

# Connecting the Dots: Behavioral Economics and a Cluster Randomized Trial

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**Duke** Clinical Research Institute

FROM THOUGHT LEADERSHIP  
TO CLINICAL PRACTICE

# Disclosures

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- Research grant to the Duke Clinical Research Institute from:
  - Novartis (Independent Investigator Award)



# The Agenda

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- A Story about Minecraft
- Why Heart Failure?
- Can We Change Behavior?
- Simple... Just Study It!
- What's Next?



## Question 1

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- What does Minecraft have to do with health?

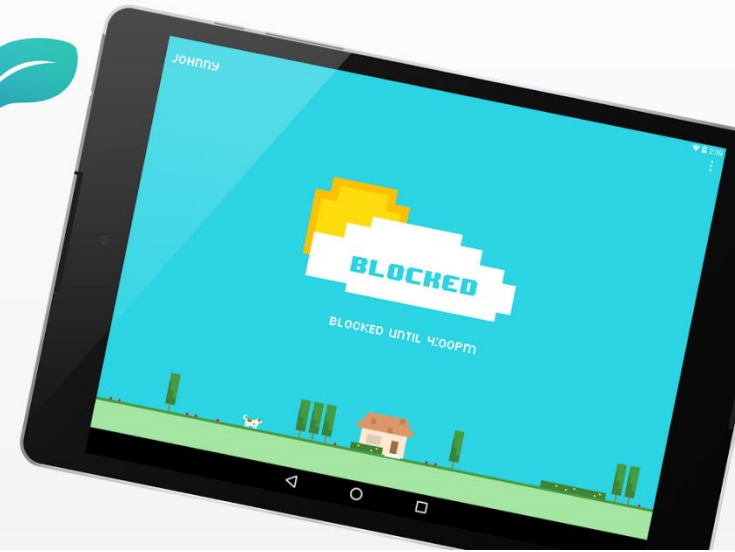


## Question 2

- Does Stampy Cat have the keys to health?



Pair your child's device  
with OurPact's parent app.



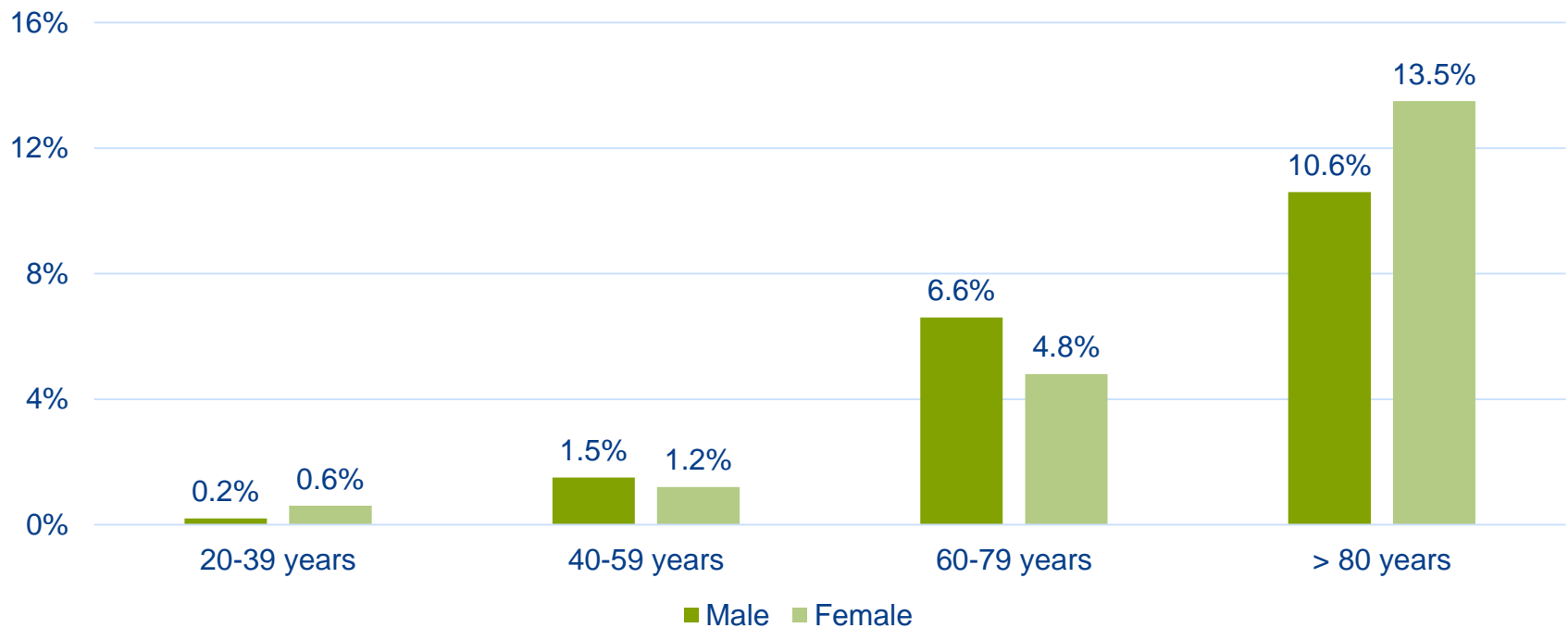
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# 5.7 million American Adults Have Heart Failure

