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Supplementary appendix

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Advancing diagnosis and prognosis in stroke: the need for biomarkers

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2 SUPPLEMENTARY METHODS

Supplementary Appendix Methods Section S1. Search terms for literature review.

Ovid Medline: January 2015-January 2025.

1. exp Stroke/187473
2. exp Ischaemic Stroke/15903
3. exp Haemorrhagic Stroke/772
4. exp Carotid Artery Thrombosis/3175
5. exp Carotid Stenosis/18849
6. exp Basal Ganglia Haemorrhage/407
7. exp "Intracranial Embolism and Thrombosis"/22971
8. exp Cerebral Haemorrhage/39378
9. exp Intracranial Haemorrhage, Hypertensive/481
10. Brain Ischaemia/65055
11. Intracranial Embolism/5823
12. Intracranial Thrombosis/3155
13. Ischaemic Attack, Transient/22378
14. Ischaemic stroke.tw./79007
15. ((brain$ or cerebr$ or intracerebral or parenchymal) adj5 (haemorrhage$ or hemorrhage$ or haematoma$ or hematoma$ or bleed)).tw./44491
16. 1 or 2 or 3 or 4 or 5 or6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15/ 329674
17. exp Magnetic Resonance Imaging/563956
18. exp Tomography, X-Ray Computed/515659
19. exp biomarkers/931593
20. exp Proteomics/77298
21. omics.mp./31181
22. exp ultrasonography, carotid arteries/7252
23. exp Positron-Emission Tomography/85649
24. exp Nuclear Medicine/7004
25. PET.mp./141740
26. exp Electroencephalography/178067
27. EEG.mp./102658
28. Exp Serum/70345
29. Exp plasma/33012
30. Exp amyloid beta-peptides/43860
31. exp High-Throughput Screening Assays/
32. exp metabolomics/32427
33. Inflammation/228640
34. Neuroimmunology.mp./1921
35. Exp natriuretic peptides/32916
36. 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32 or 33 or 34 or 35/ 2669610
37. *Atrial Fibrillation/65923
38. AFDAS.mp./37
39. atrial fibrillation detected after stroke.mp./31
40. (atrial fibrillation adj3 after stroke).tw./92

41. (recovery adj3 stroke).tw./7273
42. functional outcome.mp./33889
43. *Diagnosis/13425
44. aetiology.mp./57191
45. exp Prognosis/2034462
46. exp Recurrence/207212
47. exp disease progression/217098
48. neurological deterioration.mp./5230
49. (perih?ematomal adj5 ?edema).mp/323
50. (perilesional adj5 ?edema).mp./485
51. ((haematoma$ or hematoma$ or bleed) adj5 (oedema or edema)).tw./1132
52. ((haematoma$ or hematoma$) adj5 (expansion or growth)).tw./1455
53. (complications adj3 stroke).tw./3160
54. large vessel occlusion.mp./4431
55. LVO.mp./1785
56. (complications adj3 stroke).tw./3160
57. exp Cerebral Amyloid Angiopathy/2487
58. exp Arrhythmias, Cardiac/247476
59. stroke-heart syndrome.mp./35
60. 37 or 38 or 39 or 40 or 41 or 42 or 43 or 44 or 45 or 46 or 47 or 48 or 49 or 50 or 51 or 52 or 53 or 54 or 55 or 56 or 57 or 58 or 59 / 2473744
61. 16 and 36 and 60/18703
62. limit 61 to (english language and humans and yr="2015 -Current")/8263

Supplementary Appendix Methods Section S2: Expert Panel Selection

Working group (WG) leads were nominated by the lead authors for substantial contribution to the domain field, with attention to gender balance and disciplinary breadth. Leads then invited additional WG members to ensure multidisciplinary expertise (clinical, imaging, molecular), career-stage diversity, and institutional variety, while maintaining balanced gender representation.

To mitigate selection bias and enhance generalisability, each WG assembled a larger external panel with global representation (including under-represented regions). This panel independently voted on WG-proposed Delphi recommendations and minimum dataset items against pre-specified thresholds, providing an external check on relevance and clarity.

Supplementary Appendix Methods Section S3. Operating Procedure for Proposal of Key Priorities & Delphi Process.

Step 1: One of the WG leads shall take responsibility to co-ordinate the process.
Step 2: Each WG member reviews the available literature identified by systematic review.
Step 3: Each WG member can draft up to three key priorities and anonymously submit it to one of the 2 designated WG leads (or platform, e.g. SurveyMonkey, needs to be tracked).
Step 4: All the proposed priorities for consideration shall be compiled into a single file by the WG leads, synthesised, and circulated back to the WG (including internal reviewer) in advance of a pre-arranged conference call.
Step 5: At a pre-arranged online conference call (to be recorded), the WG (including internal reviewer) shall meet and discuss each draft priority in an open forum. The purpose of this exercise is to critically appraise each priority in terms of: 1. Content 2. Importance.
Step 6: After considering group feedback, each WG member can opt to re-submit revised draft priorities to the WG leads for the 1st round of anonymised voting. Alternatively, they may choose to withdraw their original proposal.
Step 7: The 1st round of anonymised Delphi voting shall include only WG members (including internal reviewer). This round will offer each WG member to provide a priority ranking score for each draft priority. Scoring will be ranked 1-10 based on importance.
Step 8: One of the nominated WG leads will order the top 3 ranked priorities.
Step 9: ST and JMc shall invite the external expert panel to participate in a 2nd Delphi Round.
Step 10: In the 2nd anonymised Delphi round of voting, the top ranked priorities will be circulated to all authors and the external expert panel. All WG members will be invited to vote on each key priority. External panel members shall vote on their area of expertise only. The participants will be asked to **vote to accept or reject each priority**. A 2:1 Majority is required for the recommendation to be included in the final manuscript.

Supplementary Appendix Methods Section S4. Operating Procedure for Proposal of Minimum Dataset & Delphi Process.

Step 1: One of the WG leads shall take responsibility to co-ordinate the process.
Step 2: Each WG member reviews the available literature identified by systematic review.
Step 3a: Each WG member can draft one or more data items for inclusion in a recommended dataset and anonymously submit it to one of the 2 designated WG leads.
Step 3b: The WG leads should review other section's data item proposals to identify potentially missing yet important items for their own section.
Step 4: All the proposed dataset items shall be compiled and sorted by section subheading into a single file by the WG lead and circulated to the WG members (including internal reviewer) in advance of a pre-arranged conference call.
Step 5: At a pre-arranged online conference call (to be recorded), the WG (including internal reviewer) shall meet and briefly appraise each dataset item in an open forum.
Step 6: After considering group feedback, each WG member can opt to re-submit revised dataset items to the WG for the 1st round of anonymised voting. Alternatively, they may choose to withdraw their original recommendation.
Step 7: The 1st round of anonymised Delphi voting shall include only WG members (including internal reviewer). This round will offer each WG member to provide a priority ranking score for each dataset item. Scoring will be ranked as follows:

- **Minimum dataset variables:** Data is essential for all studies relating to the subject and should be mandatorily included as a minimum dataset item.
- **Preferred dataset variables:** Data item is important to the subject and capturing it is recommended but may be precluded by practical limitations.
- **Optional dataset variables:** Data item is of interest, may be important for some specific scientific questions with a narrow or specialised focus.
- **Not important:** The data item is not relevant to the field.

Step 8: The nominated WG leads will order each dataset item after the 1st Delphi round and circulate the results to the WG. An item will be ranked according to a majority decision. If a majority is not reached the item will be put forward for another round of Delphi voting. The minimum dataset variables will be put forward for a validating 2nd Delphi voting together with the external expert panel. WG members from all sections will be invited to vote to accept or reject all minimal dataset items. External expert panel members shall vote to accept or reject each minimal dataset item on their area of expertise only. The WG lead can decide to call a second consultation round by videoconference if discussion is required.
(Optional) Step 9: All WG leads shall meet to discuss the overall results and make steps to present the results in a structured format: e.g. in tables separate per section or together in one table.

