Atherosclerosis Risk in Communities Study

Community Surveillance Heart Failure Occurrences Data Dictionary

April 2017

Community Surveillance Heart Failure Occurrences Data Dictionary

Occurrence: An occurrence refers to a single hospitalization, fatal or non-fatal, with a unique ID.

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1. Classification Variables

1.1. ADHF

Purpose

To indicate a hospitalization that has been classified as an acute decompensated heart failure event.

Description

ADHF is a numeric variable. ADHF indicates whether the final classification for an event was definite or probable decompensated heart failure or otherwise.

Type

Occurrence

Algorithm

For events classified as definite or probable decompensated heart failure (HFDIAG3= 1) ADHF=1. Otherwise (for events classified as Chronic Stable HF or Unlikely HF/Unclassifiable), ADHF= 0.

SAS Code

```
if hfdiag3=1 then adhf=1;
    if hfdiag3 in (2,3) then adhf=0 ;
```

Related Variables

HFDIAG3

1.2. ADHFTYPE_EVER

Purpose

To determine for an acute decompensated heart failure event if this can be classified as heart failure with preserved ejection fraction, systolic heart failure or recovered.

Description

ADHFTYPE_EVER is a categorical variable. ADHFTYPE_EVER is derived from the variables ADHF, LVEF-CUR_LOW and LVE_PRE_LOW. The classification of the HF occurrence is based on the type of HF (HFDIAG) and the prior (LVEF_PRE_LOW) and current (LVEF_CUR_LOW) ejection fraction data.

Type

Occurrence

Algorithm

If the HF occurrence is NOT classified as {Definite Decompensated HF or Probably Decompensated HF} then set ADHFTYPE_EVER as missing.
If the HF occurrence is classified as {Definite Decompensated HF or Probably Decompensated HF} then set ADHFTYPE_EVER as follows:
If LVEF_CUR_LOW=. and LVEF_PRE_LOW=. then ADHFTYPE_EVER="";
If LVEF_CUR_LOW=. and LVEF_PRE_LOW=0 then ADHFTYPE_EVER="ADHFPEF";
If LVEF_CUR_LOW=. and LVEF_PRE_LOW=1 then ADHFTYPE_EVER="SADHF";
If LVEF_CUR_LOW=0 and LVEF_PRE_LOW=. then ADHFTYPE_EVER="ADHFPEF";
If LVEF_CUR_LOW=0 and LVEF_PRE_LOW=0 then ADHFTYPE_EVER="ADHFPEF";
If LVEF_CUR_LOW=0 and LVEF_PRE_LOW=1 then ADHFTYPE_EVER="RECOVERED";
If LVEF_CUR_LOW=1 and LVEF_PRE_LOW=. then ADHFTYPE_EVER="SADHF";
If LVEF_CUR_LOW=1 and LVEF_PRE_LOW=0 then ADHFTYPE_EVER="SADHF";
If LVEF_CUR_LOW=1 and LVEF_PRE_LOW=1 then ADHFTYPE_EVER="SADHF";

Related Variables

ADHF, HFDIAG, LVEF_CUR_LOW, LVEF_PRE_LOW

1.3. COMP_ADHF

Purpose

To indicate a hospitalization that has been classified as an acute decompensated occurrence by a computer algorithm.

Description

COMP_ADHF is a numeric variable. COMP_ADHF indicates those events that meet certain criteria (see algorithm below) that allow them to be classified as acute decompensated occurrences without the need for MMCC review. These events receive a final classification of HFDIAG='A'.

Type

Occurrence

Algorithm

If PRED_ADHF = 1 and any of the following

1) Left ventricular ejection fraction as measured during the current hospitalization is not missing (LVEFDU > .z)
2) Record of impaired LV systolic function from the transthoracic echocardiogram (HFAA29D2 ne " ")
3) Record of impaired LV systolic function from the transesophageal echocardiogram (HFAA30C1 ne " ")
4) Lowest EF was recorded (HFAA8A > .z)
5) Qualitative description of Lowest Ejection Fraction is not missing (HFAA8A1 ne " ")

Then COMP_ADHF =1
Else, COMP_ADHF = 0

SAS Code

If PRED_ADHF=1 and (LVEFDU>.z or HFAA29D2 ne " " or HFAA30C1 ne " " or HFAA8A>.z or HFAA8A1 ne " ") then COMP_ADHF=1;
Else COMP_ADHF=0;

Related Variables

PRED_ADHF, LVEFDU, HFDIAG

1.4. FRAMINGHAM

Purpose

To determine a heart failure diagnosis based on selected variables from the Heart Failure Hospital Record Abstraction (HFA) form.

Description

FRAMINGHAM is a character variable. FRAMINGHAM is a heart failure classification system based on a scoring algorithm derived from selected variables from the HFA form.

Type

Occurrence

Algorithm

Framingham Criteria (Ho et al, 1993)	HF **present** with 2 major or 1 major plus 2 minor criteria: Major: Paroxysmal nocturnal dyspnea or oorthopnea, neck vein distension, rales, cardiomegaly, acute pulmonary edema, S3 gallop, increase venous pressure (≥ 16 cm H_20), circulation time ≥ seconds, hepatojugular reflux) Minor: ankle edema, night cough, dyspnea on exertion, hepatomagaly, pleural effusion, vital capacity decreased one third from maximum, tachycardial rate ≥ 120/min. Weight loss ≥ 4.5 kg in 5 days in response to treatment, major criterion if weight loss occurred during therapy, otherwise minor.

Framingham Criteria for Diagnosis of Heart Failure and ARIC Hospitalized Heart Failure Abstraction (HFA) Data Elements

* HFA data item numbers refer to version B 11/21/07
-- data item not included on HFA form

Classification	Criteria	Points	HFA form section (page number)	HFA variable number *
Framingham Criteria Algorithm: Heart failure present with 2 major or 1 major plus 2 minor criteria	Paroxysmal nocturnal dyspnea	Major	Section V: Physical Exam-Findings (9)	23.h
	Orthopnea	Major	Section V: Physical Exam-Findings (9)	23.i
	Jugular venous distension	Major	Section V: Physical Exam-Findings (9)	22.b
	Pulmonary rales (basilar and more than basilar)	Major	Section V: Physical Exam-Findings (9)	23.j, 23.k
	Cardiomegaly	Major	Section VI: Diagnostic tests (11)	28.d
	Acute pulmonary edema (alveloar/interstitial)	Major	Section VI: Diagnostic tests (11)	28.b, 28.c
	S3 gallop	Major	Section V: Physical Exam-Findings (10)	24.a
	Circulation time ≥ 25 seconds	Major	--	--
	Hepatojugular reflux	Major	Section V: Physical Exam Findings (9)	22.c
	Lower extremity edema	Minor	Section V: Physical Exam-Findings (9)	22.a
	Dyspnea on climbing or exertion	Minor	Section V: Physical Exam-Findings (9)	23.d
	Hepatomegaly	Minor	Section V: Physical Exam-Findings (9)	22.d
	Pleural effusion (bilateral/unilateral)	Minor	Section VI: Diagnostic tests (11)	28.g, 28.h
	Vital capacity decreased one third from maximum	Minor	Section V: Physical Exam-Findings (9)	23.m
	Weight loss ≥ 4.5 kg in 5 days in response to treatment	Minor	Section IV: Physical Exam-Vital signs (8)	20.a, 20.b

1.5. GOTHENBURG

Purpose

To determine a heart failure diagnosis based on selected variables from the HFA form.

Description

GOTHENBURG is a character variable. GOTHENBURG is a heart failure classification system based on a scoring algorithm derived from selected variables from the HFA form.

Type

Occurrence

Algorithm

Gothenburg Criteria (Eriksson et al, 1987)	Takes into account history and physical findings to calculate a score considered with drug treatment to assign HF stage. Grade 0 (**absent**) if all 3 scores are 0. Grade 1 (**latent**) if cardiac score > 0 and pulmonary and therapy score = 0. Grade 2 (**manifest HF**) if cardiac score > and either pulmonary or therapy score > 0. **Grade 3 heart failure** if cardiac score > 0 and both pulmonary and therapy score > 0. **Grade 4** if the person died in HF. Cardiac score: Coronary heart disease present in past (1 pt), present within last year (2 pts); angina pectoris present in the past (1 pt), present within last year (2 pts); swollen legs at end of day (1 pt); pulmonary rales at physical exam (1 pt); atrial fibrillation on ECG (1 pt). Note heart disease and angina can only contribute 2 points together. Pulmonary disease score: History of chronic bronchitis (1 pt), history of chronic bronchitis within last year (2 pts); history of asthma (1 pt), history of asthma within last year (2 pts); history of coughing, phlegm or wheezing (1 pt), presence of rhonchi at physical examination (1 pt). Therapy score: History of digitalis administration (1 pt), history of diuretic administration (1 pt).

