UNC PROCESS OF HEART FAILURE CLASSIFICATION IN WHI

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Introduction

- Pleomorphic nature of the HF contributes to the difficulty defining and classifying HF
- HF manifests as dyspnea, fatigue, fluid retention, decreased exercise tolerance
- Due to disorders of pericardium, myocardium, endocardium or valvular structures, great vessels or rhythm disturbances
- Useful to divide into systolic dysfunction and diastolic dysfunction
- Most extant HF classification schema created before use of biomarkers and imaging in HF care and don’t consider if event is decompensated
Published heart failure diagnostic criteria

• Boston
• Cardiovascular Health Study
• Duke
• European Society Cardiology
• Gheorgiade
• Gothenburg
• Framingham
• Modified Framingham
• Killip Score
• Minnesota HF
• NHANES
• Vasan/Levy
• Walma
• Wilhelmsen
• Zile criteria
• CV Clinical Trialists’
• ARIC
### Framingham Criteria for Diagnosis of Heart Failure

<table>
<thead>
<tr>
<th>Classification</th>
<th>Criteria</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Framingham</td>
<td>Paroxysmal nocturnal dyspnea</td>
<td>Major</td>
</tr>
<tr>
<td>Criteria</td>
<td>Orthopnea</td>
<td>Major</td>
</tr>
<tr>
<td></td>
<td>Jugular venous distension</td>
<td>Major</td>
</tr>
<tr>
<td>Algorithm:</td>
<td>Pulmonary rales (basilar and more than basilar)</td>
<td>Major</td>
</tr>
<tr>
<td>Heart failure</td>
<td>Cardiomegaly</td>
<td>Major</td>
</tr>
<tr>
<td>present with 2</td>
<td>Acute pulmonary edema (alveloar/interstitial)</td>
<td>Major</td>
</tr>
<tr>
<td>major or</td>
<td>S3 gallop</td>
<td>Major</td>
</tr>
<tr>
<td>1 major</td>
<td>Circulation time ≥ 25 seconds</td>
<td>Major</td>
</tr>
<tr>
<td>plus 2 minor</td>
<td>Hepatojugular reflux</td>
<td>Major</td>
</tr>
<tr>
<td>criteria</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lower extremity edema</td>
<td>Minor</td>
</tr>
<tr>
<td></td>
<td>Dyspnea on climbing or exertion</td>
<td>Minor</td>
</tr>
<tr>
<td></td>
<td>Hepatomegaly</td>
<td>Minor</td>
</tr>
<tr>
<td></td>
<td>Pleural effusion (bilateral/unilateral)</td>
<td>Minor</td>
</tr>
<tr>
<td></td>
<td>Vital capacity decreased one third from max</td>
<td>Minor</td>
</tr>
<tr>
<td></td>
<td>Weight loss ≥ 4.5 kg in 5 days in response to treatment</td>
<td>Minor</td>
</tr>
</tbody>
</table>
Automated Cardiovascular Clinical Trialists' Algorithm for a Hospitalized Event of Acute Decompensated Heart Failure

**Signs and symptoms** presence of ≥2 HF signs, or symptoms among the following
- Shortness of breath or dyspnea on exertion, orthopnea, paroxysmal nocturnal dyspnea, fatigue or reduced exercise tolerance, pulmonary edema, rales, peripheral edema, JVD, S3, hepatojugular reflux, altered hemodynamics, and cardiomegaly

**Treatment**
- Initiation or increase in treatment with loop diuretics or intravenous vasoactive agents. The automated algorithm’s criteria specify that this treatment should be specifically for the above symptoms; however, our abstraction only confirms that such treatment was provided during this hospitalization.

**Biomarkers and imaging, ≥1 of the following**

1. Elevated BNP (≥400 ng/L*) or elevated NT-pro-BNP using age-defined cut points
   - Or
2. LVEF <40%
   - Or
3. Moderately elevated BNP (100–400 ng/L) or NT-pro-BNP† (defined as less than age cut points) and documentation of LVEF <40% or diastolic dysfunction

All 3 criteria elements must be met to define a heart failure event. BNP indicates brain natriuretic peptide; HF, heart failure; JVD, jugular venous distention; LVEF, left ventricular ejection fraction; and NT, N-terminal.