3 SUPPLEMENTARY TABLES

Supplemental Table 1: Key Research Priorities Results of Final Delphi Round

Section	Priority	Internal Delphi Votes				External Delphi Votes			
		Total	In Favor	Against	%	Total	In Favor	Against	%
Pre-hospital	To develop biomarkers for diagnosing stroke subtypes to enable treatments (e.g. blood pressure lowering in ICH) or triage (e.g. transfer of LVO stroke)	37	36	1	97.3	17	17	0	100
	To develop diagnostic biomarkers in cohorts representative of all emergencies medical services (EMS) stroke code activations.	37	32	5	86.5	17	17	0	100
	To develop biomarkers compatible with prehospital constraints, including portability, rapid turnaround time, and cost-effectiveness.	37	36	1	97.3	17	17	0	100
Ischaemic Stroke Progression	To develop biomarkers for guiding clinical decision-making in acute ischaemic stroke (e.g. for selecting patients for recanalisation strategies).	37	35	2	94.6	21	21	0	100
	To develop (treatment-responsive) biomarkers for predicting long-term clinical outcome.	37	35	2	94.6	21	19	2	90.5
	To develop biomarkers specific to the underlying pathophysiological mechanisms of stroke progression and recovery.	37	33	4	89.2	21	20	1	95.2
Atrial Cardiopathy	To develop biomarkers for detecting atrial cardiopathy.	36	31	5	86.1	18	18	0	100
	To develop biomarkers for detecting AF after stroke.	37	35	2	94.6	18	17	1	94.4
	To develop biomarkers for predicting MACE or cognitive impairment in individuals with atrial cardiopathy.	37	33	4	89.2	18	16	2	88.9
Atherosclerosis and Plaque Vulnerability	To develop biomarkers for detecting culprit atherosclerotic plaques after acute ischaemic stroke.	37	36	1	97.3	20	18	2	90
	To develop biomarkers for improving vascular risk stratification in individuals with atherosclerotic plaques of the brain-supplying arteries.	37	32	5	86.5	19	19	0	100
	To develop biomarkers to improve patient selection for stroke and cardiovascular prevention therapies in individuals with atherosclerotic	37	35	2	94.6	20	20	0	100

	plaques of the brain-supplying arteries								
ICH	To develop surrogate markers for predicting responses to acute interventions (e.g. (minimally invasive) surgery, acute blood pressure lowering, reversal of anticoagulation).	37	35	2	94.6	17	14	3	82.4
	To develop biomarkers of parenchymal or intraventricular hematoma expansion.	37	31	6	83.8	17	15	2	88.2
	To develop biomarkers of peri-haemorrhagic oedema evolution or hematoma resorption.	37	30	7	81.1	17	14	3	82.4
	To develop biomarkers for differentiating underlying causes of ich (i.e. macrovascular, microvascular, non-vascular)	37	35	2	94.6	17	16	1	94.1
	To develop biomarkers for predicting ICH recurrence, major adverse cardiovascular events, or cognitive impairment.	37	35	2	94.6	17	17	0	100

Supplemental Table 2: Prehospital Stroke: Minimum, Preferred, and Optional Dataset Recommendations.

Dataset	Minimal	Preferred	Optional
Demographics	• Age • Sex		• Ethnicity
Index event & Baseline function	• Interval from stroke onset to review • Stroke of known onset (yes/no) • Baseline (first measured) BP • Baseline glucose • Baseline NIHSS (total score)	• Prehospital scale score • Pre-morbid mRS • TOAST[1] classification	
Acute Interventions	• IVT • EVT • Blood pressure lowering agents administered (yes or no) in the hyperacute phase • Oral anticoagulant reversal agents administered in the hyperacute phase (specify agents used)		
Medical History	• AF	• Hypertension • Diabetes Mellitus • Prior history of coronary artery disease • AF on first ECG • AFDAS[2]	• Hyperlipidaemia • Smoking status • Alcohol intake (g/week)
Baseline Imaging†	• Brain imaging performed (CT/MRI) • Vascular imaging performed (CTA/MRA) • LVO • MeVO/DVO[3]	• Infarct volume • Haematoma volume • ASPECTS Score[4] • Estimated core volume on perfusion imaging[5]	
Baseline Laboratory Variables		• Haemoglobin • Troponin T or troponin I • eGFR • LDL	
Outcomes*	• Final diagnosis (TIA, IS, ICH, or stroke mimic) • Death (in-hospital)	• Functional outcome (mRS at 90 days) • Post-stroke neurological complications (malignant oedema, haemorrhagic transformation) • Post-stroke systemic complications (eg. post-stroke pneumonia, VTE, acute decompensated heart failure)	• Recurrent stroke during follow-up • MACE‡ during follow-up
Biomarker-specific data	• Duration of biomarker measurement		

The interval from index event to biomarker measurement is considered as a minimum item of information. †The imaging modality in all instances should be captured. *For each outcome, the time interval between index event and outcome should be reported. ‡ It is recommended that MACE should always at a minimum include the individual components of 3-point MACE: recurrent non-fatal stroke (ischaemic or ICH), non-fatal myocardial infarction, and cardiovascular death. AF, atrial fibrillation; AFDAS, atrial fibrillation detected after stroke; ASPECTS, Alberta Stroke Program Early CT Score; CT, computerised tomography; CTA, computerised tomography angiography; DVO, distal vessel occlusion; ECG, electrocardiography; eGFR, estimated glomerular filtration rate; EVT, endovascular therapy; IS, ischaemic stroke; IVT, intra-venous thrombolysis; LDL, low density lipoprotein; LVO, large vessel occlusion; MACE, major adverse cardiovascular and cerebrovascular events; MeVO, medium vessel occlusion; MRI, magnetic resonance imaging; mRS, modified Rankin scale; MRA, magnetic resonance angiography; NIHSS, National Institute for Health Stroke Scale; TIA, transient ischaemic attack; TOAST, The Trial of Org 10172 in Acute Stroke Treatment; VTE. Venous thromboembolism.

Supplemental Table 3: Prehospital Minimum Dataset Recommendations: Results of Final Delphi Round

Dataset	Internal Delphi				External Delphi Votes				
	Total	In Favor	Against	%	Total	In Favor	Against	%	Decision
Age	36	36	0	100	14	14	0	100	Include
Sex	36	36	0	100	14	14	0	100	Include
Interval from stroke onset to review	36	35	1	97.2	14	13	1	92.9	Include
Stroke of known onset (yes/no)	36	35	1	97.2	14	13	1	92.9	Include
Baseline (first measured) BP	36	36	0	100	14	12	2	71.4	Include
Baseline glucose	35	32	3	91.4	14	12	2	71.4	Include
Baseline NIHSS (total score)	36	33	3	91.7	13	13	0	100	Include
IVT	36	35	1	97.2	14	12	2	85.7	Include
EVT	36	35	1	97.2	14	12	2	85.7	Include
Blood pressure lowering agents administered in the hyperacute phase (yes or no)	36	33	3	91.7	14	14	0	100	Include
Oral anticoagulant reversal agents administered in the hyperacute phase (specify agents used)	36	33	3	91.7	14	14	0	100	Include
AF	36	35	1	97.2	14	13	1	92.9	Include
Brain imaging performed (CT/MRI)	36	34	2	94.4	12	12	0	100	Include
Vascular imaging performed (CTA/MRA)	36	31	5	86.1	12	12	0	100	Include
LVO	36	33	3	91.7	12	11	1	91.7	Include
MEVO/DVO	36	30	6	83.3	12	9	3	75	Include
Final diagnosis (Ischaemic stroke/ICH/mimic)	36	36	0	100	14	14	0	100	Include
Death (in-hospital)	36	30	6	83.3	14	10	4	71.4	Include
Duration of biomarker measurement	34	24	10	70.6	14	13	1	92.9	Include

Supplemental Table 4: Ischaemic Stroke Progression: Minimum, Preferred, and Optional Dataset Recommendations.

Dataset	Minimal	Preferred	Optional
Demographics	• Age • Sex • Ethnicity		
Index event, Acute Therapies & Baseline function	• Baseline NIHSS (including sub item detail) • Pre-morbid mRS • TOAST classification • IVT administered (and interval to treatment) • EVT performed (and interval to treatment)	• Interval from stroke onset • Acute interventions other than recanalisation (e.g. BP-lowering interventions, anticoagulant reversal) • Craniectomy performed • Independent vs dependent pre-stroke • Dementia prior to stroke • Socioeconomic status	• Blood pressure variability
Medical History	• AF • Smoking status • Prior history of coronary artery disease • Diabetes Mellitus • Hyperlipidaemia • Alcohol intake (g/week) • Hypertension • Previous ischaemic stroke • Previous TIA	• Height & weight (to calculate BMI) • Charlson Co-morbidity index[6] • Infection • Peripheral arterial disease	• Frailty status (e.g. Clinical Frailty Scale)[7] • Systolic BP • Diastolic BP
Medication Use (pre-event)		• Antiplatelet • Anticoagulant • Statin • Anti-hypertensive medication use	
Baseline Imaging†	• LVO • MeVO/DVO[3] • mTICI score (in patients undergoing EVT)	• ASPECTS[4] (at baseline)* • Collateral status on baseline imaging[8] • Core volume on perfusion imaging[5] • Mismatch volume on perfusion imaging[5] • White matter hyperintensities (Fazekas scale)[9]	• Penumbra volume on baseline perfusion imaging[5] • Clot imaging features • Brain network imaging biomarkers • Blood brain barrier integrity imaging markers • Venous drainage markers on imaging[10] • Perivascular spaces (number on MRI)[11] • Chronic lacunar infarcts[12] • Chronic non-lacunar infarcts[12] • CAA diagnostic criteria met using Boston[13] or Edinburgh[14] Criteria (+/- individual components e.g. CMBs, siderosis)

Baseline Laboratory. Electroencephalogram & histological Variables	• Glucose (baseline)	• eGFR • White blood cell count	• Thrombus histological findings (H&E, MSB) • Troponin T/I • BD-Tau • Procalcitonin • Neurofilament light chain • CRP (or High-sensitivity CRP) • cfDNA, DNAse activity, MPO histone complexes • Serum LDH • Glial Fibrillary Acidic Protein • Copeptin • Cortisol • BNP/NTproBNP • Electroencephalogram biomarkers
Outcomes‡	• Infarct volume at 24h • Functional outcome (mRS 90 days) • All-cause death	• NIHSS at 24 hours • NIHSS at 7 days or discharge • Dementia • Haemorrhagic transformation (ECASS or Heidelberg)[15]	• Post-stroke fatigue (using a standardised tool)[16,17] • Anxiety and depression (using a standardised tool)[17,18] • EQ-5D-5L (patient reported quality of life questionnaire)[19] • MACE** • Post-stroke neurological complications (malignant edema, haemorrhagic transformation) • Post-stroke systemic complications (eg. post-stroke pneumonia, VTE, acute decompensated heart failure)