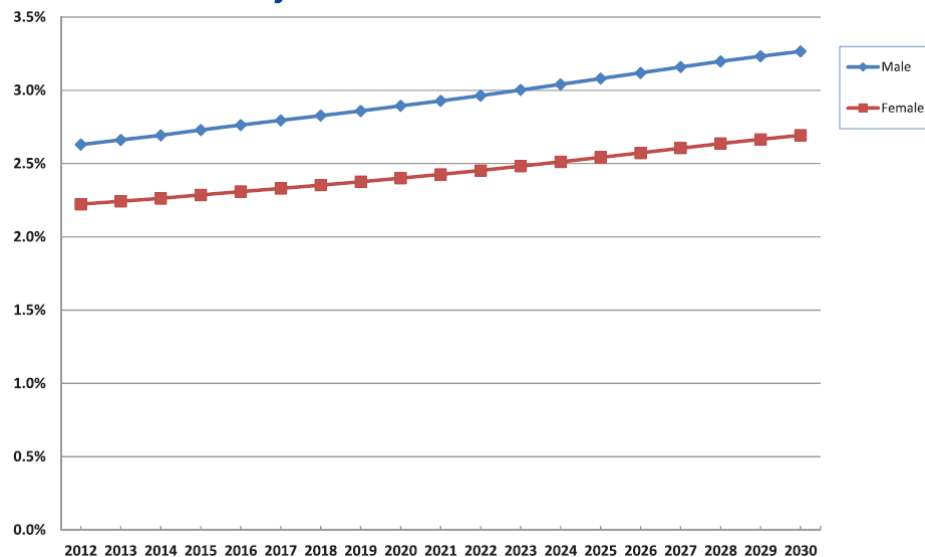


Mozaffarian D et al. Circulation. 2015 Jan 27;131(4):e29-322

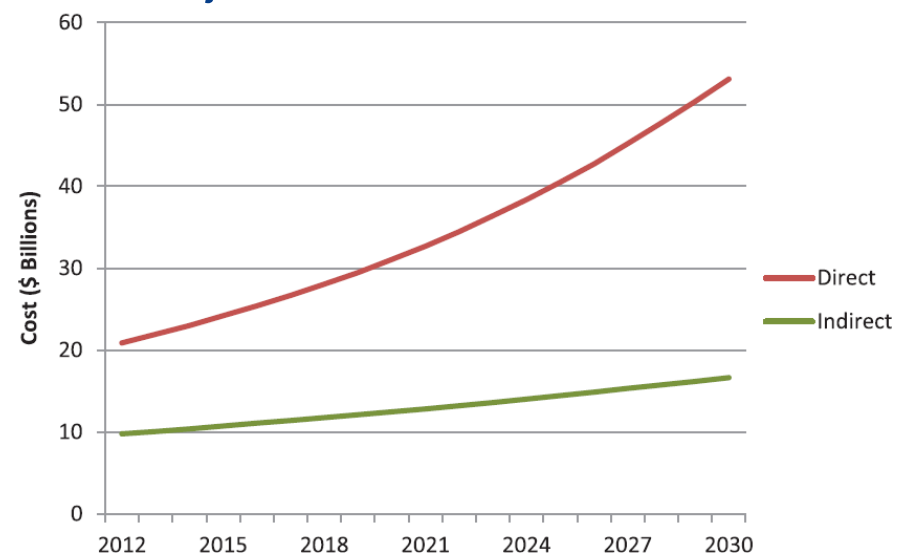


# Forecasting the Impact of Heart Failure in the United States

## Projected Prevalence



## Projected Cost Increases



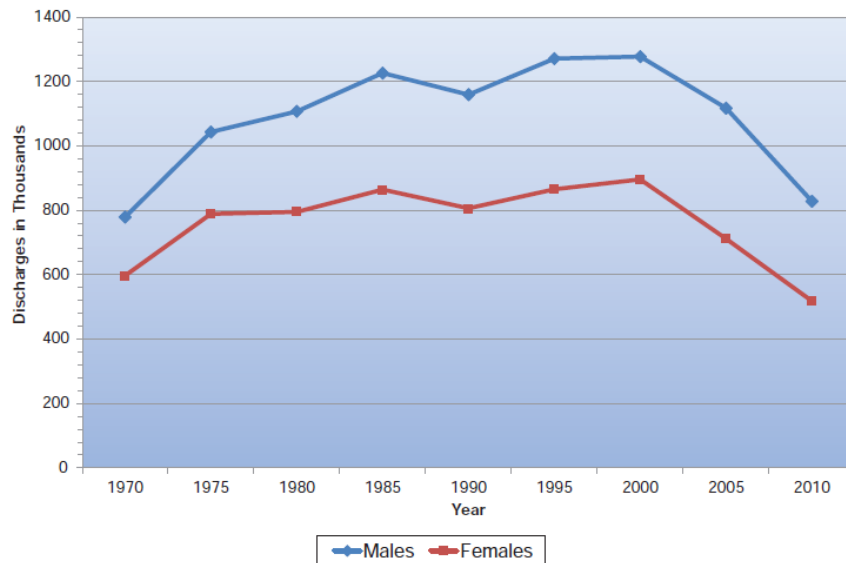
Heidenreich PA et al. Circ Heart Failure. 2013;6(3):606-19



