



**UNC REX  
HEALTHCARE**



## **Assessing HF in the Emergency Department**

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# Back to basics

	ADHERE (150,000 pts.)	EURO HF (11,327 pts.)	OPTIMIZE-HF (48,612 pts.) <sup>†</sup>
Any dyspnea (%)	89	70	90
Dyspnea at rest (%)	34	40	45
Fatigue (%)	32	35	23
Rales (%)	68	N/A	65
Peripheral edema (%)	66	23	65
Systolic BP (%)			
< 90 mmHg	2	< 1	< 8
90 - 140 mmHg	48	70	44
> 140 mmHg	50	29	48

Patients are admitted because of dyspnea

# Is dyspnea from HF?

**THE RATIONAL**  
**CLINICAL EXAMINATION**

**CLINICIAN'S CORNER**

Symptom	Sensitivity	Specificity
Dyspnea on exertion	0.84	0.34
PND	0.41	<b>0.84</b>
Orthopnea	0.50	0.77
Edema	0.51	0.76
Physical Exam Finding		
LE edema	0.50	0.78
JVD	0.39	<b>0.92</b>
Rales	0.60	0.78
Gallop (S3)	0.13	<b>0.99</b>

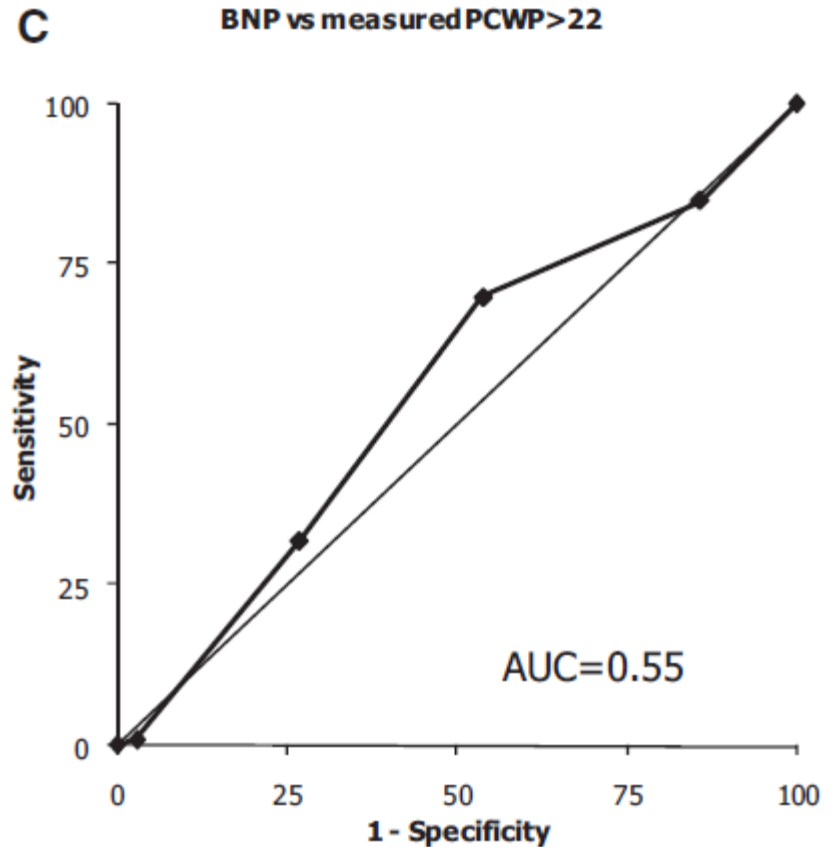
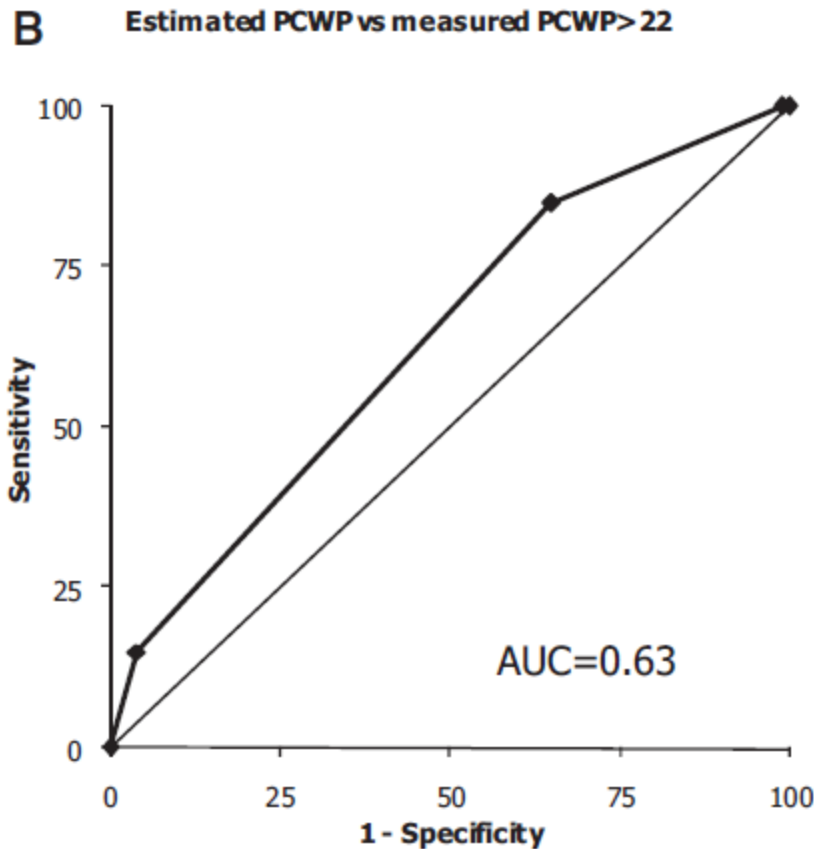
**50% of HF patients don't have LE edema**

