SUPPLEMENTAL MATERIAL
Supplemental Methods

Risk-Standardized Complication Rate Calculation Algorithm

We fitted a hierarchical generalized linear model (HGLM), which accounts for the clustering of observations within hospitals. We assume the outcome is a known exponential family distribution and is related linearly to the covariates via a known linked function, $h$. For our model, we assumed a binomial distribution and a logit link function. Further, we accounted for the clustering within facility by estimating a facility-specific effect, $\alpha_i$, which is assumed to follow a normal distribution with mean $\mu$ and variance $\tau^2$, the between-facility variance component. The HGLM is defined by the following equations:

\begin{align*}
    h(Y_{ij}) &= \alpha_i + \beta Z_{ij} \quad (1) \\
    \alpha_i &= \mu + \omega_i; \quad \omega_i \sim N(0, \tau^2) \quad (2) \\
    i &= 1 \ldots I; j = 1 \ldots n_i
\end{align*}

Where $Y_{ij}$ denotes the outcome (equal to 1 if patient has a complication, 0 otherwise) for the $j$-th patient who had an AF ablation at the $i$-th hospital; $Z_{ij} = (Z_{1ij}, Z_{2ij}, \ldots, Z_{ pij})$ is a set of $p$ patient-specific covariates derived from the data; and $I$ denotes the total number of hospitals and $n_i$ the number of ablations performed at hospital $i$. The hospital-specific intercept of the $i$-th hospital, $\alpha_i$, defined above, is comprised of $\mu$, the adjusted average intercept over all hospitals in the sample and $\omega_i$ the facility-specific intercept deviation from $\mu$. A point estimate of $\omega_i$, greater or less than 0, determines if hospitals performance is worse or better compared to the adjusted average outcome.

The HGLM was estimated using SAS version 9.4 (SAS Institute Inc., Cary, NC) GLIMMIX procedure. To estimate the covariance matrix, we used the default estimation technique (Residual Log Pseudo-Likelihood).

Provider Performance Reporting

Using the HGLM defined by Equations (1) - (2), we estimate the parameters $\hat{\mu}, \hat{\alpha}_1, \hat{\alpha}_2, \ldots, \hat{\alpha}_I, \hat{\beta},$ and $\hat{\tau}^2$. We calculate a standardized complication rate, $s_i$, for each hospital by computing the ratio of the number of predicted complications to the number of expected complications, multiplied by the unadjusted overall complication rate, $\bar{y}$. Specifically, we calculate:
Predicted \[ \hat{\gamma}(Z) = h^{-1}(\hat{\gamma} + \hat{\beta}Z) \] \hspace{1cm} (3)

Expected \[ \hat{\varepsilon}(Z) = h^{-1}(\hat{\mu} + \hat{\eta}Z) \] \hspace{1cm} (4)

\[ \hat{s}_i(Z) = \frac{\sum_{j=1}^{n_i} \hat{\gamma}_j(Z)}{\sum_{j=1}^{n_i} \hat{\varepsilon}_j(Z)} \times \bar{y} \] \hspace{1cm} (5)

If the “predicted” number of complications is higher (lower) than the “expected” number of complications, then that facility’s \( \hat{s}_i \) will be higher (lower) than the unadjusted average.

**Outlier Evaluation**

Because the statistic described in Equation (5) is a complex function of parameter estimates, we use re-sampling and simulation techniques to derive an interval estimate to determine if a hospital is performing better than, worse than, or no different from its expected rate. A hospital is considered as better than expected if its entire confidence interval falls below the expected rate, and considered worse if the entire confidence interval falls above the expected rate. It is considered no different if the confidence interval overlaps the expected rate.

More specifically, we use a bootstrapping procedure to compute confidence intervals. Because the theoretical-based standard errors are not easily derived, and to avoid making unnecessary assumptions, we use the bootstrap to empirically construct the sampling distribution for each hospital-level risk-standardized rate. The bootstrapping algorithm is described below.

