Guideline Directed Therapies: Bridging Acute and Chronic Heart Failure Care Using Technology

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Tips for GDMT, Shared Care & Technology

1. Define the mission
2. Outline best therapies
3. Begin with home
4. Standardize the process
5. Get a map
6. Add the technology (business strategy)
7. Workflow the technology (business pilot)
8. Reflect, Revise, Repeat
Chicago to Kansas City: A KU New Start: 2015
Start With Why: The Mission

**Mission:**
To see every patient in Kansas and Kansas City have access to the best heart failure therapies available anywhere in the world.

**Vision:**
To lead the nation in caring, healing, innovating, and teaching.
Let's Begin By Remembering the Epidemic

![Graph showing survival rates with Log-rank p<0.0001.](image)

Ammar et al. Circulation 2007
HF STAGES AND TREATMENTS

**At Risk for Heart Failure**
- **STAGE A**
  - At high risk for HF but without structural heart disease or symptoms of HF
  - Examples: Patients with:
    - HTN
    - Atherosclerotic disease
    - DM
    - Obesity
    - Metabolic syndrome
    - Patients: Using corticosteroids
    - With family history of cardiomyopathy
  - Goals: Healthy lifestyle
  - Prevent cardiovascular disease
  - Prevent LV structural abnormalities
  - Drugs: ACEI or ARB in appropriate patients for vascular disease or DM
  - Statins as appropriate

- **STAGE B**
  - Structural heart disease but without signs or symptoms of HF
  - Examples: Patients with:
    - Previous MI
    - LV remodeling including LVH and low EF
    - Asymptomatic valvular disease
  - Goals: Prevent HF symptoms
  - Prevent further cardiac remodeling
  - Drugs: ACEI or ARB as appropriate
  - Beta-blockers as appropriate
  - In selected patients: ICD
  - Revascularization or valvular surgery as appropriate

**Heart Failure**
- **STAGE C**
  - Structural heart disease with prior or current symptoms of HF
  - Examples: Patients with:
    - Known structural heart disease
    - HF signs and symptoms
  - Goals: Control symptoms
  - Improve HRQoL
  - Prevent hospitalization
  - Prevent mortality
  - Drugs for systolic HF
  - Diuretics for fluid retention
  - ACEI or ARB
  - Beta-blockers
  - Aldosterone antagonists
  - In selected patients: ICD
  - Revascularization or valvular surgery as appropriate

- **STAGE D**
  - Refractory HF
  - Examples: Patients with:
    - Marked HF symptoms at rest
    - Repeated hospitalizations despite GDMT
  - Goals: Control symptoms
  - Improve HRQoL
  - Reduce hospital readmissions
  - Establish patient’s end-of-life goals
  - Options: Advanced care measures
  - Heart transplant
  - Chronic hospice
  - Temporary or permanent MCS
  - Experimental surgery or drug therapy
  - Palliative care and hospice
  - ICD deactivation
PHARMACOLOGIC TREATMENT FOR STAGE C and HFrEF

2017: Class I, LOE B recommendation: ARNI

Yancy CW et al. Circulation 2013
MAGNITUDE OF BENEFIT OF PHARMACOLOGIC THERAPY FOR STAGE C HFrEF

Table 13. Medical Therapy for Stage C HFrEF: Magnitude of Benefit Demonstrated in RCTs

<table>
<thead>
<tr>
<th>GDMT</th>
<th>RR Reduction in Mortality (%)</th>
<th>NNT for Mortality Reduction (Standardized to 36 mo)</th>
<th>RR Reduction in HF Hospitalizations (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACE inhibitor or ARB</td>
<td>17</td>
<td>26</td>
<td>31</td>
</tr>
<tr>
<td>Beta blocker</td>
<td>34</td>
<td>9</td>
<td>41</td>
</tr>
<tr>
<td>Aldosterone antagonist</td>
<td>30</td>
<td>6</td>
<td>35</td>
</tr>
<tr>
<td>Hydralazine/nitrate</td>
<td>43</td>
<td>7</td>
<td>33</td>
</tr>
</tbody>
</table>

Fonarow GC et al. Am Heart J. 2011
Yancy CW et al. Circulation 2013
CUMULATIVE INCREMENTAL REDUCTION IN ODDS OF DEATH AT 24 MONTHS