*SI units shown of ng/L=pg/mL.
†Elevated NT-pro-BNP defined as: if <50 y then ≥450 ng/L; if 50–75 y then ≥900 ng/L; and if 75 y then ≥1800 ng/L. Moderately elevated NT pro-BNP defined with 300 ng/L as the bottom cut point for all age groups: if <50 y then 300–450 ng/L; if 50–75 y then 300–900 ng/L; and if 75 y then 300–1800 ng/L.

Sensitivity, specificity with ARIC review panel 0.68 and 0.75, respectively

Agreement between pairs of diagnostic criteria for heart failure.
ESC = European Society of Cardiology

<table>
<thead>
<tr>
<th></th>
<th>Boston</th>
<th>ESC</th>
<th>ESC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No HF</td>
<td>No HF</td>
<td>468</td>
<td>449</td>
</tr>
<tr>
<td></td>
<td>No HF</td>
<td>19</td>
<td>38</td>
</tr>
<tr>
<td>HF</td>
<td>No HF</td>
<td>26</td>
<td>54</td>
</tr>
<tr>
<td></td>
<td>HF</td>
<td>40</td>
<td>12</td>
</tr>
</tbody>
</table>

kappa = 0.59
kappa = 0.05
kappa = 0.06

CLASSIFICATION OF HEART FAILURE IN THE Atherosclerosis Risk in Communities (ARIC) Study: A Comparison of Diagnostic Criteria

Proportion of hospitalizations classified according to ARIC Heart Failure criteria by demographic characteristics of events. The ARIC Study

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>ADHF</th>
<th>csHF</th>
<th>No HF</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>36.0</td>
<td>8.5</td>
<td>55.2</td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
<td>0.015</td>
</tr>
<tr>
<td>Men</td>
<td>39.0</td>
<td>10.7</td>
<td>50.4</td>
<td></td>
</tr>
<tr>
<td>Women</td>
<td>33.6</td>
<td>6.7</td>
<td>59.7</td>
<td></td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Black</td>
<td>42.9</td>
<td>8.6</td>
<td>48.6</td>
<td>0.019</td>
</tr>
<tr>
<td>White</td>
<td>33.8</td>
<td>8.4</td>
<td>57.8</td>
<td></td>
</tr>
<tr>
<td>ICD-9-CM 428 code (any position)</td>
<td></td>
<td></td>
<td></td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Present</td>
<td>38.5</td>
<td>9.1</td>
<td>52.4</td>
<td></td>
</tr>
<tr>
<td>Not present</td>
<td>16.8</td>
<td>3.8</td>
<td>79.5</td>
<td></td>
</tr>
<tr>
<td>ICD-9-CM 428 code (primary)</td>
<td></td>
<td></td>
<td></td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Present</td>
<td>87.2</td>
<td>4.4</td>
<td>8.4</td>
<td></td>
</tr>
<tr>
<td>Not present</td>
<td>26.5</td>
<td>9.2</td>
<td>64.2</td>
<td></td>
</tr>
</tbody>
</table>

ADHF = acute decompensated heart failure
Percent agreement (kappa coefficient) between heart failure classification criteria. The ARIC Study

### Table 3. Percentage Agreement (κ Coefficient) Between Heart Failure Classification Criteria

<table>
<thead>
<tr>
<th>Heart Failure Diagnostic Classification Criteria</th>
<th>Framingham</th>
<th>Modified Boston</th>
<th>NHANES</th>
<th>Gothenburg</th>
<th>ICD-9-CM 428</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARIC† (acute decompensated HF)</td>
<td>69.5 (0.32)</td>
<td>63.7 (0.18)</td>
<td>60.9 (0.10)</td>
<td>59.5 (0.11)</td>
<td>62.9 (0.13)</td>
</tr>
<tr>
<td>ARIC‡ (any HF)</td>
<td>70.5 (0.21)</td>
<td>68.1 (0.10)</td>
<td>67.4 (0.03)</td>
<td>66.9 (0.13)</td>
<td>75.3 (0.22)</td>
</tr>
<tr>
<td>Framingham</td>
<td></td>
<td>87.2 (0.61)</td>
<td>81.1 (0.38)</td>
<td>72.9 (0.24)</td>
<td>75.7 (0.14)</td>
</tr>
<tr>
<td>Modified Boston</td>
<td></td>
<td>89.5 (0.62)</td>
<td>74.2 (0.23)</td>
<td>77.4 (0.09)</td>
<td></td>
</tr>
<tr>
<td>NHANES</td>
<td></td>
<td></td>
<td>73.3 (0.14)</td>
<td>79.3 (0.03)</td>
<td></td>
</tr>
<tr>
<td>Gothenburg</td>
<td></td>
<td></td>
<td>74.4 (0.12)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NHANES indicates National Health and Nutrition Examination Survey; ICD, International Classification of Disease; ARIC, Atherosclerosis Risk in Communities study; and HF, heart failure.