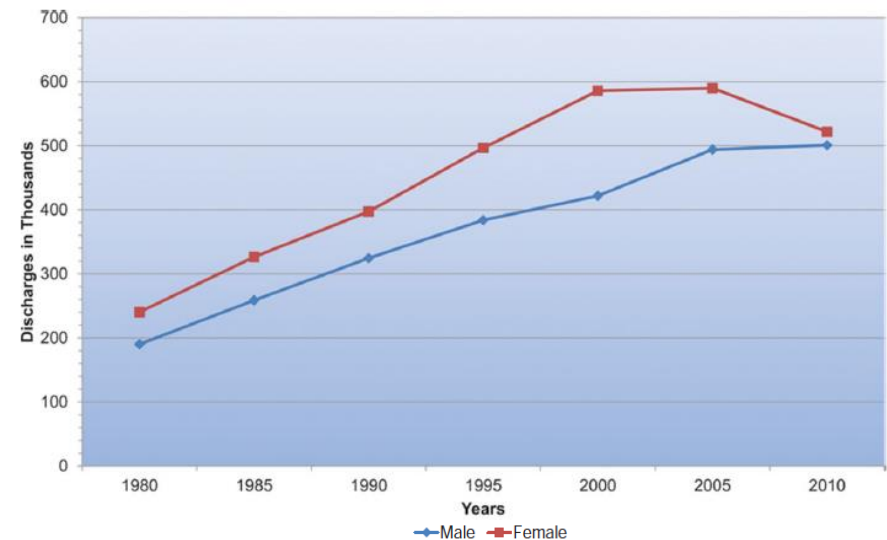


# Heart Failure: Hospitalizations Remain Common

## Coronary Heart Disease



## Heart Failure



Mozaffarian D et al. Circulation. 2015;131:e29-e322.



# The United States Public Health Perspective

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**\$2.7 trillion spent annually on health care  
(18% of US GDP)**

CV disease costs >\$445 billion today, \$1 trillion by 2030

HF costs >\$31 billion today, \$71 billion by 2030



# From Evidence to Routine Practice

- 17 years for new knowledge generated by randomized controlled trials to be incorporated into practice, and even then application is highly uneven.



# A complete and utter failure to change care...

## Original Article

### Cluster-Randomized Trial of Personalized Site Performance Feedback in Get With The Guidelines-Heart Failure

Adam D. DeVore, MD; Margueritte Cox, MS; Paul A. Heidenreich, MD, MS;  
Gregg C. Fonarow, MD; Clyde W. Yancy, MD; Zubin J. Eapen, MD, MHS;  
Eric D. Peterson, MD, MPH; Adrian F. Hernandez, MD, MHS

**Background**—There is significant variation in the delivery of evidence-based care for patients with heart failure (HF), but there is limited evidence defining the best methods to improve the quality of care.

**Methods and Results**—We performed a cluster-randomized trial of personalized site performance feedback at 147 hospitals participating in the Get With The Guidelines-Heart Failure quality improvement program from October 2009 to March 2011. The intervention provided sites with specific data on their heart failure achievement and quality measures in addition to the usual Get With The Guidelines-Heart Failure tools. The primary outcome for our trial was improvement in site composite quality of care score. Overall, 73 hospitals (n=33 886 patients) received the intervention, whereas 74 hospitals (n=37 943 patients) did not. One year after the intervention, both the intervention and control arms had a similar mean change in percentage points in their composite quality score (absolute change, +0.31 [SE, 1.51] versus +3.18 [SE, 1.68] in control;  $P=0.21$ ). Similarly, none of the individual achievement measures or quality measures improved more at

Circ Cardiovasc Qual Outcomes. 2015 Jul;8(4):421-7



# Expanding Choices: Will we be any better?

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## 1989

- Digoxin
- Diuretics
- Vasodilators

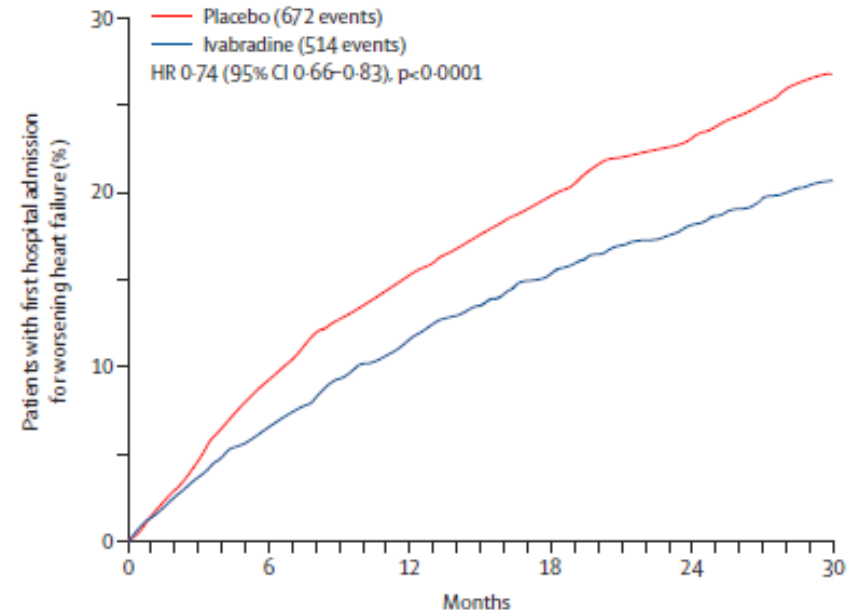
## 2017

- ACE inhibitors/ARBs
- Beta-blockers
- Aldosterone antagonists
- ARB/Neprilysin Inhibitor
- Hydralazine/Nitrates
- Ivabradine
- ICD and CRT
- Mechanical circulatory support
- CardioMEMS
- Disease management
- Palliative care

