

Supplement

Supplemental Table 1. Valve disease (ICD-10 and UK Biobank Self-report)

Mitral valve prolapse

| | |
|-------|-------------------------|
| I34.1 | Mitral (valve) prolapse |
| 1488* | Mitral valve prolapse |

Mitral valve insufficiency

| | |
|-------|--|
| I34.0 | Nonrheumatic mitral (valve) insufficiency |
| I05.1 | Rheumatic mitral insufficiency |
| I05.2 | Rheumatic mitral stenosis with insufficiency |
| 1585* | Mitral valve insufficiency |

Mitral valve stenosis

| | |
|-------|--|
| I34.2 | Nonrheumatic mitral (valve) stenosis |
| I05.0 | Rheumatic mitral stenosis |
| I05.2 | Rheumatic mitral stenosis with insufficiency |
| 1489* | Mitral valve stenosis |

Aortic valve stenosis

| | |
|-------|---|
| I35.0 | Nonrheumatic aortic (valve) stenosis |
| I35.2 | Nonrheumatic aortic (valve) stenosis with insufficiency |
| I06.0 | Rheumatic aortic stenosis |
| I06.2 | Rheumatic aortic stenosis with insufficiency |
| 1490* | Aortic valve stenosis |

Aortic valve insufficiency

| | |
|-------|---|
| I35.1 | Nonrheumatic aortic (valve) insufficiency |
| I35.2 | Nonrheumatic aortic (valve) stenosis with insufficiency |
| I06.1 | Rheumatic aortic insufficiency |

| | |
|-------------------------------|--|
| I06.2 | Rheumatic aortic stenosis with insufficiency |
| 1587* | Aortic valve insufficiency |
| Tricuspid valve insufficiency | |
| I36.1 | Nonrheumatic tricuspid (valve) insufficiency |
| I36.2 | Nonrheumatic tricuspid (valve) stenosis with insufficiency |
| I07.1 | Rheumatic tricuspid insufficiency |
| I07.2 | Rheumatic tricuspid stenosis with insufficiency |

*UK biobank self-report codes

Supplemental Table 2. ICD-10 codes used for Comorbid conditions

Smoking

| | |
|------------------|--|
| F17 (F17.0-17.9) | Mental and behavioral disorders due to use of tobacco |
| T65.2 | Toxic effect: tobacco and nicotine |
| Z72.0 | Tobacco use not otherwise specified |
| Z87.89 | Personal history of nicotine dependence (excludes current nicotine dependence) |

Coronary artery disease

| | |
|-------|--|
| I25.0 | Atherosclerotic cardiovascular disease, so described |
| I25.1 | Atherosclerotic heart disease |
| I25.2 | Old myocardial infarction |

Dyslipidemia

| | |
|-------------------|---|
| E78 (E78.0-E78.5) | Disorders of lipoprotein metabolism and other lipidaemias |
|-------------------|---|

Diabetes

| | |
|-------------------|--------------------------|
| E10 (E10.0-E10.9) | Type 1 diabetes mellitus |
| E11 (E11.0-E11.9) | Type 2 diabetes mellitus |

| | |
|--|---|
| E12 (E12.0-E12.9) | Malnutrition related diabetes mellitus |
| E13 (E13.0-E13.9) | Other specified diabetes mellitus |
| E14 (E14.0-E14.9) | Unspecified diabetes mellitus |
| N08.3 | Glomerular disorders in diabetes mellitus |
| O24 (O24.0-O24.3) | Diabetes mellitus in pregnancy |
| Heart failure | |
| I11.0 | Hypertensive heart disease with (congestive) heart failure |
| I13.0 | Hypertensive heart and renal disease with (congestive) heart failure |
| I13.2 | Hypertensive heart and renal disease with both (congestive) heart failure and renal failure |
| I50 (I50.0-I50.9) | Heart failure |
| Rheumatic Fever | |
| I00 (I00X) | Rheumatic fever without mention of heart involvement |
| I01 (I01.0-I01.9) | Rheumatic fever with heart involvement |
| I02 (I02.0-I02.9) | Rheumatic chorea |
| I09 (I09.0-I09.9) | Other rheumatic heart diseases |
| Pulmonary hypertension | |
| I27.0 | Primary pulmonary hypertension |
| I27.2 | Other secondary pulmonary hypertension |
| Atrial fibrillation and atrial flutter | |
| I48 (I48.0-I48.9) | Atrial fibrillation and flutter |
| Endocarditis | |
| I33 (I33.0-I33.9) | Acute and subacute endocarditis |
| I38 (I38X) | Endocarditis, valve unspecified |
| I39 (I39.0-I39.8) | Endocarditis and heart valve disorders in diseases classified elsewhere |

