1.a. Full Title:

Socioeconomic, demographic and clinical predictors of heart failure care: ARIC Cohort

b. Abbreviated Title (Length 26 characters):

Heart failure care

2. Writing Group:

Wayne Rosamond, Kathryn Rose, Chirayath Suchindran, Eric Whitsel, Alain Bertoni, Patricia Chang, others welcome

I, the first author, confirm that all the coauthors have given their approval for this manuscript proposal. _RF_ [please confirm with your initials electronically or in writing]

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3. Timeline:

Analyses to begin in Spring 2008. An abstract will be prepared for the October deadline of the 2009 American Heart Association Epidemiology and Prevention meeting. A draft of manuscript is expected during Spring 2009.

4. Rationale:

Heart failure (HF) care – including pharmacologic therapies\(^1\text{-}^7\), diagnostic and invasive\(^8\text{,}^9\) procedures – are efficacious for reducing rehospitalization and in-hospital death rates, morbidity and mortality, and for improving survival among HF patients. The prescription of HF therapies such as angiotensin converting enzyme (ACE) inhibitors, beta-blockers, diuretics and digoxin are supported by the American College of Cardiology / American Heart Association and European Society of Cardiology guidelines, as are certain diagnostic and invasive procedures\(^10\text{-}11\). Standards of care according to quality indicators for HF are mandated by the Centers for Medicare and Medicaid Services\(^12\text{-}13\). In addition, benefits of HF care are generally consistent across NYHA (New York Heart Association) HF classes, a clinical index of HF severity\(^7\).

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Despite its demonstrated efficacy, HF pharmacologic therapy is reported to be underused in both inpatient and outpatient contexts\(^14\text{-}16\). While Sueta et al. demonstrated that neither ethnicity nor gender influenced medication prescription among managed care patients\(^17\), other studies have shown that receipt of HF therapy differs by race, age and gender with lowest levels of use corresponding to racial minorities, patients of younger ages and females\(^3\text{-}18\text{-}20\). Clinical characteristics, such as coronary artery disease, hypertension, and diabetes have been shown to predict increased utilization of ACE inhibitors and beta-blocker therapies among managed care patients\(^17\).

Additionally, Udell et al. found receipt of implantable cardioverter defibrillators was more common among younger, male patients as compared to older, female patients, yet Guru et al. demonstrated that older, female patients are more likely to receive coronary artery bypass surgery compared to younger, male patients\(^8\text{-}9\). Meanwhile, Galvao et al. reported that women hospitalized with acute decompensated heart failure were less likely to receive invasive procedures compared to men\(^21\).

Socioeconomic Status

While some researchers treat neighborhood socioeconomic status (nSES) as a surrogate for individual SES (iSES), evidence suggests that social and environmental contexts play independent roles in health outcomes\(^22\text{-}23\). The separate influence of nSES on health could be due to health care access, presence or absence of environmental stressors, and level of social support among neighborhood residents. There is a paucity of data in the U.S. regarding the association between nSES and use of heart failure therapy at
discharge. Recently, Rathore et al. reported no decreased likelihood of elderly low nSES heart failure patients to receive ACE inhibitors compared to high nSES patients\textsuperscript{24}. Similarly, no known research exists in the U.S. on the independent influence of iSES on receipt of HF therapy. However, data exist on the topic of health effects among patients who are unable to afford their prescriptions. Heisler et al. reported an increase in rates of angina, non-fatal myocardial infarction and strokes among elderly Americans with preexisting cardiovascular disease who took less medication due to its cost\textsuperscript{25}. Lower rates of receipt of invasive procedures are reported among patients of lower socioeconomic status\textsuperscript{8,9}.

Conclusion

HF care, including pharmacologic therapy given during hospitalization or at discharge and receipt of diagnostic and invasive procedures, has not yet been investigated in the ARIC cohort. Thus, we will examine demographic and clinical factors associated with HF drug therapy and determine the independent and joint influence of nSES and iSES as potential barriers to receipt of evidence-based HF care during hospitalization or at discharge.

5. Main Hypothesis/Study Questions:

1. Examine demographic and clinical factors associated with HF care: receipt of pharmacologic therapy (ACE inhibitors, beta-blockers, diuretics and digoxin, and alternatives to these therapies) given during first hospitalization or at discharge, as well as documented performance of diagnostic (i.e., echocardiogram, angiography, chest x-ray) and invasive (i.e., pacemaker, implantable defibrillator) procedures.