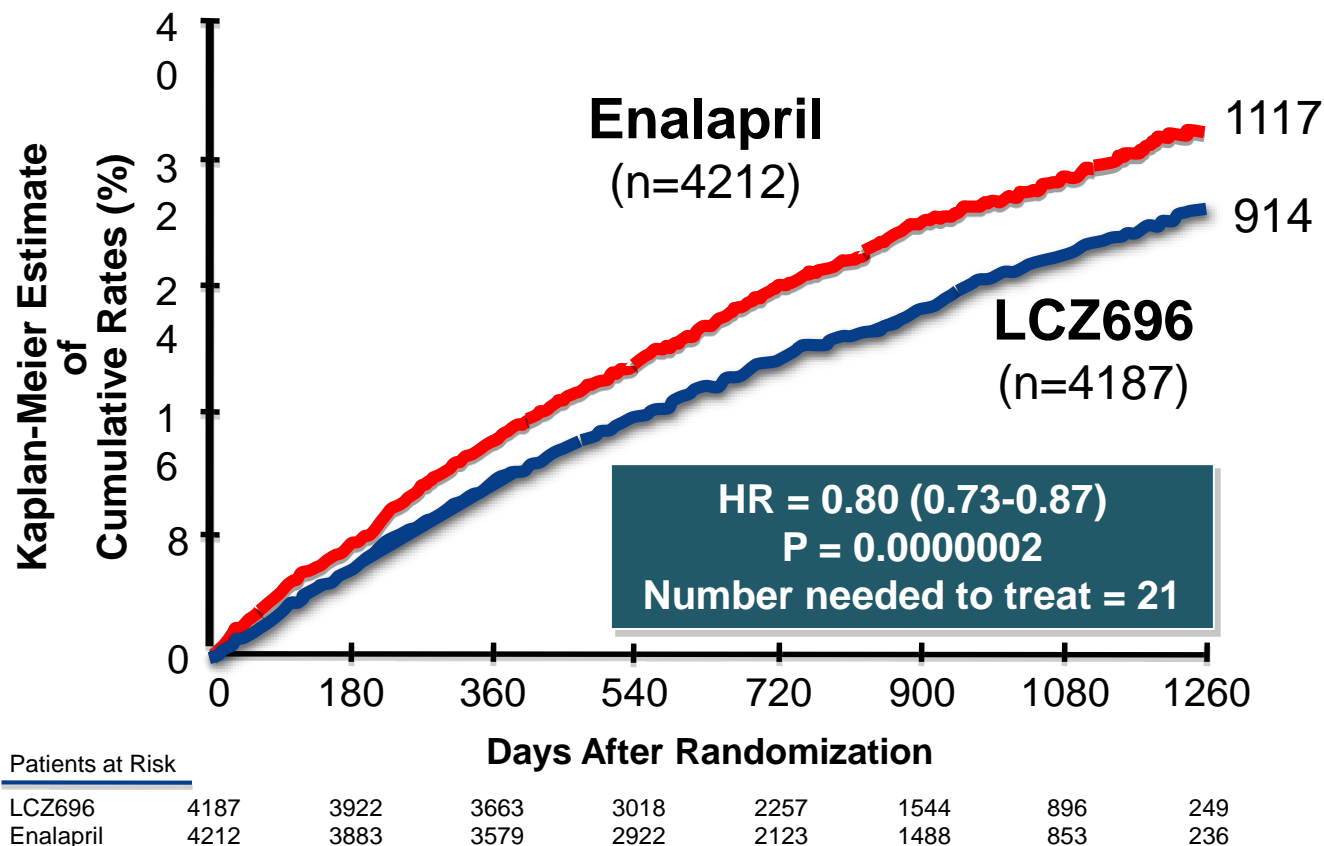


# SHIFT was a randomized, placebo-controlled trial of ivabradine

In SHIFT, patients treated with ivabradine were less likely to experience the primary composite endpoint of CV death or HF hospitalization (HR 0.82, 95% CI 0.75, 0.90) compared to placebo.