**Bootstrapping Algorithm**

Let \( I \) denote the total number of hospitals in the sample. We repeat steps 1 – 4 below for \( b = 1,2,\ldots,B \) times:

1. Sample \( I \) hospitals with replacement.

2. Fit the hierarchical logistic regression model using all patients within each sampled hospital. We use as starting values the parameter estimates obtained by fitting the model to all hospitals. If some hospitals are selected more than once in a bootstrapped sample, we treat them as distinct so that we have \( I \) random effects to estimate the variance components. At the conclusion of Step 2, we have:
   a. \( \hat{\beta}^{(b)} \) (the estimated regression coefficients of the risk factors).
   b. The parameters governing the random effects, hospital adjusted outcomes, distribution, \( \hat{\mu}^{(b)} \) and \( \hat{\tau}^{2(b)} \).
   c. The set of hospitals-specific intercepts and corresponding variances:
3. We generate a hospitals random effect by sampling from the distribution of the hospital-specific distribution obtained in Step 2c. We approximate the distribution for each random effect by a normal distribution. Thus, we draw for the unique set of hospitals sampled in Step 1.

4. Within each unique hospital sampled in Step 1, and for each case in that hospital, we calculate where and are obtained from Step 2 and is obtained from Step 3.

Ninety-five percent interval estimates (or alternative interval estimates) for the hospital-standardized outcome can be computed by identifying the 2.5th and 97.5th percentiles of randomly half of the B estimates (or the percentiles corresponding to the alternative desired intervals).

The methods outline above are similar to methods we have previously used to profile institutional variation in procedural outcomes (Reference 20 in the main text).
Table S1. ICD-10 AM and ACHI codes used to identify patients undergoing catheter ablation of atrial fibrillation.

| GROUP | DISEASE/PROCEDURE | ICD10-AM/ACHI codes |
|-------|-------------------|---------------------|
| Inclusion | Atrial fibrillation | I48, I48.0, I48.1, I48.2, I48.9 |
|         | Catheter ablation of arrhythmia circuit or focus, not elsewhere classified | 38287-01 |
|         | Catheter ablation of arrhythmia circuit or focus involving left atrial chamber | 38287-02 |
|         | Catheter ablation of arrhythmia circuit or focus involving both atrial chambers | 38290-01 |
| Exclusion | Atrial flutter | I48.3, I48.4 |
|         | Pre-excitation syndrome | I45.6 |
|         | Supra-ventricular tachycardia | I47.1 |
|         | Ventricular tachycardia | I47.2, I49.0 |
|         | Premature beats | I49.1, I49.2, I49.3, I49.4 |
|         | Other arrhythmias | I47, I47.0, I48, I49.8, I49.9, R00.0 |
|         | Presence of a cardiac device | Z95.0 |
|         | Pacemaker implantation | 38353-00 |
|         | Cardiac defibrillator implantation | 38393-00 |
|         | Open ablation | 38287-03, 38287-04, 38290-02 |
Table S2. Diagnoses and procedure codes used to identify in-hospital and post-discharge complications.

