The Impact of Recurrent Ischaemic Stroke on Length of Stay and All-Cause Costs in Patients With Non-Cardioembolic Ischaemic Stroke in Japan: Observations from ARISE

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Introduction

- Ischaemic stroke (IS) is a key cause of morbidity and mortality worldwide,[1,2] with disability burden post-stroke projected to rise.[3]
- Stroke survivors are at significant risk of recurrence:[4]
  - In the ASTRIS Japan observational study, over a median follow-up of ~17 months, 18.4% (n=3292/17,869) of the IS subgroup experienced a recurrent IS, with an incidence rate per 1000 person-years (95% confidence interval [CI]) of 107.2 (103.5–110.8).[4]
- Compared with first-time events, recurrent stroke is associated with higher mortality, poorer functional prognosis and a greater economic burden on healthcare services.[5,6]
- Therefore, prevention of stroke recurrence is a key priority;[7] however, data on the economic impact of recurrent IS are limited.

Objectives

- The objective of this analysis was to evaluate the length of hospital stay and all-cause costs to quantify the burden of recurrent IS following an index non-cardioembolic IS (NCIS) in Japan.

Methods

- This study utilised a nationwide hospital administrative database in Japan (Medical Data Vision Co., Ltd.).
- Patients were eligible if they were ≥18 years of age, were hospitalised for an index NCIS between 1 January 2015 and 30 April 2022 and had observation data of 365 days before and after the index hospitalisation.
- Length of stay for any inpatient hospital stay (except for IS or transient ischaemic attack [TIA]), all-cause costs and healthcare resource utilisation (HCRU) were evaluated over 365 days after index NCIS hospitalisation discharge.
- In a landmark analysis, patients with and without recurrent IS at Day 180 post-discharge were stratified according to absence or presence of recurrent IS during Days 181–360.
  - Non-TIA/IS length of stay and all-cause costs between pre-landmark (Days 1–180) and post-landmark (Days 181–360) periods were summarised descriptively.

Statistical analysis

- Descriptive analyses were conducted using summary statistics for continuous data.
- No imputation was performed for missing data.

Results

Participants

- A total of 7896 patients with index NCIS were included in the analysis.
- At baseline, mean age was 75.8 years, 45% were female and 75% were categorised as alert on the Japan Coma Scale (**Table 1**).
  - Hypertension (52.3%), diabetes (28.2%) and heart failure (22.5%) were common comorbidities.
  - Common medications at baseline included antihypertensives (27.3%), antiplatelets (14.3%) and statins and/or other lipid-lowering therapies (12.3%).

Table 1. Baseline characteristics of patients with index NCIS.

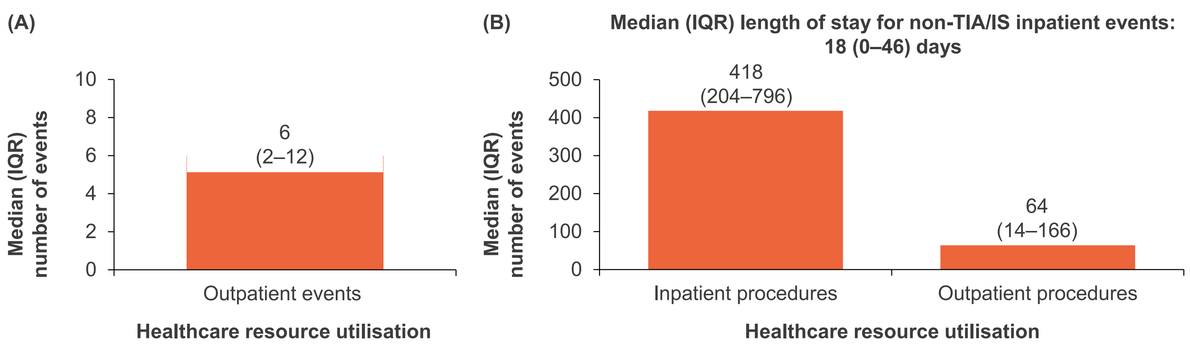
Characteristic No. (%) unless otherwise stated	Index NCIS (n=7896)
Sex†,‡	
Male	4329 (54.8)
Female	3557 (45.0)
Body mass index, kg/m², mean (SD)†	23.0 (6.3)
Age, years, mean (SD)†	75.8 (11.3)
Age, groups†	
<60 years	686 (8.7)
60–74 years	2394 (30.3)
≥75 years	4816 (61.0)
Smoker†	3091 (39.1)
Alcohol consumption/abuse†	71 (0.9)
Charlson Comorbidity Index, mean (SD)	3.3 (2.2)
Comorbidities prior to index stroke§	
Hypertension	4130 (52.3)
Diabetes	2229 (28.2)
Heart failure	1775 (22.5)
Cancer	1753 (22.2)
Coronary artery disease	1734 (22.0)
Chronic kidney disease	1001 (12.7)
History of TIA	488 (6.2)
Dementia or cognitive dysfunction	474 (6.0)
Comedication use, prior to index stroke‖	
Antihypertensives	2152 (27.3)
Antiplatelet therapies	1127 (14.3)
Statins/lipid-lowering therapies	975 (12.3)
Anti-diabetic medications	893 (11.3)
Chronic therapy with NSAIDs	42 (0.5)
Dipyridamole	34 (0.4)
Japan Coma Scale at admission¶	
0: Alert	5921 (75.0)
1: Awake without stimuli	915 (11.6)
2: Arousable with some stimuli	309 (3.9)
3: Unarousable by any forceful stimuli	335 (4.2)
Number of prior hospitalisations, mean (SD)‖	0.30 (0.74)