2. Determine the independent association of nSES (iSES) and HF care: receipt of pharmacologic therapy (ACE inhibitors, beta-blockers, diuretics and digoxin, and alternatives to these therapies) given during first hospitalization or at discharge, as well as documented performance of diagnostic (i.e., echocardiogram, angiography, chest x-ray) and invasive (i.e., pacemaker, implantable defibrillator) procedures.
   a. Do positive, graded associations between nSES (iSES) and HF care exist? If so, are they present both within and across study communities?
   b. Does iSES (nSES), race, age, gender, study community or year of incident HF event modify the nSES (iSES) – HF care association?

6. Design and analysis (study design, inclusion/exclusion, outcome and other variables of interest with specific reference to the time of their collection, summary of data analysis, and any anticipated methodologic limitations or challenges if present).
Data sources:

ARIC cohort data will be analyzed over the time period baseline-2004.

SES Exposures:

The area-level (nSES) measures selected for study from the 1990 and 2000 US Census are: median household income; median value of housing units; percent of households with interest, dividend or rental income; percent of adult residents who completed high school; percent of adult residents who completed college; and percent employed residents with executive, managerial or professional occupations.

Baseline iSES measures selected for study are available in the ARIC cohort database: family income, education, occupation, and health insurance status (i.e., receipt of Medicaid).

Health Outcomes:

In general, HF care is of interest in this analysis. Specifically, HF care outcomes are defined as receipt of the following: 1) HF therapy (ACE inhibitors, beta-blockers, diuretics and digoxin, as well as alternatives to these pharmacologic agents as data are available: aldosterone blockers, angiotensin receptor blockers, hydralazine/nitrate combinations) during hospitalization or at discharge; 2) diagnostic procedures such as echocardiogram, angiography and chest x-ray; and 3) invasive procedures, for example, pacemakers and implantable defibrillators. Covariates include race, gender, age, study community, year of event and selected clinical (i.e. history of diabetes, myocardial infarction, hyperlipidemia, coronary artery disease) characteristics at baseline.

Data Analysis:

The analysis will be restricted to participants with incident HF in the ARIC cohort (excluding patients with prevalent HF at baseline) who survived their incident HF hospitalization. As of 2004, 1,542 participants have been identified with incident HF in the ARIC cohort. Logistic regression will be used to identify demographic and clinical factors associated with HF care.

Odds ratios for HF care (and 95% confidence intervals) will be calculated using generalized estimating equations (GEE) to account for the clustering of observations by census tract. GEEs provide standard errors of the odds ratios which have been adjusted to take into account the dependence of observations made on patients from the same census tract. We will use SAS software (SAS Institute, Cary, NC) with the procedure GENMOD. We plan to repeat the analysis using GLIMMIX to investigate whether random slopes/intercepts are better than fixed effects for modeling multi-level, time dependent data.
Crude nSES/iSES-HF care analyses will be conducted, the influence of covariates in a full model will be tested, and effect modification of the nSES/iSES-HF care relationship will be explored.

7.a. Will the data be used for non-CVD analysis in this manuscript? ____ Yes __X__ No

b. If Yes, is the author aware that the file ICTDER02 must be used to exclude persons with a value RES_OTH = “CVD Research” for non-DNA analysis, and for DNA analysis RES_DNA = “CVD Research” would be used? ____ Yes _____ No N/A
(This file ICTDER02 has been distributed to ARIC PIs, and contains the responses to consent updates related to stored sample use for research.)

8.a. Will the DNA data be used in this manuscript? ____ Yes __X__ No

8.b. If yes, is the author aware that either DNA data distributed by the Coordinating Center must be used, or the file ICTDER02 must be used to exclude those with value RES_DNA = “No use/storage DNA”? ____ Yes _____ No N/A

9. The lead author of this manuscript proposal has reviewed the list of existing ARIC Study manuscript proposals and has found no overlap between this proposal and previously approved manuscript proposals either published or still in active status. ARIC Investigators have access to the publications lists under the Study Members Area of the web site at: http://www.csec.unc.edu/ARIC/search.php

___X___ Yes _______ No

10. What are the most related manuscript proposals in ARIC (authors are encouraged to contact lead authors of these proposals for comments on the new proposal or collaboration)?

MS 110 (Romn)
MS 216 (Lewis)
MS 395 (Rosamond)
MS 490 (Li)
MS 833 (Briley)
MS 1103 (Rose)

11. a. Is this manuscript proposal associated with any ARIC ancillary studies or use any ancillary study data? ____x__ Yes _____ No

11.b. If yes, is the proposal _____x__ A. primarily the result of an ancillary study (AS 1998.02)
B. primarily based on ARIC data with ancillary data playing a minor role (usually control variables; list number(s)*) __________ __________ __________

*ancillary studies are listed by number at http://www.cscc.unc.edu/aric/forms/

12. Manuscript preparation is expected to be completed in one to three years. If a manuscript is not submitted for ARIC review at the end of the 3-years from the date of the approval, the manuscript proposal will expire.

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