VERSION HISTORY

V1	11/02/2025	Internal development

PROTOCOL

This document contains the outcome specific elements necessary to implement the post-covid-events-ehrql protocol.

STUDY POPULATION

No additional criteria.

OUTCOMES

Subcategory	Event	Codelists
Arterial thrombosis events	Acute myocardial infarction	SNOMED ICD-10
Arterial thrombosis events	Ischaemic stroke	SNOMED ICD-10
Venous thrombo-embolism events	Pulmonary embolism	SNOMED ICD-10
Venous thrombo-embolism events	Deep vein thrombosis (including during pregnancy)	SNOMED SNOMED ICD-10 ICD-10
Other cardiovascular events	Transient ischaemic attack	SNOMED ICD-10
Other cardiovascular events	Subarachnoid haemorrhage and haemorrhagic stroke	SNOMED ICD-10
Other cardiovascular events	Heart failure	SNOMED ICD-10
Other cardiovascular events	Angina	SNOMED ICD-10
Arterial thrombosis events	Arterial thrombosis events (i.e., any of acute myocardial infarction, ischaemic stroke, and other arterial embolism)	AMI: SNOMED Ischaemic stroke: SNOMED Other arterial embolism: SNOMED AMI: ICD-10 Ischaemic stroke: ICD-10 Other arterial embolism: ICD-10
Venous thromboembolism events	Venous thromboembolism events (i.e., any of portal vein thrombosis, deep vein thrombosis (including during pregnancy), intracranial venous thrombosis, other deep vein thrombosis, and pulmonary embolism)	PE: SNOMED DVT: SNOMED DVT pregnancy: SNOMED Other DVT: SNOMED ICVT: SNOMED Portal vein thrombosis: SNOMED PE: ICD-10 DVT: ICD-10 DVT pregnancy: ICD-10 Other DVT: ICD-10 ICVT: ICD-10 ICVT pregnancy: ICD-10 Portal vein thrombosis: ICD-10

POTENTIAL CONFOUNDERS

We will consider the following potential confounders, which will be defined using the most recent data prior to the study start date:

Confounder	Type	Definition	Data sources
All stroke	Binary	1 if diagnosis present; 0 otherwise	Primary care, HES APC
Other arterial embolism	Binary	1 if diagnosis present; 0 otherwise	Primary care, HES APC
Venous thromboembolism events	Binary	1 if diagnosis present; 0 otherwise	Primary care, HES APC
Heart failure	Binary	1 if diagnosis present; 0 otherwise	Primary care, HES APC
Angina	Binary	1 if diagnosis present; 0 otherwise	Primary care, HES APC
Lipid lowering medications	Binary	1 if prescription present; 0 otherwise	Primary care
Antiplatelet medications	Binary	1 if prescription present; 0 otherwise	Primary care
Anticoagulation medications	Binary	1 if prescription present; 0 otherwise	Primary care
Combined oral contraceptive pill	Binary	1 if prescription present; 0 otherwise	Primary care
Hormone replacement therapy	Binary	1 if prescription present; 0 otherwise	Primary care

PROPOSED OUTPUTS

The proposed outputs from this protocol will be like those included in the paper 'Association of COVID-19 with arterial and venous vascular diseases: a population-wide cohort study of 48 million adults in England and Wales'. Listed here for convenience:

Table 1. Patient characteristics in the pre-vaccination, vaccinated and unvaccinated cohorts

Table 2. Number of cardiovascular events in the pre-vaccination cohort, vaccinated cohort and unvaccinated cohort, with person-years of follow-up, by COVID-19 severity

Table 3. Adjusted hazard ratios (95% CI) comparing the incidence of arterial thrombotic events after versus before or without a COVID-19 diagnosis, in the pre-vaccination, vaccinated and unvaccinated cohorts, overall and according to COVID-19 severity

Table 4. Adjusted hazard ratios (95% CI) comparing the incidence of venous thrombotic events after versus before or without a COVID-19 diagnosis, in the pre-vaccination, vaccinated and unvaccinated cohorts, overall and according to COVID-19 severity

Table 5. Maximally adjusted hazard ratios (95% CI) comparing the incidence of other vascular events after versus before or without a COVID-19 diagnosis, in the pre-vaccination, vaccinated and unvaccinated cohorts, overall and according to COVID-19 severity

Figure 1. Estimated number of COVID-19 cases identified by community testing in England between January 2020 and January 2022.

Figure 2. Maximally adjusted hazard ratios and 95% CIs comparing the incidence of arterial thrombotic and venous thrombotic events after versus before or without a COVID-19 diagnosis, in the pre-vaccination, vaccinated and unvaccinated cohorts, overall and by COVID-19 severity.

Figure 3. Maximally adjusted hazard ratios and 95% CIs comparing the incidence of arterial

thrombotic, venous thrombotic, and other vascular events after versus before or without a COVID-19 diagnosis, in the pre-vaccination, vaccinated and unvaccinated cohorts.

Figure 4. Estimated absolute increase in the risk of arterial thrombotic and venous thrombotic events over time since COVID-19 diagnosis, compared with no COVID-19 diagnosis, in the pre-vaccination, vaccinated and unvaccinated cohorts.