*Among hospitalized events eligible for review by the ARIC HF Classification Committee. The data are weighted to account for the sampling probabilities (705 sampled events yielding a weighted number of 5011).

†Combines cases classified as definite and possible decompensated HF together as HF=yes; chronic stable HF, or HF unlikely combined as heart failure=no.

‡Combines cases classified as definite and possible decompensated HF and chronic stable HF together as HF=yes; HF unlikely classified as HF=no.

Intersection of heart failure classification by ARIC, Framingham, and primary ICD-9 428 diagnosis code

HF subtypes

• Definite or possible acute decompensated HF (ADHF)
  • Evidence from symptoms, signs, imaging, or treatment of an acute exacerbation, worsening or new onset of symptoms or other decompensated circulatory state

• Reduced or preserved ejection fraction
  • HF reduced ejection fraction (HFrEF)
    • Current or most recent LV ejection fraction < 50%
  • HF preserved ejection fraction (HFpEF)
    • LV ejection fraction ≥ 50%

• Unclassifiable - unknown LVEF
  • Assessment of heart function either before or during hospitalization available for 90% of cases of ADHF

From the ARIC experience

- Commonly used epidemiologic criteria for classifying hospitalized HF are moderately sensitive in identifying ADHF
- High false-positive rate suggest their specificity is poor
- ARIC study may be useful in research of hospital discharges of ADHF
- ADHF events can be separate into HF reduced ejection fraction and HF preserved ejection fraction
Objectives for WHI HF classification

• Design an abstraction process for medical records acquired by WHI of suspected cases of heart failure similar to ARIC
• Capture data on diagnostic tests, quality of care and clinical prognostic factors
• Process eligible events through a physician reviewer system that follows ARIC HF classification guidelines
Processing HF Events in WHI

Regional Centers

Heart Failure eligible hospitalizations

Medical records and documents to RC

Completed event documentation

Central record abstraction

UNC Coordinating Center

HF computer classification

Event summary form

MD Review

Framingham Boston NHANES Trialist

Analysis dataset

Event Classification

- Worsening or new onset of symptoms
- Results of history and physical
- Findings from diagnostic tests
  - chest X-ray
  - transthoracic echo
  - transesophageal echo
  - coronary angiography
  - radionuclide ventriculogram
  - MRI, CT
  - stress tests
- Biochemical analysis
  - BNP, pro-BNP, troponin,
  - hemoglobin, hematocrit
  - serum creatinine,
  - BUN, sodium
- Medications
WHI Events Eligible for Investigation

• Timing
  • WHI 1994-2005 (completed)
  • Extension 1: 2005-2010 (completed)
  • Extension 2: 2010-2015 (in process)

• Event type
  • All locally or centrally confirmed WHI CHF cases
  • Self-reported CHF, angina, or other CVD with ≥2 essential documents
    • Essential documents: discharge summary, procedure report, ED records, 12-lead ECG, cardiac biomarkers, imaging reports
  • 2% not reviewed due to lack of essential documents

• Current status
  • 4735 events completed (WHI + Extension 1) – data distributed
  • 285 events complete for Extension 2, additional 295 in process
Medical Record Abstractors

- Materials available for abstractors
  - Blinded PDF of hospitals records provided by WHI
- Abstractor training
  - Veteran ARIC abstractors (n=5) or other active clinical nurses (n=9)
  - Standard training set of medical records
  - Initial face-to-face training session
  - Follow-up training by conference call
- Abstraction Quality Control
  - 40 randomly selected cases re-abstracted by each abstractor
Data Elements (n=202)