The interval from index event to biomarker measurement is considered as a minimum item of information.†The imaging modality in all instances should be captured. *Although ASPECTS was developed on, and is best validated for, non-contrast CT, it could also be assessed on MRI if MRI is obtained as the primary baseline imaging modality. ‡ For each outcome, the time interval between index event and outcome should be reported. **It is recommended that MACE should always at a minimum include the individual components of 3-point MACE: recurrent non-fatal stroke (ischaemic or ICH), non-fatal myocardial infarction, and cardiovascular death. AF, atrial fibrillation; ASPECTS, Alberta Stroke Program Early CT Score; BMI, body mass index; BNP, brain natriuretic peptide; BP, blood pressure; CAA, cerebral amyloid angiopathy; cfDNA, cell-free deoxyribonucleic acid; CMBs, cerebral microbleeds; CRP, C-reactive protein; CT, computerised tomography; DNAse, deoxyribonuclease; DVO, distal vessel occlusion; eGFR, estimated glomerular filtration rate; LDH, lactate dehydrogenase; IVT, intra-venous thrombolysis; LVO, large vessel occlusion; MeVO, medium vessel occlusion; mTICI, modified Thrombolysis in Cerebral Infarction score; MPO, myeloperoxidase; MRI, magnetic resonance imaging; mRS, modified Rankin scale; NIHSS, National Institute for Health Stroke Scale; NTproBNP, N-terminal prohormone of brain natriuretic peptide; TIA, transient ischaemic attack; TOAST, The Trial of Org 10172 in Acute Stroke Treatment.

Supplemental Table 5: Ischaemic Stroke Progression Minimum Dataset Recommendations: Results of Final Delphi Round.

Dataset	Internal Delphi Votes				External Delphi Votes				Decision
	Total	In Favor	Against	%	Total	In Favor	Against	%	
Age	36	36	0	100	20	20	0	100	Include
Sex	36	36	0	100	19	18	1	94.7	Include
Ethnicity	36	28	8	77.8	19	16	3	84.2	Include
Baseline NIHSS (including sub item detail)	35	32	3	91.4	20	20	0	100	Include
Pre-morbid mRS	34	27	7	79.4	19	17	2	89.5	Include
TOAST classification	34	32	2	94.1	20	20	0	100	Include
IVT	35	35	0	100	20	20	0	100	Include
EVT	35	35	0	100	20	20	0	100	Include
AF	35	35	0	100	20	20	0	100	Include
Coronary artery disease	35	30	5	85.7	20	18	2	90	Include
Diabetes Mellitus	35	35	0	100	20	20	0	100	Include
Hyperlipidaemia	35	33	2	94.3	19	16	3	84.2	Include
Previous ischaemic stroke	35	34	1	97.1	20	19	1	95	Include
Previous TIA	35	34	1	97.1	20	19	1	95	Include
Hypertension	35	35	0	100	20	19	1	95	Include
Smoking status	35	34	1	97.1	20	18	2	90	Include
NIHSS at 24h	34	32	2	94.1	20	18	2	90	Include
Occlusion site on baseline imaging	35	34	1	97.1	20	19	1	95	Include
mTICI score (in patients undergoing EVT)	35	30	5	85.7	20	19	1	95	Include
Glucose (baseline)	34	29	5	85.3	20	17	3	85	Include
Infarct volume at 24h	34	26	8	76.5	20	17	3	85	Include
mRS 7 days	34	11	23	32.4	20	9	11	45	Exclude
mRS 90 days	35	34	1	97.1	19	18	1	94.7	Include
All-cause death	35	35	0	100	20	19	1	95	Include
Interval from onset to EVT/IVT	35	35	0	100	20	17	3	85	Include

Supplemental Table 6: Cardiopathy: Minimum, Preferred, and Optional Dataset Recommendations.

Dataset	Minimal	Preferred	Optional
Demographics	• Age • Sex	• Ethnicity • Education	
Index event and stroke severity	• Index event type (Ischaemic stroke, TIA, or ICH) • Baseline NIHSS (total score) • EVT • ABCD2 score (TIAs only)	• TOAST[1] (or SSS-TOAST[20]) classification • ESUS[12] • IVT	
Pre-morbid functional status	• Pre-morbid mRS	• Independent vs dependent • Dementia prior to stroke	
Medical History	• AF on ECG on admission • Documented clinical history of AF known **prior** to stroke • New diagnosis of AF since stroke (AFDAS)[2] • Hyperlipidaemia • Hypertension • Diabetes mellitus • Prior ischaemic stroke • Prior ICH • Prior TIA • Prior history of coronary artery disease • Chronic kidney disease • Prior history of peripheral arterial disease	• Obstructive sleep apnoea • AF subtype (paroxysmal, persistent, or permanent)[20] • Smoking status • Alcohol (units per week) • Heart failure • Aortic valve disease • Mitral valve disease • Hyperthyroidism (history or by lab values) • Heart rate • Systolic BP • Diastolic BP • Previous relevant clinical bleeding • CHA2DS2-VASc • ABC-stroke score • Height and weight (to calculate BMI)	• HAS-BLED score • Charlson Co-morbidity Index[7] • Frailty status (e.g. Clinical Frailty Scale) • Prosthetic heart valve (and type)
Medication Use (pre-event)	• Antiplatelet • Anticoagulant • Statin • Anti-hypertensive medication use	• Any lipid-lowering drug • ACE inhibitor or ARB • Calcium channel blocker • Thiazide diuretic • Loop diuretic • Mineralocorticoid receptor antagonist • Beta-blocker • Anti-arrhythmics • Neprilysin inhibitors (e.g. Sacubitril) • Anticoagulant type (if applicable) • Anticoagulant dose (if applicable) • INR at time of stroke (if taking vitamin K antagonist)	
Baseline Neuroimaging†		• Number of (sub)-acute infarcts • Location of (sub)-acute infarcts (e.g. cortical, subcortical, watershed etc) • Size of (sub)-acute infarcts (diameter or volume) • Evidence of insular infarction Early infarct signs (e.g. ASPECTS) • White matter hyperintensities (Fazekas scale)[9]	• Number of established infarcts • Chronic lacunar infarcts[12] • Chronic non-lacunar infarcts[12] • Brain volume (WMV, GMV) • Core volume (perfusion imaging)[5] • Penumbra volume (perfusion imaging)[5] • Mismatch volume (perfusion imaging) • Mismatch ratio (perfusion imaging) • SO-EndAIF

		• CAA diagnostic criteria met using Boston[13] or Edinburgh[14] Criteria (+/- individual components eg CMBs, siderosis) • White matter hyperintensity volume	
Baseline Vascular imaging	• LVO	• Culprit vessel stenosis • MeVO/DVO[4] • Arterial dissection • Intra-luminal thrombus • Suspected culprit plaque	• Location of suspected culprit plaque • Plaque-RADS score (and individual components intra-plaque haemorrhage, ulceration etc)[21] • IMT
Cardiac Evaluation	• 12-lead ECG performed • Transthoracic echocardiography (TTE) performed • LA thrombus • PFO	• Cardiac monitoring modality for AF detection. • Duration of cardiac monitoring for AF detection • Trans-oesophageal echocardiography (TOE) • Cardiac MRI • LA diameter • LA volume • LA volume index • LA emptying fraction (passive/active/total) • LA fibrosis (Utah stage of LA LGE) • Atrial septal aneurysm • Mitral stenosis • Aortic stenosis • LV ejection fraction • LV thrombus • ECG waveform • LV WMA • P-wave duration • LV apical hypokinesis • Heart rate • LVH (by ECG or echocardiography) • AIB	• Cardiac CT • LA Strain • LA strain rate • LA morphology • LA spontaneous echo contrast • LA fibroelastoma/myoxma • LAA shape/morphology • LAA flow velocity • LAA thrombus • LAA orifice area • LAA volume • LAA trabeculation • LAA fibrosis • LAA spontaneous echo contrast • Valvular vegetations • Endocarditis • LV mass index • LVDd • LVDs • LV longitudinal strain • e’ • LV diastolic function (E/e’) • IV septal wall thickness • Posterior wall thickness • Aortic plaque thickness • Doppler peak E-wave velocity • Doppler A-wave velocity time integral • PTFV1 • P-wave area • PR interval • QTc • P wave axis • P wave axis
Baseline Laboratory Variables	• eGFR • LDL • NT-proBNP or BNP • Troponin T or troponin-I	• Creatinine • HDL • Total cholesterol • Triglycerides • MR-proANP or ANP or NT ANP • LP(a) • CRP or high-sensitivity CRP* • D-dimer	• Factor VIII • Fibrinogen • Cystatin C • GDF-15* • Copeptin* • ApoA1 • ApoB • IL-16* • D-dimer • Anti-thrombin-III • IL-6 • NFL* • BMP10 • Haemoglobin • Creatinine clearance • VCAM-1* • Midregional proadrenomedullin*

