



**Supplementary Figure:** Flow chart diagram illustrating the CALIBER phenotype algorithm for heart failure.

We sought to define incident and prevalent cases of non-fatal and fatal heart failure and have validated and reused this phenotype in wide range of research publications (see table below).

### 1. Secondary Care (incident and prevalent)

In Hospital Episode Statistics (HES, hospital admission data) we used ICD-10 codes (see table below) for HF diagnosis when marked as the primary diagnosis i.e. the main condition treated or investigated during the relevant episode of healthcare. We used the date of admission to hospital as the date of the event.

ICD-10 code	ICD-10 term
I50.0	Congestive heart failure
I50.1	Left ventricular heart failure
I50.9	Heart failure, unspecified
I11.0	Hypertensive heart disease with (congestive) heart failure
I13.0	Hypertensive heart and renal disease with (congestive) heart failure
I32.25	Hypertensive heart and renal disease with both (congestive) heart failure and renal failure

### 2. Primary Care (incident)

In Clinical Practice Research Datalink (CPRD, primary care data) we ascertained HF cases by searching for Read terms related to HF diagnosis **OR** related to abnormal echocardiogram findings which provided evidence of left ventricular systolic or diastolic dysfunction – see tables below.

Read terms are organized in top-level chapters i.e. chapter G....00 is related to *Circulatory System Diseases* and sub-headings i.e. heading G2...00 is related to *Hypertensive Heart Disease* while G3...00 is related to *Ischaemic Heart Disease*.

### *Heart failure diagnosis*

<b>Read code</b>	<b>Read term</b>
G580400	Congestive heart failure due to valvular disease
G210.00	Malignant hypertensive heart disease
G210000	Malignant hypertensive heart disease without CCF
G210100	Malignant hypertensive heart disease with CCF
G211100	Benign hypertensive heart disease with CCF
G21z100	Hypertensive heart disease NOS with CCF
G230.00	Malignant hypertensive heart and renal disease
G232.00	Hypertensive heart&renal dis wth (congestive) heart failure
G234.00	Hyperten heart&renal dis+both(congestv)heart and renal fail
G1yz100	Rheumatic left ventricular failure
1O1..00	Heart failure confirmed
662W.00	Heart failure annual review
662p.00	Heart failure 6 month review
8B29.00	Cardiac failure therapy
8H2S.00	Admit heart failure emergency
9Or0.00	Heart failure review completed
G400.00	Acute cor pulmonale
G41z.11	Chronic cor pulmonale
G554000	Congestive cardiomyopathy
G554011	Congestive obstructive cardiomyopathy
G58..00	Heart failure
G58..11	Cardiac failure
G580.00	Congestive heart failure
G580.11	Congestive cardiac failure
G580.12	Right heart failure
G580.13	Right ventricular failure
G580.14	Biventricular failure
G580000	Acute congestive heart failure
G580100	Chronic congestive heart failure
G580200	Decompensated cardiac failure
G580300	Compensated cardiac failure
G581.00	Left ventricular failure
G581.11	Asthma - cardiac
G581.13	Impaired left ventricular function
G581000	Acute left ventricular failure
G582.00	Acute heart failure
G58z.00	Heart failure Not Otherwise Specified
G58z.12	Cardiac failure Not Otherwise Specified
G5yy900	Left ventricular systolic dysfunction
G5yyA00	Left ventricular diastolic dysfunction
R2y1000	[D]Cardiorespiratory failure

### *Abnormal echocardiogram findings*

<b>Read code</b>	<b>Read term</b>
585f.00	Echocardiogram shows left ventricular systolic dysfunction
585g.00	Echocardiogram shows left ventricular diastolic dysfunction

### 3. Primary Care (prevalent)

Prevalent cases were identified using the incident case definition (see previous section) in addition to a set of Read terms indicating historical/possible/suspected HF diagnosis at any point in the past.