• Screening for decompensation
  • Shortness of breath, edema, PND, orthopnea, hypoxia
  • MD note that HF was cause of admission
  • Date and time of symptoms: at admission, during hospitalization

• History of HF
  • Diagnosis, Hospitalization, Treatment
  • Prior cardiac imaging- type and ejection fraction (% and qualitative)
  • Timing

• Medical History
  • General
  • Respiratory
  • Cardiovascular
  • Gastrointestinal
  • Renal
  • Neurology
  • Was angina or MI listed as precipitating factor?
Data Elements (continued)

• Physical Exam, Signs and Symptoms
  • Blood pressure, heart rate, height and weight
• General signs and symptoms
  • Lower extremity edema
  • Hepatomegaly
  • Leg fatigue on walking
• Respiratory
  • Cough
  • Dyspnea
  • Rhonchi
  • Basilar rales
  • Wheezing
• Cardiovascular
  • S3 S4 gallop
  • Murmur
  • Chest pain
Data Elements (continued)

• Diagnostic Test Results
  • Chest x-ray
    • Pulmonary edema, cardiomegaly, pleural effusion, upper zone redistribution
  • Transthoracic echocardiogram (also TEE)
    • Ejection fraction
    • LV wall thickness
    • Impaired LV systolic-diastolic function
    • Aortic stenosis
    • Mitral regurgitation
    • Mitral stenosis
    • TR jet velocity
    • Regional wall motion abnormality
    • Dilated L, R, ventricle
Data Elements (continued)

• Diagnostic Test Results (continued)
  • Right heart catheterization
    • Various pressure readings
  • Coronary angiography
    • Ejection fraction
    • Ventricular pressures
    • Coronary stenosis details
  • Ejection fraction from other tests
    • Cardiac radionuclide ventriculogram
    • Magnetic resonance imaging
    • Cardiac CT
    • Stress Test
    • Other cardiac imaging
Data Elements (continued)

- Biochemical measurements
  - BNP (worst, last, upper limit normal)
  - Pro-BNP (worst, last, upper limit normal)
  - Troponin (worst, upper limit normal)
  - Sodium
  - Serum creatinine
  - BUN
  - Hemoglobin
  - Hematocrit
Data Elements (continued)

- Treatments
  - Cardioversion
  - Ablation
  - Aortic balloon pump
  - Percutaneous coronary intervention
  - CPAP or BIPAP
  - Mechanical ventilation
  - Thoracentesis
  - Ventricular Assist Device
  - Heart transplant
  - Cardiac ICU/CCU admission
Data Elements (continued)

• Medications (prior to hospitalization, at discharge)
  • ACE inhibitors
  • Angiotensin II receptor blockers
  • Beta Blockers
  • Digitalis
  • Diuretics
  • Aldosterone Blocker
  • Lipid lowering agents
  • Nitrates
  • Hydralazine
  • IV inotropes
  • IV diuretics
**Event Summary Form**

### A. MHI Identifiers

<table>
<thead>
<tr>
<th>Event HF Event ID</th>
<th>Admission Date</th>
<th>Discharge Date</th>
<th>Primary Discharge Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>1113128H1</td>
<td>08/12/2003</td>
<td>08/16/2003</td>
<td>428.0</td>
</tr>
</tbody>
</table>

### B. Selected data elements from hospital record.

#### I. SCREENING CRITERIA FOR COMPLETE CHART ABSTRACTION:

- Increasing or new onset edema: Yes
- Increasing or new onset dyspnea: Yes
- Increasing or new onset paroxysmal nocturnal dyspnea: No/Not Recorded
- Increasing or new onset orthopnea: Yes
- Increasing or new onset hypoxia: No/Not Recorded
- MD note indicates reason for hospitalization was heart failure: Yes

#### II. HISTORY OF HEART FAILURE (HF):

- Previous diagnosis: No/Not Recorded
- Previous hospitalization: No/Not Recorded
- Previous treatment: No/Not Recorded
- History of MI: No/NR
- History of hypertension: Yes
- Discharge status: Alive