| COMPLICATIONS                                | ICD-10 AM or ACHI codes | Code description                                                  |
|----------------------------------------------|-------------------------|------------------------------------------------------------------|
| **Cardiopulmonary failure and shock**        |                         |                                                                  |
| Cardiac arrest                               | I46                     | Cardiac arrest                                                   |
| I46.0                                        |                         | Cardiac arrest with successful resuscitation                     |
| I46.9                                        |                         | Cardiac arrest, unspecified                                      |
| I46.1                                        |                         | Sudden cardiac death, so described                               |
| **Acute respiratory failure**                | J96.0                   | Acute respiratory failure                                         |
| J96.00                                       |                         | Acute respiratory failure, type I                                |
| J96.01                                       |                         | Acute respiratory failure, type II                               |
| J96.09                                       |                         | Acute respiratory failure type unspecified                       |
| **Shock**                                    | R57.x                   | Cardiogenic shock                                                |
| T81.1                                        |                         | Shock during or resulting from a procedure, not elsewhere classified|
| T88.2                                        |                         | Shock due to anaesthesia                                          |
| T78.2                                        |                         | Anaphylactic shock, unspecified                                   |
| T80.5                                        |                         | Anaphylactic shock due to serum                                   |
| T88.6                                        |                         | Anaphylactic shock due to adverse effect of correct drug or medicament properly administered |
| **Cardiorespiratory resuscitation**          | 92052-00                | Cardiopulmonary resuscitation                                    |
| **Stroke/Transient ischemic attack**         |                         |                                                                  |
| Stroke                                       | I64                     | Stroke, not specified as haemorrhage or infarction                |
| I63                                          |                         | Cerebral infarction                                              |
| I63.0                                        |                         | Cerebral infarction due to thrombosis of precerebral arteries     |
| I63.1                                        |                         | Cerebral infarction due to embolism of precerebral arteries       |
| I63.2                                        |                         | Cerebral infarction due to unspecified occlusion or stenosis of precerebral arteries |
| I63.3                                        |                         | Cerebral infarction due to thrombosis of cerebral arteries        |
| I63.4                                        |                         | Cerebral infarction due to embolism of cerebral arteries          |
| I63.5                                        |                         | Cerebral infarction due to unspecified occlusion or stenosis of cerebral arteries |
| I63.6                                        |                         | Cerebral infarction due to cerebral venous thrombosis, nonpyogenic|
| I63.8                                        |                         | Other cerebral infarction                                         |
| I63.9                                        |                         | Cerebral infarction, unspecified                                  |
| I61                                          |                         | Intracerebral haemorrhage                                         |
I61.0  Intracerebral haemorrhage in hemisphere, subcortical
I61.1  Intracerebral haemorrhage in hemisphere, cortical
I61.2  Intracerebral haemorrhage in hemisphere, unspecified
I61.3  Intracerebral haemorrhage in brain stem
I61.4  Intracerebral haemorrhage in cerebellum
I61.5  Intracerebral haemorrhage, intraventricular
I61.6  Intracerebral haemorrhage, multiple localised
I61.8  Other intracerebral haemorrhage
I61.9  Intracerebral haemorrhage, unspecified
I62  Other nontraumatic intracranial haemorrhage
I62.0  Subdural haemorrhage (acute)(nontraumatic)
I62.1  Nontraumatic extradural haemorrhage
I62.9  Intracranial haemorrhage (nontraumatic), unspecified
I60  Subarachnoid haemorrhage
I60.0  Subarachnoid haemorrhage from carotid siphon and bifurcation
I60.1  Subarachnoid haemorrhage from middle cerebral artery
I60.2  Subarachnoid haemorrhage from anterior communicating artery
I60.3  Subarachnoid haemorrhage from posterior communicating artery
I60.4  Subarachnoid haemorrhage from basilar artery
I60.5  Subarachnoid haemorrhage from vertebral artery
I60.6  Subarachnoid haemorrhage from other intracranial arteries
I60.7  Subarachnoid haemorrhage from intracranial artery, unspecified
I60.8  Other subarachnoid haemorrhage
I60.9  Subarachnoid haemorrhage, unspecified

Transient ischemic attack
G45  Transient cerebral ischaemic attacks and related syndromes
G45.0  Vertebro-basilar artery syndrome
G45.1  Carotid artery syndrome (hemispheric)
G45.2  Multiple and bilateral precerebral artery syndromes
G45.3  Amaurosis fugax
G45.4  Transient global amnesia
G45.8  Other transient cerebral ischaemic attacks and related syndromes
G45.9  Transient cerebral ischaemic attack, unspecified
## Pericardial effusion

| Condition                        | Code   | Description                                      |
|----------------------------------|--------|--------------------------------------------------|
| Pericardial effusion             | I31.2  | Haemopericardium, not elsewhere classified        |
|                                  | I31.3  | Pericardial effusion (noninflammatory)           |
| Pericardiocentesis               | 3835900| Pericardiocentesis                               |
|                                  | 3845000| Transthoracic drainage of pericardium             |
|                                  | 3845001| Thoracoscopic drainage of pericardium             |
|                                  | 3845200| Subxyphoid drainage of pericardium                |

## Haemothorax or pneumothorax

| Condition                        | Code   | Description                                      |
|----------------------------------|--------|--------------------------------------------------|
| Haemothorax                      | J94.2  | Haemothorax                                      |
| Pneumothorax                     | J93    | Pneumothorax                                     |
|                                  | J93.2  | Iatrogenic pneumothorax                          |
|                                  | J93.8  | Other pneumothorax                               |
|                                  | J93.9  | Pneumothorax, unspecified                        |
| Thoracentesis                    | 3880000| Diagnostic thoracentesis                         |
|                                  | 3880300| Therapeutic thoracentesis                        |
|                                  | 3880600| Insertion of intercostal catheter for drainage    |