Gothenburg Criteria for Diagnosis of Heart Failure and ARIC Hospitalized Heart Failure Abstraction (HFA) Data Elements

Classification	Criteria	Points	Heart Failure Abstraction (HFA) form section (page number)	HFA variable number *
Gothenburg Criteria Algorithm (pts): Grade 0 (absent) if all 3 scores are 0. Grade 1 (latent) if cardiac score > 0 and pulmonary and therapy score = 0. Grade 2 (manifest heart failure) if cardiac score > and either pulmonary or therapy score > 0. Grade 3 if cardiac score > 0 and both pulmonary and therapy score > 0. Grade 4 if the person died in heart failure. Grade 5 (unspecified) if: (cardiac score=0 and pulmonary score=0 and therapy score>0) or (cardiac score=0 and pulmonary score>0 and therapy score=0) or (cardiac score=0 and pulmonary score>0 and therapy score>0)	Cardiac score **:			
	Coronary heart disease present in past	1	Section III: Medical History (6)	11.h
	Coronary heart disease present within last year	2	Section III: Medical History (6)	11.g
	Angina pectoris present in the past	1	Section III: Medical History (5)	11.a
	Angina pectoris present within last year	2	--	--
	Dyspnoea at night	1	Section V: Physical Exam-Findings (9)	23.h
	Pulmonary rales	1	Section V: Physical Exam-Findings (9)	23.j, 23.k
	Atrial fibrillation on ECG	1	Section VI: Diagnostic tests (11)	26.c
	Pulmonary score:			
	History of chronic bronchitis	1	Section III: Medical History (5)	10.b
	History of chronic bronchitis within last year	2	--	--
	History of asthma	1	Section III: Medical History (5)	10.a
	History of asthma within last year	2	--	--
	History of coughing, phlegm or wheezing	1	Section III: Medical History (5)	10.e
	Presence of rhonchi at physical examination	1	Section V: Physical Exam-Findings (9)	23.g
	Therapy score:			
	History of digitalis administration	1	Section IX: Medications (18)	67
	History of diuretic administration	1	Section IX: Medications (18)	68

* HFA data item numbers refer to version B 11/21/07 or HFS version A 11/21/07
** Note: heart disease and angina can only contribute 2 points together.
-- data item not included on HFA form

1.6. HFDIAG

Purpose

To determine the final heart failure classification for an occurrence.

Description

HFDIAG is a character variable. Unlike in cohort surveillance, most community heart failure occurrences are not reviewed by two MMCC members. Depending on the information present in the hospital record a community occurrence may get between zero and three reviews. The description of the algorithm that determines how many reviews an occurrence gets is below. **This is the definitive heart failure classification for a community surveillance occurrence.**

Type

Occurrence

Algorithm

Hospitalizations are reviewed by a single member of the heart failure MMCC with the classification determined by the MMCC reviewer becoming the event's final ARIC classification with the following exception.

a. If the Framingham, NHANES, and Modified Boston computer classification scoring algorithms meet the formula below* AND the heart failure MMCC classification is either "chronic stable heart failure" or "no heart failure", the case is sent to the Chair of the heart failure MMCC for adjudication. The Chair's adjudicated classification becomes the event's final ARIC classification.

* Framingham criteria equal "heart failure present", and NHANES criteria equals "heart failure present", and Modified Boston criteria equal "definite or possible heart failure".

Hospitalizations NOT reviewed by the MMCC:
If BNP (HFAA39a) is greater than 875 pg/ml and:
There is evidence in the doctor's notes that the hospitalization was for HF (HFAA2),
Or
There is evidence of edema (HFAA22a),
Or
There is evidence of basilar rales (HFAA23j),
There is evidence in the doctors notes that the hospitalization was for HF (HFAA2) and:
There is increasing or new onset paroxysmal nocturnal dyspnea (HFAA1c),
Or
There is increasing or new onset orthopnea (HFAA1d),
Or
There is an indication of paroxysmal nocturnal dyspnea during this hospitalization (HFAA23h).
Or
An x-ray showed signs of congestive heart failure during this hospitalization (HFAA28l).

If either criteria #2 or #3 above is met and there is at least one left ventricular function measurement available in the HFA these events are classified as acute decompensated heart failure.

Remarks

This variable was created from HDX form, question 6.

Related Variables

HFDIAG3

1.7. HFDIAG3

Purpose

To determine the final heart failure classification for an occurrence.

Description

HFDIAG3 is a numeric variable. HFDIAG3 is similar to HFDIAG except classifications ‘A’ and ‘B’ have been collapsed into one category and classifications ‘D’ and ‘E’ have been collapsed into one category.

Type

Occurrence

Algorithm

If HFDIAG is Definite Decompensated HF or Probable Decompensated HF then HFDIAG3 = 1
If HFDIAG is Chronic Stable HF then HFDIAG = 2
If HFDIAG is Unlikely HF or Unclassifiable then HFDIAG3 = 3

SAS CODE

If HFDIAG= ‘A’ or ‘B’ then HFDIAG3=1
If HFDIAG= ‘C’ then HFDIAG3=2
If HFDIAG= ‘D’ or ‘E’ then HFDIAG3=3

Related Variables

HFDIAG

1.8. HFTYPE_EVER

Purpose

To determine if a hospitalization can be classified as heart failure with preserved ejection fraction, systolic heart failure or recovered.

Description

HFTYPE_EVER is a categorical variable. HFTYPE_EVER is calculated from the variables: HFDIAG, LVEF_CUR_LOW and LVEF_PRE_LOW. The classification of the HF occurrence is based on the type of HF(HFDIAG) and the prior (LVEF_PRE_LOW) and current (LVEF_CUR_LOW) ejection fraction data.

Type

Occurrence

Algorithm

If the HF occurrence is not classified as {Definite Decompensated HF, Probably Decompensated HF, Chronic Stable HF} then set HFTYPE_EVER as missing.
If the HF occurrence is classified as {Definite Decompensated HF, Probably Decompensated HF, Chronic Stable HF} then set HFTYPE_EVER as follows:
If LVEF_CUR_LOW=. and LVEF_PRE_LOW=. then HFTYPE_EVER="";
If LVEF_CUR_LOW=. and LVEF_PRE_LOW=0 then HFTYPE_EVER="HFPEF";
If LVEF_CUR_LOW=. and LVEF_PRE_LOW=1 then HFTYPE_EVER="SHF";
If LVEF_CUR_LOW=0 and LVEF_PRE_LOW=. then HFTYPE_EVER="HFPEF";
If LVEF_CUR_LOW=0 and LVEF_PRE_LOW=0 then HFTYPE_EVER="HFPEF";
If LVEF_CUR_LOW=0 and LVEF_PRE_LOW=1 then HFTYPE_EVER="RECOVERED";
If LVEF_CUR_LOW=1 and LVEF_PRE_LOW=. then HFTYPE_EVER="SHF";
If LVEF_CUR_LOW=1 and LVEF_PRE_LOW=0 then HFTYPE_EVER="SHF";
If LVEF_CUR_LOW=1 and LVEF_PRE_LOW=1 then HFTYPE_EVER="SHF";

Related Variables

HFDIAG, LVEF_CUR_LOW, LVEF_PRE_LOW

1.9 HF_HX

Purpose

To determine a prior history of hospitalized heart failure.

Description

HF_HX is a character variable. This variable takes the value from the response abstracted into question 7b of the HFA form.

Type

Occurrence

Algorithm

SAS Code

HF_HX=HFAA7b

Related Variables

HFAA7b

1.10 INCADHF

Purpose

Indicates whether an occurrence is the first hospitalization for acute decompensated heart failure.

Description

INCADHF is a numeric variable. INCADHF indicates whether or not there is a prior history of hospitalization for an acute decompensated heart failure occurrence as determined via medical record abstraction.

Type

Occurrence

Algorithm

If the occurrence is an Acute Decompensated Heart Failure (ADHF = 1) and if there no prior hospitalization for heart failure or prior hospitalization for heart failure was not recorded or if the patient was unsure (HFAA7B = N or U), then INCADHF = 1.

If the occurrence was not an Acute Decompensated Heart Failure (ADHF = 0) or if there was a prior hospitalization for heart failure (HFAA7B = Y) then INCADHF = 0

SAS Code

```
if ADHF=1 and HFAA7B in("N","U") then INCADHF=1;
if ADHF=0 or HFAA7b="Y" then INCADHF=0;
```

Related Variables

ADHF, HFAA7B

1.11 INCADHFTYPE_EVER

Purpose

To indicate for a first acute decompensated heart failure with preserved ejection fraction.
To determine if a hospitalization can be classified as heart failure with preserved ejection fraction, systolic heart failure or recovered.

Description

INCADHFTYPE_EVER is a categorical variable. INCADHF_EVER is derived from the variables HFDIAG, INCADHF, LEVEF_CUR_LOW, LVEF_PRE_LOW. . The classification of the HF occurrence is based on the type of HF(HFDIAG) , no evidence of prior HF (INCADHF), and the prior (LVEF_PRE_LOW) and current (LVEF_CUR_LOW) ejection fraction data.