Supplemental Table 3. Valve Interventions denoted by Office of Population Census and Surveys version 4 (OPCS-4)

Aortic valve interventions

K26 (K26.1-K26.9) Plastic repair of aortic valve *K26 code is included in codes that are used for TAVR

Mitral valve interventions

K25 (K25.1-K25.9) Plastic repair of mitral valve (including both replacement and repair)

K30.1 Revision of plastic repair of mitral valve

K30.8 Other specified revision of plastic repair of valve of heart

K30.9 Unspecified revision of plastic repair of valve of heart

K34.1 Annuloplasty of mitral valve

K35.1 Percutaneous transluminal mitral valvotomy

K35.5 Percutaneous transluminal valvuloplasty

K35.8 Other unspecified therapeutic transluminal operations on valve of heart

K35.9 Unspecified therapeutic transluminal operations on valve of heart

Tricuspid valve interventions

K27 (K27.1-K27.9) Plastic repair of tricuspid valve

K34.2 Annuloplasty of tricuspid valve

Percutaneous interventions

Y79 Approach to an organ through an artery

Y53 Approach to an organ under radiologic control

Y07.2 Clipping of organ NOC

Supplemental Table 4. Causes of Death included in Cardiovascular Mortality (ICD-10)

Cardiac arrest

I46 (I46.0-I46.9) Cardiac arrest

Stroke

I60 (I60.0-I60.9) Subarachnoid hemorrhage

I61 (I61.0-I61.9) Intracerebral hemorrhage

I62 (I62.0-I62.9) Other nontraumatic intracranial hemorrhage

I63 (I63.0-I63.9) Cerebral infarction

I64 (I64X) Other cerebral infarction

Heart Failure (same as above covariate)

I11.0 Hypertensive heart disease with (congestive) heart failure

I13.0 Hypertensive heart and renal disease with (congestive) heart failure

I13.2 Hypertensive heart and renal disease with both (congestive) heart failure and renal failure

I50 (I50.0-I50.9) Heart failure

Myocardial Infarction (Heart Attack)

I21 (I21.0-I21.9) Acute myocardial infarction

I22 (I22.0-I22.9) Subsequent myocardial infarction

I23 (I23.0-I23.9) Certain current complications following acute myocardial infarction

I25.2 Old myocardial infarction

Supplemental Table 5. Demographics and comorbidities of patients with incident valve disease receiving valvular interventions

| | No Intervention (N = 13289) | Any intervention (N = 309) | P value |
|--|--------------------------------|-------------------------------|---------|
| Female, n (%) | 5899 (44) | 81 (26) | <0.001 |
| BMI >30 kg/m ² , n (%) | 4322 (33) | 96 (31) | 0.57 |
| SBP (mmHg) | 145 ± 21 | 147 ± 22 | 0.20 |
| Smoking (%) | 500 (4) | 13 (4) | 0.69 |
| Dyslipidemia, n(%) | 1761 (13) | 94 (30) | <0.001 |
| Diabetes, n (%) | 1491 (11) | 36 (12) | 0.82 |
| CAD, n (%) | 1964 (15) | 105 (34) | <0.001 |
| CHF, n (%) | 1780 (13) | 21 (6) | <0.001 |
| Rheumatic fever, n(%) | 891 (7) | 0 | <0.001 |
| Infective endocarditis, n (%) | 966 (7) | 8 (3) | 0.0016 |
| Atrial fibrillation and flutter, n (%) | 3725 (28) | 115 (37) | <0.001 |
| Pulmonary hypertension, n(%) | 313 (2) | 7 (2) | 0.91 |

Values are expressed as mean ± SD or n (%); BMI, body mass index; SBP, systolic blood pressure; CAD, coronary artery disease; CHF, congestive heart failure.

Supplemental Figure 1. Cumulative mortality among patients with valvular heart disease (VHD) receiving interventions. Kaplan-Meier survival curves for all-cause (a) and cardiovascular (b) mortality among patients with VHD who did and did not receive valvular interventions. Models were adjusted for age, sex, systolic blood pressure, obesity, smoking, dyslipidemia, diabetes, coronary artery disease, congestive heart failure and valvular interventions.