Outcomes‡	• AF • Recurrent ischaemic stroke • ICH • Myocardial infarction[24] • MACE* • Cardiovascular death[23] • All-cause death	• Diagnostic modality for AF detection • AF burden[22] • Silent brain infarcts • Systemic embolism • Acute decompensated HF[23] • Death due to HF[23] • Sudden cardiac death[23] • Functional outcome (mRS at 90 days) • Dementia • Major bleeding (using a standardised definition) • TIA	
The interval from index event to biomarker measurement is considered a minimum dataset item.* These items could consider more for prognosis than aetiology. ‡ For each outcome, the time interval between index event and outcome should be reported. It is recommended that MACE should always at a minimum include the individual components of recurrent non-fatal stroke (ischaemic or ICH), non-fatal myocardial infarction, and cardiovascular death. Information regarding the imaging modality used should always be collected. AF, atrial fibrillation; AFDAS, atrial fibrillation detected after stroke; AIB, Apparent Integrated Backscatter; ANP, atrial natriuretic peptide; BMI, body mass index; BMP-10, Bone morphogenetic protein 1; BNP, brain natriuretic peptide; CAA, cerebral amyloid angiopathy; CABG, coronary artery bypass graft; CMBs, cerebral microbleeds; CRP, C-reactive protein; CT, computerised tomography; DVO, distal vessel occlusion; ECG, electrocardiography; eGFR, estimated glomerular filtration rate; e', tissue doppler-derived early diastolic velocity of the mitral annulus; ESUS, embolic stroke of undetermined source; EVT, endovascular thrombectomy; GDF-15, growth differentiation factor-15; GMV, grey-matter volume; HDL, high-density lipoprotein; HF, heart failure; ICH, intra-cerebral haemorrhage; IL-6, interleukin-6; IL-16, interleukin-16; IMT, intimal media thickness; IS, ischaemic stroke; IVT, intravenous thrombolysis; LA, left atrial; LAA, left atrial appendage; LDL, low density lipoprotein; LGE, late gadolinium enhancement; LP(a), lipoprotein (a); LV, left ventricle; LVDd, left ventricular diastolic dysfunction; LVH, left ventricular hypertrophy; LVO, large vessel occlusion; MACE, major adverse cardiovascular and cerebrovascular events; MEVO, medium vessel occlusion; MRA, magnetic resonance angiography; MRI, magnetic resonance imaging; MR-proANP, mid-regional pro-atrial natriuretic peptide; mRS, modified Rankin scale; NFL, neurofilament light chain; NIHSS, National Institute for Health Stroke Scale; NTproBNP, N-terminal prohormone of brain natriuretic peptide PFO, patent foramen ovale; PWTV1, p-wave terminal force in lead V1; SO-EndAIF, Scan Onset to End of Arterial Input Function. Reflects cardiac output efficiency; SSS-TOAST, Stop Stroke Study TOAST; TIA, transient ischaemic attack; TOAST, The Trial of Org 10172 in Acute Stroke Treatment; TOE, trans-oesophageal echocardiography; TTE, transthoracic echocardiography; VCAM-1, vascular cell adhesion molecule 1; WMV, white matter volume. † The imaging modality in all instances should be captured.			

Supplemental Table 7: Cardiopathy Minimum Dataset Recommendations: Results of Final Delphi Round

Dataset	Internal Delphi Votes				External Delphi Votes				Decision
	Total	In Favor	Against	%	Total	In Favor	Against	%	
Age	32	32	0	100	18	18	0	100	Include
Sex	32	32	0	100	18	18	0	100	Include
Index event type (Ischaemic stroke, TIA, or ICH)	32	32	0	100	18	18	0	100	Include
Baseline NIHSS (total score)	32	31	1	96.9	18	18	0	100	Include
ABCD2 score (TIAs only)	31	21	10	67.7	18	13	5	72.2	Include
Pre-morbid mRS	31	27	4	87.1	18	12	6	66.6	Include
IVT	32	31	1	96.9	18	11	7	61.1	Exclude
EVT	32	31	1	96.9	18	12	6	66.6	Include
Hypertension	32	32	0	100	18	18	0	100	Include
AF known prior to stroke	31	31	0	100	18	18	0	100	Include
New AF diagnosed after the stroke on baseline ECG	31	29	2	93.6	18	16	2	88.9	Include
New AF detected after stroke (AFDAS), on post-stroke cardiac monitoring (during treatment episode for index event)	31	29	2	93.6	18	18	0	100	Include
Coronary artery disease	32	31	1	96.9	18	17	1	94.4	Include
Diabetes mellitus	32	32	0	100	18	17	1	94.4	Include
Hyperlipidaemia	32	31	1	96.9	18	17	1	94.4	Include
Peripheral arterial disease	31	28	3	90.3	18	12	6	66.7	Include
Chronic kidney disease	32	29	3	90.6	18	17	1	94.4	Include
Prior ischaemic stroke	32	31	1	96.9	18	18	0	100	Include
Prior ICH	32	29	3	90.6	18	16	2	88.9	Include
Prior TIA	32	29	3	90.6	18	15	3	83.3	Include
Antiplatelet	32	32	0	100	18	16	2	88.9	Include
Anticoagulant	32	29	3	90.6	18	17	1	94.4	Include
Statin	32	29	3	90.6	18	14	4	77.8	Include
Anti-hypertensive medication use	32	29	3	90.6	18	15	3	83.3	Include
LVO	31	28	3	90.3	18	15	3	83.3	Include
12-lead ECG	31	29	2	93.4	18	18	0	100	Include
Transthoracic echocardiography (TTE)	32	29	3	90.6	18	17	1	94.4	Include
LA thrombus	32	31	1	96.9	18	17	1	94.4	Include
PFO	31	29	2	93.6	18	15	3	83.3	Include
Glucose*	32	28	4	87.5	18	11	7	61.1	Exclude
eGFR	31	30	1	96.8	18	16	2	88.9	Include
LDL	32	31	1	96.9	17	13	4	76.5	Include
NT-proBNP or BNP	32	28	4	87.5	18	16	2	88.9	Include
Troponin T or troponin-I	32	25	7	78.1	18	14	4	77.8	Include
AFDAS during follow-up	31	30	1	96.8	18	18	0	100	Include
Recurrent ischaemic stroke	31	31	0	100	18	18	0	100	Include
TIA	31	28	3	90.3	18	11	7	61.1	Exclude
ICH	31	29	2	93.6	18	18	0	100	Include
Myocardial infarction	31	31	0	100	18	18	0	100	Include
MACE	31	30	1	96.8	18	18	0	100	Include
Cardiovascular death	31	29	2	93.6	17	16	1	94.1	Include
All-cause death	31	30	1	96.8	18	17	1	94.4	Include

Supplemental Table 8: Atherosclerosis and Plaque Vulnerability: Minimum, Preferred, and Optional Dataset Recommendations.

Dataset	Minimal	Preferred	Optional
Demographics	• Age • Sex • Ethnicity		
Index event and stroke severity	• Index event type (Ischaemic stroke, TIA, or ICH) • Interval from stroke onset • NIHSS (total score) at presentation • IVT • EVT • Earlier event in the same territory (within 6 months of the presenting event) and approximate interval since earlier event. • TOAST Criteria[1]	• ESUS[12]	
Pre-morbid functional and cognitive status	• Pre-stroke mRS	• Dementia prior to stroke	
Medical History	• Hypertension • Diabetes mellitus • Prior history of coronary artery disease • Heart Failure • Smoking status • AF on ECG on admission • Documented clinical history of AF known **prior** to stroke • New diagnosis of AF since stroke (AFDAS)[2] • Hyperlipidaemia • Height & weight (to calculate BMI) • Prior history of peripheral arterial disease (including prior carotid revascularisation) • Previous ischaemic stroke • Previous TIA • Previous ICH • Alcohol consumption (grammes/week) • Active solid organ malignancy	• Obstructive sleep apnoea • AF subtype (paroxysmal, sustained, or permanent)[20]	• Documented angiographic evidence of coronary artery disease without prior myocardial infarction or revascularisation • Frailty status (e.g. Clinical Frailty Scale)[7] • Charlson Co-morbidity Index[6] • Systolic BP • Diastolic BP
Medication Use (pre-event & discharge)	• Antiplatelets • Anticoagulants • Statin • Anti-hypertensive medication use • Other lipid-lowering therapy		• ACE inhibitor or ARB at discharge • Calcium channel blocker • Thiazide diuretics • Anti-arrhythmics at discharge