Type

Occurrence

Algorithm

If the HF occurrence is NOT classified as {Definite Decompensated HF or Probably Decompensated HF} OR INCADHF~=1 then set INCADHFTYPE_EVER as missing.
If the HF occurrence is classified as {Definite Decompensated HF, Probably Decompensated HF, Chronic Stable HF} AND INCADHF=1 then set INCADHFTYPE_EVER as follows:
If LVEF_CUR_LOW=. and LVEF_PRE_LOW=. then INCADHFTYPE_EVER="";
If LVEF_CUR_LOW=. and LVEF_PRE_LOW=0 then INCADHFTYPE_EVER="INCADHFPEF";
If LVEF_CUR_LOW=. and LVEF_PRE_LOW=1 then INCADHFTYPE_EVER="INCSADHF";
If LVEF_CUR_LOW=0 and LVEF_PRE_LOW=. then INCADHFTYPE_EVER="INCADHFPEF";
If LVEF_CUR_LOW=0 and LVEF_PRE_LOW=0 then INCADHFTYPE_EVER="INCADHFPEF";
If LVEF_CUR_LOW=0 and LVEF_PRE_LOW=1 then INCADHFTYPE_EVER="RECOVERED";
If LVEF_CUR_LOW=1 and LVEF_PRE_LOW=. then INCADHFTYPE_EVER="INCSADHF";
If LVEF_CUR_LOW=1 and LVEF_PRE_LOW=0 then INCADHFTYPE_EVER="INCSADHF";
If LVEF_CUR_LOW=1 and LVEF_PRE_LOW=1 then INCADHFTYPE_EVER="INCSADHF";

Related Variables

HFDIAG, INCADHF, LVEF_CUR_LOW, LVEF_PRE_LOW

1.12 LVEF_CUR

Purpose

To indicate the ejection fraction for the current hospitalization.

Description

LVEF_CUR is a continuous variable that is derived from the HFA ejection fraction variables: HFAA29B, HFAA30B, HFAA32B1, HFAA33B, HFAA34B, HFAA35B and HFAA36C.
Only those variables with test date on or after (arrival date – 90 days) and on or before discharge date are eligible. LVEF_CUR is set to the first non-missing value using the following order: HFAA29B, HFAA34B, HFAA35B, HFAA33B, HFAA32B1, HFAA36C, HFAA30B.

Type

Occurrence

Algorithm

From the 7 variables:
HFAA29B, HFAA30B, HFAA32B1, HFAA33B, HFAA34B, HFAA35B and HFAA36C select those ones that have their respective date in the time interval:

hospital arrival date (CHIA6A)-90 days <= date <= discharge date (HFAA0C)

Take the first non-missing value using the following order:
HFAA29B, = EF Transthoracic echocardiogram
HFAA34B = EF MRI
HFAA35B = EF CT SCAN
HFAA33B = EF Radionuclide ventriculogram
HFAA32B1 = EF Coronary angiography
HFAA36C = EF Stress test
HFAA30B = EF Transesophageal echocardiogram

Related Variables

HFAA29B, HFAA30B, HFAA32B1, HFAA33B, HFAA34B, HFAA35B,, HFAA36C
LVEF_CUR_DAT, LVEF_CUR_SOU, LVEF_CUR_LOW, LVEF_PRE, HFTYPE_EVER

1.13. LVEF_CUR_DAT

Purpose

To indicate the date of the current ejection fraction.

Description

LVEF_CUR_DAT is a numeric variable. It is the date of the HFA ejection fraction variable from which LVEF_CUR was derived.

Type

Occurrence

Algorithm

If LVEF_CUR was derived from HFAA34B then LVEF_CUR_DAT = HFAA34A
If LVEF_CUR was derived from HFAA35B then LVEF_CUR_DAT = HFAA35A
If LVEF_CUR was derived from HFAA33B then LVEF_CUR_DAT = HFAA33A
If LVEF_CUR was derived from HFAA29B then LVEF_CUR_DAT = HFAA29A
If LVEF_CUR was derived from HFAA30B then LVEF_CUR_DAT = HFAA30A
If LVEF_CUR was derived from HFAA32B1 then LVEF_CUR_DAT = HFAA32A
If LVEF_CUR was derived from HFAA36C then LVEF_CUR_DAT = HFAA36A

Related Variables

HFAA29B, HFAA30B, HFAA32B1, HFAA33B, HFAA34B, HFAA35B,, HFAA36C, LVEF_CUR, LVEF_CUR_SOU

1.14. LVEF_CUR_LOW

Purpose

To indicate if the current ejection fraction is less than 50.

Description

LVEF_CUR_LOW is an indicator variable. LVEF_CUR_LOW is derived from the variables HDXA5, LVEF_CUR, HFAA29D2, HFAA30C1, HFAA29A and HFAA30A.

LVEF_CUR_LOW takes the first non-missing value in the following hierarchy. The reviewer assessment is the first preference (HDXA5, collapsed across multiple reviewers), then the quantitative abstracted value (LVEF_CUR) and finally the qualitative abstracted value recorded in the variables HFAA29D2 and HFAA30C1.

Type

Occurrence

Algorithm

LVEF_CUR_LOW is the first non-missing value from the following hierarchy: HDXA5 (reviewer qualitative assessment), LVEF_CUR (cut-off is 50%), HFAA29D2 (TTE, qualitative) and HFAA30C1 (TEE, qualitative).

The qualitative variables HFAA29D2 and HFAA30C1 are only considered if their respective dates are in the time interval [hospital arrival date, (CHIA6A)-90 days, discharge date (HFAA0C)]

Related Variables

HDXA5, HFAA29D2, HFAA30C1, LVEF_CUR, HFTYPE_EVER

1.15. LVEF_CUR_SOU

Purpose

To indicate the source of the current ejection fraction.

Description

LVEF_CUR_SOU is a character variable that indicates the current HFA ejection fraction variable from which LVEF_CUR was derived.

Type

Occurrence

Algorithm

If LVEF_CUR was derived from HFAA34B then LVEF_CUR_SOU =' 34B MRI'
If LVEF_CUR was derived from HFAA35B then LVEF_CUR_ SOU =' 35B CT SCAN'
If LVEF_CUR was derived from HFAA33B then LVEF_CUR_ SOU =' 33B RADIO VENTRI'
If LVEF_CUR was derived from HFAA29B then LVEF_CUR_ SOU =' 29B TRANSTHORACIC'
If LVEF_CUR was derived from HFAA30B then LVEF_CUR_ SOU =' 30B TRANSESOPHAGEAL'
If LVEF_CUR was derived from HFAA32B1 then LVEF_CUR_ SOU ='32B1 ANGIOGRAPHY'
If LVEF_CUR was derived from HFAA36C then LVEF_CUR_ SOU = '36C STRESS TEST'

Related Variables

HFAA29B, HFAA30B, HFAA32B1, HFAA33B, HFAA34B, HFAA35B,, HFAA36C, LVEF_CUR, LVEF_CUR_DAT

1.16. LVEF_PRE

Purpose

To indicate the ejection fraction for previous hospitalizations.

Description

LVEF_PRE is a continuous variable. LVEF_PRE is derived from the variables: HFAA29B, HFAA30B, HFAA32B1 and HFAA8A.

Type

Occurrence

Algorithm

Consider continuous ejection fraction variables: HFAA29B, HFAA30B, HFAA32B1 taken during the time interval: [arrival date (CHIA6A)-2 years, arrival date (CHIA6)). Consider also HFAA8A if its year HFAA8B >= year of the arrival date.
HFA Q29B = EF TTE
HFA Q32B1 = EF Coronary angiography
HFA Q30B = EF TEE

If two values recorded with same imaging modality, give preference to more recent measure. Apply hierarchy based on modality, as defined in LVEF_CUR.

The qualitative variables HFAA29D2 and HFAA30C1 are only considered if their respective dates are in the time interval [CHIA6A)-2 years, arrival date (CHIA6))

Related Variables

HFAA29B, HFAA30B, HFAA32B1, HFAA8A, LVEF_CUR, LVEF_PRE_LOW, LVEF_PRE_SOU, LVEF_PRE_YEAR.

1.17. LVEF_PRE_LOW

Purpose

To indicate if the previous ejection fraction is less than 50.

Description

LVEF_PRE_LOW is an indicator variable. LVEF_PRE_LOW is derived from the variables: HDXA5, LVEF_CUR, HFAA29D2, HFAA30C1, HFAA29A and HFAA30A.

The quantitative abstracted value is the first preference (LVEF_PRE), then the qualitative abstracted value in the variables HFAA29D2, HFAA30C1 and HFAA8A.

Type

Occurrence

Algorithm

LVEF_PRE_LOW is the first non-missing value from the following hierarchy: LVEF_PRE (cut-off is 50%) and then qualitative abstracted value from HFAA29D2 (TTE, qualitative), HFAA30C1 (TEE, qualitative) and HFAA8A (prior imaging).