## Atrio-oesophageal fistula

| Condition                        | Code   | Description                                      |
|----------------------------------|--------|--------------------------------------------------|
| Oesophageal perforation          | K22.3  | Perforation of oesophagus                        |
| Mediastinitis                    | J85    | Abscess of lung and mediastinum                  |
|                                  | J85.3  | Abscess of mediastinum                           |

## Any bleeding

| Condition                        | Code   | Description                                      |
|----------------------------------|--------|--------------------------------------------------|
| Post-procedural haemorrhage/hematoma | R58 | Haemorrhage, not elsewhere classified            |
|                                  | T81.0  | Haemorrhage and haematoma complicating a procedure, not elsewhere classified |
|                                  | Y60.5  | Unintentional cut, puncture, perforation or haemorrhage during heart catheterisation |
| Internal organ bleeding (bleeding from the gastro-intestine, pulmonary, or urinary system) | K92.2 | Gastrointestinal haemorrhage, unspecified |
|                                  | I98.3  | Esophageal varices with bleeding                  |
|                                  | K22.6  | Gastro-oesophageal laceration-haemorrhage syndrome |
|                                  | K25.0, 25.2, 25.4, 25.6 | Gastric ulcer with haemorrhage |
|                                  | K26.0, 26.2, 26.4, 26.6 | Duodenal ulcer with haemorrhage |
|                                  | K27.0, 27.2, 27.4, 27.6 | Peptic ulcer with haemorrhage |
|                                  | K28.0, 28.4, 28.6 | Gastrojejunal ulcer with haemorrhage |
| ICD-10 Code | Description |
|-------------|-------------|
| K29.0       | Acute haemorrhagic gastritis |
| K62.5       | Haemorrhage of anus and rectum |
| K66.1       | Hemoperitoneum |
| K92.0       | Hematemesis |
| K92.1       | Melena |
| R04.0       | Epistaxis |
| R04.1       | Haemorrhage from throat |
| R04.2       | Haemoptysis |
| R04.8       | Haemorrhage from other sites in respiratory passages |
| R04.9       | Haemorrhage from respiratory passages, unspecified |
| N02.x       | Recurrent and persistent haematuria |
| R31.0       | Unspecified haematuria |
| D62         | Acute post haemorrhagic anaemia |

**Bleeding requiring blood transfusion**
- Z51.3: Blood transfusion without reported diagnosis
- 13706-01: Administration of whole blood
- 13706-02: Administration of packed cells

### Vascular Injury

| ICD-10 Code | Description |
|-------------|-------------|
| I72.4       | Aneurysm and dissection of artery of lower extremity |
| I77.0       | Arteriovenous fistula, acquired |
| T81.7       | Vascular complications following a procedure, not elsewhere classified |

| ICD-10 Code | Description |
|-------------|-------------|
| 33142-00    | Repair of false aneurysm in femoral artery |
| 33139-00    | Repair of false aneurysm in iliac artery |
| 34121-00    | Repair of simple arteriovenous fistula of extremity with restoration of continuity |
| 34121-01    | Repair of complex arteriovenous fistula of extremity with restoration of continuity |

### Post-Procedural Infections

| ICD-10 Code | Description |
|-------------|-------------|
| T81.42      | Sepsis following a procedure |
| U90         | Healthcare associated infections |
| U90.0       | Healthcare associated Staphylococcus aureus bacteraemia |

| ICD-10 Code | Description |
|-------------|-------------|
| J13         | Pneumonia due to Streptococcus pneumoniae |
| J14         | Pneumonia due to Haemophilus influenzae |
J15 Bacterial pneumonia, not elsewhere classified
J15.0 Pneumonia due to Klebsiella pneumoniae
J15.1 Pneumonia due to Pseudomonas
J15.2 Pneumonia due to staphylococcus
J15.3 Pneumonia due to streptococcus, group B
J15.4 Pneumonia due to other streptococci
J15.5 Pneumonia due to Escherichia coli
J15.6 Pneumonia due to other Gram-negative bacteria
J15.7 Pneumonia due to Mycoplasma pneumoniae
J15.8 Other bacterial pneumonia
J15.9 Bacterial pneumonia, unspecified
J18 Pneumonia, organism unspecified
J18.0 Bronchopneumonia, unspecified
J18.1 Lobar pneumonia, unspecified
J18.2 Hypostatic pneumonia, unspecified
J18.8 Other pneumonia, organism unspecified
J18.9 Pneumonia, unspecified