**Best symptoms/findings:**

- PND
- JVD
- Gallop
- Rales

**Traditional methods are often either sensitive or specific but not both; they also struggle to communicate severity of HF**

# Can we assess elevated filling pressures?



**We are not very good job predicting left sided pressures**

## ReDS Vest

- Non-invasive vest that can be used to measure lung-fluid content
- **Surrogate for physical exam**



## ReDS Vest

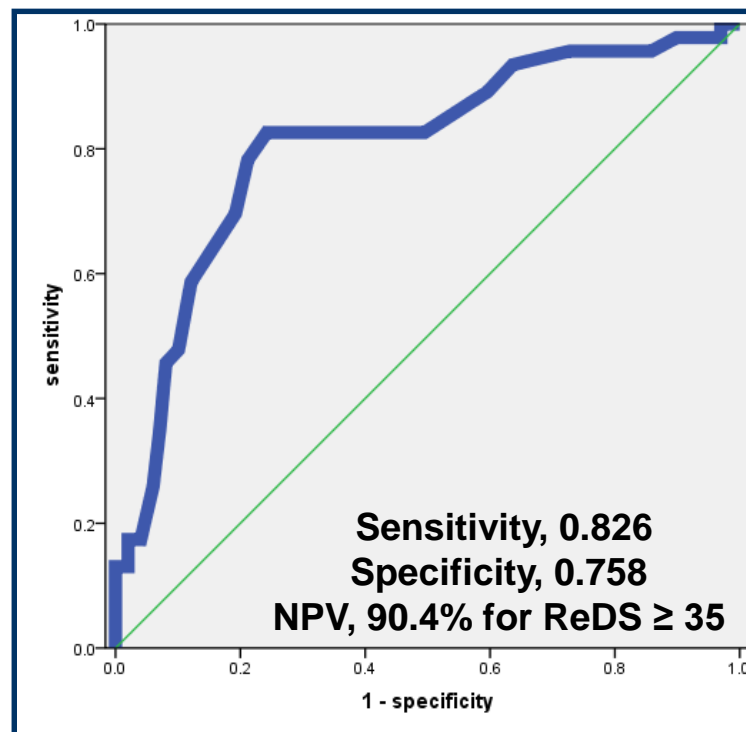
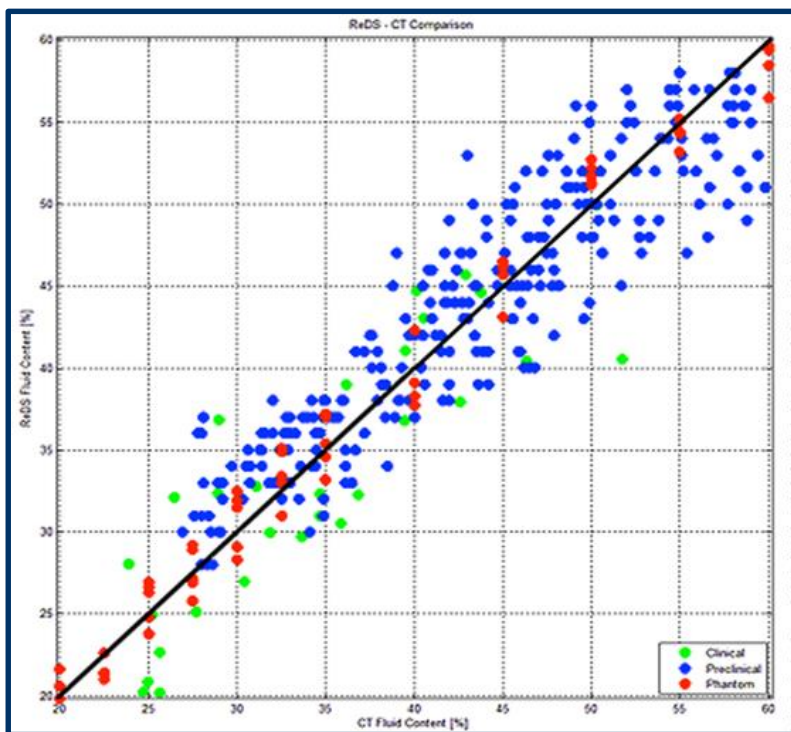
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- Emits low power electromagnetic signals into the body
- Device measures dielectric return signals, which reflect the fluid content of the tissues
- Provides an **absolute** number that reflects the lung fluid content (normal 20-35%)