# PARADIGM-HF: Prospective comparison of ARNI with ACEI to Determine Impact on Global Mortality and morbidity in HF trial



# The Agenda

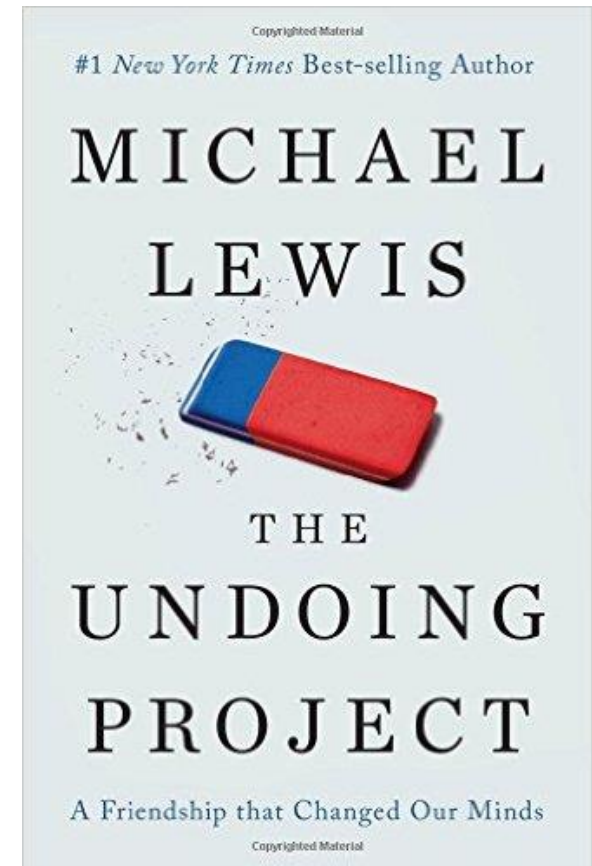
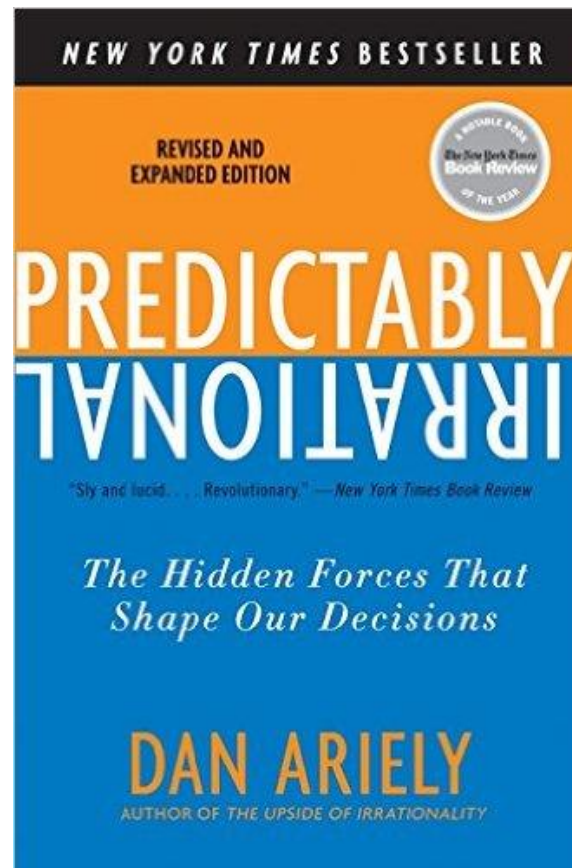
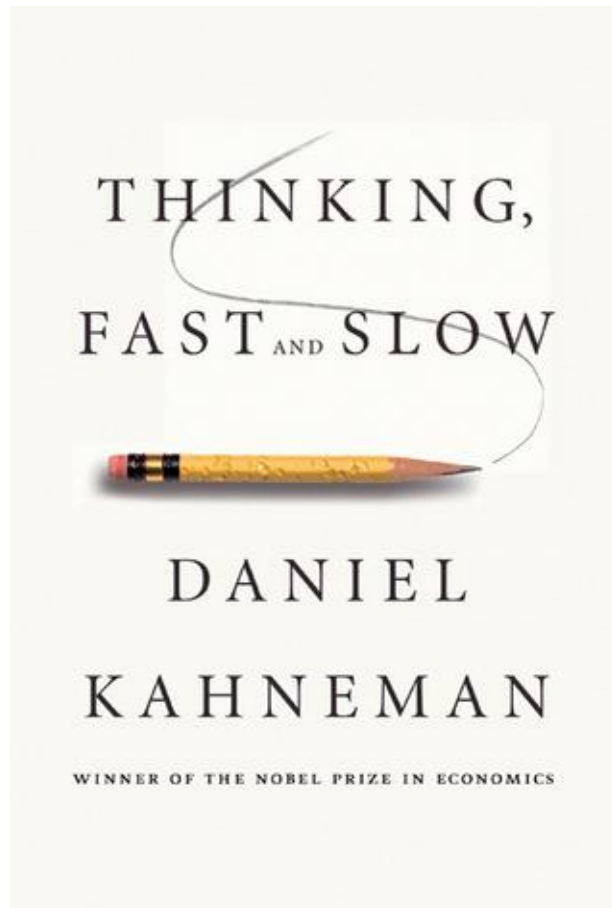
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# Perhaps... We don't always do the “right” thing



# Barriers to behavior change

Concept	Barrier	Heart Failure Example
<b>Present bias</b>	Tendency to heavily discount future effects compared to present benefits	Patient decides to consume an unhealthy but delicious meal now despite knowing that it contributes to poor health outcomes in the future
<b>Intent-behavior gap</b>	The disconnect between knowledge and action	Patient understands the importance of symptom monitoring but fails to do it.
<b>Status quo bias (inertia)</b>	Tendency to favor the current state of things over initiating change	Patient continues to manage prescription refills on their own rather than enrolling in the more efficient automatic refill program.
<b>Bounded rationality</b>	People operate under the limitations of time, cognitive abilities, and inadequate information when making decisions	Patients do not always make the most logical and best decisions in their heart failure care.
<b>Prospect theory</b>	Extent of risk-seeking and risk-averse behaviors are determined by perceived gains and losses (reference point)	Heart failure patients tend to be more risk-averse in making treatment decisions because they perceive a less acute deterioration of their health.



