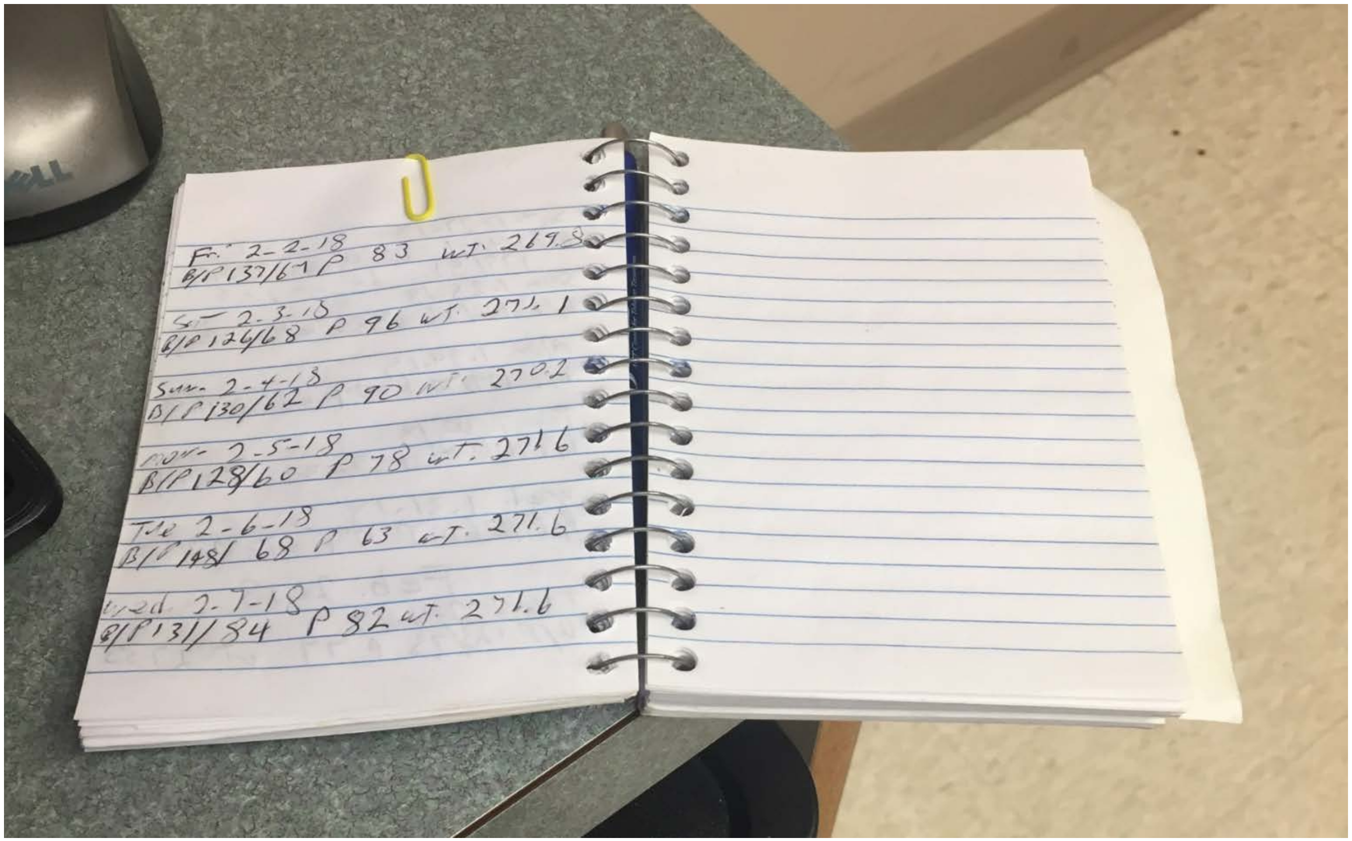
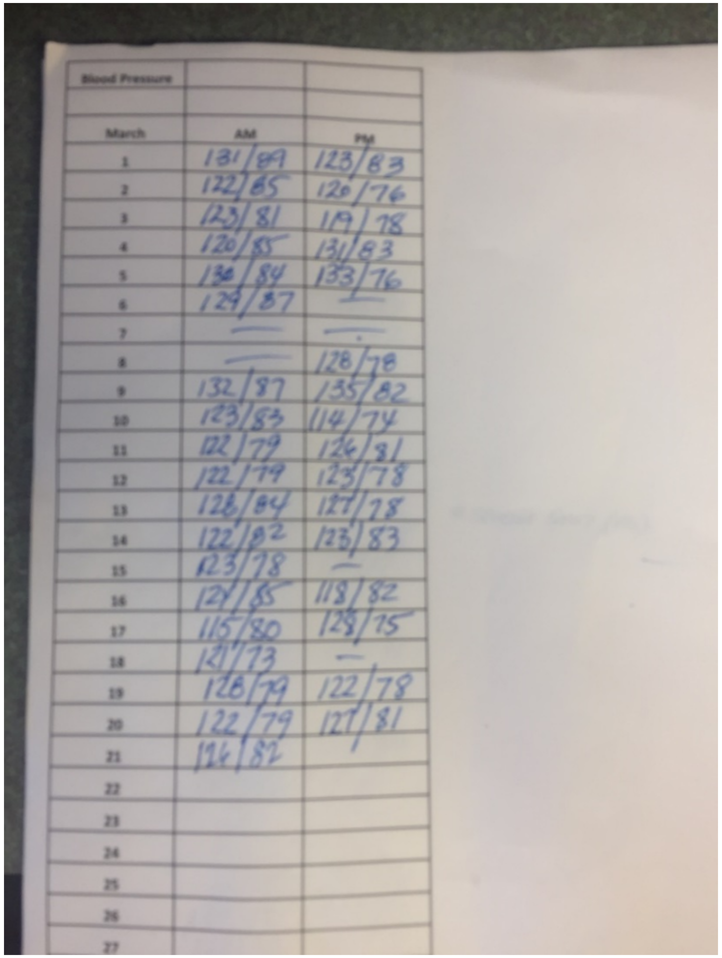
Flipping pages