| Endocarditis | I33 | Acute and subacute endocarditis |
|--------------|-----|--------------------------------|
|              | I33.0 | Acute and subacute infective endocarditis |
|              | I33.9 | Acute endocarditis, unspecified |
|              | I38  | Endocarditis, valve unspecified |

| Pericarditis | I30 | Acute pericarditis |
|--------------|-----|--------------------|
|              | I30.0 | Acute nonspecific idiopathic pericarditis |
|              | I30.1 | Infective pericarditis |
|              | I30.8 | Other forms of acute pericarditis |
|              | I30.9 | Acute pericarditis, unspecified |
|              | I24.1 | Dressler's syndrome |

| Post-procedural acute myocardial infarction | I21 | Acute myocardial infarction |
|-------------------------------------------|-----|----------------------------|
|                                          | I21.0 | Acute transmural myocardial infarction of anterior wall |
|                                          | I21.1 | Acute transmural myocardial infarction of inferior wall |
| Code    | Description                                                                 |
|---------|-----------------------------------------------------------------------------|
| I21.2   | Acute transmural myocardial infarction of other sites                       |
| I21.3   | Acute transmural myocardial infarction of unspecified site                  |
| I21.4   | Acute subendocardial myocardial infarction                                 |
| I21.9   | Acute myocardial infarction, unspecified                                   |
| I26     | Pulmonary embolism                                                          |
| I26.0   | Pulmonary embolism with mention of acute cor pulmonale                      |
| I26.8   | Iatrogenic pulmonary embolism                                               |
| I26.9   | Pulmonary embolism without mention of acute cor pulmonale                   |
| I82     | Other venous embolism and thrombosis                                       |
| I82.2   | Embolism and thrombosis of vena cava                                       |
| I82.3   | Embolism and thrombosis of renal vein                                      |
| I82.8   | Embolism and thrombosis of other specified veins                           |
| I82.9   | Embolism and thrombosis of unspecified vein                                |
| N99.0   | Postprocedural kidney failure                                               |
| N17     | Acute kidney failure                                                       |
| N17.0   | Acute kidney failure with tubular necrosis                                 |
| N17.1   | Acute kidney failure with acute cortical necrosis                           |
| N17.2   | Acute kidney failure with medullary necrosis                               |
| N17.8   | Other acute kidney failure                                                 |
| N17.9   | Acute kidney failure, unspecified                                          |
| I44.2   | Atrioventricular block, complete                                            |
| 38497-00| Coronary artery bypass, using 1 saphenous vein graft                        |
| 38497-01| Coronary artery bypass, using 2 saphenous vein grafts                       |
| 38497-02| Coronary artery bypass, using 3 saphenous vein grafts                       |
| 38497-03| Coronary artery bypass, using >= 4 saphenous vein grafts                    |
| 38497-04| Coronary artery bypass, using 1 other venous graft                          |
| 38497-05| Coronary artery bypass, using 2 other venous grafts                         |
| 38497-06| Coronary artery bypass, using 3 other venous grafts                         |
| Code    | Description                                              |
|---------|----------------------------------------------------------|
| 38497-07 | Coronary artery bypass, using >= 4 other venous grafts   |
| 38500-00 | Coronary artery bypass, using 1 LIMA graft               |
| 38503-00 | Coronary artery bypass, using >= 2 LIMA grafts           |
| 38500-01 | Coronary artery bypass, using 1 RIMA graft               |
| 38503-01 | Coronary artery bypass, using >= 2 RIMA grafts           |
| 38500-02 | Coronary artery bypass, using 1 radial artery graft      |
| 38503-02 | Coronary artery bypass, using >= 2 radial artery grafts  |
| 38500-03 | Coronary artery bypass, using 1 epigastric artery graft  |
| 38503-03 | Coronary artery bypass, using >= 2 epigastric artery grafts |
| 38500-04 | Coronary artery bypass, using 1 other arterial graft      |
| 38503-04 | Coronary artery bypass, using >= 2 other arterial grafts  |
| 38500-05 | Coronary artery bypass, using 1 composite graft          |
| 38503-05 | Coronary artery bypass, using >= 2 composite grafts      |
| 90201-00 | Coronary artery bypass, using 1 other graft, not elsewhere classified |
| 90201-01 | Coronary artery bypass, using 2 other grafts, not elsewhere classified |
| 90201-02 | Coronary artery bypass, using 3 other grafts, not elsewhere classified |
| 90201-03 | Coronary artery bypass, using >= 4 other grafts, not elsewhere classified |
| 38456-19 | Other intrathoracic procedures on arteries of heart without cardiopulmonary bypass |
| 38653-01 | Other intrathoracic procedures on atrium with cardiopulmonary bypass |
| 38653-02 | Other intrathoracic procedures on ventricle of heart with cardiopulmonary bypass |
| 38653-03 | Other intrathoracic procedures on septum with cardiopulmonary bypass |
| 38653-04 | Other intrathoracic procedures on aortic valve with cardiopulmonary bypass |
| 38653-05 | Other intrathoracic procedures on mitral valve with cardiopulmonary bypass |
| 38653-06 | Other intrathoracic procedures on tricuspid valve with cardiopulmonary bypass |
| 38653-07 | Other intrathoracic procedures on pulmonary valve with cardiopulmonary bypass |
| 38653-08 | Other intrathoracic procedures on arteries of heart with cardiopulmonary bypass |
| 38600-00 | Cardiopulmonary bypass, central cannulation               |
| 38603-00 | Cardiopulmonary bypass, peripheral cannulation            |
| 38627-01 | Adjustment of cannula for cardiopulmonary bypass         |
| 38653-00 | Other intrathoracic procedures on heart with cardiopulmonary bypass |
In-hospital complications were identified by procedure codes and secondary diagnoses of the index hospitalisation. Post-discharge complications were identified by the procedure codes and the primary discharge diagnosis of hospital readmissions. ACHI = Australian Classification of Health Interventions; AMI = acute myocardial infarction; ICD10-AM = International Classification of Diseases, 10th Revision, Australian Modification.
Table S3. Candidate variables considered for the risk adjustment model.

