

# Characteristics and Clinical Outcomes in Patients With TIA by ABCD<sup>2</sup> Score: A Retrospective Observational Study of a Representative US EHR Database

P843



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## Introduction

- Approximately 240,000 people in the United States (US) experience a transient ischaemic attack (TIA) each year.<sup>1</sup>
  - Following a TIA, around 5% of people experience a stroke within the first 2 days and 10% within the first 90 days, with stroke risk increasing according to the number of associated risk factors.<sup>2</sup> Ten-year cumulative incidence of stroke is around 18%.<sup>3</sup>
- ABCD<sup>2</sup> scores (Age, Blood pressure, Clinical features, Duration of symptoms and Diabetes) at initial presentation<sup>4</sup> show good predictive value for recurrent ischaemic stroke (IS)<sup>5</sup>; however, real-world characteristics and outcomes by ABCD<sup>2</sup> risk group are poorly understood.

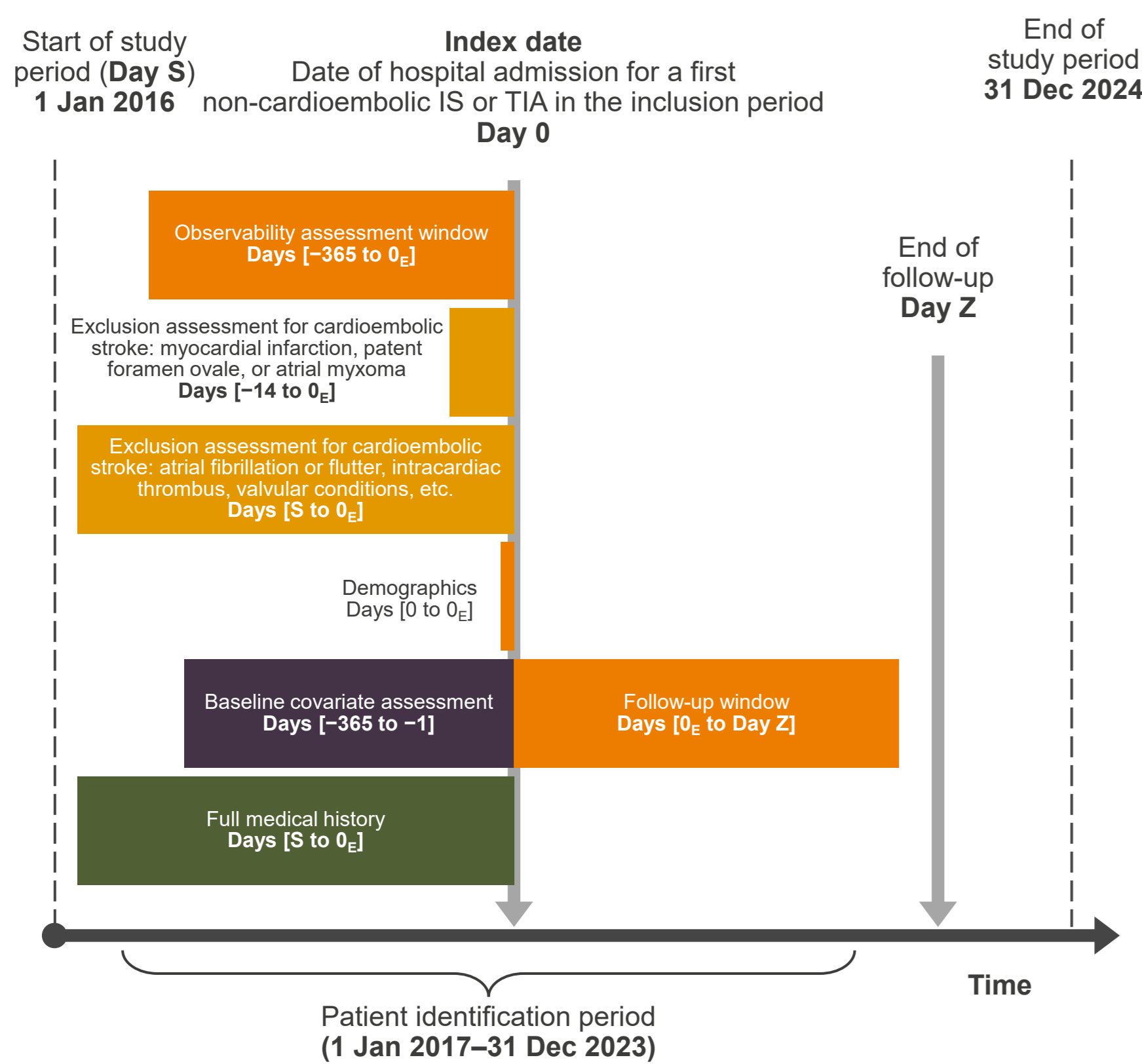
## Objectives

- This sub-analysis of the US-based retrospective observational ALTEA study (Analysis of a Large nationally representative US database on the Burden of disease and treatment patterns among stroke and TIA patients) assessed real-world patient characteristics and outcomes by ABCD<sup>2</sup> risk group in routine practice.

## Methods

- ALTEA included adults (≥18 years of age) hospitalised for first non-cardioembolic IS or TIA (based on International Classification of Diseases, 10th Revision, Clinical Modification codes) between January 2017 and December 2023, as recorded in the Truveta electronic health record (EHR) database (Figure 1).

Figure 1. ALTEA study design



Day 0<sub>E</sub>, follow-up started from date of discharge from the index hospitalisation; Day S, start of study period; Day Z, the earliest of death, end of follow-up period or up to 365 days following hospitalisation for stroke/TIA. IS, ischaemic stroke; TIA, transient ischaemic attack.