The qualitative variables HFAA29D2 and HFAA30C1 are only considered if their respective dates are in the time interval [CHIA6A)-2 years, arrival date (CHIA6))

Related Variables

LVEF_PRE, HFAA29D2, HFAA8A, HFAA30C1, HFTYPE_EVER

1.18. LVEF_PRE_SOU

Purpose

To indicate the source of the previous ejection fraction.

Description

LVEF_PRE_SOU is a character variable that indicates the current HFA ejection fraction variable from which LVEF_PRE was derived.

Type

Occurrence

Algorithm

IF LVEF_CUR COMES FROM HFAA8A THEN LVEF_CUR_SOU = 'HFAA8A'
IF LVEF_CUR COMES FROM HFAA29B THEN LVEF_CUR_SOU = '29B TRANSTHORACIC'
IF LVEF_CUR COMES FROM HFAA30B
THEN LVEF_CUR_SOU = '30B TRANSESOPHAGEAL'
IF LVEF_CUR COMES FROM HFAA32B1 THEN LVEF_CUR_SOU = '32B1 ANGIOGRAPHY'

Related Variables

HFAA8A, HFAA29B, HFAA30B, HFAA32B1, LVEF_PRE

Remarks:

In the definition of LVEF_PRE, the variable HFAA8A is used even if it is missing. This implies that most of the 10667 missing values of LVEF_PRE, correspond to HFAA8A.

1.19. LVEF_PRE_YEAR

Purpose

To indicate the date of the previous ejection fraction.

Description

LVEF_PRE_YEAR is a numeric variable. It is the year of the HFA ejection fraction variable from which LVEF_PRE was derived.

Type

Occurrence

Algorithm

IF LVEF_CUR COMES FROM HFAA8A THEN LVEF_CUR_YEAR = HFAA8B
IF LVEF_CUR COMES FROM HFAA29B THEN LVEF_CUR_YEAR = YEAR(HFAA29A)
IF LVEF_CUR COMES FROM HFAA30B THEN LVEF_CUR_YEAR = YEAR(HFAA30A)
IF LVEF_CUR COMES FROM HFAA32B1 THEN LVEF_CUR_YEAR = YEAR(HFAA32A)

Related Variables

LVEF_PRE, HFAA8B, HFAA29A, HFAA30A, HFAA32A

1.20. MBOSTON

Purpose

To determine a heart failure diagnosis based on selected variables from the HFA form.

Description

MBOSTON is a character variable. MBOSTON is a heart failure classification system based on a scoring algorithm derived from selected variables from the HFA form.

Type

Occurrence

Algorithm

Modified Boston (Carlson et al, 1985)	Point system (8-12 points **definite HF**, 5-7 points **possible HF**, < 5 **HF unlikely**) Category I: History No dyspnea (0 pts), leg fatigue on walking on level (1 pt), dyspnea walking on level (2 pts), paroxysmal nocturnal dyspnea (3 pts), orthopnea (4 pts), dyspnea at rest (4 pts). Category II: Physical findings: Heart rate < 90 (0 pts), 91-110 (1 pt), > 110 (2 pts) Jugular venous pressure: < 6 cm H_20 (0 pts), > 6 cm H_20 (2 pts), > 6 mm H_20 plus liver enlargement or pitting edema (3 pts) Pulmonary rales: No (0 pts), at the bases only (1pt), more than basilar (2 pts) Wheezes: No (0 pts), yes (3 pts) S3 gallop: No (0 pts), yes (3 pts) Category III: Chest X-ray - normal (0 pts), upper flow redistribution (2 pts), cardiac enlargement (relative heart volume>540 $ml.m^{-2}$ in men and > 490 ml m^{-2} in women) (3 pt), interstitial pulmonary edema (3 pts), bilateral pleural effusion (3 pts), alveolar pulmonary edema (4 pts) No more than 4 points allowed for each of three categories

Modified Boston Criteria for Diagnosis of Heart Failure and ARIC Hospitalized Heart Failure Abstraction (HFA) Data Elements

Classification	Criteria	Points	Heart Failure Abstraction (HFA) form section (page number)	HFA variable number *
Modified Boston Criteria Algorithm (pts): 8-12 = definite HF 5-7 = possible HF < 5 = HF unlikely Note: No more than 4 points allowed for each of three categories	Category I:			
	No dyspnea	0	Section V: Physical Exam-Findings (9)	23.b-23.d
	Leg fatigue on walking on level	1	Section V: Physical Exam-Findings (9)	22.e
	Dyspnea walking on level	2	Section V: Physical Exam-Findings (9)	23.c
	Paroxysmal nocturnal dyspnea	3	Section V: Physical Exam-Findings (9)	23.h
	Orthopnea	4	Section V: Physical Exam-Findings (9)	23.i
	Dyspnea at rest	4	Section V: Physical Exam-Findings (9)	23.b
	Category II:			
	Heart rate < 90	0	Section IV: Physical Exam- Vital Signs (8)	18a
	Heart rate 91-110	1	Section IV: Physical Exam- Vital Signs (8)	18a
	Heart rate > 110	2	Section IV: Physical Exam- Vital Signs (8)	18a
	Pulmonary Rales-bases only	1	Section V: Physical Exam-Findings (9)	23.j
	Pulmonary Rales more than basilar	2	Section V: Physical Exam-Findings (9)	23.k
	Wheezes	3	Section V: Physical Exam-Findings (10)	23.i
	S3 gallop	3	Section V: Physical Exam-Findings (9)	24.a
	Category III:			
	Upper flow redistribution	2	Section VI: Diagnostic tests (11)	28.e
	Cardiomegaly (relative heart volume)	3	Section VI: Diagnostic tests (11)	28.d
	Interstitial pulmonary edema	3	Section VI: Diagnostic tests (11)	28.c
	Bilateral pleural effusion	3	Section VI: Diagnostic tests (11)	28.g
	Alveolar pulmonary edema	4	Section VI: Diagnostic tests (11)	28.b

* HFA data item numbers refer to version B 11/21/07 or HFS version A 11/21/07

1.21. NHANES

Purpose

To determine a heart failure diagnosis based on selected variables from the HFA form.

Description

NHANES is a character variable. NHANES is a heart failure classification system based on a scoring algorithm derived from selected variables from the HFA form.

Type

Occurrence

Algorithm

NHANES (Schocken et al, 1992)	Point system (**HF present** if score ≥ 3): History: Shortness of breath when hurrying on the level or up slight hill (1 pt), shortness of breath when walking at ordinary pace on the level (1pt), stops for breath when walking at own pace (2 pts), stops for breath after 100 yards on the level (2 pts) Physical exam: Heart rate 91-110 (1pt), > 110 (2 pts), basal rales (1pt), > basal rates (2 pts), neck vein distension (1pt), neck vein distention and edema or hepatomegaly (2 pts) Chest x-ray: cephalization of pulmonary veins (1pt), interstitial edema (2pts), alveolar fluid and pleural fluid (3 pts), interstitial edema and pleural fluid (3pts)

NHANES Criteria for Diagnosis of Heart Failure and ARIC Hospitalized Heart Failure Abstraction (HFA) Data Elements

Classification	Criteria	Points	Heart Failure Abstraction (HFA) form section (page number)	HFA variable number *
NHANES Criteria Algorithm (pts): heart failure present if score ≥ 3	History:			
	Shortness of breath when hurrying on the level or up slight hill	1	Section V: Physical Exam-Findings (9)	23.d
	Shortness of breath when walking at ordinary pace on the level	1	Section V: Physical Exam-Findings (9)	23.c
	Stops for breath when walking at own pace	2	Section V: Physical Exam-Findings (9)	23.e
	Stops for breath after 100 yards on the level	2	Section V: Physical Exam-Findings (9)	23.f
	Physical Exam:			
	Heart rate 91-110	1	Section IV: Physical Exam-Vital Signs (8)	18.a
	Heart rate > 110	2	Section IV: Physical Exam-Vital Signs (8)	18.a
	Basal rales	1	Section V: Physical Exam-Findings (9)	23.j
	More than basal rates	2	Section V: Physical Exam-Findings (9)	23.k
	Neck vein distension	1	Section V: Physical Exam-Findings (9)	22.a, 22.b, 22.d
	Neck vein distention and edema or hepatomegaly	2	Section V: Physical Exam-Findings (9)	22.b, 22.d, 22.a
	Chest X-ray:			
	Upper zone redistribution/ cephalization	1	Section VI: Diagnostic Tests (11)	28.e
	Interstitial edema	2	Section VI: Diagnostic Tests (11)	28.c
	Alveolar fluid and pleural fluid	3	Section VI: Diagnostic Tests (11)	28.b, 28.g, 28.h
	Interstitial edema and pleural fluid	3	Section VI: Diagnostic Tests (11)	28.c, 28.h, 28.g

* HFA data item numbers refer to version B 11/21/07 or HFS version A 11/21/07

1.22. PRIDISCH

Purpose

To indicate the primary ICD-9 discharge code for an occurrence

Description

PRIDISCH is a character variable. PRIDISCH is the primary reason for an occurrence as indicated by ICD-9 discharge code in the CHI form.