| Variables | Description                                                                                                                                | P value |
|-----------|--------------------------------------------------------------------------------------------------------------------------------------------|---------|
| CC2       | Septicemia/Shock                                                                                                                            | 0.012   |
| CC3       | Central Nervous System Infection                                                                                                            | 0.195   |
| CC6       | Other Infectious Diseases                                                                                                                   | <0.001  |
| CC7       | Metastatic Cancer and Acute Leukemia                                                                                                         | 0.001   |
| CC8       | Lung, Upper Digestive Tract, and Other Severe Cancers                                                                                         | 0.001   |
| CC9       | Lymphatic, Head and Neck, Brain, and Other Major Cancers                                                                                        | 0.023   |
| CC15      | Diabetes with Renal or Peripheral Circulatory Manifestation                                                                                   | <0.001  |
| CC19      | Diabetes without Complication                                                                                                                | 0.159   |
| CC21      | Protein-Calorie Malnutrition                                                                                                                 | 0.000   |
| CC22      | Other Significant Endocrine and Metabolic Disorders                                                                                           | 0.009   |
| CC23      | Disorders of Fluid/Electrolyte/Acid-Base Balance                                                                                              | <0.001  |
| CC24      | Other Endocrine/Metabolic/Nutritional Disorders                                                                                               | <0.001  |
| CC28      | Acute Liver Failure/Disease                                                                                                                   | 0.004   |
| CC29      | Other Hepatitis and Liver Disease                                                                                                             | 0.001   |
| CC33      | Inflammatory Bowel Disease                                                                                                                   | 0.080   |
| CC34      | Peptic Ulcer, Hemorrhage, Other Specified Gastrointestinal Disorders                                                                         | 0.061   |
| CC36      | Other Gastrointestinal Disorders                                                                                                              | 0.000   |
| CC39      | Disorders of the Vertebras and Spinal Discs                                                                                                   | 0.031   |
| CC41      | Osteoporosis and Other Bone/Cartilage Disorders                                                                                               | 0.124   |
| CC43      | Other Musculoskeletal and Connective Tissue Disorders                                                                                          | <0.001  |
| CC45      | Disorders of Immunity                                                                                                                         | 0.080   |
| CC46      | Coagulation Defects and Other Specified Hematological Disorders                                                                             | <0.001  |
| CC47      | Iron Deficiency and Other/Unspecified Anemias and Blood Disease                                                                              | <0.001  |
| CC48      | Delirium and Encephalopathy                                                                                                                  | 0.076   |
| CC49      | Dementia                                                                                                                                     | 0.045   |
| CC53      | Drug/Alcohol Abuse, Without Dependence                                                                                                        | 0.248   |
| CC58      | Depression                                                                                                                                   | 0.239   |
| CC60      | Other Psychiatric Disorders                                                                                                                  | 0.164   |
| CC69      | Spinal Cord Disorders/Injuries                                                                                                                | 0.009   |
| CC70      | Muscular Dystrophy                                                                                                                           | 0.089   |
| CC75      | Coma, Brain Compression/Anoxic Damage                                                                                                         | 0.193   |
