Heart disease in America: Opportunities & Need for a Continuum of Care
Focus on Heart Failure

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We must fundamentally change the ways in which we deliver care.
The Facts:

About 630,000 Americans die from heart disease per year—1 in every 4 deaths.
Someone has a heart attack (MI) every 40 sec
The #1 killer for most racial/ethnic groups
It costs the US ~ $200 billion/yr
Includes the cost of health care services, medications and lost productivity

AHA Statistical Update
Heart Disease and Stroke Statistics—2017 Update: A Report From the AHA. Circulation. 2017;135:e146-e603
Heart Disease Mortality in the US by state

Heart Disease Death Rates, 2011-2013
Adults, Ages 35+, by County

Rates are spatially smoothed to enhance the stability of rates in counties with small populations.

Data Source:
National Vital Statistics System
National Center for Health Statistics


Prevalence of ideal, intermediate, and poor cardiovascular health metrics in 2006 (American Heart Association 2020 Impact Goals baseline year) and 2020 projections assuming current trends continue.

Extent of awareness, treatment, and control of high blood pressure by race/ethnicity and sex (NHANES 2011–2014).

Hospital discharges for heart failure by sex (United States: 1980–2010).

Hypertension is an important risk factor for HF


The Facts:

- 2011 to 2014, ~6.5 million American adults ≥20 years of age had HF. An increase from an estimated 5.7 million 2009 to 2012.
- 5 yr survival of HF after an MI improved in 2001 to 2010 versus 1990 to 2000, from 54% to 61%.
- Of new HF hospitalizations, 53% had HF with reduced ejection fraction and 47% had preserved ejection fraction.
  - Black males - highest proportion of hospitalized HF with reduced ejection fraction (70%);
  - white females had the highest proportion of hospitalized HF with preserved ejection fraction (59%).
- Survival has improved between 1979 and 2000.
- Mortality still high: ≈50% diagnosed with HF will die within 5 yrs.
In 2012, total cost for HF was estimated to be $30.7 billion.  
68% was attributable to direct medical costs.  
By 2030, the total cost of HF will increase ~127% to $69.7 billion from 2012. 
$244 for every US adult.
The Landscape of Heart Failure

Complex Hospitalizations are frequent
Costs are high
CMS rule penalties
Patients are becoming more challenging
Team effort
AHF Recurs With Increasing Frequency and Contributes to Progression of Chronic HF

Risk of recurrence increases following initial AHF.\(^2\)
Risk of ischemic heart disease and cardiovascular disease also increases.\(^2\)

H, hospitalization; NYHA, New York Heart Association.
Medicare Spending

Medicare Spending, 2011

<table>
<thead>
<tr>
<th>Category</th>
<th>Dollars, in billions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>549</td>
</tr>
<tr>
<td>Inpatient hospital</td>
<td>133</td>
</tr>
<tr>
<td>Medicare advantage</td>
<td>124</td>
</tr>
<tr>
<td>Physician fee schedule</td>
<td>68</td>
</tr>
<tr>
<td>Prescription drugs</td>
<td>67</td>
</tr>
<tr>
<td>Other part B services</td>
<td>48</td>
</tr>
<tr>
<td>Outpatient hospital</td>
<td>35</td>
</tr>
<tr>
<td>Skilled nursing facilities</td>
<td>33</td>
</tr>
<tr>
<td>Home health</td>
<td>20</td>
</tr>
<tr>
<td>Hospice</td>
<td>15</td>
</tr>
<tr>
<td>Administration</td>
<td>8</td>
</tr>
</tbody>
</table>

Note: Individual dollar amounts may not sum to total due to rounding.
Heart Failure is the most common reason for 30 day rehospitalization

52% of heart failure patients are not seen in the first 30 days after a hospitalization