Type

Occurrence

Algorithm

If the primary discharge diagnosis (CHIA1B) is not missing then PRIDISCH is the primary discharge diagnosis.
Else, if the first discharge diagnosis and procedure code from Q 9 (CHIA9A) is not missing then PRIDISCH is that discharge diagnosis/procedure code.
Else if the first record of ICD9-CM diagnoses and procedure codes from the hospital discharge index (CHIA2A) is not missing then PRIDISCH is that ICD9-CM diagnosis/procedure code.
If the primary admission diagnosis (CHIA1B) is not missing then PRIDISCH is the primary admission diagnosis.

SAS Code

```
if ~missing(CHIA1B) then PriDisch = CHIA1B;
else if ~missing(CHIA9A) then PriDisch = CHIA9A;
else if ~missing(CHIA2A) then PriDisch = CHIA2A;
else if ~missing(CHIA1A) then PriDisch = CHIA1A;
```

Related Variables

CHIA2A, CHIA9A, CHIA1A, CHIA1B

1.23. PRVCHD

Purpose

To indicate whether there is a prior history of cardiovascular disease for a given heart failure occurrence.

Description

PRVCHD is a numeric variable. PRVCHD indicates whether there is a prior history of cardiovascular disease for a given heart failure occurrence.

Type

Occurrence

Algorithm

If participant responded “Yes, medical history” to any of the following (HFAA11A = "Y" or HFAA11G="Y" or HFAA11H ="Y" or HFAA11K = "Y" or HFAA11E1 ="Y" or HFAA11E2 = "Y"):

1. Angina
2. Coronary heart disease (within year)
3. Coronary heart disease (ever)
4. Myocardial infarction
5. Cardiac procedures (CABD, or PCI)

Or if participant responded Yes to “Angina or Myocardial infarction listed as a precipitating factor.”

Or if a coronary angiography was performed and the left main, left anterior descending artery and branches, left circumflex/marginal artery, right coronary artery and branches, or intermediate ramus coronary stenosis was between 50-100% *(HFAA32B2A = "D" or HFAA32B2A = "E" or HFAA32B2A = "F" or HFAA32B2A ="G" HFAA32B2B = "D" or HFAA32B2B = "E" or HFAA32B2B = "F" or HFAA32B2B ="G" or HFAA32B2C = "D" or HFAA32B2C = "E" or HFAA32B2C = "F" or HFAA32B2C ="G" or HFAA32B2D = "D" or HFAA32B2D = "E" or HFAA32B2D = "F" or HFAA32B2D ="G" or HFAA32B2E = "D" or HFAA32B2E = "E" or HFAA32B2E = "F" or HFAA32B2E ="G")*

Or if there was coronary bypass grafts present (HFAA32B3 = “Y”),

Then PRVCHD = 1. Else, PRVCHD = 0.

Related Variables

1.24. RADHF

Purpose

Indicates whether an occurrence is not the first hospitalization (recurrent) for acute decompensated heart failure.

Description

RADHF is a numeric variable. RADHF indicates whether or not a given hospitalization is a recurrent heart failure occurrence as determined via medical record abstraction.

Type

Occurrence

Algorithm

If the ADHF was not an incident ADHF (if ADHF=1 and INCADHF=0) then RADHF = 1.
If it was not an ADHF or if it was not an incident ADHF (if ADHF=0 or INCADHF=1 then RADHF=0) then RADHF = 0

SAS Code

```
if ADHF=1 and INCADHF=0 then RADHF=1;
if ADHF=0 or INCADHF=1 then RADHF=0;
```

Related Variables

ADHF, INCADHF

1.25. TRIALISTHF

Purpose

To determine a heart failure diagnosis based on selected variables from the HFA form.

Type

Occurrence

Description

TRIALIST is an indicator variable used to classify heart failure based on a modified version of an algorithm developed by the Cardiovascular Clinical Trialists (CCT) Workshop. The criteria were operationalized and automated as described in Loehr et al 2013. The value 1 indicates HF present, and 0 HF absent.

Algorithm

See Loehr et al, 2013.

Related Variables

2. Identification Variables

2.1. CELB02

Purpose

To map a surveillance ID to the Cohort participant ID.

Type

Occurrence

Description

CELB02 is a character variable. CELB02 is the cohort participant ID from question number 2 of the Cohort Event Eligibility (CEL) form. CELB02 is the same for all occurrences within a person. For any community surveillance occurrence that is not for an ARIC cohort participant CELB02 is missing.

Related Variables

ID

2.2 CENTER

Purpose

To identify the field center from which a participant for a given occurrence originates

Type

Occurrence, Demographic

Description

CENTER is a character variable.

Related Variables

2.3. ID

Purpose

To determine an occurrence-level ID for community surveillance.

Type

Occurrence

Description

ID is a character variable. ID is a unique identifier for each heart failure occurrence. There may be multiple ID values for the same cohort participant ID (CELB02).

Related Variables

CELB02

2.4. HFAA0a

Purpose

To determine hospital number.

Type

Occurrence

Description

HFAA0a is a character variable and is used to determine a hospital code number.

Algorithm

Forsyth County	Name	Hospital Type	Notes
11	North Carolina Baptist	Teaching	
12	Forsyth County Memorial	Non teaching	
13	Medical Park	Non teaching	
14	Kernersville	Non teaching	
15	Clemmons Medical Center	Non teaching	
96	Hospital outside study area	--	
Jackson			
21	University of Mississippi Med Center	Teaching	
22	Veterans Administration Hospital	Teaching	
23	St. Dominic's Hospital	Non teaching	
24	Central Mississippi Medical Center	Non teaching	
25	Mississippi Baptist Hospital	Non teaching	
26	River Oaks Hospital	Non teaching	
27	Madison County Medical Center	Non teaching	JHS only
28	Rankin Medical Center	Non teaching	JHS only
97	Hospital out of study area	--	
Minneapolis			
30	Abbott-Northwestern	Teaching	
31	Riverside Medical Center	Teaching	
32	Fairview-Southdale	Non teaching	
33	Fairview-Ridges	Non teaching	
34	Hennepin County Med. Center	Teaching	
35	Mercy Hospital	Non teaching	
36	Methodist Hospital	Teaching	
37	Metropolitan	Non teaching	
38	Midway	Non teaching	
39	Mt. Sinai	Non teaching	
40	North Memorial	Teaching	
41	St. Paul Ramsey	Non teaching	
42	St. John's Northeast	Non teaching	

43	St. Mary's	Non teaching
44	Unity	Non teaching
45	University of Minnesota Hospital	Teaching
46	VA Hospital	Teaching
47	Fairview Medical Center	Non teaching
48	Phillips Eye Institute	Non teaching
98	Hospital out of study area	--

Washington Co.

51	Meritus Medical Center	Non teaching
52	Western Maryland Center	Non Teaching
53	VA Medical Center, WV	Non Teaching
54	University of Maryland	Teaching
55	Frederick Memorial	Non teaching
56	Johns Hopkins Hospital	Teaching
57	Washington Hospital Center	Non Teaching
58	George Washington University	Teaching
59	Georgetown University	Teaching
60	Saint Joseph Medical Center	Non teaching
61	Washington Adventist	Non teaching
62	Sinai Hospital	Non teaching
63	Union Memorial	Non Teaching
99	Hospital out of study area	--

Related Variables

Teaching

2.5. TEACHING

Purpose

To determine teaching status of a hospital.

Type

Occurrence

Description

TEACHING is a character variable and denote the teaching status of the hospital.

Algorithm

See the algorithm under HFAA0A (hospital codes) for details.

Related Variables

HFAA0A

3. Demographic / Eligibility Variables

3.1. AGE

Purpose

To determine a participant's age at each occurrence in community surveillance.

Type

Occurrence.

Description

AGE is a numeric variable.

Algorithm

SAS Code

```
PREBDAY=not((month(DDATE)>month(DOB1)) or
(month(DDATE)=month( DOB1) & day(DDATE)>= day( DOB1)));
AGE=year(DDATE)-year(DOB1)-PREBDAY;
```

Related Variables

DDATE, DOB1

3.2. RACE1

Purpose

To determine the race/ethnicity of a participant for occurrences in cohort surveillance.

Type

Occurrence

Description

RACE1 is a character variable. The value of RACE1 is derived from question number 4 of the Common Hospital Information (CHI) form.

Algorithm

SAS Code

```
RACE1=CHIA4;
```

Related Variables

CHIA4

3.3. SEX

Purpose

To determine a participants sex for occurrences in community surveillance.

Type

Occurrence

Description

SEX is a character variable. The value of SEX is derived from question number 3 of the CHI form.