- To be included, patients had to have ≥12 months' EHR activity prior to the index date and, in the 12 months prior to the index date, to have received care documented in the EHR database from >1 provider. Patients with risk factors associated with cardioembolic stroke were excluded.
- Patient characteristics, 1-year clinical outcomes and healthcare resource utilisation across ABCD<sup>2</sup> risk categories (low, moderate and high) were assessed.
  - ABCD<sup>2</sup> scores were calculated from structured data and unstructured clinical notes processed with Truveta's large language model.

## Statistical analysis

- Time-to-event methods were used to evaluate all study outcomes. Cumulative risk of study outcomes was estimated using standard Kaplan–Meier methods. Patients were followed from the date of hospital admission until the earliest of death, end of follow-up period or up to 365 days following hospitalisation for IS/TIA.

## Results

### Study population

- In total, 54,392 patients experienced a TIA, 4667 (9%) of whom had ABCD<sup>2</sup> scores available. Of these patients, 51%, 42% and 8% were classified as low, moderate or high risk, respectively (Table 1).

### Study population (continued)

- Patients categorised as high risk were older compared with those at low risk; a lower percentage at high risk and a higher percentage at low risk were female versus male (Table 1).
- Patients categorised as high risk had a higher prevalence of comorbidities than those at low risk, including hypertension, hyperlipidaemia and diabetes, as well as higher prevalence of coronary artery disease, cerebrovascular disease, chronic kidney disease, obesity, prior stroke and peripheral artery disease.
  - Accordingly, high-risk patients were more likely to be taking medications for high blood pressure, lowering cholesterol and diabetes, and were more likely to have received parenteral anticoagulant therapy or prior antiplatelet, respectively (Table 1).

Table 1. Baseline characteristics by ABCD<sup>2</sup> score.