Readmission Labeled a National Priority by MedPAC

**HF and AMI readmission highlighted.**

**Table 5-3**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Type of hospital admission</th>
<th>Number of admissions with readmissions</th>
<th>Readmission rate</th>
<th>Average Medicare payment for readmission</th>
<th>Total spending on readmissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heart failure</td>
<td>Medical</td>
<td>90,273</td>
<td>12.5%</td>
<td>$6,531</td>
<td>$590,000,000</td>
</tr>
<tr>
<td>COPD</td>
<td>Medical</td>
<td>52,327</td>
<td>10.7</td>
<td>6,587</td>
<td>345,000,000</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>Medical</td>
<td>74,419</td>
<td>9.5</td>
<td>7,165</td>
<td>533,000,000</td>
</tr>
<tr>
<td>AMI</td>
<td>Medical</td>
<td>20,866</td>
<td>13.4</td>
<td>6,535</td>
<td>136,000,000</td>
</tr>
<tr>
<td>CABG</td>
<td>Surgical</td>
<td>18,554</td>
<td>13.5</td>
<td>8,136</td>
<td>151,000,000</td>
</tr>
<tr>
<td>PTCA</td>
<td>Surgical</td>
<td>44,293</td>
<td>10.0</td>
<td>8,109</td>
<td>359,000,000</td>
</tr>
<tr>
<td>Other vascular</td>
<td>Surgical</td>
<td>18,029</td>
<td>11.7</td>
<td>10,091</td>
<td>182,000,000</td>
</tr>
<tr>
<td>Total for seven conditions</td>
<td></td>
<td>318,760</td>
<td></td>
<td></td>
<td>$2,296,000,000</td>
</tr>
<tr>
<td>Total DRGs</td>
<td></td>
<td>1,134,483</td>
<td></td>
<td></td>
<td>$7,980,000,000</td>
</tr>
<tr>
<td>Percent of total</td>
<td></td>
<td>28.1%</td>
<td></td>
<td></td>
<td>28.8%</td>
</tr>
</tbody>
</table>

**Note:** COPD (chronic obstructive pulmonary disease), AMI (acute myocardial infarction), CABG (coronary artery bypass graft), PTCA (percutaneous transluminal coronary angioplasty), DRG (diagnosis related group). Analysis is for readmissions within 15 days of discharge from the initial inpatient stay. Readmissions are identified using 3M’s software that defines potentially preventable readmissions.

**Source:** 3M analysis of 2005 Medicare discharge claims data.

From: Page 110 of MedPAC July 2007 report
Vicious Cycle of Conventional Care

Conventional CHF Care

1. Patient neglects to seek timely help from caregivers

2. Physician office-based management inadequate to meet CHF patient needs

3. In acute crisis, patient turns to only alternative - Hospital ED

4. Rapid discharge increases odds of early readmission

% Annual DRG 127 Volume

90% admitted

All CHF Patients Presenting to ED
Risk of Death Is High Following Hospitalization for AHF

Mortality rates following hospitalization for AHF\textsuperscript{1,2}

<table>
<thead>
<tr>
<th>Time</th>
<th>Mortality (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>In-hospital</td>
<td>10</td>
</tr>
<tr>
<td>60–90 days post-discharge</td>
<td>20</td>
</tr>
<tr>
<td>After 1 year</td>
<td>30</td>
</tr>
<tr>
<td>Within 5 years</td>
<td>60</td>
</tr>
</tbody>
</table>

Risk of death increases progressively and independently with each HF event\textsuperscript{1}

Number of hospitalizations predicts mortality\textsuperscript{3,4}

Proportions of Readmissions for Causes Other Than the Condition at Initial Discharge

- Heart Failure: 63% for other causes, 37% for same cause
- Pneumonia: 70.9% for other causes, 29.1% for same cause
- COPD: 63.8% for other causes, 36.2% for same cause
- Gastrointestinal Problems: 78.9% for other causes, 21.1% for same cause

Outcomes in Patients Hospitalized With HF

Hospital Readmissions

<table>
<thead>
<tr>
<th>Days</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>20%</td>
</tr>
<tr>
<td>6</td>
<td>50%</td>
</tr>
</tbody>
</table>

Mortality

<table>
<thead>
<tr>
<th>Days</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>12%</td>
</tr>
<tr>
<td>12</td>
<td>33%</td>
</tr>
<tr>
<td>5</td>
<td>50%</td>
</tr>
</tbody>
</table>

Mean LOS: 6.5 days

Fonarow, GC. Rev Cardiovasc Med. 2002;3(suppl 4):S3

Annual mortality rate-
NYHA class III HF-
12% [COPERNICUS DATA]
NYHA class II HF-
7% [SCD-HeFT DATA]
Public Reporting AMI and HF RSRR.