Algorithm

SAS Code

SEX=CHIA3;

Related Variables

CHIA3

3.4. SKIPOUT

Purpose

To identify occurrences where the hospital record suggests there are no signs /symptoms indicative of heart failure.

Type

Occurrence

Description

SKIPOUT is a character variable. SKIPOUT indicates an occurrence that does not need to be abstracted beyond questions 1, 2, and 3a of the HFA form. These questions are related to the onset of signs and symptoms of heart failure and the presence of an ICD-428 discharge code in the medical record. A response of 'No' to all of these questions suggests the occurrence is not heart failure related.

Algorithm

If HFA questions 1, 2, 3='No' then SKIPOUT=1.
Otherwise SKIPOUT=0.

SAS Code

```
if Selighfa=1 then do;
    if not (hfaa1a="Y"| hfaa1b="Y"| hfaa1c="Y"| hfaa1d="Y"| hfaa1e="Y" or hfaa2="Y")
    then skipout=1; else skipout=0;
```

Related Variables

HFAA1a, HFAA1b, HFAA1c, HFAA1d, HFAA1e, HFAA2, HFAA3

4. Occurrence Date & Case Fatality Variables

4.1. DDATE

Purpose

To determine the date of discharge for each occurrence.

Type

Occurrence

Description

DDATE is a numeric variable. DDATE is derived from question 0c of the HFA form.

Algorithm

DDATE is taken from the HFA form, Question 0C.

SAS Code

DDATE=HFAA0c

Related Variables

HFAA0c, YEARDOD

4.2. DDAYS_HF2

Purpose

To determine the number of days from a heart failure occurrence to the date of death.

Type

Occurrence

Description

DDAYS_HF 2 is a numeric variable. DDAYS_HF2 is related to case-fatality. For heart failure occurrences with a final classification of ADHF or chronic HF (HFDIAG='A', 'B', or 'C') if a death later occurred this variable provides the number of days after the occurrence to the date of death.

Algorithm

DDAYS_ HF2 is the Date of Death subtracted by the HF Event Date

SAS Code

DDAYS_HF2=DOD – HFEVTDATE

Related Variables

DOD, HFEVTDATE

Remarks

DDAYS_HF2 is the number of days from an admission date of a heart failure occurrence to the date of death if the admission date is non-missing. If admission date is missing the DDAYS_HF2 will be calculated with the discharge date.

4.3. DOD

Purpose

To indicate the date of death for a heart failure occurrence that is followed by a death.

Type

Occurrence

Description

DOD is a numeric variable. DOD is related to case-fatality. For heart failure occurrences with a final classification of ADHF or chronic HF (HFDIAG='A', 'B', or 'C') if a death later occurred this variable provides the date of death.

Algorithm

For a heart occurrence that is simultaneously a hospitalization and a death DOD has the same value as DDATE. For deaths that occur after a heart failure hospitalization DOD is obtained from search NDI records.

Related Variables

DDATE,

4.4. EVTYPE_F

Purpose

To indicate if an event is case-fatality eligible as either a heart failure event or both a heart failure and CHD event.

Type

Occurrence

Description

EVTYPE_F is a character variable. EVTYPE_F is related to case-fatality. For heart failure occurrences eligible for case-fatality tracking (HFDIAG='A', 'B', or 'C') EVTYPE_F indicates if the occurrence is only heart failure eligible or if it is also as a CHD surveillance event.

Related Variables

MIDX3, HFDIAG (from Heart Failure Occurrence dataset)

Remarks

*EVTYPE_F= CHD still indicates that these are both CHD and HF eligible occurrences. However, they were treated as CHD occurrences during the NDI search and case fatality file creation process.

4.5. F28_HF2

Purpose

To indicate if a death has occurred within 28 days of a heart failure occurrence.

Type

Occurrence

Description

F28_HF2 is a numeric variable. F28_HF2 is related to case-fatality. For heart failure occurrences eligible for case-fatality tracking (HFDIAG='A', 'B', or 'C') F28_HF2 indicates if the date of death occurred within 28 days of the heart failure hospitalization date. Occurrences that are not classified as being heart failure (HFDIAG not = 'A', 'B', 'C') or were not submitted to NDI this variable has value of 2. All occurrences classified as skipouts get value of 2 as their cases were not further investigated.

Algorithm

If known to have died within 28 days of the event then F28_HF2 = 1
If sent for NDI search and was not found to have died within 28 days of Event, then F28_HF2 = 0
If not known to have died within 28 days of the event and not sent for NDI then F28_HF2 = 2

SAS Code

```
If HFDIAG=D or E, then F28_HF2=2;
Else if HFDIAG=A, B, or C, then do;

    IF CF_ELIG =0 then F28_HF2=2;
    Else IF CF_ELIG=1 then do ;

            If 0<=DDAYS_HF2<=28 then F28_HF2=1;
            Else if DDAYS_HF2>28 then F28_HF2=0

                    Else DDAYS_HF2=. Then F28_HF2=2
```

Related Variables

DDAYS_HF

Remark

There is one year lag time in the creation of the case-fatality variables because NDI usually available one year after the death. Therefore, the value of F28_HF2 for 2010 event set to be unknown (a value of 2).

4.6. F365_HF2

Purpose

To indicate if a death has occurred within 365 days of a heart failure occurrence.

Type

Occurrence

Description

F365_HF2 is a numeric variable. F365_HF2 is related to case-fatality. For heart failure occurrences eligible for case-fatality tracking (HFDIAG='A', 'B', or 'C') F365_HF2 indicates if the date of death occurred within 365 days of the heart failure hospitalization date. Occurrences that are not classified as being heart failure (HFDIAG not = 'A', 'B', 'C') or were not submitted to NDI this variable has value of 2. All occurrences classified as skipouts get value of 2 as their cases were not further investigated.

Algorithm

If known to have died within 365 days of the event then F365_HF2 = 1
If sent for NDI search and was not found to have died within 365 days of Event, then F365_HF2 = 0
If not known to have died within 365 days of the event and not sent for NDI then F365_HF2= 2

SAS Code

```
If HFDIAG=D or E, then F365_HF2=2;
Else if HFDIAG=A, B, or C, then do;

    IF CF_ELIG =0 then F365_HF2=2;
    Else IF CF_ELIG=1 then do ;

            If 0<=DDAYS_HF2<=365 then F365_HF2=1;
            Else if DDAYS_HF2>365 then F365_HF2=0

                    Else DDAYS_HF2=. Then F365_HF2=2
```

Related Variables

DDAYS_HF

Remark

There is one year lag time in the creation of the case-fatality variables because NDI usually available one year after the death. Therefore, the value of F365_HF2 for 2010 event set to be unknown (a value of 2).

4.7. HFEVTDATE

Purpose

To determine the occurrence date for heart failure community surveillance.

Type

Occurrence

Description

HFEVTDATE is a numeric variable. HFEVTDATE is derived from question number 6a of the CHI form. This is the date of admission for each occurrence. IF CHIA6a is missing then the date of discharge is used.

Algorithm

The HFEVTDATE takes the first non-missing date from this ordering of variables (questions on forms CHI, HFA, and CFD): CHIA6a, CHIA0c, HFAA0c, and CFDA0c. If they are all missing then HFEVTDATE is missing.

SAS Code

HFEVTDATE follows this hierarchy:

```
If CHIA6a ne . then HFEVTDATE=CHIA6a;
  Else If CHIA0c ne . then HFEVTDATE= CHIA0c;
  Else If HFAA0c ne . then HFEVTDATE= HFAA0c;
  Else If CFDA0c ne . then HFEVTDATE= CFDA0c;
  Else HFEVTDATE= .;
```

Related Variables

CHIA6a, CHIA0c, HFAA0c, CFDA0c

4.8. YEARDOD

Purpose

To determine the year of discharge/death for each occurrence.

Type

Occurrence

Description

YEARDOD is a numeric variable. YEARDOD is derived from question 0c of the HFA form.

Algorithm

YEARDOD=year (HFAA0c)

Related Variables

HFAA0c, DDATE

5. Occurrence Date & Case Fatality Variables Based on Version3

Starting in calendar year 2012, all occurrences except skipout were sent for the NDI search (previously the search was limited to occurrences with HFDIAG=A, B, or C). The variables described in Section 5 are reflecting the additional death information.

5.1. DDAYS_HF3

Purpose

To determine the number of days from a heart failure occurrence to the date of death for the heart failure occurrences with any final classification of Definite Decompensated HF, Probable Decompensated HF, Chronic Stable HF, Unlikely HF, or Unclassifiable HF occurrences. (HFDIAG='A', 'B', 'C', 'D', or 'E').

Type

Occurrence

Description

DDAYS_HF is a numeric variable. DDAYS_HF is related to case-fatality. For heart failure occurrences with any final classification (HFDIAG='A', 'B', 'C', 'D', or 'E') and if a death later occurred this variable provides the number of days after the occurrence to the date of death.