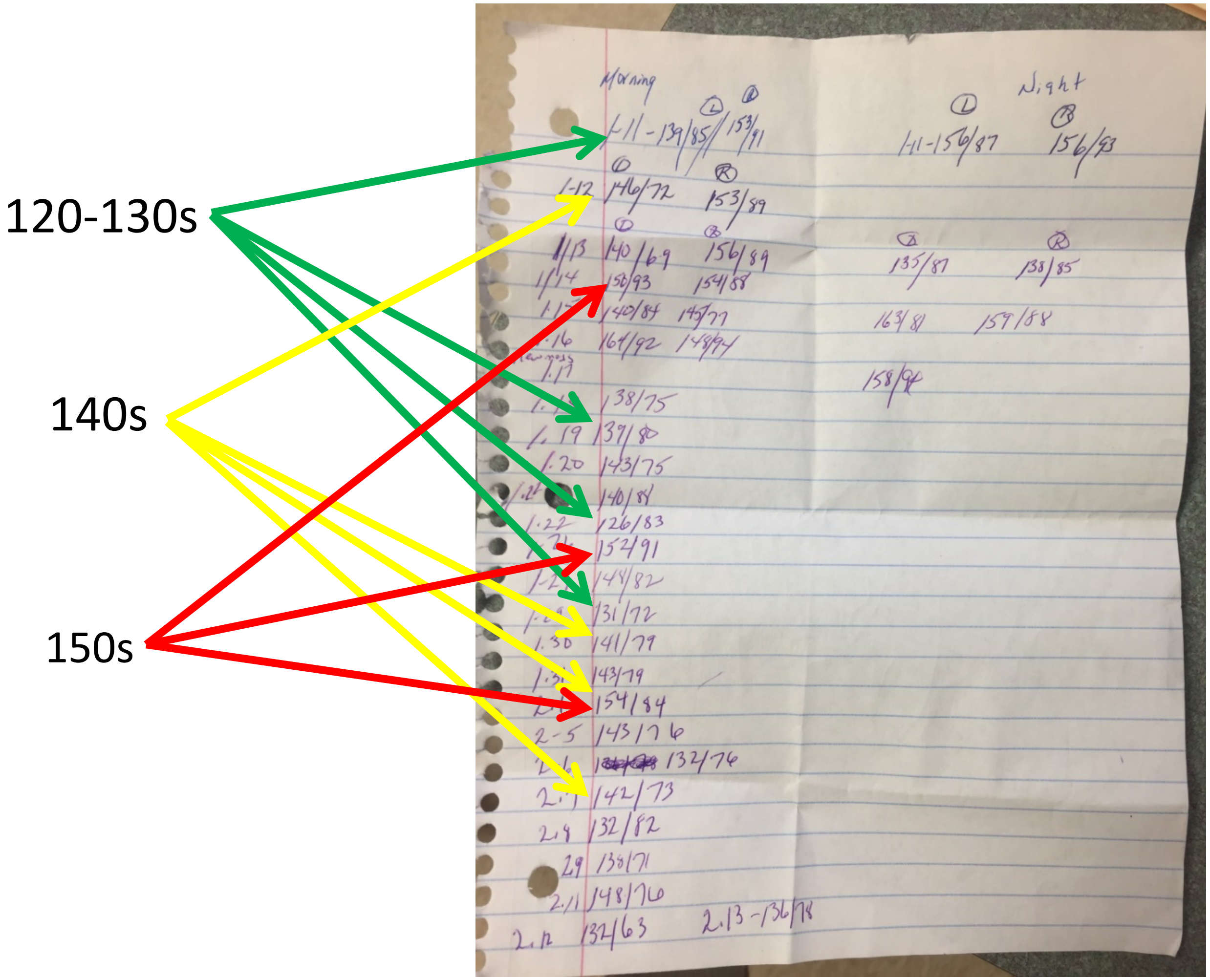


Best we can do?