Baseline Neuroimaging	• MRI Performed • Imaging modality used to quantify neuroimaging data • Acute infarct on imaging • Acute infarct territorial pattern (e.g. none, anterior circulation, posterior circulation; multiple territories) • Laterality of acute infarct (e.g. left, right, bilateral) • Presence of chronic non-lacunar infarct[12] • Presence of chronic lacunar infarct[12]	• Number of acute infarcts (e.g. single, multiple) • Location of Acute infarcts (e.g. cortical, subcortical, watershed etc) • Burden of chronic lacunar infarcts (e.g. single, or multiple) • CAA diagnostic criteria met using Boston[13] or Edinburgh[14] Criteria (+/- individual components e.g. CMBs, siderosis) • White matter hyperintensities (Fazekas scale)[9]	• Acute infarct maximal diameter (of largest infarct) • Acute infarct volume • Evidence of acute insular infarction • Chronic non-lacunar infarction burden (e.g. single, or multiple) • Distribution of chronic non-lacunar infarcts (e.g. distribution of a single or multiple vascular territories) • Presence of chronic non-lacunar infarct in distribution of the suspected culprit plaque. • Core infarct volume (on perfusion imaging)[5] • Penumbra volume • Mismatch volume • Mismatch ratio • Imaging software was used for CTP
Aortic Arch Imaging	• Imaging modality used to image aortic arch	• Aortic arch plaque grade[21]	• Aortic arch calcification (pattern and severity)
Extra-cranial carotid and vertebral Imaging†	• Imaging modality used to image the extra-cranial ICA • Maximal wall thickness of the extra-cranial ICA plaque • Luminal stenosis of the extra-cranial ICA plaque • Extra-cranial vertebral artery (V1-V3 segments) luminal stenosis (%)	• Presence of suspected culprit plaque in the extra-cranial circulation (other than ICA) & degree of stenosis (e.g. subclavian, brachiocephalic, common carotid artery) • Plaque-RADS score (and individual components intra-plaque haemorrhage, ulceration etc)[22]	• Extra-cranial vertebral artery (V1-V3 segments) maximal wall thickness (MWT)
Intra-cranial Vascular Imaging†	• Imaging modality to evaluate intra-cranial circulation • Presence of a suspected culprit plaque (irrespective of stenosis severity) in the intra-cranial circulation. • Location of suspected culprit intra-cranial plaque • Degree of stenosis of suspected culprit plaque		• Evidence of intra-cranial culprit plaque enhancement after gadolinium (if performed)
Baseline laboratory investigations	• eGFR • CRP or hsCRP • HbA1c • Total cholesterol • LDL • HDL • Triglycerides • Interval from stroke to sample measurement	• IL-6 • Lp(a) • Haemoglobin • Troponin T or troponin I • NTproBNP	

Cardiac evaluation	• Echocardiographic imaging performed (& imaging modality)	• LA thrombus identified • LA Diameter • LA Volume (mls) • LA Volume Index (mls/m^2) • LV hypertrophy • LV ejection fraction • LV thrombus • PFO presence and Shunt size • Inter-atrial septal aneurysm • LV Apical akinesis	
Risk Factor Control and Medication Use During Follow-Up	• Anti-platelets • Statins • Any other lipid-lowering therapies • Anti-hypertensives • Oral anticoagulants (specify) • Glucose-lowering medications	• LDL • HbA1c • CRP (or hsCRP)	• Clinic Blood Pressure reading • 24hr average BP reading
Vascular Imaging During Follow-Up†		• Repeat imaging of extra-cranial arteries performed • Imaging modality used on repeat imaging of extra-cranial arteries. • ICA luminal stenosis measurement • Repeat imaging of the intra-cranial arteries performed. • Imaging modality used for repeat imaging of intra-cranial arteries • Degree of stenosis of suspected culprit plaque on follow-up intra-cranial vascular imaging	
Cardiac Rhythm Monitoring During Follow-Up	• Cardiac rhythm performed post-discharge • New AF detected since admission ECG (AFDAS)	• Cardiac monitoring modality used • Total duration of cardiac monitoring from index stroke • AFDAS subtype (paroxysmal or non-paroxysmal)	• The longest single duration of AF detected on cardiac monitoring • AFDAS burden (total duration of AF divided by the total duration of monitoring)[23]
Outcomes*	• Recurrent ischaemic stroke • Recurrent stroke within the territory of the culprit plaque that caused the index stroke • TIA • ICH • Myocardial infarction[24] • MACE‡ • Cardiovascular death[25] • All-cause death • Non-fatal (resuscitated) cardiac arrest • Sudden cardiac death[25] • Functional Outcome (mRS) at 90 days • Carotid revascularisation since index stroke • Carotid revascularisation procedure type (and side)	• Disabling recurrent stroke • TOAST subtype of recurrent ischaemic stroke. • Cause of death (if not due to cardiovascular cause) • PCI or CABG during follow-up. • EQ-5D-5L[19] (patient reported quality of life questionnaire) • Peripheral vascular intervention (specify) • Hospitalisation for unstable angina[25]	• Hospitalisation for decompensated HF[25] • Dementia

The interval from index event to biomarker measurement is considered a minimum dataset item.† Information regarding the imaging modality used should always be collected. * For each outcome, the time interval between index event and outcome should be reported. ‡ It is recommended that MACE should always at a minimum include the individual components of recurrent non-fatal stroke (ischaemic or ICH), non-fatal myocardial infarction, and cardiovascular death. ACE, angiotensin converting enzyme; AF, atrial fibrillation; AFDAS, Atrial fibrillation detected after stroke; ARB, angiotensin-II receptor blocker; BMI, body mass index; BNP, brain natriuretic peptide; BP, blood pressure; CAA, cerebral amyloid angiopathy; CABG, coronary artery bypass graft; CMBs, cerebral microbleeds; CRP, C-reactive protein; CT, computerised tomography; CTP, computerised tomography perfusion imaging; ECG, electrocardiography; ESUS, embolic stroke of undetermined significance; EVT, endovascular thrombectomy; eGFR, estimated glomerular filtration rate; HbA1c, haemoglobin A1c; HDL, high-density lipoprotein; HF, heart failure; ICA, internal carotid artery; ICH, intra-cerebral haemorrhage; IL-6, interleukin-6; LA, left atrium; LDL, low density lipoprotein; LP(a), lipoprotein (a); LV, left ventricle; LVH, left ventricular hypertrophy; MACE, major adverse cardiovascular and cerebrovascular events; MRI, magnetic resonance imaging; mRS, modified Rankin scale; NIHSS, National Institute for Health Stroke Scale; NTproBNP, N-terminal prohormone of brain natriuretic peptide; PCI, percutaneous coronary intervention; TIA, transient ischaemic attack; TOAST, The Trial of Org 10172 in Acute Stroke Treatment.

Supplemental Table 9: Atherosclerosis and Plaque Vulnerability Minimum Dataset Recommendations: Results of Final Delphi Round.

Dataset	Internal Delphi Votes				External Delphi Votes				Decision
	Total	In Favor	Against	%	Total	In Favor	Against	%	
Age	35	35	0	100	20	20	0	100	Include
Sex	35	35	0	100	20	20	0	100	Include
Ethnicity	35	31	4	88.6	20	18	2	90	Include
Index event subtype	35	34	1	97.1	20	19	1	95	Include
Interval from stroke onset	35	32	3	91.4	20	18	2	90	Include
NIHSS (total score) at presentation	34	33	1	97.1	20	18	2	90	Include
Intra-venous thrombolysis administered	34	32	2	94.1	20	18	2	90	Include
EVT performed	34	32	2	94.1	20	18	2	90	Include
Earlier event in the same territory (within 6 months of the presenting event) and approximate interval since earlier event.	35	31	4	88.6	20	18	2	90	Include
TOAST Criteria	35	34	1	97.1	20	20	0	100	Include
Pre-stroke mRS	33	29	4	87.9	20	18	2	90	Include
Prior history of hypertension	35	35	0	100	19	19	0	100	Include
History of diabetes mellitus	35	35	0	100	20	20	0	100	Include
Prior coronary artery disease	35	34	1	97.1	20	19	1	95	Include
Heart failure	35	27	8	77.1	20	15	5	75	Include
AF on ECG on admission	35	32	3	91.4	19	17	2	89.5	Include
Documented clinical history of AF known prior to stroke	35	33	2	94.3	20	20	0	100	Include
AFDAS detected on post-stroke cardiac monitoring, identified during treatment episode for index event	35	34	1	97.1	20	20	0	100	Include
Is the AF paroxysmal (defined as spontaneous termination within 7 days) or non-paroxysmal (persistent or permanent)	35	21	14	60	20	16	4	80	Exclude
Hyperlipidaemia	35	35	0	100	20	19	1	95	Include
Height and weight (used to derive BMI)	35	31	4	88.6	20	19	1	95	Include
Prior history of peripheral arterial disease	35	32	3	91.4	20	18	2	90	Include
Prior history of ischaemic stroke/TIA	35	34	1	97.1	20	20	0	100	Include
Prior history of spontaneous ICH	34	30	4	88.2	20	18	2	90	Include
Alcohol consumption (grammes/week)	34	29	5	85.3	20	16	4	80	Include
Active solid organ malignancy	34	25	9	73.5	20	18	2	90	Include
MRI Performed	34	30	4	88.2	20	20	0	100	Include
Acute infarct on imaging	35	34	1	97.1	20	20	0	100	Include
Acute infarct territorial pattern (e.g. none, anterior circulation, posterior circulation; multiple territories)	34	32	2	94.1	20	20	0	100	Include
Laterality of acute infarct (e.g. left, right, bilateral)	34	30	4	88.2	20	18	2	90	Include
Presence of chronic non-lacunar infarct	34	28	6	82.4	20	18	2	90	Include
Presence of chronic lacunar infarct	35	28	7	80	20	17	3	85	Include
Imaging modality used to image aortic arch	34	30	4	88.2	20	18	2	90	Include
Imaging modality used to image the extra-cranial ICA?	35	34	1	97.1	20	20	0	100	Include
Maximal wall thickness of the extra-cranial ICA plaque	35	27	8	77.1	20	15	5	75	Include