<b>ReDS Vest reading</b> % H2O in lungs	20 – 35% NORMAL	36 – 40% MODERATE RISK	> 40% SIGNIFICANT RISK
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# ReDS Vest Accuracy vs. other measures of HF

## ReDS vs. CT scan and PA catheterization (PCWP > 17)



**Accurate, Absolute, Actionable**

# UNC Rex: Early experience



## **Product trial/pilot January 2018**

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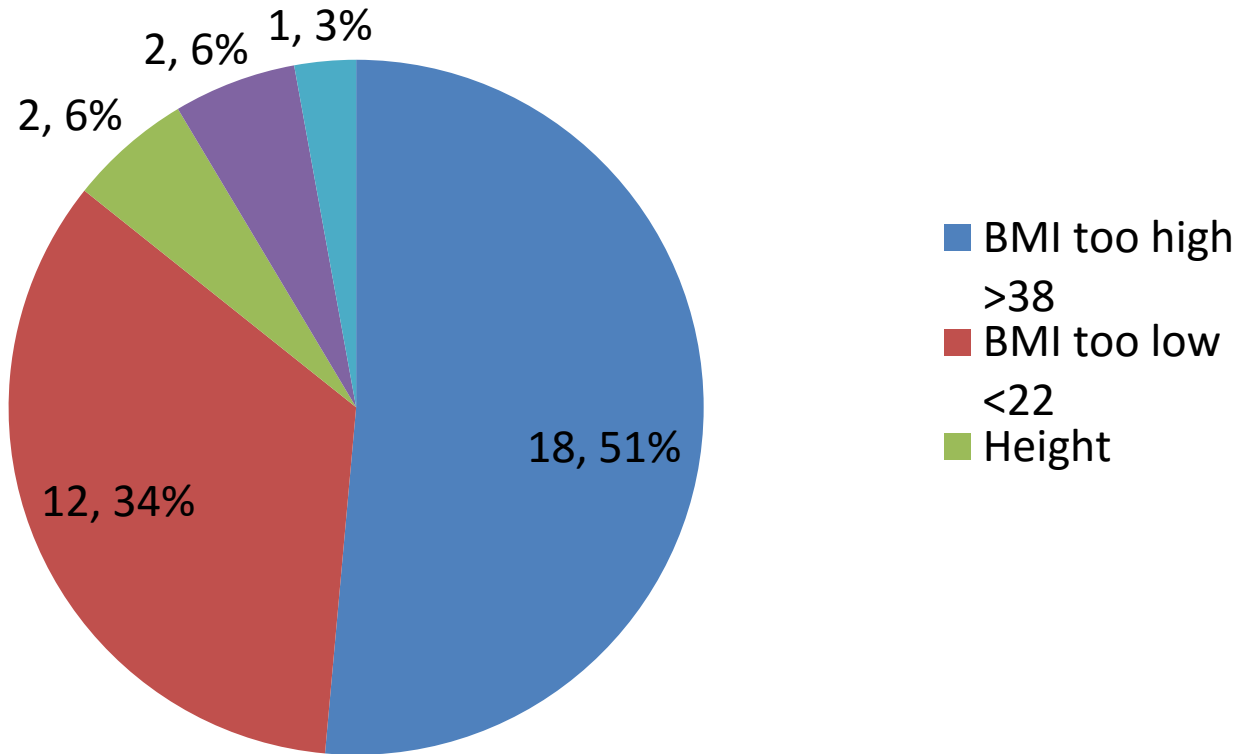
**Two week period of testing the device in the emergency room and HF clinic**

