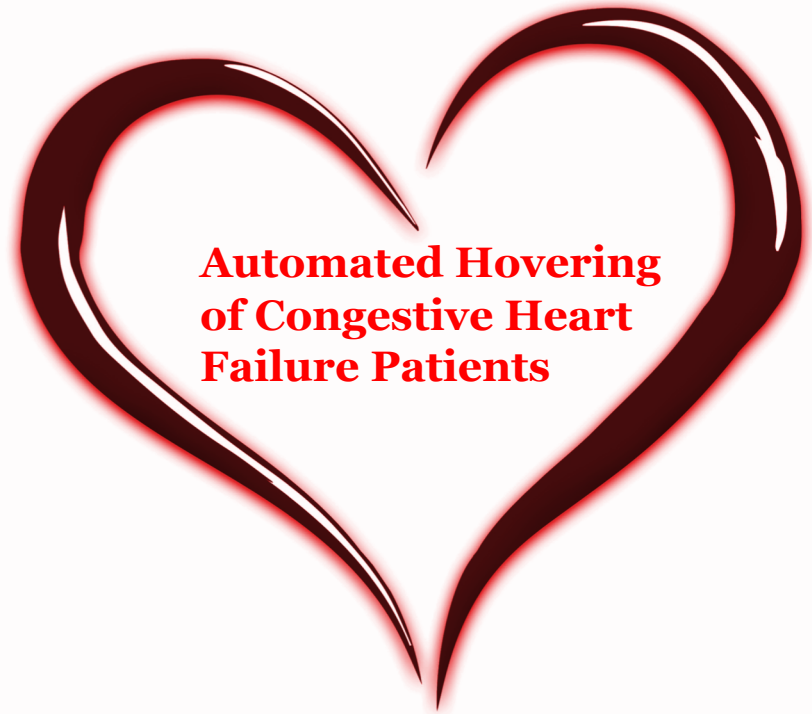




Bryson Houston, SUMR Scholar

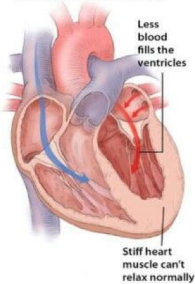


**Automated Hovering  
of Congestive Heart  
Failure Patients**

# Congestive Heart Failure

- Chronic progressive condition that affects the “pumping power” of the heart
- In 2011, an ARHQ study showed that heart failure was the #1 reason for hospital readmission within 30 days

Diastolic Heart Failure

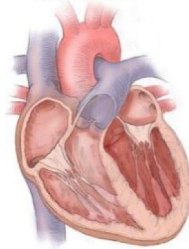


## Diastolic

Thickened, stiff heart muscles

Unable to relax and fill with blood

Normal Heart

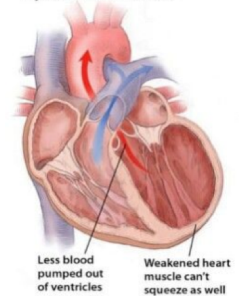


## Systolic

Thin, weakened heart muscles

Not enough pressure to pump blood to the body

Systolic Heart Failure



# Study Overview

- 566 UPHS patients enrolled
- 1:1 randomization to control or intervention group in the EMPOWER program within 30 days of discharge
- Intervention set-up
  - Wireless pill bottle
  - Automated body weight scale
  - Loss aversion lottery incentive
  - Support partner
  - Inspirational messaging



# Process of Weight Monitoring



Way to Health

Electronic Medical Record

Provider Response

# Way to Health Alerts

- Patients contacted if there's a weight change of 3lb/24hr, 5lb/72hr, or -10lb/1 week
- Symptoms questionnaire:
  - Increasing chest pain?
  - Increasing SOB?
  - Worsening swelling in legs, ankles, feet?
  - Worsening appetite or nausea?
  - Difficulty with meds?
  - Other symptoms?
- Providers are also called if there is an increase in chest pain or shortness of breath

Medication								
Weight	239.5	240.0	243.0*	244.5*	242.0	241.5*	237.0*	239.5*

# EPIC Alerts

## Result Information

Flag: Abnormal

Status: Final result (Collected: 8/31/2018 12:11)

### WAY TO HEALTH - WEIGHT MONITORING MESSAGING [317292672] (Abnormal)

Resulted: 08/31/18 1215, Result status: Final result

Resulting lab: WAYTOHEALTH

#### Specimen Information

ID	Type	Source	Collected On
—	—	—	08/31/18 1211

#### Components

Component	Value	Reference Range	Flag	Lab
WAY TO HEALTH:MESSAGE	--	—	A	WTH

#### Comment:

Weight on 8/29/18 = 385.5  
Weight on 8/30/18 = 387  
Weight on 8/31/18 = 390.5

**3lbs in 1 day and 5lbs in 3 days**

Increasing chest pain? N

Increased SOB? N

Worsening swelling in legs, ankles, or feet? Yes

Worsening of appetite or nausea? N

Difficulty with meds? N

Pt reported increased swelling in both feet.