Luminal stenosis of the extra-cranial ICA plaque	35	32	3	91.4	20	20	0	100	Include
Identify other individual components of the Plaque-RADS score (e.g. intra-plaque haemorrhage, ulceration etc)	33	21	12	63.6	20	16	4	80	Exclude
Extra-cranial vertebral artery (V1-V3 segments) luminal stenosis (%)	35	28	7	80	20	19	1	95	Include
Imaging modality to evaluate intra-cranial circulation	35	34	1	97.1	20	20	0	100	Include
Presence of a suspected culprit plaque (irrespective of stenosis severity) in the intra-cranial circulation.	35	33	2	94.3	20	18	2	90	Include
Location of suspected culprit intra-cranial plaque	35	32	3	91.4	20	20	0	100	Include
Luminal stenosis severity of intra-cranial culprit plaque	35	31	4	88.6	20	18	2	90	Include
eGFR	34	30	4	88.2	20	19	1	95	Include
CRP or hsCRP	34	27	7	79.4	20	20	0	100	Include
HbA1c	35	32	3	91.4	20	18	2	90	Include
Total cholesterol	35	27	8	77.1	20	18	2	90	Include
LDL	35	33	2	94.3	20	20	0	100	Include
HDL	35	26	9	74.3	20	19	1	95	Include
Triglycerides	35	26	9	74.3	20	17	3	85	Include
Echocardiographic imaging performed (& imaging modality)	35	28	7	80	20	18	2	90	Include
PFO presence	34	22	12	64.7	20	15	5	75	Exclude
Anti-platelets	35	35	0	100	20	20	0	100	Include
Oral anticoagulants	35	35	0	100	20	20	0	100	Include
Statins	35	35	0	100	20	20	0	100	Include
Any other lipid-lowering therapies	35	34	1	97.1	20	19	1	95	Include
Anti-hypertensives	34	34	0	100	20	20	0	100	Include
Glucose-lowering medications	35	33	2	94.3	20	19	1	95	Include
Cardiac rhythm monitoring performed post-discharge	34	29	5	85.3	20	18	2	90	Include
AFDAS detected during follow-up	34	30	4	88.2	20	18	2	90	Include
Recurrent ischaemic stroke	35	34	1	97.1	20	20	0	100	Include
Recurrent stroke within the territory of the culprit plaque that caused the index stroke	35	31	4	88.6	20	20	0	100	Include
TIA	35	27	8	77.1	20	18	2	90	Include
ICH	35	32	3	91.4	20	20	0	100	Include
Myocardial infarction	35	35	0	100	20	20	0	100	Include
MACE	35	32	3	91.4	20	20	0	100	Include
Cardiovascular death	35	32	3	91.4	20	19	1	95	Include
All-cause death	35	32	3	91.4	20	18	2	90	Include
Non-fatal (resuscitated) cardiac arrest	33	23	10	69.7	20	18	2	90	Include
Sudden cardiac death	33	26	7	78.8	20	18	2	90	Include
Hospitalisation for unstable angina	34	20	14	58.8	20	15	5	75	Exclude
Functional Outcome (mRS) at 90 days	35	30	5	80	20	19	1	95	Include
Carotid revascularisation since index stroke	35	35	0	100	20	18	2	90	Include
Carotid revascularisation procedure type (and side)	35	27	8	77.1	20	18	2	90	Include

Supplemental Table 10: ICH, Diagnosis and Aetiology: Minimum, Preferred, and Optional Dataset Recommendations.

Dataset	Minimal	Preferred	Optional
Demographics	• Age • Sex	• Ethnicity	
Index event, Acute Therapies & Baseline function	• Interval from onset to admission • Admission GCS	• Pre-morbid mRS • Baseline NIHSS • Dementia prior to stroke	• Temperature on admission • Systolic BP • Diastolic BP • Any acute surgical intervention • Type of acute surgical intervention • Osmotic therapy (and subtype) • Haemostatic therapy (and subtype) • Acute BP lowering therapy • Interval from stroke onset to initiation of BP-lowering therapy • Guideline target BP achieved <1 hour • Interval from initiation of BP-lowering therapy to guideline target BP • SBP reduction >70mmHg <1 hour • Anticoagulant reversal
Medical History	• Diabetes Mellitus • Previous ICH • Hypertension	• Prior history of coronary artery disease • Prior ischaemic stroke • Smoking status • Hyperlipidaemia • Height & weight (to calculate BMI)	• AF
Medication Use (pre-event)	• Antiplatelet • Anticoagulant	• Statin	
Baseline Imaging†	• Interval from onset to imaging • Interval from onset to subsequent scan(s) • ICH location (deep supra-tentorial, lobar supra-tentorial, or infra-tentorial) • ICH Volume on initial and subsequent imaging • IVH	• Multiple ICH • CHARTS[26] location • Radiological markers of haematoma expansion (e.g. Spot sign[27]) • Haematoma shape[28] (round, irregular) • Graeb Score[29] for IVH volume • Perihaematomal oedema volume on diagnostic scan • Perihaematomal oedema volume on subsequent brain scan(s) • Subarachnoid haemorrhage on diagnostic scan • Subdural haemorrhage on diagnostic scan • CAA diagnostic criteria met using Boston[13] or Edinburgh[14] Criteria (+/- individual components eg CMBs, siderosis) • White matter hyper intensities (Fazekas scale)[9]	

Outcomes*			• mRS • Recurrent ICH • Ischaemic stroke • Myocardial infarction[24] • MACE‡ • All-cause death • Cardiovascular death[25] • Non-cardiovascular death • Dementia • Cognitive impairment • Other neuropsychiatric symptoms (e.g. depression and anxiety using a standardised tool such as HADS[18,25])
The interval from index event to biomarker measurement is considered a minimum dataset item.† Information regarding the imaging modality used should always be collected. * For each outcome, the time interval between index event and outcome should be reported. ‡ It is recommended that MACE should always at a minimum include the individual components of recurrent non-fatal stroke (ischaemic or ICH), non-fatal myocardial infarction, and cardiovascular death. AF, atrial fibrillation; BMI, body mass index; BP, blood pressure; [26], cerebral amyloid angiopathy; CHARTS, Cerebral Haemorrhage Anatomical RaTing inStrument; CMBs, cerebral microbleeds; CT, computerised tomography; GCS, Glasgow Coma Scale; HADS, Hospital Anxiety and Depression Scale; ICH, intra-cerebral haemorrhage; IVH, intra-ventricular haemorrhage; MACE, major adverse cardiovascular and cerebrovascular events; MRI, magnetic resonance imaging; mRS, modified Rankin scale; NIHSS, National Institute for Health Stroke Scale; SBP, systolic blood pressure.			

Supplemental Table 11: ICH Progression: Minimum, Preferred, and Optional Dataset Recommendations.

Dataset	Minimal	Preferred	Optional
Demographics	• Age • Sex	• Ethnicity	
Index event, Acute Therapies & Baseline function	• Interval from onset to admission • Admission GCS • Any acute surgical intervention • Type of acute surgical intervention • Haemostatic therapy (and subtype) • Acute BP lowering therapy • Anticoagulant reversal • Osmotic therapy (and subtype)	• Pre-morbid mRS • Baseline NIHSS • Pre-stroke dementia	• Temperature on admission • Systolic BP • Diastolic BP • Interval from stroke onset to initiation of BP-lowering therapy • Interval from initiation of BP-lowering therapy to guideline target BP • Guideline target BP achieved <1 hour • SBP reduction >70mmHg <1 hour
Medical History	• Diabetes Mellitus • Previous ICH • Hypertension	• Prior ischaemic stroke • Smoking status • Hyperlipidaemia • Height & weight (to calculate BMI) • Prior history of coronary artery disease	• AF • Prior ischaemic stroke
Medication Use (pre-event)	• Antiplatelet • Anticoagulant	• Statin	
Baseline Imaging†	• Interval from onset to imaging • Interval from onset to subsequent scan(s) • ICH location • ICH Volume on initial and subsequent imaging • IVH	• Multiple ICH • CHARTS location • Radiological markers of haematoma expansion (e.g. Spot sign) • Haematoma shape (irregular, spheroid) • GRAEB Score • Perihaematomal oedema volume on diagnostic scan • Perihaematomal oedema volume on subsequent brain scan(s) • Subarachnoid haemorrhage on diagnostic scan • Subdural haemorrhage on diagnostic scan • CAA diagnostic criteria met using Boston[26] or Edinburgh[14] Criteria (+/- individual components e.g. CMBs, siderosis)	

Outcomes*	• Functional outcome (mRS)	• Recurrent ICH • Ischaemic stroke • Myocardial infarction • All-cause death • Cardiovascular death • MACE‡ • Non-cardiovascular death • Dementia • Cognitive impairment • Other neuropsychiatric symptoms (e.g. depression and anxiety)	
The interval from index event to biomarker measurement is considered a minimum dataset item. † Information regarding the imaging modality used should always be collected. * For each outcome, the time interval between index event and outcome should be reported. ‡ It is recommended that MACE should always at a minimum include the individual components of recurrent non-fatal stroke (ischaemic or ICH), non-fatal myocardial infarction, and cardiovascular death. AF, atrial fibrillation; BP, blood pressure; CAA, cerebral amyloid angiopathy; CHARTS, Cerebral Haemorrhage Anatomical RaTing inStrument;; CMBs, cerebral microbleeds; CT, computerised tomography; GCS, Glasgow Coma Scale; ICH, intra-cerebral haemorrhage; IVH, intra-ventricular haemorrhage; MACE, major adverse cardiovascular and cerebrovascular events; MRI, magnetic resonance imaging; mRS, modified Rankin scale; NIHSS, National Institute for Health Stroke Scale.			