**ED patients either had a history of CHF or presented with dyspnea**

**Study usability and outcomes**

# Inclusion versus Exclusion from Pilot

Patient excluded from ReDS reading 35/114 or 31%



- All reasons for exclusion
- BMI > 38
  - BMI < 22
  - Height > 6'4"
  - Height < 5'1"
  - C. Diff \*
  - Implant or Device
  - Patient or Family Refusal\*
- \* no patient's in these categories*

**~70% of patients could be assessed by ReDS**

# Patient Satisfaction & Understanding

## Patient questions

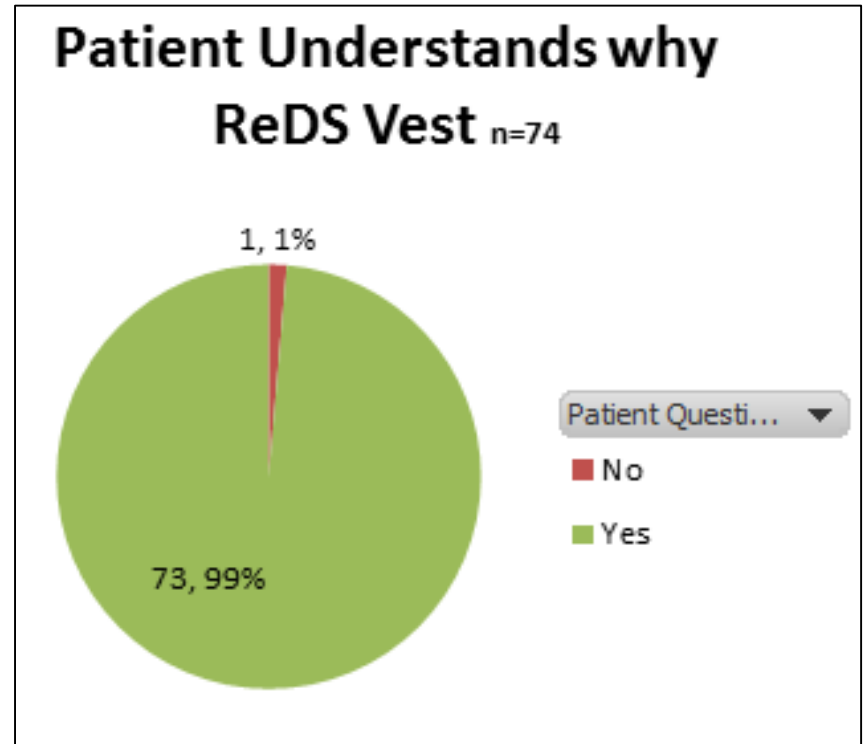
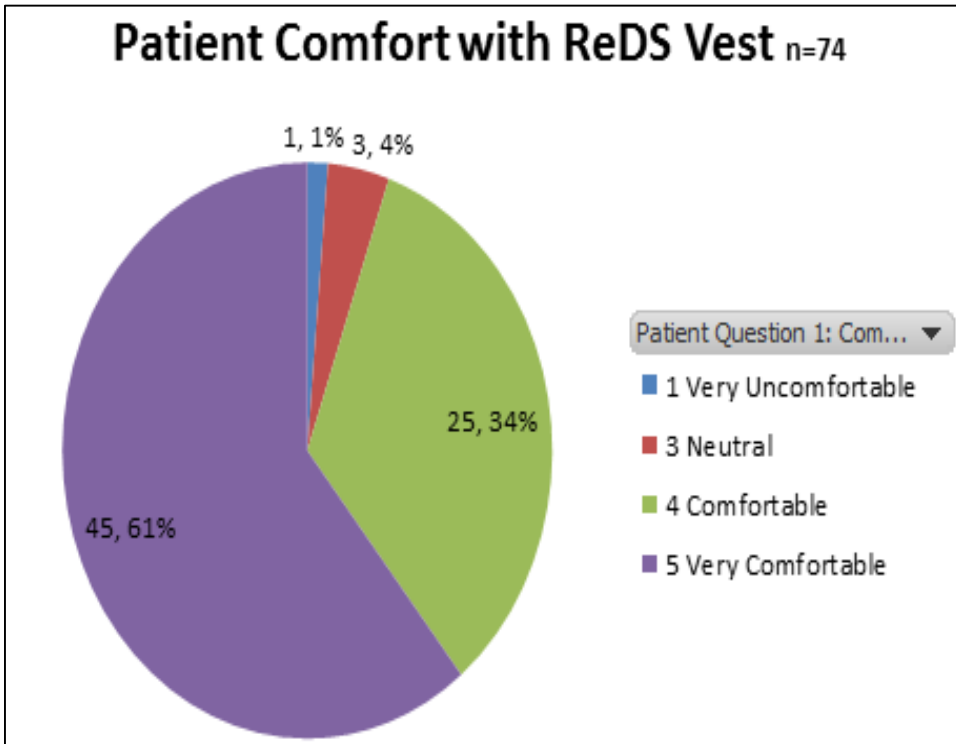
1) On a scale 1 - 5, how comfortable was it to wear this vest?