# Concepts utilized to design interventions

Concept	Barrier	Heart Failure Example
<b>Mental accounting</b>	Tendency to have separate mental accounts of one resource, especially as it pertains to money	Patients react differently to financial rewards given as a deduction on insurance premiums versus a check of the same amount.
<b>Loss aversion</b>	Tendency to react more strongly to avoiding losses than acquiring gains	Patient is more motivated to engage in physical activity by a financial incentive framed as a loss (money taken from patient) rather than a gain (money given to patient).
<b>Anticipated regret (regret aversion)</b>	In the face of uncertainty, people tend to take into account the possibility of feeling regret when making a decision	Patient adheres to medication regimen to avoid feeling of regret in a lottery incentive.
<b>Liberatarian paternalism</b>	The behavior of individuals can be influenced while not restricting their freedom of choice	Employers implement financial incentives to modify patient behavior.
<b>Mental accounting</b>	Tendency to have separate mental accounts of one resource, especially as it pertains to money	Patients react differently to financial rewards given as a deduction on insurance premiums versus a check of the same amount.



# Concepts utilized to design interventions

Tool	Description	Heart Failure Example
<b>Automated hovering</b>	Monitoring patient behavior in their daily lives and continuously encouraging behavior change	Electronically monitoring medication adherence via pillbox or trending changes in weight via electronic scale.
<b>Commitment contract</b>	Patients pre-commit to behavior change by depositing a certain sum of money that is only accessible after a goal is achieved	Patient decides to exercise 150 minutes a week and deposits \$100. The money is lost if patient fails to meet the goal in a previously determined timeframe.
<b>Social networks</b>	Behavioral change is influenced by behavior of individuals in patient's social networks	Patient joins with other heart failure patients in his social circle. They decide collectively to commit to monitoring weights daily.



# A ton of questions....

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- What are the long-term impacts and sustainability of behavioral change of the interventions?
- What is the role of mobile technology, wearables, and telemonitoring for outpatient management of heart failure patients?
- How can we increase utilization of these devices, especially in patients whom it would benefit?
- What is the optimal design and framework of financial incentives?
- How can we utilize social networks of heart failure patients to encourage behavior change?
- What are the incremental effects of each of the factors (loss aversion, anticipated regret, etc.) on patient engagement?
- What combination of incentives and monitoring is ideal for heart failure patients?



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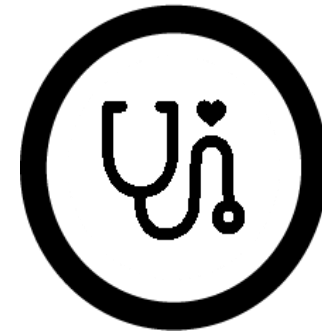
# Heart Failure QI Interventions Today

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**HOSPITAL**



**CLINIC**



# Two Quality Improvement Interventions

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## Direct Engagement (Patient and Site Level)

- Opinion leaders in HF and QI working with local cardiology and/or HF specialists and support staff to help healthcare systems and hospitals design or revise quality improvement plans
- Duke Pillbox (medication management tool)

## Digital Engagement (Patient Level only)

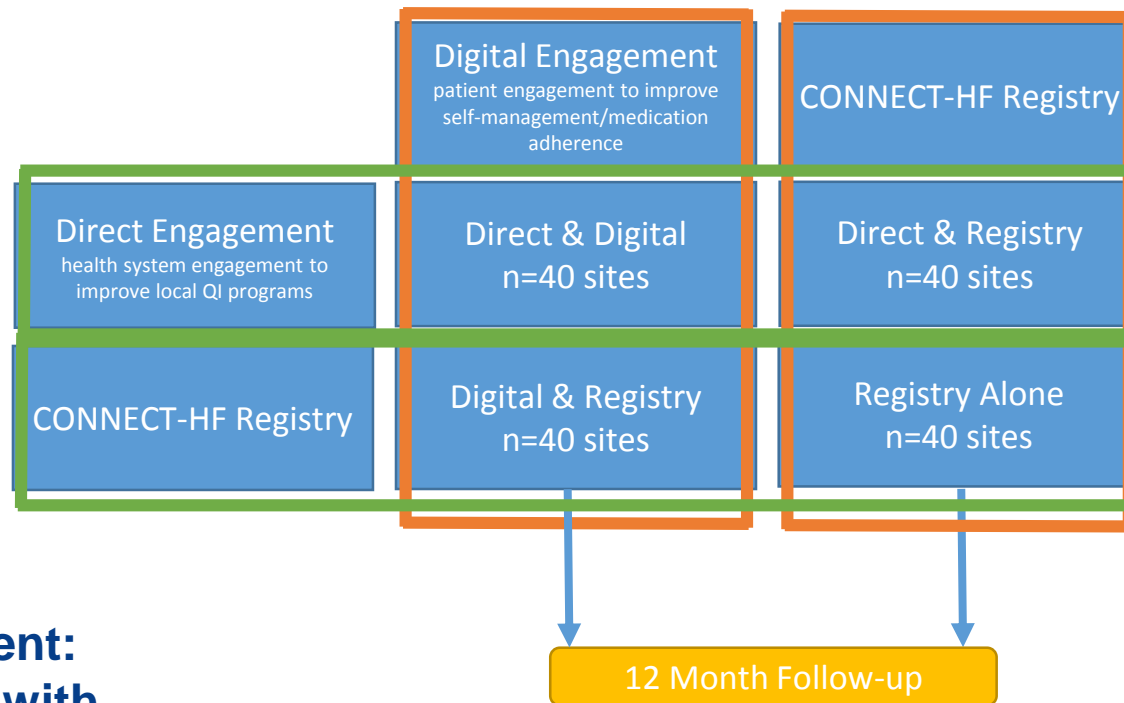
- Mobile applications featuring behavioral tools
- Self-monitoring and self-management of heart failure
- Facilitate continued use of evidence-based care