Characteristic	All patients with TIA as index event (N=54,392)	ABCD <sup>2</sup> score <sup>†</sup>		
		Low risk (<4) (n=2363)	Moderate risk (4–5) (n=1954)	High risk (>5) (n=350)
<b>Age, mean (SD), years</b>	69.0 (14.6)	65.3 (15.2)	72.2 (12.1)	72.5 (10.5)
<b>Sex, no. (%)</b>				
Female	29,234 (53.7)	1238 (52.4)	1033 (52.9)	161 (46.0)
Male	24,495 (45.0)	1113 (47.1)	904 (46.3)	185 (52.9)
Other or unknown	663 (1.2)	12 (0.5)	17 (0.9)	4 (1.1)
<b>Ethnicity, no. (%)</b>				
White	40,580 (74.6)	1866 (79.0)	1552 (79.4)	256 (73.1)
Black/African American	5796 (10.7)	157 (6.6)	121 (6.2)	35 (10.0)
Asian	1083 (2.0)	73 (3.1)	45 (2.3)	14 (4.0)
Other <sup>‡</sup>	2547 (4.7)	124 (5.2)	93 (4.8)	18 (5.1)
Unknown	4386 (8.1)	143 (6.1)	143 (7.3)	27 (7.7)
<b>Comorbidities<sup>§</sup>, no. (%)</b>				
Hypertension	42,391 (77.9)	1696 (71.8)	1530 (78.3)	300 (85.7)
Hyperlipidaemia	24,815 (45.6)	903 (38.2)	992 (50.8)	211 (60.3)
Diabetes	14,314 (26.3)	281 (11.9)	535 (27.4)	203 (58.0)
Coronary artery disease	11,206 (20.6)	306 (12.9)	387 (19.8)	98 (28.0)
Cerebrovascular disease	11,295 (20.8)	348 (14.7)	360 (18.4)	93 (26.6)
Chronic kidney disease	9218 (16.9)	240 (10.2)	314 (16.1)	91 (26.0)
Obesity	9103 (16.7)	303 (12.8)	298 (15.3)	87 (24.9)
Prior stroke	7526 (13.8)	220 (9.3)	218 (11.2)	64 (18.3)
Prior ischaemic stroke	7182 (13.2)	211 (8.9)	202 (10.3)	61 (17.4)
Active bleeding	5838 (10.7)	216 (9.1)	213 (10.9)	53 (15.1)
PCI	4064 (7.5)	125 (5.3)	129 (6.6)	50 (14.3)
Malignancy	7624 (14.0)	315 (13.3)	300 (15.4)	47 (13.4)
Anaemia	7074 (13.0)	192 (8.1)	173 (8.9)	47 (13.4)
Heart failure	5004 (9.2)	109 (4.6)	152 (7.8)	46 (13.1)
Peripheral artery disease	2624 (4.8)	75 (3.2)	85 (4.4)	41 (11.7)
Acute kidney injury	4324 (7.9)	91 (3.9)	117 (6.0)	41 (11.7)
Prior TIA	4914 (9.0)	169 (7.2)	159 (8.1)	39 (11.1)
Major surgery	3608 (6.6)	122 (5.2)	141 (7.2)	35 (10.0)
<b>Prior therapies, no. (%)</b>				
High blood pressure medications	30,353 (55.8)	1096 (46.4)	1136 (58.1)	236 (67.4)
Cholesterol-lowering medications	23,402 (43.0)	786 (33.3)	876 (44.8)	186 (53.1)
Anti-diabetic medications	9249 (17.0)	249 (10.5)	363 (18.6)	116 (33.1)
Anti-obesity medications	1663 (3.1)	50 (2.1)	67 (3.4)	21 (6.0)
NSAIDs	19,738 (36.3)	712 (30.1)	599 (30.7)	123 (35.1)
Prior antiplatelet therapy	12,980 (23.9)	363 (15.4)	386 (19.8)	98 (28.0)
Prior parenteral ACT	17,177 (31.6)	560 (23.7)	556 (28.5)	136 (38.9)
Prior oral ACT	3813 (7.0)	125 (5.3)	111 (5.7)	18 (5.1)
Thrombolytic therapy	357 (0.7)	11 (0.5)	7 (0.4)	6 (1.7)
Thrombectomy	12 (<0.1)	0 (0.0)	0 (0.0)	0 (0.0)

<sup>†</sup>ABCD<sup>2</sup> score unknown in 49,725 patients.