2) Do you understand why we are using this vest?

Yes

No



**Patient satisfaction was high 95%**  
**Patient understanding was very high 99%**

## UNC-Rex next steps

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- **On the basis of the product evaluation pilot and existing data, we purchased 3 vests**
- **Identified superusers and champions from the ED and our dedicated HF clinic to help implement utilization**
- **Began to work on creating a pathway and collecting data**
  - Risk stratification?**
  - Utilization of HF clinic as an alternative to admission (high % of patients with LOS < 3 days)**

# Emergency Room Pathway

	Low Risk – Refer to Clinic	Moderate Risk	Significant Risk – Admit**
<b>Heart Rate</b>	≤ 80 bpm	80 – 100 bpm	> 100 bpm
<b>Blood Pressure</b>	≥ 120 / 80		≤ 90 / 60 > Systolic 180
<b>O2 Sat</b>	≥ 95%	92 – 94%	< 92%
<b>ReDS Vest reading % H2O in lungs</b>	<b>25 – 35%</b>	<b>36 – 40%</b>	<b>&gt; 40%</b>

↓  
Attempt to discharge with HF clinic follow up

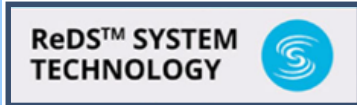
**Clinical judgement zone**

↓  
**Admit**

## First 55 emergency department patients

# Identifying high risk HF patients: early decision making

Total n = 55  
Mean age 73; Male 62%



**Green = 21**  
proBNP 4851

**Yellow = 10**  
proBNP 8472

**Red = 24**  
proBNP 12961

**Admitted?**

**HF = 5 (24%)**  
Non-HF = 7 (33%)  
Discharge = 9 (43%)

**HF = 6 (60%)**  
Non-HF = 4 (30%)  
Discharge = 1 (10%)

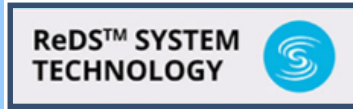
**HF = 19 (79%)**  
Non-HF = 2 (8%)  
Discharge = 3 (13%)

**p-value = 0.003**

**Early decision making aided by ReDS**

# Identifying high risk HF patients: 30 day outcomes

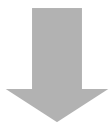
Total n = 55  
 Mean age 73; Male 62%



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 proBNP 12961



**Re-admit?**

**Yes = 2 (10%)**  
**No = 19 (90%)\***

**Yes = 1 (10%)**  
**No = 9 (90%)**

**Yes = 9 (38%)**  
**No = 15 (62%)**

**p-value = 0.02 for ReDS ≥ 40**

**\* - of the 9 patients discharged from ED, none were subsequently admitted**

**Identifying a high risk cohort = opportunities for improvement, resource allocation**



## Next steps

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**Continuing to collect data with the hope of using this across our health care system**

**Nationwide study of ReDS vest use in the emergency room?**

**Targeted interventions?**

- Time to diuretic
- Use of cardiology, HF consultants
- ReDS vest at discharge to make sure they are dry

## Summary

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**ReDS vest is a highly accurate and absolute measure of lung fluid content**

**ReDS vest can help triage and identify diagnoses in emergency room patients with undifferentiated dyspnea and/or history of CHF**

**Initial data suggests that ReDS vest reading in the emergency department predicts outcomes out to 30 days. This can be used to identify patients who can be safely discharged vs. require more intensive resources**

# Discussion (food for thought)



**Will this be like the ECG for congestive heart failure?**



**How do we communicate the degree of volume overload?**