To view this patient's daily weights in EPIC, select the REVIEW FLOWSHEETS tab on the left-hand side of the patient chart. Select UPHS AMB WTH WEIGHT to see all recorded weights from oldest to newest (left to right)

#### Result:

CHF EMPOWER PROGRAM

Patient triggered 3 lbs in 1 day weight gain alert on 8/31/18.

Patient triggered 5 lbs in 3 days weight gain alert on 8/31/18.

#### Result Read / Acknowledged

[Acknowledge result](#)

User

Time Read / Acknowledged

Carbino, Chanel, RN

8/31/2018 12:16 PM

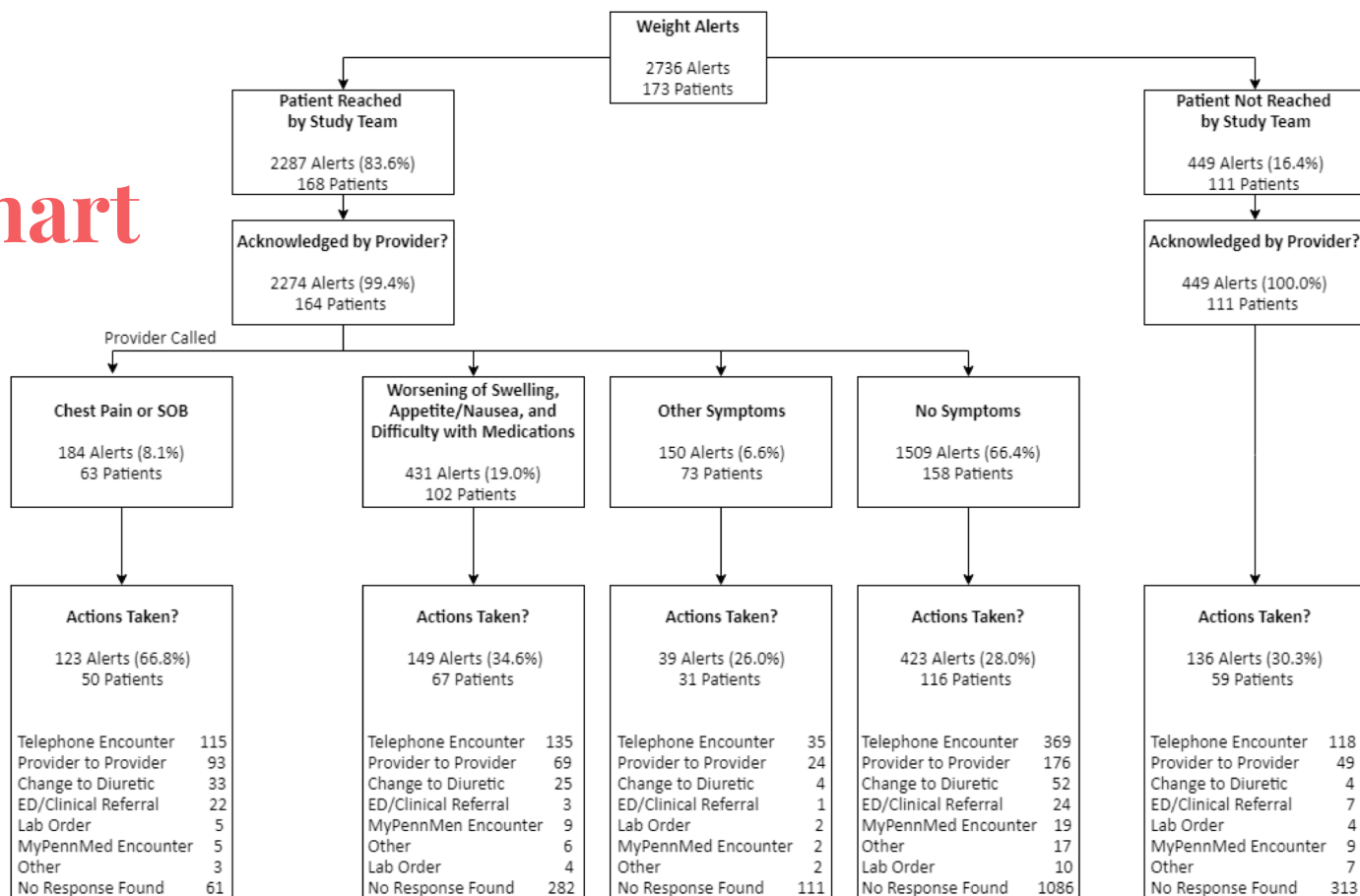
Reynolds, Carl R, MD

9/3/2018 9:45 AM

# Providers' Responses

- Once the alert was acknowledged, we tracked to see if and how providers responded to the abnormal alert
  - MyPennMed (online message portal)
  - Telephone Encounter
  - Lab Orders
  - Change to Diuretics
  - ED or clinic referral
  - Provider to Provider Contact (discussing patient care with another team member)