Algorithm

DDAYS_ HF is the Date of Death subtracted by the HF Event Date

SAS Code

```
DDAYS_HF3=DOD3 - HFEVTDATE;
```

Related Variables

DOD3, HFEVTDATE

5.2. DOD3

Purpose

To indicate the date of death for a heart failure occurrence that is followed by a death for final classification of Definite Decompensated HF, Probable Decompensated HF, Chronic Stable HF, Unlikely HF, or Unclassifiable HF occurrences. (HFDIAG='A', 'B', 'C', 'D', or 'E').

Type

Occurrence

Description

DOD3 is a numeric variable. DOD3 is related to case-fatality. For heart failure occurrences with any final classification (HFDIAG='A', 'B', 'C', 'D', or 'E') and if a death later occurred this variable provides the date of death.

Algorithm

For a heart occurrence that is simultaneously a hospitalization and a death DOD has the same value as DDATE. For deaths that occur after a heart failure hospitalization DOD is obtained from search NDI records.

Related Variables

DDATE

5.3. F28_HF3

Purpose

To indicate if a death has occurred within 28 days of a heart failure occurrence.

Type

Occurrence

Description

F28_HF3 is a numeric variable. F28_HF3 is related to case-fatality. For heart failure occurrences eligible for case-fatality tracking (HFDIAG='A', 'B', 'C, 'D', or 'E'), F28_HF3 indicates if the date of death occurred within 28 days of the heart failure hospitalization date. Occurrences that were not submitted to NDI this variable has value of 2. All occurrences classified as skipouts get value of 2 as their cases were not further investigated.

Algorithm

If known to have died within 28 days of the event then F28_HF3= 1
If sent for NDI search and was not found to have died within 28 days of Event, then F28_HF3 = 0
If not known to have died within 28 days of the event and not sent for NDI then F28_HF3 = 2

SAS Code

```
IF CF_ELIG =0 then F28_HF3=2;

Else IF CF_ELIG=1 then do ;

    If 0<=DDAYS_HF3<=28 then F28_HF3=1;

    Else if  DDAYS_HF3>28 then F28_HF3=0 ;

            Else if DDAYS_HF3=. Then F28_HF3=2 ;
```

Related Variables

DDAYS_HF3

Remark

There is one year lag time in the creation of the case-fatality variables because NDI usually available one year after the death. Therefore, the value of F28_HF3 for 2010 event set to be unknown (a value of 2) .

5.4. F365_HF3

Purpose

To indicate if a death has occurred within 365 days of a heart failure occurrence.

Type

Occurrence

Description

F365_HF3 is a numeric variable. F365_HF3 is related to case-fatality. For heart failure occurrences eligible for case-fatality tracking (HFDIAG='A', 'B', 'C, 'D', or 'E'), F365_HF3 indicates if the date of death occurred within 365 days of the heart failure hospitalization date. Occurrences that were not submitted to NDI this variable has value of 2. All occurrences classified as skipouts get value of 2 as their cases were not further investigated.

Algorithm

If known to have died within 365 days of the event then F365_HF3 = 1
If sent for NDI search and was not found to have died within 365 days of Event, then F365_HF3 = 0
If not known to have died within 365 days of the event and not sent for NDI then F365_HF3 = 2

SAS Code

```
IF CF_ELIG =0 then F365_HF3=2;

Else IF CF_ELIG=1 then do ;

    If 0<=DDAYS_HF3<=365 then F365_HF3=1;

    Else if  DDAYS_HF3>365 then F365_HF3=0

            Else if DDAYS_HF3=. then F365_HF3=2
```

Related Variables

DDAYS_HF3

Remark

There is one year lag time in the creation of the case-fatality variables because NDI usually available one year after the death. Therefore, the value of F365_HF3 for 2011 event set to be unknown (a value of 2) .

5.5. CF_ELIG

Purpose

To indicate if an NDI search was made for death information of any heart failure occurrence.

Type

Occurrence

Description

CF_ELIG is a numeric variable. CF_ELIG is an indicator variable that shows if an occurrence is eligible for the case fatality analysis in community surveillance. Starting in calendar year 2012, all occurrences were sent for the NDI search excluding the skipouts.(previously the search was limited to occurrences with HFDIAG=A, B, or C).However, there is a year lag time in the creation of the case-fatality variables because NDI usually available one year after the death. Therefore, the value of 2011 occurrence set to be not eligible.

Algorithm

1 if the occurrence is eligible for case fatality analysis with valid HFDIAG values (HFDIAG= A, B, C, D, or E).
0 if not sent to the NDI either because the occurrence is a skipout or current closing event year occurrence

6. Sampling Variables

6.1. CODENUM

Purpose

Indicates whether a heart failure occurrence also has CHD eligible ICD-9 discharge codes.

Type

Occurrence

Description

CODENUM is a numeric variable. CODENUM indicates whether a heart failure occurrence also has CHD surveillance eligible ICD-9 discharge codes.

Algorithm

If a 410 code is present then CODENUM=1;
Else if a 411 code is present then CODENUM=2;
Else if a 412 code is present then CODENUM=3;
Else if a 402-403, 427-429, or 518.4-518.5 code are present then CODENUM=4;
Else if a 250-251, or 350-460, or 745-748, or 798-800 or procedure codes 35-40, or 88.5-88.6, 0.66 then CODENUM=5;
Else CODENUM=0;

Related Variables

HFNUM, HF428, ICDGRP

6.2. HF428

Purpose

Indicates whether a hospital record contains an ICD-9 discharge code of 428.

Type

Occurrence

Description

HF428 is a numeric variable. HF428 indicates whether the hospital record for a particular occurrence contains an ICD-9 discharge code of 428 (as indicated on the Common Hospital Information Form).

Algorithm

If CHIA02a-CHIA02z or CHIA09a-CHIA09z includes 428.x (where x is any number) than HF428=1. Otherwise, HF428=0.

SAS Code

```
do i=1 to 26;
     if index(icd(i),'428')=1 then has428_x=1;
     if index(icdq9(i),'428')=1 then hasq9_428_x=1;
     end;

  if has428_x=1 or hasq9_428_x=1 then HF428=1;
     else HF428=0;
```

Related Variables

HFNUM, ICDGRP, CHIA02a-z, CHIA 09a-z

6.3. HFNUM

Purpose

Indicates whether a hospital record contains an ICD-9 discharge code of 428 or other eligible discharge code.

Type

Occurrence

Description

HFNUM is a numeric variable. HFNUM indicates whether the hospital record for a particular occurrence contains an ICD-9 discharge code of 428 (as indicated on the Common Hospital Information Form) or one of the other eligible discharge codes.

Algorithm

If CHIA02a-CHIA02z or CHIA09a-CHIA09z includes 428.x (where x is any number) than HFNUM=1. Otherwise, HFNUM=2.

Related Variables

HF428, ICDGRP, CHIA02, CHIA 09

6.4. HF_SF

Purpose

Indicates the sampling fraction used to select a given hospitalization.

Type

Occurrence

Description

HF_SF is a numeric variable. HF_SF is the sampling fraction used to select a given hospitalization. HF_SF is assigned based on the field center, ICD discharge code group, race, and gender.

Algorithm

See manual 3a for a detailed description of the sampling procedures.

Related Variables

CENTER, HL_RACE, ORIGCODE_N, HFNUM, SEX

6.5. HL_RACE

Purpose

Indicates the race group from which a given hospitalization was sampled from.

Type

Occurrence

Description

HL_RACE is a character variable. HL_RACE is the race group from which a given hospitalization was sampled. This is taken from the hospital discharge data provided by each hospital within the community surveillance catchment area. HL_RACE may differ from the variable RACE1 if upon abstraction the medical record indicates a different race than what was initially provided by the hospital.

Algorithm

None

Related Variables

RACE1

6.6. ICDGRP

Purpose

Indicates the ICD-9 discharge code group for a given hospitalization.

Type

Occurrence

Description

ICDGRP is a numeric variable. ICDGRP is derived from the ICD discharge codes found in the medical records and a person's age.

Algorithm

If CODENUM is 1, 2, 3, or 4 and HFNUM is 1 and HF_AGE = 1 (age is between 55 and 74 inclusive) then ICDGRP = CODENUM.
If CODENUM is 1, 2, 3, or 4 and HFNUM is 1 and HF_AGE =2 (age is between 75 and 84 inclusive) then ICDGRP = CODENUM + 4.
If HFNUM = 1 and CODENUM = 5, then ICDGRP = 9
Else, ICDGRP = 0

SAS Code

```
if CODENUM in (1, 2, 3, 4, 5) or (HFNUM in (1, 2) and age>=55);
    if HFNUM =1 then
      if CODENUM in (1,2,3,4) and HF_AGE=1 then ICDGRP=CODENUM;
        else if CODENUM in(1,2,3,4) and HF_AGE=2 then ICDGRP=CODENUM+4;
            else ICDGRP=9;
else ICDGRP=0;
```

Related Variables

HFNUM, CODENUM

6.7. ORIGCODE_N

Purpose

Indicates the ICD-9 discharge codes an occurrences eligibility and sampling was determined from.