Change in Odds of 24-Month Mortality (%)

-38% (+20% to -68%)
\( P = 0.1566 \)

-77% (-43% to -91%)
\( P = 0.0017 \)

-90% (-70% to -98%)
\( P < 0.0001 \)

## Potential Impact of Optimal Implementation of Evidence-Based HFrEF Therapies on Mortality in the US

<table>
<thead>
<tr>
<th>Guideline Recommended Therapy</th>
<th>HF Patient Population Eligible for Treatment, n*</th>
<th>Current HF Population Eligible and Untreated, n (%)</th>
<th>Potential Lives Saved per Year</th>
<th>Potential Lives Saved per Year (Sensitivity Range*)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACEI/ARB</td>
<td>2,459,644</td>
<td>501,767 (20.4)</td>
<td>6516</td>
<td>(3336-11,260)</td>
</tr>
<tr>
<td>ARNI (replacing ACEI/ARB)</td>
<td>2,287,296</td>
<td>2,287,296 (100)</td>
<td>28,484</td>
<td>(18,230-41,017)</td>
</tr>
<tr>
<td>Beta-blocker</td>
<td>2,512,560</td>
<td>361,809 (14.4)</td>
<td>12,922</td>
<td>(6616-22,329)</td>
</tr>
<tr>
<td>Aldosterone Antagonist</td>
<td>603,014</td>
<td>385,326 (63.9)</td>
<td>21,407</td>
<td>(10,960-36,991)</td>
</tr>
<tr>
<td>Hydralazine/Nitrate</td>
<td>150,754</td>
<td>139,749 (92.7)</td>
<td>6655</td>
<td>(3407-11,500)</td>
</tr>
<tr>
<td>CRT</td>
<td>326,151</td>
<td>199,604 (61.2)</td>
<td>8317</td>
<td>(4258-14,372)</td>
</tr>
<tr>
<td>ICD</td>
<td>1,725,732</td>
<td>852,512 (49.4)</td>
<td>12,179</td>
<td>(6236-21,045)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>-</strong></td>
<td><strong>-</strong></td>
<td><strong>96,480</strong></td>
<td><strong>(53,013-158,514)</strong></td>
</tr>
</tbody>
</table>

HFpEF TRENDS

Owan TE et al. NEJM 2006
HFpEF TRENDS

A Patients with Reduced Ejection Fraction

- 1987–1991
- 1997–2001

Survival

Year

No. at Risk
1987–1991 819 525 424 336 274 220
1997–2001 748 520 447 319 210 114

P=0.003

B Patients with Preserved Ejection Fraction

- 1987–1991
- 1997–2001

Survival

Year

No. at Risk
1992–1996 771 537 447 375 314 262
1997–2001 885 629 513 363 230 138

P=0.36
RESPONSE TO TREATMENT HFrEF AND HFP EF

CHARM-Alternative
CHARM-Preserved
SOLVD
DIG
OPTIMIZE-BB
OPTIMIZE-ACE
I-PRESERVE
PEP-CHF
DiG-Preserved
OPTIMIZE-BB
OPTIMIZE-ACE

Hazard Ratio for Death or HF Hospitalization

11/13/2019
Borlaug BA et al. Circulation 2011
Wireless pulmonary artery haemodynamic monitoring in chronic heart failure: a randomised controlled trial

William T Abraham, Philip B Adamson, Robert C Bourge, Mark F Aaron, Maria Rosa Costanzo, Lynne W Stevenson, Warren Strickland, Suresh Neeffagaru, Nirav Raval, Steven Krueger, Stanislav Weiner, David Shavelle, Bradley Jeffries, Jay S Yadav, for the CHAMPION Trial Study Group*

Inclusion Criteria:

- NYHA III symptoms for at least 3 months
- Irrespective of LVEF
- HF hospitalization in last 12 months
- Reduced EF patients had to be on stable medical therapy
Treatment group had 3X’s the changes to medical regimen vs. control group
LOS for HF related hospitalizations was shorter in treatment group
37% reduction in overall HF related hospitalizations!
NNT to prevent one HF related hospitalization = 4
PRE-SPECIFIED SUB-GROUP ANALYSIS:
Rate of HF hospitalizations by baseline EF