Rate of Readmission for Heart Attack Patients

- Lower Percentages Are Better
- U.S. National 30-Day Readmission Rate for Heart Attack = 19.9%
- 20.6% No different than National Rate
- Based on 941 patients

Legend
- X% ← Estimated readmission rate (risk-adjusted)

“Section 3025 of the Affordable Care Act added section 1886(q) to the Social Security Act establishing the Hospital Readmissions Reduction Program, which requires CMS to reduce payments to Inpatient Prospective Payment Systems (IPPS) hospitals with excess readmissions, effective for discharges beginning on October 1, 2012.”
Rehospitalizations in Heart Failure

• Nearly one in four patients hospitalized with HF is rehospitalized within 30 days of discharge

  Opportunity to Improve

• 30-day rates of rehospitalizations in HF have risen over the past 2 decades and vary widely by hospital, even after adjusting for case mix and other factors

  Opportunity to Improve

• Many HF hospitalizations are preventable, but effective strategies to prevent rehospitalizations are underutilized

  Opportunity to Improve
Transitions of care beyond the front door: Wishful thinking!
Transitions of care beyond the front door: Reality
Is this metric fair?
Are there not patients who need to be in the hospital?
Penalties for CMS already in place.

News FLASH!!!!
It’s the “handoff”
Continuity of HF Care

Reliable Care: Not Missing the Steps

How to best transition care?

- Work closely with ED: Decongest the ED
  - Observation status with care paths
- Personal physician visits to home
- Visiting nurses trained in HF care
- Phone monitoring by a nurse/team
- Early/frequent visits to HF team
- Home monitoring (scale, phone systems, implanted devices, internet based reporting)
- Let the patient decide when to call
Understanding health care as a system

- How we improve what we make
- What society needs
- How we create, make health care
Hospital Variation in Early Follow-up After Heart Failure Hospitalization

Median Follow-up Visit within 7 days = 37.5%

225 Hospitals

Hernandez et al. JAMA 2010;303:1716-1722.
Study Conclusions

• Rates of physician follow-up within 1 week of discharge were low and varied substantially across hospitals.

• Patients discharged from hospitals with more consistent early follow-up with 7 days have lower risk of 30-day readmission.

• Enhanced transition planning and ensuring that patients are evaluated within a week of discharge represents an achievable target for hospital quality improvement.
H2H Core Concepts

• **Post-discharge medication management.** Patients must not only have access to the proper medications, they need to be properly educated on how to use them.

• **Early follow-up.** Discharged patients should have a follow-up visit scheduled within a week of discharge, as well as the means of getting to that appointment.

• **Symptom management.** Patients must recognize the signs and symptoms that require medical attention, as well as the appropriate person to contact if those signs/symptoms appear.
Telemonitoring in Patients with Heart Failure

Sarwat I. Chaudhry, M.D., Jennifer A. Mattera, M.P.H., Jeptha P. Curtis, M.D., John A. Spertus, M.D., M.P.H., Jeph Herrin, Ph.D., Zhenqiu Lin, Ph.D., Christopher O. Phillips, M.D., M.P.H., Beth V. Hodshon, M.P.H., J.D., R.N., Lawton S. Cooper, M.D., M.P.H., and Harlan M. Krumholz, M.D.

CONCLUSIONS

Among patients recently hospitalized for heart failure, telemonitoring did not improve outcomes. The results indicate the importance of a thorough, independent evaluation of disease-management strategies before their adoption. (Funded by the National Heart, Lung, and Blood Institute; ClinicalTrials.gov number, NCT00303212.)

Implantable monitors
Improved Adherence to ACC/AHA HF Guidelines Translates to Improved Clinical Outcomes in Real World HF Patients

- Each 10% improvement in ACC/AHA guideline-recommended composite care was associated with a 13% lower odds of 24-month mortality (adjusted OR 0.87; 95% CI, 0.84 to 0.90; \( P<0.0001 \)).

7-10 day visit: Why may it not work

- What processes occur?
- Information obtained/acted upon
- Changing course of therapy
- Uptitration of evidence based care
- Patient education---who delivers?
Isn’t it working?

- Is it a monitor or the system it’s deployed in?
- Who monitors the monitor?
- Who responds to monitoring signals and how?
- Do those that monitor and assess have authority to change therapy?
## Clinic Evaluation