| CC76      | Mononeuropathy, Other Neurological Conditions/Injuries                                                                                         | 0.006   |
| CC77      | Respirator Dependence/Tracheostomy Status                                                                                                     | 0.031   |
| CC79      | CardioRespiratory Failure & Shock                                                                                                             | 0.005   |
| CC80      | Congestive Heart Failure                                                                                                                     | <0.001  |
| CC81      | Acute Myocardial Infarction                                                                                                                  | 0.018   |
| CC82      | Unstable Angina and Other Acute Ischemic Heart Disease                                                                                         | 0.105   |
| CC83      | Angina Pectoris/Old Myocardial Infarction                                                                                                     | <0.001  |
| CC84      | Coronary Atherosclerosis/Other Chronic Ischemic Heart Disease                                                                               | <0.001  |
| CC85      | Heart Infection/Inflammation, Except Rheumatic                                                                                                 | 0.020   |
| CC86      | Valvular and Rheumatic Heart Disease                                                                                                           | 0.001   |
| Code   | Description                                         | p-value   |
|--------|-----------------------------------------------------|-----------|
| CC89   | Hypertensive Heart and Renal Disease or Encephalopathy | <0.001    |
| CC91   | Hypertension                                        | <0.001    |
| CC93   | Other Heart Rhythm and Conduction Disorders         | <0.001    |
| CC94   | Other and Unspecified Heart Disease                 | 0.001     |
| CC98   | Cerebral Atherosclerosis and Aneurysm               | 0.094     |
| CC102  | Speech, Language, Cognitive, Perceptual Deficits    | 0.151     |
| CC104  | Vascular Disease with Complications                 | 0.041     |
| CC106  | Other Circulatory Disease                           | 0.033     |
| CC108  | Chronic Obstructive Pulmonary Disease               | <0.001    |
| CC109  | Fibrosis of Lung and Other Chronic Lung Disorders   | 0.004     |
| CC110  | Asthma                                              | 0.004     |
| CC111  | Aspiration and Specified Bacterial Pneumonias       | 0.098     |
| CC113  | Viral and Unspecified Pneumonia, Pleurisy          | 0.000     |
| CC114  | Pleural Effusion/Pneumothorax                       | 0.007     |
| CC115  | Other Lung Disorders                                | <0.001    |
| CC120  | Diabetic and Other Vascular Retinopathies           | 0.033     |
| CC124  | Other Eye Disorders                                 | 0.054     |
| CC127  | Other Ear, Nose, Throat, and Mouth Disorders        | 0.001     |
| CC128  | Kidney Transplant Status                            | 0.031     |
| CC131  | Renal Failure                                       | <0.001    |
| CC134  | Incontinence                                        | 0.019     |
| CC135  | Urinary Tract Infection                             | 0.055     |
| CC136  | Other Urinary Tract Disorders                       | 0.004     |
| CC139  | Other Female Genital Disorders                      | 0.194     |
| CC142  | Miscarriage/Abortion                                | 0.195     |
| CC143  | Completed Pregnancy With Major Complications        | 0.013     |
| CC144  | Completed Pregnancy With Complications               | 0.006     |
| CC145  | Completed Pregnancy Without Complications (Normal Delivery) | 0.033   |
| CC146  | Uncompleted Pregnancy With Complications             | 0.080     |
| CC147  | Uncompleted Pregnancy With No or Minor Complications | 0.006     |
| CC152  | Cellulitis, Local Skin Infection                    | 0.122     |
| CC156  | Concussion or Unspecified Head Injury               | 0.028     |
| CC158  | Hip Fracture/Dislocation                            | 0.242     |
| CC160  | Internal Injuries                                   | <0.001    |
| CC162  | Other Injuries                                      | <0.001    |
| CC164  | Major Complications of Medical Care and Trauma      | 0.001     |
| CC165  | Other Complications of Medical Care                 | 0.024     |
| CC166  | Major Symptoms, Abnormalities                       | <0.001    |
| CC167  | Minor Symptoms, Signs, Findings                     | <0.001    |
| CC179  | Post-Surgical States/Aftercare/Elective             | 0.003     |
| Female sex |                                             | <0.001   |
| Age    |                                                   | 0.011     |
| Ablation of both atria |                               | 0.002     |
| Hypertension |                                              | <0.001    |
Comorbidities are defined using the Condition Categories (CC) classification system (18). P value derived from bivariate analysis with an outcome of major complications as the dependent variable.
Table S4. Variables included in the risk-adjustment model.