#### III. IN-HOSPITAL HEART FAILURE (HF):

- New onset or progression/exacerbation of HF:
  - At the time of admission: Yes
  - During this hospitalization: Yes

#### IV. EJECTION FRACTION (EF):

- Prior to this hospitalization: EP%
- Lowest Ejection Fraction (LVEF): —
- LV Function-Qualitative Description: —
- During this hospitalization: EP%
- Transthoracic Echocardiogram: 25
- Transesophageal Echocardiogram: —
- Coronary angiography: 25
- Radionuclide Ventriculogram (LV): —
- Radionuclide Ventriculogram (RV): —

#### V. BNP LEVELS:

<table>
<thead>
<tr>
<th>BNP</th>
<th>Worst</th>
<th>Last</th>
<th>ULN*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ProBNP</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| ULN = Upper Limit |

#### VI. PERTINENT CHEST X-RAY FINDINGS:

- Alveolar/pulmonary edema: No/Unknown
- Interstitial pulmonary edema: No/Unknown
- Cardiomegaly: Yes
- Cephalization/Upper zone redistribution: No/Unknown
- Bilateral pleural effusion: Yes
- Unilateral pleural effusion: —
- Congestive heart failure/pulmonary vascular congestion: Yes

- Bilateral pleural effusion on CXR
- TTE: 25% EF
- CA: 25% EF
- No BNP

---

**Primary 428 code**

**New onset edema**

**Symptoms on admission**

**TTE: 25% EF**

**CA: 25% EF**

**No BNP**

**Bilateral pleural effusion on CXR**
Physician Reviewers

- Information available to reviewers
  - Event summary form
  - Copies of echo, cath, chest X-ray, and nuclear reports; discharge summary; history and physical

- Reviewer training
  - Veteran ARIC HF reviewers (n=9) and other cardiologist (n=7)
  - Designated lead reviewer conducted all trainings of new reviewers
  - Standard set of training cases
  - Face to face and teleconference trainings

- Reviewer Quality Control
  - 125 randomly selected cases re-reviewed
## Differentiating decompensated HF from chronic stable HF

### HEART FAILURE DIAGNOSIS FORM

**WHI**

**Women's Health Initiative**

**MEMBER ID NUMBER:**

**DATE FORM ENTERED:**

**CONTACT NUMBER:**

**FORM CODE:**

**VERSION A DATE:** 09/25/2012

**Instructions:** Please complete the Heart Failure Diagnosis Form using the attached Event Summary Form and the medical reports provided to assign a heart failure diagnosis. If you mark an answer as incorrect, mark an “X” through the incorrect answer and circle the appropriate response.

### PART A: ADMINISTRATIVE INFORMATION

1. **Batch Number:**
   - [ ]
2. **Type of Review:**
   - Original: [ ]
   - Adjudication: [ ]
   - Special review: [ ]
3. **Date of HFD completion:**
   - Month: [ ]
   - Day: [ ]
   - Year: [ ]
4. **Code number of person completing this form:**
   - [ ]

### PART B: REVIEW OF COMPUTER'S HEART FAILURE DIAGNOSIS

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
<th>Unknown</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. Is there evidence of (past or present):</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Abnormal LV systolic function?</td>
<td>Y</td>
<td>N</td>
<td>U</td>
</tr>
<tr>
<td>b. Abnormal RV systolic function?</td>
<td>Y</td>
<td>N</td>
<td>U</td>
</tr>
<tr>
<td>c. LV diastolic dysfunction?</td>
<td>Y</td>
<td>N</td>
<td>U</td>
</tr>
<tr>
<td>4. Estimated LVEF (worst related to current hospitalization):</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. &lt; 25%</td>
<td>Y</td>
<td>N</td>
<td>U</td>
</tr>
<tr>
<td>b. 25-49%</td>
<td>Y</td>
<td>N</td>
<td>U</td>
</tr>
<tr>
<td>c. &lt; 35%</td>
<td>Y</td>
<td>N</td>
<td>U</td>
</tr>
<tr>
<td>d. Unknown</td>
<td>Y</td>
<td>N</td>
<td>U</td>
</tr>
<tr>
<td>5. Assign an overall heart failure diagnosis based on your clinical judgment (select only one)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Definite decompensated heart failure</td>
<td>A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. Possible decompensated heart failure</td>
<td>B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. Chronic stable heart failure</td>
<td>C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. Heart failure unlikely</td>
<td>D</td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. Unclassifiable</td>
<td>E</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Differentiation based on review of:**