# Result Flowchart

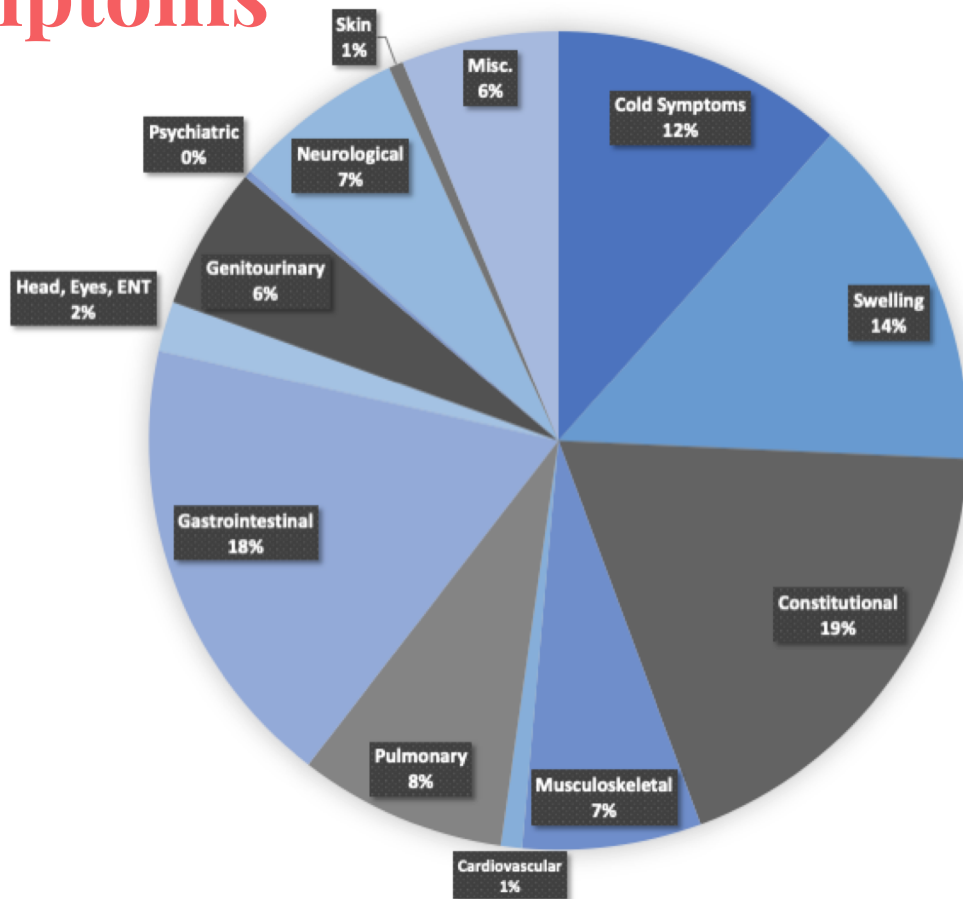


Actions taken: provider attempted to reach out to patient after receiving weight alert or the provider made note of the weight alert and routed it to a different provider

June 13, 2016- January 29, 2018



# Other Symptoms



# Other Symptoms Continued

## **Constitutional**

Tiredness  
Fatigue  
Thirst

## **Swelling**

Abdomen  
Hand  
Knees

## **Genitourinary**

Frequent Urination  
Urination Problems

## **Pulmonary**

SOB upon exertion  
Ongoing SOB  
Heavy breathing

## **Neurological**

Dizziness  
Weakness  
Lightheaded

## **Musculoskeletal**

Different areas of pain (i.e leg, foot, back)  
Leg cramps  
Neck Stiffness

## **Miscellaneous**

Difficulty sleeping  
Became/feeling depressed  
Bacteria infection

## **Gastrointestinal**

Vomiting  
Constipation  
Chronic lack of appetite  
Diarrhea

## **Cold Symptoms**

Had a cold  
Experienced cold symptoms  
Flu

# Results

- Providers acknowledged 99% of all alerts
- Patients reported no symptoms in  $\frac{2}{3}$  of the alerts
- If patient reported chest pain or shortness of breath AND received a call from the EMPOWER program, preliminary findings indicate that providers are twice as likely to take action
- Telephone encounters proved to be the most common way to respond

# Discussion

- Should the study team send alerts to providers if patient repeatedly reports no symptoms?
- Can we use automated hovering as an effective tool for other chronic conditions?
- Next Steps: Do these alerts prevent readmission?

# Lessons Learned

- Significance of Congestive Heart Failure
- Importance of patient/provider relationship
- Consistency is key

RESEARCH

A hand holding a blue marker is shown at the bottom right, underlining the word "RESEARCH" which is written in a large, blue, hand-drawn font.