Blood Pressure		
March	AM	PM
1	131/89	123/83
2	122/85	120/76
3	123/81	119/78
4	120/85	131/83
5	138/84	133/76
6	129/87	—
7	—	—
8	—	128/78
9	132/87	135/82
10	123/83	114/74
11	122/79	126/81
12	122/79	123/78
13	126/84	127/78
14	122/82	123/83
15	123/78	—
16	124/85	118/82
17	115/80	128/75
18	121/73	—
19	128/79	122/78
20	122/79	127/81
21	124/82	
22		
23		
24		
25		
26		
27		

Average? Treatment decision?



Paradigm shift

- Hypertension is everywhere and effective treatment can have enormous public health impact
- Current care is not organized for optimal chronic disease management
- Time to embrace technology, team-based care, and remote monitoring of patient-generated data

Team care, remote monitoring

- In hypertension, the evidence strongly supports:
  - Protocol-driven evidence based treatment algorithms
  - Team care – process support from pharmacists, nurses, dieticians, social workers
  - Home BP monitoring combined with team care significantly outperforms usual clinic-based management for hypertension

Whelton PK, et al. *J Am Coll Cardiol.* 2017

Remote Hypertension Management Using Home Blood Pressure Telemonitoring and a Standardized Treatment Protocol

- Prospective study
- Goal enrollment 100 patients
- Evaluate feasibility, safety, and efficacy
- Estimate trends in BP control, antihypertensive medication adjustment, treatment intensity, patient satisfaction, resource utilization

Eligibility and enrollment

Inclusion Criteria

1. Patient aged ≥18 years at screening
2. Patient of UMMC clinician approving the study
3. At least 2 clinic encounters in the past 12 months with systolic BP ≥ 140 mmHg or diastolic BP ≥ 90 mmHg

Exclusion Criteria

1. Stage 4 or 5 chronic kidney disease
2. Systolic heart failure (LVEF <50%) or major cardiovascular event (MI, stroke) within 3 months
3. Resistant hypertension (prescribed 3 or more antihypertensive medications at target doses) or known secondary cause of hypertension
4. Pregnancy or unwillingness to use birth control for women of child-bearing potential
5. Institutionalized, dementia, limited life expectancy, uncontrolled mental illness, substance abuse, or other conditions that would prohibit ability to perform regular home BP monitoring

Recruitment

- Direct clinic referral

Ship telemedicine kit:

- iPad tablet
- Wireless BP cuff

Digital Consent

- Audiovisual consent with iPad
- Onboarding and instruction
- Baseline medical assessment

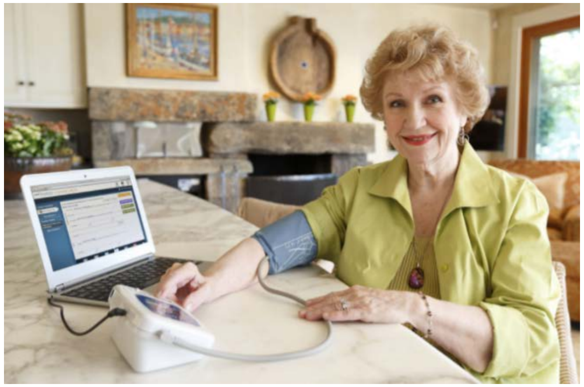
BP Telemonitoring

Home BP monitoring

UMMC Center for Telehealth

Daily health sessions
- Bluetooth BP transmission
- Active monitoring, safety assessment
- Engagement reminders

3-week phone visits
- BP control assessment
- Medication up-titration per protocol



Preliminary data

	N = 85
Age, mean (SD), y	60.1 (11.0)
Female sex, %	54 (64)
African American, %	39 (45)
Household income <$50K, %	52 (61)
Resides in rural county, %	19 (22)
Distance to UMMC, miles	30.4 (30.0)
Obese, BMI >30	32.4 (8.6)
Diabetes mellitus	20 (24)

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Preliminary data

N = 37	Baseline	6-months	P-value
Systolic BP, mm Hg	138.7 (12.1)	123.5 (11.5)	<0.001
Diastolic BP, mm Hg	82.1 (7.1)	74.5 (6.9)	<0.001
Antihypertensive	1.5 (1.1)	2.2 (1.2)	<0.001

What have we learned?

- Efficient data capture and analysis
- Structured team-based protocols, weekly meetings
- Patient adherence, engagement strategies
- Medication protocol adjustments
- Flexibility, real-world adjustments, examples:
  - Out of country
  - Recent gout
  - Symptom assessment

Future directions

- 100 participants, enroll and complete protocol
- Complete efficacy and safety analysis
- Consider protocol revisions
  - Individualize protocols: 3, 6, 9, 12 months
  - Physical activity monitoring
  - Improve education materials
  - Assess need for "booster" sessions
- Sustainable program
  - How to continue after grant funding
  - Institution adoption
  - Pilot CPT codes, formal economic analysis

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Thank you

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