Abraham WT et al. Lancet 2011
Begin with Home
Staff Stakeholders
Niche Content Expert Stakeholders
Wins Propel Momentum: “If You Build It…”
- First LVAD implant 2015
- TJC Certification 2016
- 100% VAD survival 2016
- UNOS Listing Initiation 2016
- 100% HTX survival 10 cases 2017
- CMS Certification 2017
- Vizient HF mortality index < 0.5 2016-19
- Lowest LVAD Implant LOS 2017-19
- 100% HTX Survival SRTR 2016-19
- COE payer contracts 2019
Heat Map

Hubs
Community Partners: Heart Failure Care Clinics

KU Hospital: Main Campus (2 clinic sites) (began with 1 site ‘15)
Overland Park (2016)
KC-Kansas State Ave (2016)
Liberty (2017)
Atchison (2018)
St. Joseph MO (2018)
Hays (including Hays TeleHealth) (2018)
Topeka KU-St. Francis Campus (2019)
Hays TeleHealth (2019)
Wichita (2019)
Wichita TeleHealth go live (2020)
Incorporating Technology in Shared Care

- Mobile App (no additional hardware required)
- Wearables (Both HF and LVAD remote monitoring devices)
- Implantable devices (and ongoing studies)
- Telehealth (bridging gaps in physical space needs & travel limitations)
Home Grown Mobile app and Online Dashboard Features & Functions

**Patient App**
- Guides patients medical management through **color-code** gradient indications
- Tailored patient profiles
- Custom questions & vitals tracking provides immediate feedback on chronic conditions
- Medication and app input reminders promotes adherence for meds & daily measurements

**Provider Dashboard**
- Spot trends in patient profiles through graphs
- Main dashboard triages patients according to their severity level
- Ability to enter comments and initiate chat function with patients
Wearables & Machine Learning

API – Application Programming Interface
LVAD RM Program: INR and Doppler BP

PT/INR CONTROL & COMPARISONS (N=261)

CRITICAL OUT-OF-RANGE VALUES
PT/INR ≤ 1.5 & ≥ 3.5

### Implantable Devices & Trials

**Thu, Apr 25, 6:01 PM**

![Image of a group of people in scrubs and lab coats celebrating]

#### Alyssa Boyce-White

<table>
<thead>
<tr>
<th>Study ID</th>
<th>Study Site</th>
<th>Total Enrolled</th>
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<tbody>
<tr>
<td>US0173</td>
<td>Kansas University Medical Center</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td>Kansas City, KS</td>
<td></td>
</tr>
<tr>
<td>US0499</td>
<td></td>
<td>68</td>
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<tr>
<td>US3562</td>
<td></td>
<td>55</td>
</tr>
<tr>
<td>US0007</td>
<td></td>
<td>50</td>
</tr>
<tr>
<td>US0087</td>
<td></td>
<td>33</td>
</tr>
</tbody>
</table>

*Mon, Aug 5, 2:24 PM*

- **907 total patients enrolled**
- **Within last 30 days**: 80
- **Between 31-60 days**: 68
- **Over 60 days**: 55
- **No longer enrolling**: 50
- **33 patients enrolled recently**
TeleHealth & Remote Monitoring

**Monthly Hays Flight**
-EP MD / APP
-HF : VAD : Transplant MD/APP
-Focus on new / complex pts

**Monthly TeleHealth**
-Hays patients
-Surrounding region
-Focus on return visits
-Med titrations
-tie to remote PA pressure monitoring data
-tie to ICD/CRT device remote monitoring data
What this is all about...

THIS SHALL BE A PLACE WHERE THE PEOPLE OF KANSAS AND AREAS SURROUNDING MAY ENJOY THE BEST MEDICAL CARE AVAILABLE ANYWHERE.

Simeon Bishop Bell, MD--1911

- SRTR 100% heart transplant survival
- Heart Transplant and VAD metrics are in the top 10% nationally for
  - Survival
  - Cost Reduction
  - Length of Stay
- Lowest VAD implant hospitalization length of stay in the nation (Vizient 2017-2019)
Program Building = Team Building
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Thank you!

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