<table>
<thead>
<tr>
<th></th>
<th>Total Population (n=122)</th>
<th>Post Hospital Discharge (n=73)</th>
<th>Systolic Dysfunction (n=67)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age (mean ± SD)</strong></td>
<td>68±11 years</td>
<td>69±10 years</td>
<td>65 ± 11 years</td>
</tr>
<tr>
<td><strong>EF ≤ 40%</strong></td>
<td>55%</td>
<td>50%</td>
<td>100%</td>
</tr>
<tr>
<td><strong>Oral/Injectable/Inhaled Medications</strong></td>
<td>15 (4-27)</td>
<td>14 (4-26)</td>
<td>13 (6-24)</td>
</tr>
<tr>
<td><strong>Medication Discrepancies</strong></td>
<td>52% (n=64)</td>
<td>52% (n=38)</td>
<td>51% (n=34)</td>
</tr>
<tr>
<td><strong>Number of Discrepancies</strong></td>
<td>3 (1-12)</td>
<td>3 (1-12)</td>
<td>3 (1-12)</td>
</tr>
<tr>
<td><strong>Medication Optimization</strong></td>
<td>71% (n=87)</td>
<td>71% (n=52)</td>
<td>75% (n=50)</td>
</tr>
<tr>
<td><strong>Number of Medications Optimized</strong></td>
<td>2 (1-5)</td>
<td>2 (1-5)</td>
<td>2 (1-4)</td>
</tr>
<tr>
<td><strong>Days between discharge and clinic visit (mean ± SD)</strong></td>
<td>n/a</td>
<td>what=10 ± 6 days</td>
<td>n/a</td>
</tr>
<tr>
<td><strong>30-day all cause readmission rate % (mean number of days)</strong></td>
<td>n/a</td>
<td>8% (16 days)</td>
<td>n/a</td>
</tr>
<tr>
<td><strong>Mortality within 30 days</strong></td>
<td>1.6% (n=2)</td>
<td>2.7% (n=2)</td>
<td>1.4% (n=1)</td>
</tr>
</tbody>
</table>

Milfred-LaForest S. HFSA 2010. [Abstract]
186/month Nov ICD 428 - 1 hospital

Patient Interaction:
RN
MD
PT Rehab
Nutrition
Psych
Pharmacy

Follow up: 7-10 Day
Brown Bag clinic
Med Rec.
**Typical List of Meds: BB Clinic**

<table>
<thead>
<tr>
<th>Medication</th>
<th>Dosage/Route</th>
</tr>
</thead>
<tbody>
<tr>
<td>Propranolol</td>
<td>100mg QD</td>
</tr>
<tr>
<td>Losartan</td>
<td>50mg TID</td>
</tr>
<tr>
<td>Lisinopril</td>
<td>40mg BID</td>
</tr>
<tr>
<td>Furosemide</td>
<td>10mg PO</td>
</tr>
</tbody>
</table>

**Notes:**
- Adjust as needed based on patient response and laboratory results.
- Monitor for side effects and adjust accordingly.
- Consult with pharmacist or physician for any questions or concerns.

**First Aid Pharmacy**
- (714) 893-5700
Work Flow

- **Staffed by clinical hospital pharmacists**
  - Clinical pharmacists as “preceptors”
  - Nurse practitioner/Fellow/attending available
  - Symptom evaluation (vitals, questionnaire, KCCQ)
  - Review pre-discharge BNP, serum Cr, electrolytes;
    - If none, order
  - Focus on medications
    - Education, drug interaction self-management tools,
      pill box fills, discard duplicates
- **One half day per week**
  - 6 slots, 1hr each
Medicine reconciliation/Patient education

- Each clinic session is staffed by clinical hospital pharmacists
  - Clinical pharmacists act as “preceptors”
  - Nurse practitioner/Fellow/attending available
Patient education

► Educate patients/caregivers about **indications** and **adverse effects** of medications

► Patient education booklet: “Living with Heart Failure”

► Update **Med list** in EMR

► Letter sent to PMD/Cardiologist about changes made/updated med list during the clinic

► Next appointment scheduled
Identify the problem

Expired/duplicates
“Under the counter” - “my husbands NTG for CP”
Eliminate poly-pharmacy

Duplicates/Expired/No longer needed
<table>
<thead>
<tr>
<th>Parameter (n=32)</th>
<th>Mean ± Std Dev</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>61 ± 14</td>
</tr>
<tr>
<td>Gender (% women)</td>
<td>25%</td>
</tr>
<tr>
<td>HF-PEF (n)</td>
<td>8</td>
</tr>
<tr>
<td>EF (%)</td>
<td>72 ± 8</td>
</tr>
<tr>
<td>Pro BNP</td>
<td>1382.5 ± 159 pg/ml</td>
</tr>
<tr>
<td>HF-REF (n)</td>
<td>24</td>
</tr>
<tr>
<td>EF (%)</td>
<td>30 ± 6</td>
</tr>
<tr>
<td>Pro BNP</td>
<td>7008 ± 7905 pg/ml</td>
</tr>
<tr>
<td>KCCQ overall Score</td>
<td>52.14 ± 20.46</td>
</tr>
</tbody>
</table>
30 Day Readmissions

BB: 8 readmits \( \leq 30 \) days ---8.3%
    4 for HF (50%)
Controls: 16 readmits \( \leq 30 \) days—24.4%
Barriers

- Discomfort of physicians at changing or up-titrating medications: “MY patient”. “I want to do this myself”.