Supplemental Table 12: ICH: Recovery, Recurrence and Complications: Minimum, Preferred, and Optional Dataset Recommendations.

Dataset	Minimal	Preferred	Optional
Demographics	• Age • Sex	• Ethnicity	
Index event, Acute Therapies & Baseline function	• Interval from onset to admission • Admission GCS • Any acute surgical intervention • Type of acute surgical intervention • Haemostatic therapy (and subtype) • Acute BP lowering therapy • Anticoagulant reversal • Osmotic therapy (and subtype)	• Pre-morbid mRS • Baseline NIHSS • Pre-stroke dementia	• Temperature on admission • Systolic BP • Diastolic BP • Interval from stroke onset to initiation of BP-lowering therapy • Interval from initiation of BP-lowering therapy to target BP • Guideline target BP achieved <1 hour • SBP reduction >70mmHg <1 hour
Medical History	• Diabetes Mellitus • Previous ICH • Hypertension	• Prior history of coronary artery disease • Prior ischaemic stroke • Smoking status • Hyperlipidaemia • Height & weight (to calculate BMI)	• Frailty status (e.g. Clinical Frailty Scale) [7] • Charlson Co-morbidity Index[6]
Medication Use (pre-event)	• Antiplatelet • Anticoagulant	• Statin	
Baseline Imaging†	• Interval from onset to imaging • Interval from onset to subsequent scan(s) • ICH location • ICH Volume on initial and subsequent imaging • IVH	• Multiple ICH • CHARTS location • Radiological markers of haematoma expansion (e.g. Spot sign) • Haematoma shape (irregular, spheroid) • GRAEB Score • Perihaematomal oedema volume on diagnostic scan • Perihaematomal oedema volume on subsequent brain scan(s) • Subarachnoid haemorrhage on diagnostic scan • Subdural haemorrhage on diagnostic scan • CAA diagnostic criteria met using Boston[26] or Edinburgh[14] Criteria (+/- individual components eg CMBs, siderosis)	
Outcomes*	• Functional outcome (mRS) • Recurrent ICH • Ischaemic stroke • Myocardial infarction • All-cause death • Cardiovascular death • MACE‡ • Non-cardiovascular death • Dementia • Cognitive impairment	• Other neuropsychiatric symptoms (eg. depression and anxiety)	

The interval from index event to biomarker measurement is considered a minimum dataset item.† Information regarding the imaging modality used should always be collected. * The outcome of interest will depend on the purpose of the study in question. For each outcome, the time interval between index event and outcome should be reported. ‡ It is recommended that MACE should always at a minimum include the individual components of recurrent non-fatal stroke (ischaemic or ICH), non-fatal myocardial infarction, and cardiovascular death. AF, atrial fibrillation; CAA, cerebral amyloid angiopathy; CHARTS, ; CMBs, cerebral microbleeds, CMBs; CT,

computerised tomography; GCS, Glasgow Coma Scale; ICH, intra-cerebral haemorrhage; MRI, magnetic resonance imaging; mRS, modified Rankin scale; NIHSS, National Institute for Health Stroke Scale.

Supplemental Table 13: Minimum Dataset Recommendations for all ICH: Results of the Final Delphi Round.

Dataset	Internal Delphi Votes				External Delphi Votes				Decision
	Total	In Favor	Against	%	Total	In Favor	Against	%	
All ICH Studies									
Age	32	32	0	100	17	17	0	100	Include
Sex	32	32	0	100	17	17	0	100	Include
Interval from onset to admission	32	30	2	93.9	17	17	0	100	Include
Admission GCS	32	31	1	96.9	17	16	1	94.1	Include
Diabetes Mellitus	32	31	1	96.9	17	16	1	94.1	Include
Previous ICH	32	32	0	100	17	17	0	100	Include
Hypertension	35	35	0	100	17	17	0	100	Include
Antiplatelet	32	32	0	100	17	17	0	100	Include
Anticoagulant	32	32	0	100	17	17	0	100	Include
Interval from onset to imaging	32	30	2	96.8	17	17	0	100	Include
Interval from onset to subsequent scan(s)	32	30	2	93.8	17	17	0	100	Include
ICH location	32	31	1	96.9	17	17	0	100	Include
ICH Volume	32	28	4	87.5	17	17	0	100	Include
ICH volume on follow-up brain scan(s)	32	29	3	90.6	17	15	2	88.2	Include
Intra-ventricular haemorrhage	32	29	3	90.6	17	17	0	100	Include
Studies Related To Stroke Progression or Recurrence, Recovery and Complications									
Any acute surgical intervention	32	31	1	96.9	17	17	0	100	Include
Type of acute surgical intervention	32	31	1	96.9	17	17	0	100	Include
Osmotic therapy (and subtype)	32	26	6	81.3	17	12	5	70.8	Include
Haemostatic therapy (and subtype)	32	31	1	96.9	17	15	2	88.2	Include
Acute BP lowering therapy	32	32	0	100	17	17	0	100	Include
Anticoagulant reversal	32	32	0	100	16	16	0	100	Include
Studies Related to Recurrence, Recovery and Complications									
Functional outcome (mRS)	31	31	0	100	17	17	0	100	Include
Recurrent ICH	32	32	0	100	17	17	0	100	Include
Ischaemic stroke	32	32	0	100	17	17	0	100	Include
Myocardial infarction	31	31	0	100	17	17	0	100	Include
Dementia	32	28	4	87.5	17	17	0	100	Include
Cognitive impairment	32	25	7	78.1	17	16	1	94.1	Include
Other neuropsychiatric symptoms	32	24	8	75	17	11	6	64.7	Exclude

Supplemental Table 14: Proposed Definitions of Selected Dataset Items

Dataset Item / Term	Proposed Definition	Reference
AF burden	A suggested definition is the proportion of time spent in AF expressed as a percentage of the recording time, undertaken during a specified monitoring duration	Doehner et al[23]
AFDAS	AF or flutter diagnosed in patients with stroke or TIA on short-term pr prolonged cardiac monitoring AND No prior history of AF AND No AF on ECG performed after the stroke in people without known AF	Sposato et al[2]
AF Subtype	Paroxysmal AF is considered AF that lasts 7 days or less. Persistent AF is present when an AF episode either lasts longer than 7 days or is terminated by cardioversion. Persistent AF is discerned from long-lasting persistent AF by its duration and recurrence pattern. Permanent AF is continuous AF that is no longer deemed suitable for rhythm control therapy	
Alcohol intake	Due to the variability in international reporting of alcohol units, it is suggested to record an estimated weekly intake in g/week to improve comparability between studies.	
Atrial cardiopathy	A pathological state of the atria characterised by structural, functional, and electrophysiological abnormalities that increase the risk of thromboembolism, independent of overt atrial fibrillation.	
Biomarker	A measurable indicator of a biological process, disease state, therapeutic response, or reaction to an exposure. It can be molecular (e.g., proteins), physiological (e.g., EEG), or imaging-based (e.g., lesion volume on CT or MRI).	FDA-NIH Biomarker Working Group[30]
Cerebral Haemorrhage Anatomical RaTing inStrument (CHARTS)	Classification system for ICH into broad categories of lobar, deep and infratentorial, and uncertain, with additional data captured regarding presence of intra-ventricular haemorrhage and cortical subarachnoid haemorrhage extension.	Charidimou et al [26]
Coronary artery disease	Suggested definition might include: Prior history of myocardial infarction, PCI, CABG, or angiographic/imaging evidence of coronary atherosclerosis.	
Cardiovascular death	Death resulting from an acute myocardial infarction, sudden cardiac death, death due to heart failure, death due to stroke, death due to cardiovascular procedures, death due to cardiovascular haemorrhage, and death due to other cardiovascular causes.	Hicks et al[25]
Diabetes mellitus	Suggested definition might include new or prior diagnosis by medical documentation or self-reported history, or on glucose-lowering medications pre-event	
ESUS	Stroke detected by CT/MRI that is not lacunar AND Absence of extracranial or intracranial atherosclerosis causing ≥50 percent luminal stenosis of the artery supplying the area of ischaemia AND No major-risk cardioembolic source of embolism AND No other specific cause of stroke identified.	Hart et al[12]
GRAEB Score	A measure of intra-ventricular volume ranging from 0-12. A maximum score of 4 is given for each lateral ventricle, where it is expanded and filled with blood and a maximum score of 2 is given for the third and fourth ventricles if they are similarly filled.	Graeb et al