<sup>‡</sup>Includes categories of 'Other' and Native American, Alaskan, Hawaiian or Pacific Islander.

<sup>§</sup>Comorbidities occurring in ≥10% of patients with ABCD<sup>2</sup> score >5. Key differences between ABCD<sup>2</sup> score categories outlined in orange.

ABCD<sup>2</sup>, Age, Blood pressure, Clinical features, Duration of symptoms and Diabetes; ACT, anticoagulant therapy; NSAID, non-steroidal anti-inflammatory drug; PCI, percutaneous coronary intervention; SD, standard deviation; TIA, transient ischaemic attack.

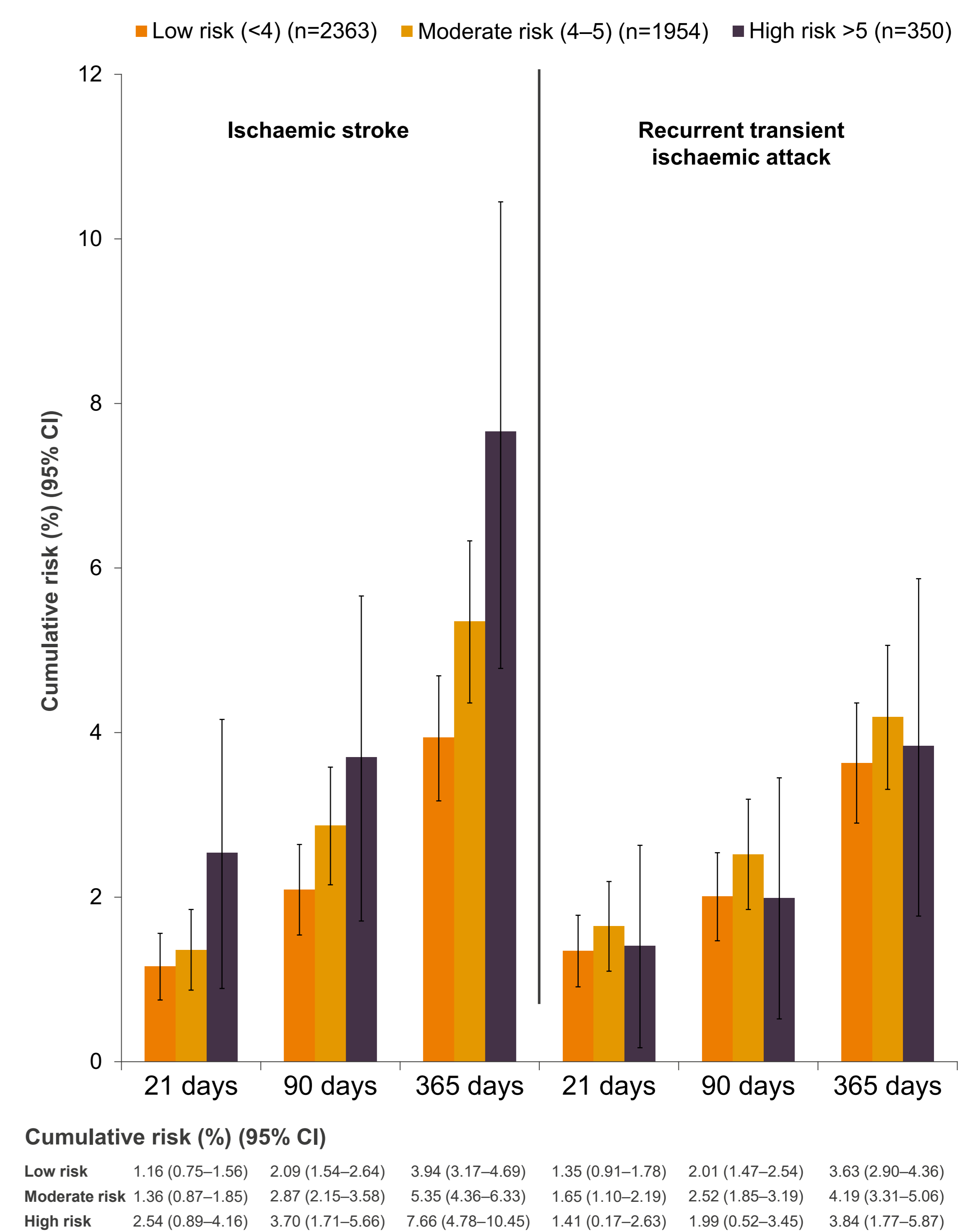
### Clinical outcomes

- At all time points up to 1 year, high-risk patients had a higher risk of IS versus low- and moderate-risk patients (Figure 2).
  - The cumulative risk of IS was almost twice as great in the high- versus low-risk group at all time points.
  - The cumulative risk of recurrent TIA was slightly higher in those with moderate-risk scores.

### Healthcare resource utilisation

- In comparison with low- or moderate-risk patients, high-risk patients had increased inpatient admissions, longer hospital stays and more discharges to nursing home or rehabilitation settings (Table 2).

Figure 2. Clinical outcomes by ABCD<sup>2</sup> score.<sup>†</sup>



<sup>†</sup>Cumulative risk (%) and 95% CIs were estimated using time-to-event methods, accounting for censoring. Reported cumulative risks represent the probability of experiencing the outcome by the end of the specified time point, regardless of interval-specific event counts.

ABCD<sup>2</sup>, Age, Blood pressure, Clinical features, Duration of symptoms and Diabetes; CI, confidence interval.

Table 2. Healthcare resource utilisation by ABCD<sup>2</sup> score.

	Low risk (<4) (n=2363)	Moderate risk (4–5) (n=1954)	High risk (>5) (n=350)