†Assessed at Day 0.
‡Data unavailable for 10 patients.
§Most commonly occurring; assessed in all available data records prior to index.
‖Assessed during baseline.
¶Assessed at index hospitalisation.
NCIS, non-cardioembolic ischaemic stroke; NSAID, non-steroidal anti-inflammatory drug; SD, standard deviation; TIA, transient ischaemic attack.

Healthcare resource utilisation

- Healthcare resource utilisation outcomes for the overall NCIS population are reported in **Figure 1**.

Figure 1. Median (IQR) healthcare resource utilisation in the 12 months following index hospitalisation in the overall NCIS population (n=7896) for outpatient events (A) and inpatient and outpatient procedures (B).

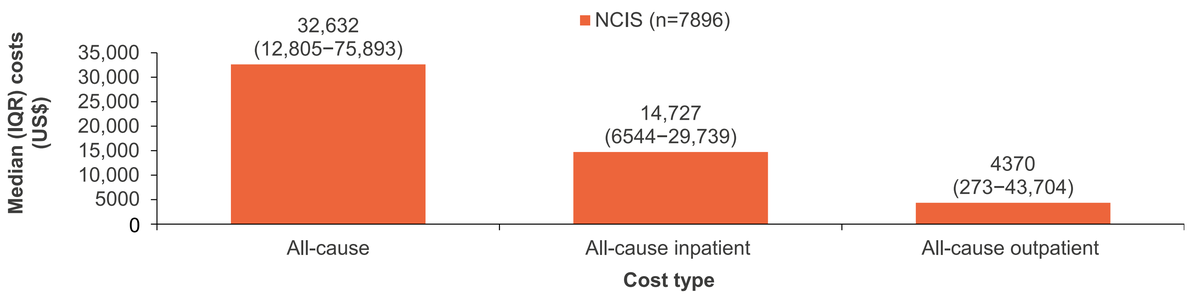


IQR, interquartile range; IS, ischaemic stroke; NCIS, non-cardioembolic ischaemic stroke; TIA, transient ischaemic attack.

Healthcare costs

- In the overall NCIS population, median all-cause costs in the 12 months following the index hospitalisation were US$32,632 (Yen¥ 3,695,619) (**Figure 2**).
  - Median all-cause inpatient costs were US$14,727 (Yen¥ 1,667,819), while all-cause outpatient costs were US$4370 (Yen¥ 494,846).

Figure 2. Median (IQR) healthcare costs (US$) in the 12 months following index hospitalisation in the overall NCIS population (n=7896).