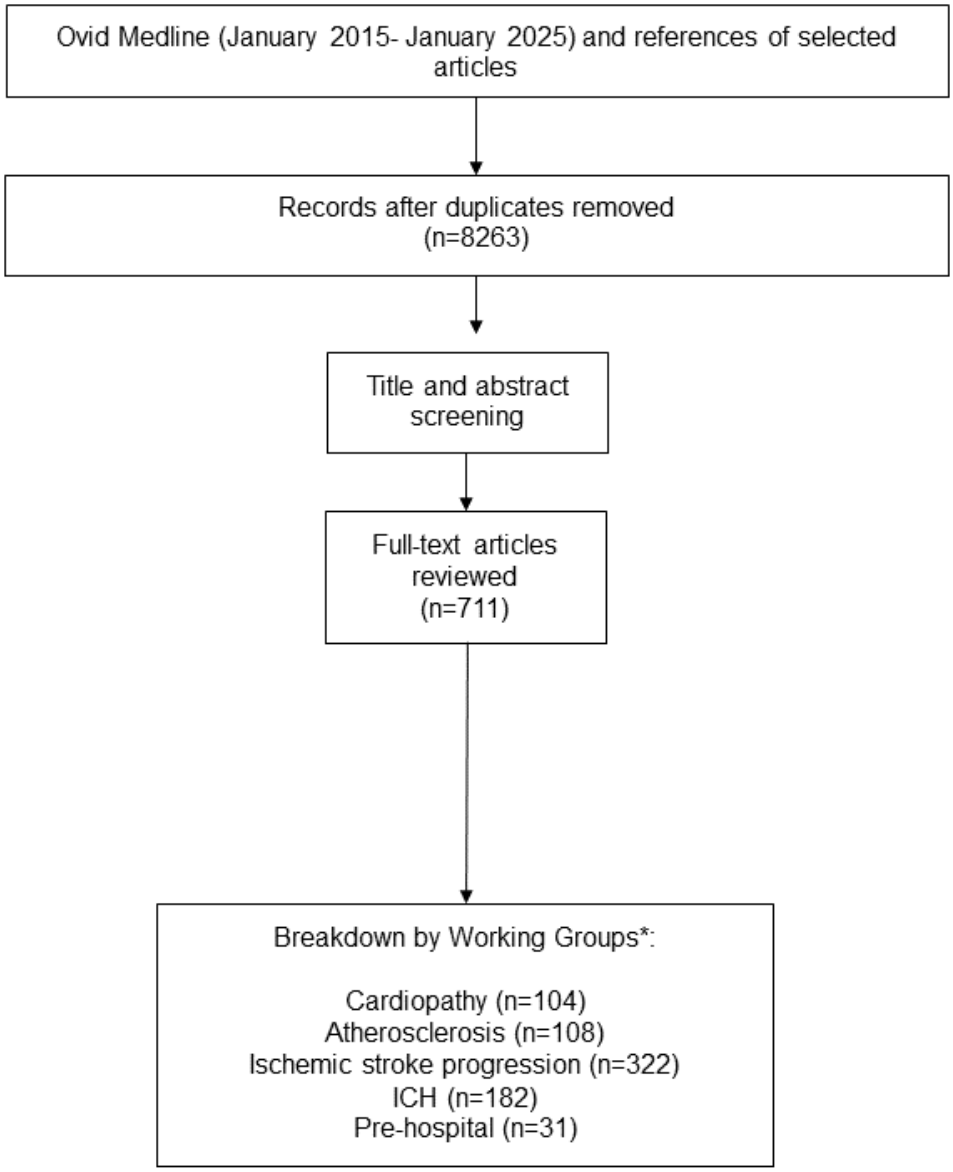
Haematoma expansion	An increase in haematoma volume after initial intracerebral haemorrhage, typically occurring within the first few hours. Haematoma expansion is a key predictor of poor functional outcome and mortality.	
Haematoma shape	(1) round, with round and smooth margins (2) irregular, with irregular, multinodular margins	Fujii et al[28]
Heart failure hospitalisation	1) Admitted to the hospital with a primary diagnosis of HF. AND 2) Length-of-stay in hospital extends for at least 24 hours. AND 3) New or worsening symptoms due to HF on presentation. AND 4) Objective evidence of new or worsening HF (exam and laboratory criterion)	Hicks et al[25]
Hospitalisation for unstable angina	1. Ischaemic discomfort at rest, or in an accelerating pattern with frequent episodes associated with progressively decreased exercise capacity. AND 2. Prompting an unscheduled hospitalisation within 24 hours of the most recent symptoms. AND 3. At least one of the following: a. New or worsening ST or T wave changes on resting ECG b. Definite evidence of inducible myocardial ischaemia c. Angiographic evidence of new or worse ≥ 70% lesion (≥ 50% for left main lesion) and/or thrombus in an epicardial coronary artery that is believed to be responsible for the myocardial ischaemic symptoms/signs. d. Need for coronary revascularisation procedure (PCI or CABG) for the presumed culprit lesion(s). AND 4. Negative cardiac biomarkers and no evidence of acute myocardial infarction.	Hicks et al[25]
Hyperlipidaemia	Suggested definition might include new or prior diagnosis by medical documentation or self-reported history, or on lipid-lowering medications pre-event	
Hypertension	Suggested definition might include new or prior diagnosis by medical documentation or self-reported history, or on anti-hypertensive medications pre-event	
LVO	Occlusion in one of the following vessel segments: - M1 segment - Large proximal M2 segment - Terminal ICA - P1 segment - A1 segment	Ospel et al[3]
Major adverse cardiovascular and cerebrovascular events	A composite clinical endpoint encompassing events such as myocardial infarction, stroke, and cardiovascular death. MACE is commonly used to evaluate cardiovascular risk and treatment efficacy.	
MeVO/DVO	A) Occlusion in one of the following vessel segments: 1. M2 or M3 segment 2. A2 or A3 segment 3. P2 or P3 segment AND B) Substantial clinical deficit (one of the following): NIHSS 5 or more	Ospel et al[3]

	NIHSS 3 - 5 with disabling deficit Note: large proximal M2 occlusions considered as part of the LVO spectrum rather than the MeVO spectrum	
Myocardial infarction	Third Universal Definition	Thygesen et al[24]
Penumbra volume (imaging)	Penumbra volume = hypoperfusion volume – core volume. Different CT and MR perfusion software use different thresholds estimate "hypoperfusion" and "core", and thence the software and thresholds used should always be reported alongside the penumbra volume. Commonly, relative Cerebral Blood Flow <30% is used to define "core" and Tmax>6s is used to define penumbra	Demeestere et al[5]
Perivascular spaces	Number of perivascular spaces (PVS) visible in the entire brain on T2W imaging irrespective of their size. We suggest the following categories: 0-10, 11-20 and >20 PVS	Potter et al[11]
Plaque vulnerability	The propensity of an atherosclerotic plaque to rupture or thrombose, leading to vascular events. Vulnerable plaques are typically characterised by a thin or ruptured fibrous cap, large lipid core, inflammatory cell infiltration, intraplaque haemorrhage and neovascularisation.	
Prehospital diagnosis	Identification of a disease condition before hospital arrival, typically conducted by emergency medical services (EMS) personnel.	
Prior ICH	Suggested definition might include prior history of spontaneous non-traumatic intra-cerebral haemorrhage, by self-report or medical documentation.	
Prior TIA	Suggested definition might include prior history of retinal or hemispheric TIA, by self-report or medical documentation.	
SSS-TOAST/Causative Classification system	1. Supra-aortic large artery atherosclerosis. 2. Cardio-aortic embolism. 3. Small artery occlusion. 4. Other causes. 5. Undetermined causes: a) Cryptogenic b) Unclassified Link to online computer algorithm: https://ccs.mgh.harvard.edu/ccs_title.php	Ay et al[31]
Stroke progression	The clinical or biomarker-based worsening of ischaemic brain injury after the initial event, often driven by factors such as infarct growth, oedema formation, or secondary complications.	
Sudden cardiac death	Death that occurs unexpectedly and not within 30 days of an acute myocardial infarction, includes the following scenarios: a. Death witnessed and occurring without new or worsening symptoms. b. Death witnessed <60 minutes of the onset of new or worsening cardiac symptoms, unless the symptoms suggest acute MI c. Death witnessed and attributed to an identified arrhythmia. d. Death after unsuccessful resuscitation from cardiac arrest. e. Death after successful resuscitation from cardiac arrest and without identification of a specific cardiac or non-cardiac aetiology. f. Unwitnessed death in a subject seen alive and clinically stable ≤ 24 hours prior to being found dead without any evidence supporting a specific non-cardiovascular cause of death.	Hicks et al[25]
Surrogate marker	A biomarker used as a substitute for a clinical endpoint, expected to predict clinical benefit. Surrogate endpoints can enable accelerated regulatory approval if they are reasonably likely to predict meaningful outcomes.	
TOAST	Classification as follows: 1. Large-artery atherosclerosis. 2. Cardioembolism (high-risk/medium-risk sources). 3. Small-vessel occlusion. 4. Stroke of other determined aetiology. 5. Stroke of undetermined aetiology: a. Two or more causes identified. b. Negative evaluation. c. Incomplete evaluation.	Adams et al[1]
Type of acute surgical intervention for ICH	Information to be captured might include: 1. Craniotomy with haematoma removal. 2. Minimally invasive surgical haematoma removal. 3. Surgery with catheter placement with thrombolysis. 4. Decompressive craniectomy without haematoma removal.	

	5. External ventricular drainage with or without thrombolysis, and with or without minimally invasive surgical removal of intraventricular haemorrhage. 6. Cerebellar craniotomy with haematoma removal.	
Venous drainage markers (imaging)	Information to be captures might include at the very minimum presence or absence of asymmetric internal cerebral vein opacification (CTA or MRA). Alternatively, venous drainage delay can be assessed using semi-quantitative methods like the Cortical Vein Opacification Score (COVES) although this is probably not always necessary and a simple dichotomous, qualitative assessment will likely suffice in most scenarios	Hoffman et al[10]

4 SUPPLEMENTAL FIGURES

Supplemental Figure 1: PRISMA Flow Diagram



5 SUPPLEMENTAL REFERENCES

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