<b>Inpatient admission at index event, n (%)</b>	1221 (51.7)	1154 (59.1)	269 (76.9)
LOS at index event, mean (SD), days	2.1 (3.9)	2.4 (4.4)	3.6 (5.1)
<b>Discharge status at index event,<sup>†</sup> n (%)</b>			
Home	2061 (87.2)	1660 (85.0)	288 (82.3)
Skilled nursing facility	69 (2.9)	79 (4.0)	24 (6.9)
Rehabilitation	23 (1.0)	21 (1.1)	11 (3.1)
Hospice	6 (0.3)	8 (0.4)	2 (0.6)
Other	162 (6.9)	128 (6.6)	19 (5.4)
Missing/unknown	35 (1.5)	49 (2.5)	5 (1.4)

<sup>†</sup>A total of 9655 patients (4.1% of the cohort) died during index hospitalisation, including 9335 patients (5.2%) in the ischaemic stroke cohort and 320 patients (0.6%) in the transient ischaemic attack cohort. ABCD<sup>2</sup>, Age, Blood pressure, Clinical features, Duration of symptoms and Diabetes; LOS, length of stay; SD, standard deviation.

### Limitations

- This cohort included patients whose final diagnosis was TIA; excluded patients included those presenting with TIA whose magnetic resonance imaging (MRI) showed an infarct (assigned a final diagnosis of stroke) and those with an initial impression of TIA whose final diagnosis was of a non-ischaemic aetiology.
- Relatively few patients in this cohort had an available ABCD<sup>2</sup> score (9%).

## Conclusions

- In this US observational study, relatively few patients with TIA (7.5%) were classified as high-risk (ABCD<sup>2</sup> score >5).
- These high-risk TIA patients were more likely to have incident IS, to be taking secondary prevention therapies, to have a longer length of hospital stay or to be discharged to a skilled nursing facility or rehabilitation centre.
- These real-world findings may guide treatment decisions and resource planning.

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