Type

Occurrence

Description

ORIGCODE_N is a character variable. ORIGCODE_N is taken from the hospital discharge data provided by each hospital in the community surveillance catchment area. ORIGCODE_N may differ from the discharge codes abstracted into the CHI form if upon abstraction the medical record indicates a different discharge codes than what was initially provided by the hospital.

Algorithm

None

Related Variables

CHIA02a-z, CHIA09a-z

6.8. SAMSTRAT2

Purpose

Indicates the sampling stratum for an occurrence.

Type

Occurrence

Description

SAMSTRAT2 is a character variable. SAMSTRAT2 is derived from the center, race, gender, discharge code group, and year of discharge. Most statistical software packages require the use of this type of variable in weighted analyses to indicate the sampling strategy used.

Please contact the ARIC coordinating center if you need further details about this variable.

Algorithm

SAMSTRAT2=center||HL_race||GENDER||ICDGRP||YEARDOD;

Related Variables

CENTER, HL_RACE, GENDER, ICDGRP, YEARDOD

6.9. SAMWTHF

Purpose

Indicates the sampling weight for an occurrence.

Type

Occurrence

Description

SAMWTHF is a numeric variable. SAMWTHF is the sampling weight for an occurrence.

Algorithm

SAWTHF= 1/X of the sampling fraction (HF_SF)

SAS Code

```
samwthf=1/linkp;
```

Related Variables

CENTER, HL_RACE, ORIGCODE_N, HFNUM, SEX, HF_SF

7. Miscellaneous Variables

7.1. BMI

Purpose

To determine the body mass index for the current hospitalization.

Type

Occurrence

Description

BMI is a continuous variable. BMI is derived from questions HFAA20b (discharge weight), HFAA20a (admission weight) and HFAA19a, height; after transforming both variables to metric system using the unit information recorded in HFAA20b1, HFAA20a1 and HFAA19a1; BMI is set to weight/(height*height).

Algorithm

To calculate weight use discharge weight in metric units (both HFAA20b and HFAA20b1 should not be missing). If any of them is missing use admission weight in metric units (both If HFAA20a and HFAA20a1 should not be missing). Calculate height in metric units (both HFAA19a and HFAA19a1 should not be missing). Finally set BMI to weight/(height*height).

Related Variables

BMI_CAT

7.2. BMI_CAT

Purpose

To determine the body mass index category for the current hospitalization.

Type

Occurrence

Description

BMI_CAT is a numeric variable. BMI_CAT is derived from BMI. The standard categories are: underweight, normal, overweight and obese.

Algorithm

If BMI is missing set BMI_CAT to missing. If BMI is not missing and less than 18.5 set BMI_CAT to 1 (underweight). If BMI is in the interval [18.5,25) set BMI_CAT to 2 (normal). If BMI is in the interval [25,30) set BMI_CAT to 3 (overweight). If BMI is greater or equal than 30 set BMI_CAT to 4 (obese).

Related Variables

BMI

7.3. BNP_LAST

Purpose

To determine the last laboratory value of brain natriuretic peptide (BNP) for the current hospitalization.

Type

Occurrence

Description

BNP_LAST is a continuous variable. BNP_LAST is derived from question HFAA39b. For all occurrences where HFAA39b is > 5000 then BNP_LAST is set to 5001.

Algorithm

If HFAA39b is missing then set BNP_LAST to missing.
If HFAA39b is >5000 then BNP = 5001.
If HFAA39b is not missing and less than or equal to 5000, set BNP_LAST = HFAA39b.

Related Variables

BNP_WORST

7.4. BNP_WORST

Purpose

To determine the worst laboratory value of brain natriuretic peptide (BNP) for the current hospitalization.

Type

Occurrence

Description

BNP_WORST is a continuous variable. BNP_WORST is derived from question HFAA39a. For all occurrences where HFAA39a is > 5000 then BNP_WORST is set to 5001.

Algorithm

If HFAA39a is missing then set BNP_LAST to missing.
If HFAA39a is >5000 then BNP = 5001.
If HFAA39a is not missing and less than or equal to 5000, set BNP_LAST = HFAA39a.

Related Variables

BNP_LAST

7.5. EGFREPI_LAST

Purpose

To determine the last laboratory value of eGFREpi for the current hospitalization.

Type

Occurrence

Description

EGFREPI_LAST is a continuous variable. EGFREPI_LAST is derived from the variables: age, race, sex and Creatinine_last (HFAA44b); using the Epi algorithm defined below.

Algorithm

brace=0;
if race1='B' then brace=1;

If sex='F'
EGFREPI_LAST=141*[min(CREATININE_LAST/0.7,1)^-0.329]*[max(CREATININE_LAST/0.7,1)^-1.209]*(0.993^age)*[brace*0.159+1]*1.018
If sex='M'
EGFREPI_LAST=141*[min(CREATININE_LAST/0.9,1)^-0.411]*[max(CREATININE_LAST/0.9,1)^-1.209]*(0.993^age)*[brace*0.159+1]

If race1 is missing or equal to 'U' or sex is missing or Creatinine_last is missing set EGFREPI_LAST to missing.

Related Variables

EGFREPI_WORST, CREATININE_LAST, CREATININE_WORST

7.6. EGFREPI_WORST

Purpose

To determine the worst laboratory value of eGFREpi for the current hospitalization.

Type

Occurrence

Description

EGFREPI_WORST is a continuous variable. EGFREPI_WORST is derived from the variables: age, race, sex and Creatinine_worst (HFAA44a); using the Epi algorithm defined below.

Algorithm

brace=0;
if race1='B' then brace=1;

If sex='F'
EGFREPI_WORST=141*[min(CREATININE_WORST/0.7,1)^-0.329]*[max(CREATININE_WORST/0.7,1)^-1.209]*(0.993^age)*[brace*0.159+1]*1.018
If sex='M'
EGFREPI_WORST=141*[min(CREATININE_WORST/0.9,1)^-0.411]*[max(CREATININE_WORST/0.9,1)^-1.209]*(0.993^age)*[brace*0.159+1]

If race1 is missing or equal to 'U' or sex is missing or Creatinine_worst is missing set EGFREPI_WORST to missing.

Related Variables

EGFREPI_LAST, CREATININE_LAST, CREATININE_WORST

7.7. LOS

Purpose

To determine the length of stay for the current hospitalization.

Type

Occurrence

Description

LOS is an integer variable. LOS is derived as the difference of HFAA0c (discharge date) and CHIA6a (arrival date).

Algorithm

If HFAA0c-CHIA6a>=0
then LOS=HFAA0c-CHIA6a
else LOS=.

Related Variables

7.8. TROPONINI_LAST

Purpose

To determine the last laboratory value of troponin I for the current hospitalization.

Type

Occurrence

Description

TROPONINI_LAST is a numeric variable. TROPONINI_LAST is derived from question number 42b of the HFA form.

Algorithm

IF HFA Question 42b is anything < 0.10 then TROPONINI_LAST = 0.000001. Otherwise TROPONINI_LAST is the response to HFA Question 42b.

Related Variables

TROPONINI_WORST, TROPONINT_LAST, TROPONINT_WORST

7.9. TROPONINI_WORST

Purpose

To determine the worst laboratory value of troponin I for the current hospitalization.

Type

Occurrence

Description

TROPONINI_WORST is a numeric variable. TROPONINI_WORST is derived from question number 42a of the HFA form.

Algorithm

IF HFA Question 42a is anything < 0.10 then TROPONINI_WORST = 0.000001. Otherwise TROPONINI_WORST is the response to HFA Question 42b.

Related Variables

TROPONINI_LAST, TROPONINT_LAST, TROPONINT_WORST

7.10. TROPONINT_LAST

Purpose

To determine the last laboratory value of troponin T for the current hospitalization.

Type

Occurrence

Description

TROPONINT_LAST is a numeric variable. TROPONINT_LAST is derived from question number 41b of the HFA form.

Algorithm

IF HFA Question 41b is anything < 0.1 then TROPONINT_LAST = 0.000001. Otherwise TROPONINT_LAST is the response to HFA Question 41b.

Related Variables

TROPONINT_WORST, TROPONINI_LAST, TROPONINI_WORST

7.11. TROPONINT_WORST

Purpose

To determine the worst laboratory value of troponin T for the current hospitalization.

Type

Occurrence

Description

TROPONINT_WORST is a numeric variable. TROPONINT_WORST is derived from question number 41a of the HFA form.

Algorithm

IF HFA Question 41a is anything < 0.1 then TROPONINT_WORST = 0.000001. Otherwise TROPONINT_WORST is the response to HFA Question 41a.

Related Variables

TROPONINT_LAST, TROPONINI_LAST, TROPONINI_WORST