# CONNECT-HF

## 2x2 Design with 160 US Sites and 8000 patients



**Engagement:  
Designed with  
The CardioYaks!**

Care Optimization through  
Patient and hospital Engagement  
Clinical Trial for HF

### 2 Co-primary Endpoints:

1. Time to 1<sup>st</sup> readmission or death
2. Change in HF quality metrics



# Intervention

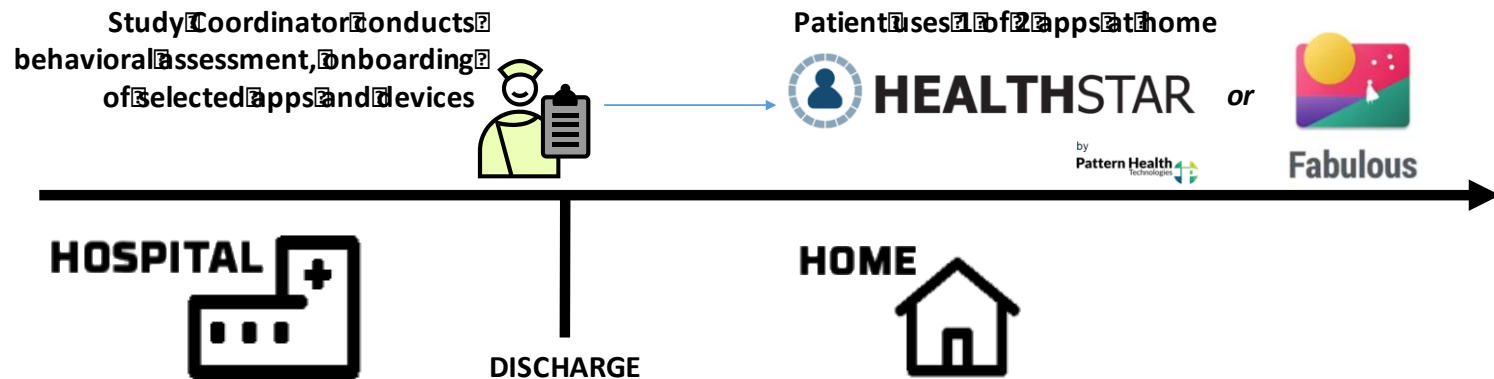


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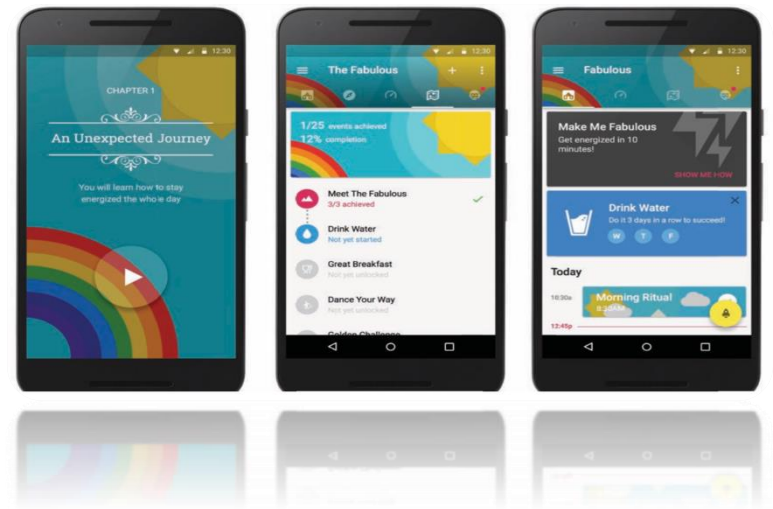
# Digital Strategy

*Optimizing chronic disease management and secondary prevention efforts requires sustainable and durable change in patient behavior.*