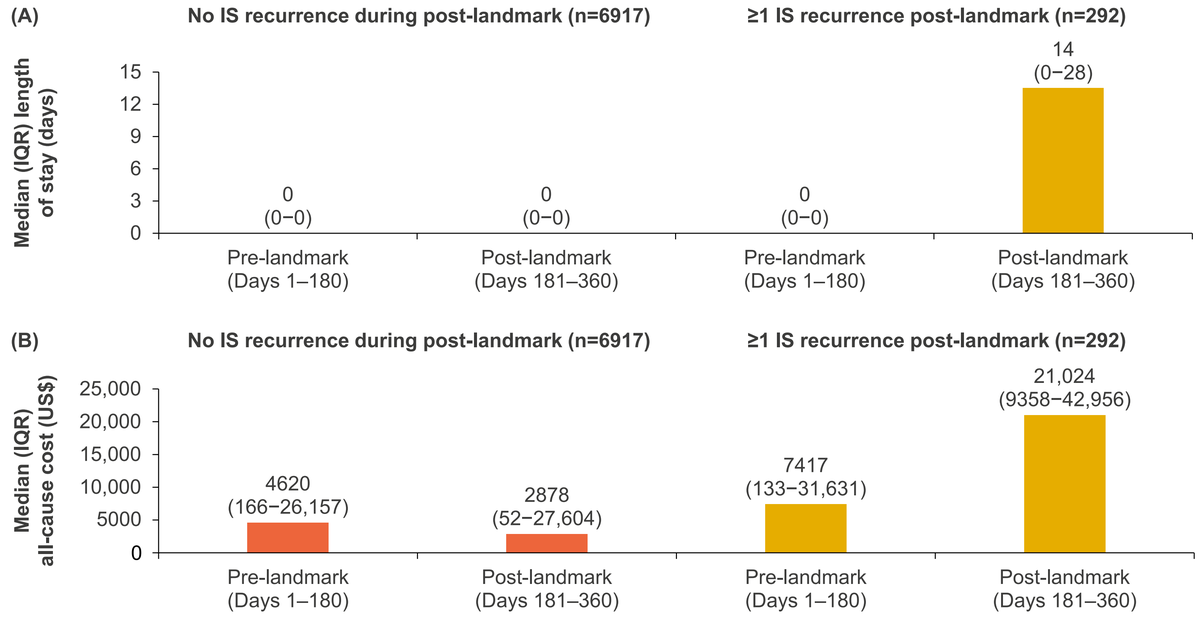
Mean (SD) costs: **all-cause** US$65,813 (148,993) (Yen¥ 7,453,367 [16,873,487]); **all-cause inpatient**: US$24,033 (37,350) (Yen¥ 2,721,735 [4,229,878]); **all-cause outpatient:** US$41,780 (136,025) (Yen¥ 4,731,632 [15,404,796]).
IQR, interquartile range; NCIS, non-cardioembolic ischaemic stroke; SD, standard deviation; US, United States.

Landmark analysis

Patients <u>without</u> IS recurrence from Day 1 to 180

- In patients who did not have a recurrence prior to Day 180 post-discharge, during the post-landmark analysis, data were available for 6917 patients who did not have an IS recurrence and 292 patients who had at least one recurrence from Day 181 to 360.
- Analysis of the pre- to post-landmark period showed that:
  - In patients without recurrent IS, there was no increase in median non-TIA/IS inpatient length of stay, while there was an increase in patients who had at least one recurrence (**Figure 3A**).
  - For median all-cause costs, while patients without recurrent IS had no increase in costs in the post-landmark period, costs increased in those with recurrent IS (**Figure 3B**).

Figure 3. Patients <u>without</u> IS recurrence from Day 1 to 180 (pre-landmark): Median (IQR) length of stay for non-TIA/IS inpatient events (A) and all-cause costs (B) following index hospitalisation in patients with NCIS.