- augmentation of therapy for worsening HF
- control of symptoms by therapy
- asymptomatic heart failure (evidence of LV systolic dysfunction [EF <50%] with no symptoms)
- specificity of heart failure rather than other comorbidities resulting in a decompensated state (COPD, renal disease)

### 6. Assign an overall heart failure diagnosis based on your clinical judgment.

(a) Definite decompensated heart failure
(b) Possible decompensated heart failure
(c) Chronic stable heart failure
(d) Heart failure unlikely
(e) Unclassifiable
Differentiating HF with systolic or diastolic dysfunction

• Important because risk factors, treatment and prognosis differ between syndrome subtypes

3. Is there evidence of (past or present):
(a) Abnormal LV systolic function?
(b) Abnormal RV systolic function?
(c) LV diastolic dysfunction?

4. Estimated LVEF (worst): a. ≥50%, b. 35-49%, c. < 35%
HF Diagnosis form (HDF) - online version

Instructions: Please complete the Heart Failure Diagnosis Form using the attached Event Summary Form and the medical reports provided to assign a heart failure diagnosis.

PART A: ADMINISTRATIVE INFORMATION

1a. Batch Number: 1.05

1b. Type of Review: Original

1c. Date of HFD completion: 05/09/2013

2. Code number of person completing this form: 501

PART B: REVIEW OF COMPUTER’S HEART FAILURE DIAGNOSIS

3. Is there evidence of (past or present):
   3a. Abnormal LV systolic function? No
   3b. Abnormal RV systolic function? Unknown
   3c. LV diastolic dysfunction Yes

4. Estimated LVEF (worst related to current hospitalization):
   50% or more

5. Assign an overall heart failure diagnosis based on your clinical judgment
   Possible decompensated heart failure

6. Was this event fatal?
   6a. Was decompensated heart failure the primary cause of death? Yes

7. Comments:
   No HF in ecf but yes in chart. 2 week hospitalization. of 68%, BNP 174 ->127. Pneumonia, bilateral pleural effusion, lymphoma is main, leg edema, beta. "resolving congestive failure" on June 9 Xray. No clear treatment for HFE is possible.
## Reviewer Quality Control

<table>
<thead>
<tr>
<th>Original review</th>
<th>Repeat Review</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Definite ADHF</td>
</tr>
<tr>
<td>Definite ADHF</td>
<td>21</td>
</tr>
<tr>
<td>Possible ADHF</td>
<td>7</td>
</tr>
<tr>
<td>Chronic stable HF</td>
<td>2</td>
</tr>
<tr>
<td>No HF</td>
<td>5</td>
</tr>
<tr>
<td>TOTAL</td>
<td>35</td>
</tr>
</tbody>
</table>

Percent agreement (ADHF vs. Not ADHF) = 82%
## WHI HF vs. Framingham classification

<table>
<thead>
<tr>
<th>Framingham Criteria</th>
<th>WHI HF classification</th>
<th>Framingham Criteria</th>
<th>WHI HF classification</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ADHF (def + poss)</td>
<td>Not ADHF (chronic+no+ unclass)</td>
<td>TOTAL</td>
</tr>
<tr>
<td>HF Present</td>
<td>2230</td>
<td>657</td>
<td>2887</td>
</tr>
<tr>
<td>HF Absent</td>
<td>505</td>
<td>1343</td>
<td>1848</td>
</tr>
<tr>
<td>TOTAL</td>
<td>2735</td>
<td>2000</td>
<td>4735</td>
</tr>
</tbody>
</table>

Percent agreement = 75% (kappa = 0.49)

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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ADHF (def+poss+chronic)</td>
<td>Not ADHF (no+ unclass)</td>
<td>TOTAL</td>
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</tbody>
</table>

Percent agreement = 69% (kappa = 0.30)
THANK YOU

Questions
Intersection of heart failure classification by ARIC, Framingham, and ICD-9-CM 428 code

Codes classification defined on basis of the presence of an ICD-9-CM 428 in any position