| Variables                                | OR   | SE    | P value | 95% CI |
|------------------------------------------|------|-------|---------|--------|
| Female                                   | 1.22 | 0.07  | 0.001   | 1.08 – 1.36 |
| Age                                      | 1.01 | 0.00  | 0.002   | 1.00 – 1.01 |
| Year of ablation                         | 0.96 | 0.16  | 0.013   | 0.93 – 0.99 |
| History of ablation in the preceding year| 0.77 | 0.07  | 0.003   | 0.64 – 0.92 |
| Ablation of both atria                   | 1.32 | 0.08  | <0.001  | 1.18 – 1.47 |
| Hypertension                             | 1.34 | 0.11  | <0.001  | 1.15 – 1.56 |
| Haematological disorders                 | 2.46 | 0.24  | <0.001  | 2.03 – 2.98 |
| History of pneumonia                     | 2.09 | 0.29  | <0.001  | 1.60 – 2.73 |
| Musculoskeletal and connective tissue disorders | 1.33 | 0.12  | 0.002   | 1.11 – 1.59 |
| Other lung disorders                     | 1.40 | 0.19  | 0.013   | 1.07 – 1.83 |

OR = adjusted odd ration, CI = confidence intervals, SE = standard error
Table S5. Crude hospital’s complication rates.

| Complications                              | Median (Range)          |
|--------------------------------------------|-------------------------|
| Primary outcome                            | 5.74% (0.00% - 21.43%)  |
| Mortality                                  | 0.00% (0.00% - 1.08%)   |
| Cardiorespiratory failure                  | 0.00% (0.00% - 1.68%)   |
| Stroke/TIA                                 | 0.17% (0.00% - 1.20%)   |
| Pericardial effusion                       | 0.69% (0.00% - 4.82%)   |
| Haemothorax/pneumothorax                   | 0.00% (0.00% - 3.57%)   |
| Bleeding                                   | 3.75% (0.00% - 17.86%)  |
| Vascular injury                            | 0.07% (0.00% - 2.56%)   |
| Infections                                 | 0.43% (0.00% - 2.56%)   |
| Pericarditis                               | 0.00% (0.00% - 1.94%)   |
| Procedure-related AMI                      | 0.00% (0.00% - 1.20%)   |
| Venous thromboembolism                     | 0.00% (0.00% - 1.20%)   |
| Acute kidney injury                        | 0.00% (0.00% - 4.00%)   |
| Complications requiring cardiac surgery    | 0.00% (0.00% - 3.57%)   |
| Complete AV block                          | 0.00% (0.00% - 3.53%)   |

AMI = acute myocardial infarction, AV = atrioventricular, TIA = transient ischemic attack.
Figure S1. Model calibration per decile of patient’s risks.
Figure S2. Funnel plot of hospital’s risk-standardized complication rates without Winsorisation.
Figure S3. Funnel plot of hospital’s risk-standardized complication rate with 10% Winsorisation.