1.a. Full Title:


b. Abbreviated Title (Length 26 characters):

Hospitalization trends

2. Writing Group:

Writing group members:

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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 Fall 2011. An abstract will be prepared for the February 3 deadline of the 2012 Society for Epidemiologic Research meeting. A manuscript draft is expected during Summer 2012.

4. **Rationale:**

Since 2000, population trends in myocardial infarction (MI) incidence are shown to be decreasing or stabilizing. Meanwhile, hospitalization rates for MI in New Zealand are increasing, and the authors of the report suggest that the trends may reflect more than the underlying changes in MI incidence. In particular, the burden of readmission among patients with HF is quite high.

A recent article in *Circulation: Heart Failure* documented hospitalization rates for heart failure (HF) in Tennessee. From 1997 to 2006, the authors reported an increase in HF hospitalization rates, and rates were higher among blacks than whites and among men than women.

From 1983 to 1989, the National Hospital Discharge Survey (NHDS) reported stable rates of MI admissions, and the most commonly reported complication during that time period was HF. Findings from the NHDS from 1980 to 2006 indicate decreasing age-adjusted rates of MI hospitalizations, but an increase in age-adjusted rates of HF hospitalizations among those aged 65 and older.

Existing ARIC community surveillance studies have reported MI incidence rates, but not hospitalization rates for MI and HF. We propose to compare overall (not just incident) hospitalizations for MI and HF among three sources of data: the ARIC community surveillance, the ARIC cohort, and the NHDS. These data, collectively, provide an opportunity to both assess the burden of hospitalizations for MI and HF in the context of national, community, and cohort data, and to quantify the magnitude of the healthy cohort effect over time. We will also determine if there are absolute differences in trends by (5-year) age/race/gender groups.

5. **Main Hypothesis/Study Questions:**

1. What are the trends in absolute differences in hospitalization rates for myocardial infarction (MI) and heart failure (HF) between the ARIC community surveillance and cohort, restricting to the age range of the cohort over time?
   a. What are the trends in absolute differences in hospitalization rates for MI and HF between the ARIC community surveillance and cohort within (5-year) age/race/gender groups, restricting to the age range of the cohort over time?

2. What are the trends in absolute differences in hospitalization rates for MI and HF
between the ARIC community surveillance and the National Hospital Discharge Survey (NHDS), restricting to the age range of community surveillance over time?

a. What are the trends in absolute differences in hospitalization rates for MI and HF between the ARIC community surveillance and the NHDS within (5-year) age/race/gender groups, restricting to the age range of community surveillance over time?

6. Data (variables, time window, source, inclusions/exclusions):

ARIC surveillance data will be analyzed over the time period 1987-2008. ARIC cohort data will be analyzed over the time period baseline-present. Additional data to be incorporated in these analyses include that of the US Census for population denominators and that of the National Hospital Discharge Survey (NHDS) for national hospitalization rates. In the description of statistical methods that follow, please note that analyses will be restricted to the applicable age ranges and race/study community groups.

Trends in rates of hospitalization for MI will be calculated based on the presence of an ICD-9-CM discharge diagnosis code of 410 (acute MI). Trends in rates of HF hospitalizations will be calculated using an ICD-9-CM code of 428. Our analyses in ARIC surveillance data will be weighted by the sampling probabilities of the discharge codes. We acknowledge that NHDS data will also likely require the consideration of sampling probabilities in the analyses.

Age/race/gender-specific hospitalization rates will be computed for ARIC surveillance based on population estimates derived by interpolation from U.S. Census data (1990 data for events occurring 1987 to 1994; 2000 data for events occurring 1995 onward). The logs of the weighted rates will be modeled as linear functions of year and five-year age groups using Poisson regression (PROC GENMOD). The analysis of NHDS data will be similar to that of ARIC surveillance. The offset used in Poisson regression for ARIC cohort data will be the log of the person-time contributed by the members of the cohort during a given event year.

Covariates of interest for the regression analyses include age, race, study community, gender, year of event, hospital type (teaching vs. non-teaching), and co-occurring discharge diagnosis codes (for construction of the Charlson comorbidity score).

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_DÑA = “CVD Research” would be used?

* For ARIC community surveillance, between 35 and 74 years, inclusive, for events between January 1, 1987 and December 31, 2004, and between 35 and 84 years, inclusive, for events on and after January 1, 2005.
(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  ____ 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.cscc.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# 283 (Watkins) Fourteen-year (1987 to 2000) trends in the attack rates of, therapy for, and mortality from non-ST elevation actue coronary syndromes in four United States Communities
    - MS# 338C (Rosamond) Coronary heart disease trends in four United States communit ies: the Atherosclerosis Risk in Communities (ARIC) Study 1987-1996
    - MS# 579 (Hughes) Why are heart disease mortality rates for African American men and women in Mississippi so high? A comparison of cardiovascular risk factor data from Jackson, MS with data for the entire US
    - MS# 1102 (Rose) Neighborhood SES disparities in rates and temporal trends in rates of MI in ARIC surveillance
    - MS# 1106 (Couper) Investigating the effect of the AHA 2003 definition of CHD on CHD incidence rates in ARIC community surveillance
    - MS# 1489 (Chang) Surveillance of heart failure hospitalizations requires more than just the ICD-9 code: rates of acute decompensation versus chronic disease in the ARIC Study
    - MS#1670 (Allen) The Impact of Health Care Availability on Hospitalized MI Incidence Rates and CHD Mortality Rates: The ARIC Surveillance Study

11. a. Is this manuscript proposal associated with any ARIC ancillary studies or use any ancillary study data?  ____ Yes  ____x__ No
11.b. If yes, is the proposal
   ___  A. primarily the result of an ancillary study
   ___  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.

References

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   heart disease hospitalisations in New Zealand: trend for admissions and incidence can
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   Rehospitalization or Death After an Incident Heart Failure Hospitalization / Clinical
5. Husaini BA, Mensah GA, Sawyer D, et al. Race, Sex, and Age Differences in Heart
   Failure-Related Hospitalizations in a Southern State / Clinical Perspective.
6. Feinleib M, Havlik RJ, Gillum RF, Pokras R, McCarthy E, Moien M. Coronary heart
7. Liu L. Changes in Cardiovascular Hospitalization and Comorbidity of Heart Failure
   in the United States: Findings from the National Hospital Discharge Surveys 1980-