- Discomfort of physicians in ACEI use in patients with abnormal renal function: “I have already tried this. He/she doesn’t tolerate it.”

- Experience with diuretic flexible regimen—new to providers

- Clinical inertia or “I already do the right thing for patients. Do not need any other guidance”

- Pts without transportation to attend
We needed to go to the hospitalization
Navigating the In-patient Landscape
Barriers

- Obtaining the “right” number of patients
- Finding patients currently in hospital for HF
- Varying #’s by DRG
- Which ICD codes to use
- Multiple initiatives not well coordinated
- Referrals to BBC
  - HF Attending “stand-by” during BBC other than Dr. Piña
- Support from physicians/housestaff/PA’s.
Brown Bag Clinic: Better Adherence Methods
Sampling of 50

- **HF primary admission** -- 33% with correct diagnosis on admission
- **HF 30 day Re-admission** -- 24% with correct diagnosis on admission
- Out of the 33% diagnosed correctly on primary admission with HF only 14% were re-admitted for HF the others were admitted for other reasons but carried the diagnosis of HF or were incorrectly diagnosed on readmission
- % Of patients seen by cardiology during either of the admissions = 47.6%
Admission

- Identification by CTCC (trained didactics)
- RN: intake assessment
- PharmD: medication reconciliation/work-up

Hospitalization

- RN/PharmD education:
  - Disease progression
  - Signs/symptoms
  - Exercise/weight monitoring
  - Medication regimen and side effects
- RN/PharmD clinical functions:
  - Pro-BNP monitoring
  - Pharmacotherapy recommendations (GDMT)

Discharge

- RN: follow-up appointments/transitions of care
- PharmD: medication delivery/transitions of care
There need to be a links!
partnering with community physicians or physician groups to reduce readmission

partnering with local hospitals to reduce readmissions

having nurses responsible for medication reconciliation

arranging follow-up appointments before discharge

having a process in place to send all discharge paper or electronic summaries directly to the patient’s primary physician

assigning staff to follow up on test results that return after the patient is discharged

*Background*—Reducing hospital readmission rates is a national priority; however, evidence about hospital strategies that are associated with lower readmission rates is limited. We sought to identify hospital strategies that were associated with lower readmission rates for patients with heart failure.

Number of Strategies

(Circ Cardiovasc Qual Outcomes. 2013;06:444-450.)
# Hospital Discharge

<table>
<thead>
<tr>
<th>Recommendation or Indication</th>
<th>COR</th>
<th>LOE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Performance improvement systems in the hospital and early postdischarge outpatient setting to identify HF for GDMT</td>
<td>I</td>
<td>B</td>
</tr>
</tbody>
</table>
| Before hospital discharge, at the first postdischarge visit, and in subsequent follow-up visits, the following should be addressed:  
  a) initiation of GDMT if not done or contraindicated;  
  b) causes of HF, barriers to care, and limitations in support;  
  c) assessment of volume status and blood pressure with adjustment of HF therapy;  
  d) optimization of chronic oral HF therapy;  
  e) renal function and electrolytes;  
  f) management of comorbid conditions;  
  g) HF education, self-care, emergency plans, and adherence; and  
  h) palliative or hospice care. | I   | B   |
| Multidisciplinary HF disease-management programs for patients at high risk for hospital readmission are recommended | I   | B   |
| A follow-up visit within 7 to 14 days and/or a telephone follow-up within 3 days of hospital discharge is reasonable | IIa | B   |
| Use of clinical risk-prediction tools and/or biomarkers to identify higher-risk patients is reasonable | IIa | B   |
Strategies

- Understand thyself—process map
- Triage of patients by risk factors for readmissions
- Using information on high-end users of care by cost analysis
- Identification of the “frequent flyers”
- Early clinic: Are these patients who come a different group.
  - Those who do not come to clinic.
- Transition to the next or chronic care appt.
- Should the EHR not help us???? So far…poorly
If we want to work with a system to influence its direction -- a normal desire as we work with human organizations--the place for us to work is deep in the dynamics of the system where [its] identity is taking form.

Wheatley & Kellnor-Rogers, 1996