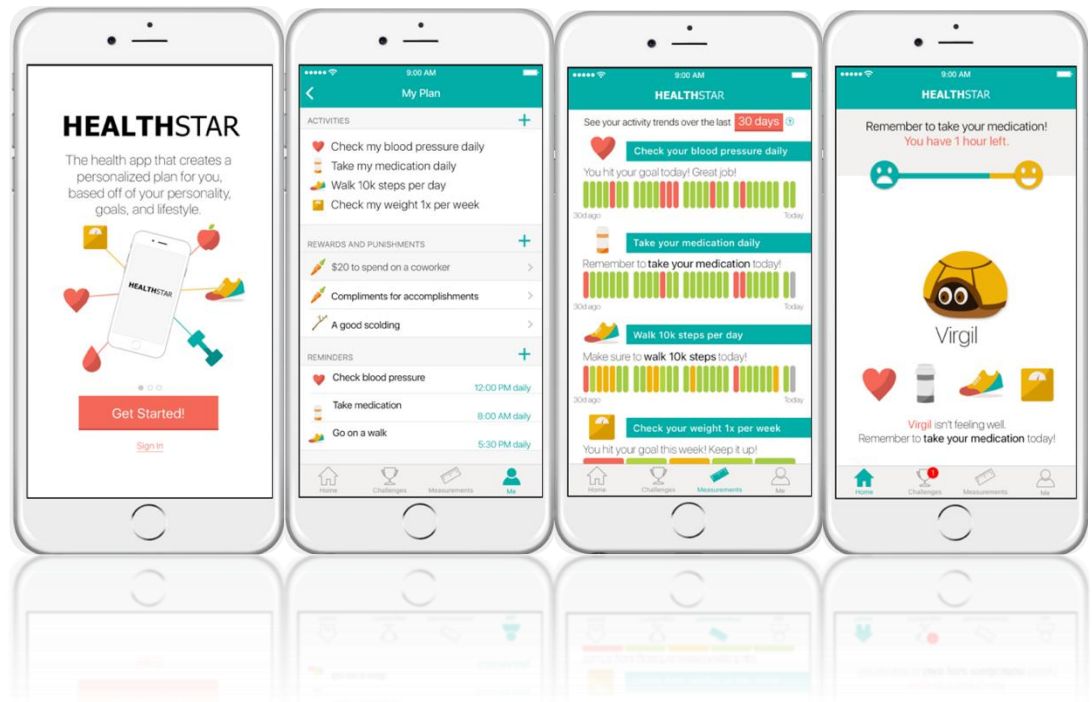
# Fabulous

- Utilizes the principle of habitualization for “nudges” on self-management and adherence
- Mobile app features:
  - Reminders, notifications
  - User progress
  - Activity tracker



# HealthStar

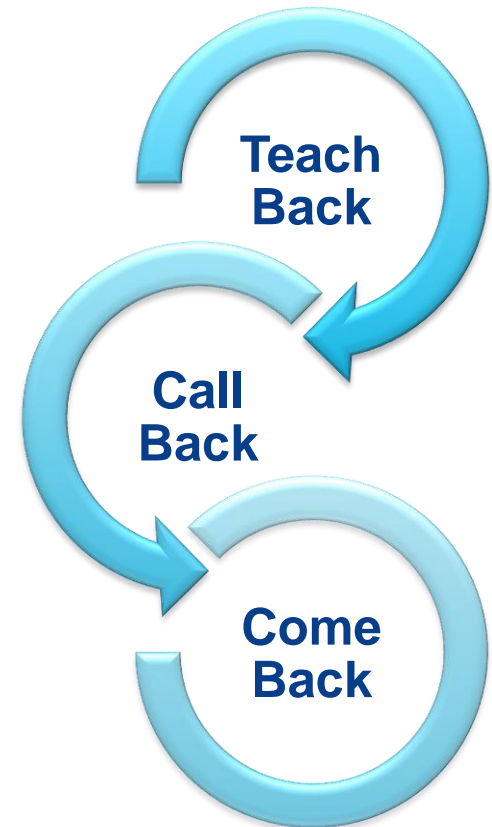
- Utilizes the principle of loss aversion on:
  - Medication adherence
  - Activity
  - Diet
  - Weight measurements



# Direct Engagement

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A health-system engagement strategy (direct) that will involve site visits and ongoing mentoring from teams of healthcare professionals with specialized training and field experience to help health systems and individual hospitals to design local quality improvement plans.



# Direct Intervention Tools

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- Hospital management protocols
- Duke PillBox
- Supplemental Discharge Patient Materials



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# What's next?

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- Clinical engagement
- Patient engagement
- Intervention refinement
- Launch!
- And....
  - Deployment in health systems
  - Fidelity
  - Follow-up
  - Sweat it out



# Conclusions

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- Addiction is a powerful tool
- Heart failure is a paradigm case for challenges in US Healthcare
  - Chronic
  - Poor outcomes
  - Costly
  - Growing
- If we can employ the evolving behavioral economic tools integrated with new technologies, perhaps we can improve health
- Or will it take dedicated health system interventions!
- Regardless, trials integrated into practice will be needed to get the answers



# Thanks

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- Adam DeVore, MD
- Zubin Eapen, MD
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- Duke HSR
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  - Mayme Roettig

The CardioYaks!