Read code	Read term
14A6.00	H/O: heart failure
14AM.00	H/O: Heart failure in last year
1736	Paroxysmal nocturnal dyspnoea
1J60.00	Suspected heart failure
23E1.00	O/E - pulmonary oedema
388D.00	New York Heart Assoc classification heart failure symptoms
662T.00	Congestive heart failure monitoring
662f.00	New York Heart Association classification - class I
662g.00	New York Heart Association classification - class II
662h.00	New York Heart Association classification - class III
662i.00	New York Heart Association classification - class IV
679X.00	Heart failure education
8CL3.00	Heart failure care plan discussed with patient
8HBE.00	Heart failure follow-up
8HHz.00	Referral to heart failure exercise programme
8Hg8.00	Discharge from practice nurse heart failure clinic
8Hk0.00	Referred to heart failure education group
9N0k.00	Seen in heart failure clinic
9N2p.00	Seen by community heart failure nurse
9N4s.00	Did not attend practice nurse heart failure clinic
9N4w.00	Did not attend heart failure clinic
9N6T.00	Referred by heart failure nurse specialist
9On..00	Left ventricular dysfunction monitoring administration
9On0.00	Left ventricular dysfunction monitoring first letter
9On1.00	Left ventricular dysfunction monitoring second letter
9On2.00	Left ventricular dysfunction monitoring third letter
9On3.00	Left ventricular dysfunction monitoring verbal invite
9On4.00	Left ventricular dysfunction monitoring telephone invite
9Or..00	Heart failure monitoring administration
9Or1.00	Heart failure monitoring telephone invite
9Or2.00	Heart failure monitoring verbal invite
9Or3.00	Heart failure monitoring first letter
9Or4.00	Heart failure monitoring second letter
9Or5.00	Heart failure monitoring third letter
9h1..00	Exception reporting: LVD quality indicators
9h11.00	Excepted from LVD quality indicators: Patient unsuitable
9h12.00	Excepted from LVD quality indicators: Informed dissent
9hH..00	Exception reporting: heart failure quality indicators
9hH0.00	Excepted heart failure quality indicators: Patient unsuitable
9hH1.00	Excepted heart failure quality indicators: Informed dissent

G581.12	Pulmonary oedema - acute
G58z.11	Weak heart
H54..00	Pulmonary congestion and hypostasis
H541.00	Pulmonary congestion
H541000	Chronic pulmonary oedema
H541z00	Pulmonary oedema NOS
H54z.00	Pulmonary congestion and hypostasis NOS
H584.00	Acute pulmonary oedema unspecified
H584z00	Acute pulmonary oedema NOS
ZRad.00	New York Heart Assoc classification heart failure symptoms

#### **4. Fatal cases**

In the Office of National Statistics (ONS) mortality register, we used ICD-10 and ICD-9 terms to identify fatal HF cases where a) an HF diagnosis was recorded as the underlying cause of death, or b) death from any cause occurred within 30 days of an HF diagnosis in primary or secondary care.

ICD-10 code	ICD-10 term
I50.0	Congestive heart failure
I50.1	Left ventricular heart failure
I50.9	Heart failure, unspecified
I11.0	Hypertensive heart disease with (congestive) heart failure
I13.0	Hypertensive heart and renal disease with (congestive) heart failure
I32.2	Hypertensive heart and renal disease with both (congestive) heart failure and renal failure

ICD-9 code	ICD-9 term
428.0	Congestive heart failure, unspecified
428.1	Left heart failure
428.9	Heart failure, unspecified

#### **5. Combining evidence across sources to define and date HF phenotypes**

We took the first occurring diagnosis code in primary, secondary care or the death registry to define the date, and clinical setting, of diagnosis. A prevalent case was defined as existing at or before the date of baseline; and incident case was defined as the new occurrence of a heart failure diagnosis code among people who, at baseline, did no previous diagnosis codes.

For identifying prevalent cases in primary care, we used a broader list of Read terms in addition to the case definition. While these terms alone did not provide sufficient certainty to identify incident cases, using them to exclude prevalent cases ensured that we removed any patient that had a historic or suspected HF diagnosis from the analysis.