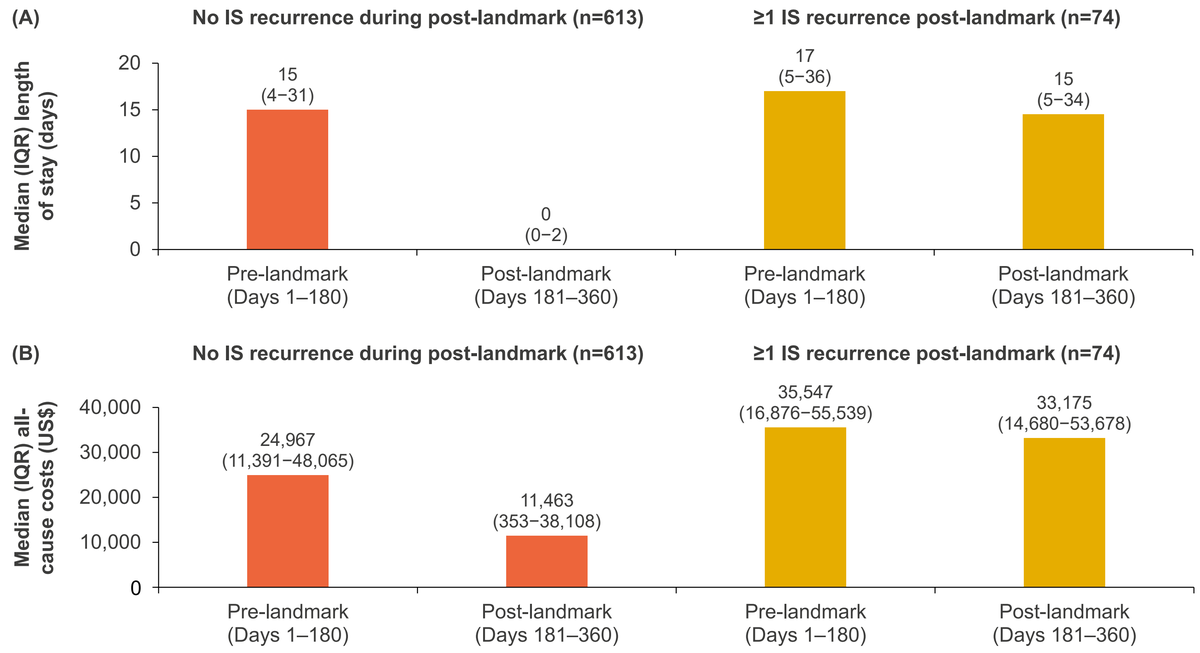


IQR, interquartile range; IS, ischaemic stroke; NCIS, non-cardioembolic ischaemic stroke; TIA, transient ischaemic attack; US, United States.

Patients <u>with</u> IS recurrence from Day 1 to 180

- In patients who had a recurrence prior to Day 180 post-discharge, during the post-landmark analysis, data were available for 613 patients who did not have an IS recurrence and 74 patients who had at least one recurrence.
- Analysis of the pre- versus post-landmark period showed that:
  - For median non-TIA/IS inpatient length of stay, there was a substantial decrease in patients without recurrent IS, but only a small decrease in those who had at least one recurrence (**Figure 4A**).
  - Median all-cause costs decreased in patients without recurrent IS but were generally similar in patients with recurrent IS (**Figure 4B**).
- Patients with IS recurrence from Day 1 to 180 had greater costs than patients without IS recurrence from Day 1 to 180, for both pre-landmark and post-landmark analyses (**Figure 3** and **Figure 4**).

Figure 4. Patients <u>with</u> IS recurrence from Day 1 to 180 (pre-landmark): Median (IQR) length of stay for non-TIA/IS inpatient events (A) and all-cause costs (B) following index hospitalisation in patients with NCIS.



IQR, interquartile range; IS, ischaemic stroke; NCIS, non-cardioembolic ischaemic stroke; TIA, transient ischaemic attack; US, United States.

Conclusions

- Patients with index NCIS and recurrent IS experienced a median of 6 outpatient events and numerous inpatient and outpatient procedures in the 12 months post index event, with median healthcare costs of ~32,600 US$.
- Overall, all-cause costs were higher in patients for whom IS recurrence occurred between Day 1 and Day 180.
  - However, while pre- versus post-landmark all-cause costs were similar in patients with IS recurrence occurring between Day 1 and Day 180, they were higher post-landmark when recurrence occurred after Day 180.
- Our findings highlight the burden of recurrent IS and emphasise the importance of secondary stroke prevention.

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Disclosures

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