Clinical characteristics, in-hospital management, and outcomes of patients with in-hospital vs. community-onset ischaemic stroke: a hospital-based cohort study

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Summary

Background Lack of high-quality national-level data on in-hospital ischaemic stroke hinders the development of tailored strategies for this subgroup's identification, treatment, and management.

Methods We analyzed and compared clinical characteristics, in-hospital management measures, and outcomes, including death or discharge against medical advice (DAMA), major adverse cardiovascular events (MACEs), disability at discharge, and in-hospital complications between in-hospital and community-onset ischaemic stroke enrolled in the Chinese Stroke Center Association registry from August 2015 to December 2022.

Findings The cohort comprised 14,948 in-hospital and 1,366,898 community-onset ischaemic stroke patients. In-hospital ischaemic stroke exhibited greater stroke severity, higher prevalence of comorbidities, more pre-admission medications, and had suboptimal management measures, for example, the onset-to-needle time within 4.5 h (83.3% vs. 93.1%; difference, −9.8% [−11.4% to −8.3%]), and antithrombotics at discharge (78.6% vs. 90.0%; difference, −11.4% [95% CI, −12.1% to −10.7%]). After adjusting for covariates, in-hospital ischaemic stroke remains associated with higher risks of unfavorable outcomes, including in-hospital death/DAMA (13.9% vs. 8.6%; adjusted risk difference [aRD], 2.2% [95% CI, 1.8%–2.7%]; adjusted odds ratio [aOR], 1.35 [95% CI, 1.25–1.45]), MACE (12.6% vs. 6.5%; aRD, 4.1% [95% CI, 3.5%–4.7%]; aOR, 1.68 [95% CI, 1.52–1.85]), and complications (23.7% vs. 12.1%; aRD, 6.5% [95% CI, 5.1%–7.9%]; aOR, 1.72 [95% CI, 1.64–1.80]), except for disability at discharge (41.1% vs. 33.1%; aRD, 0.4% [95% CI, −1.7% to 2.5%]; aOR, 0.99 [95% CI, 0.88–1.11]).

Interpretation In-hospital ischaemic stroke demonstrated more severe strokes, worse vascular risk profiles, suboptimal management measures, and worse outcomes compared to community-onset ischaemic stroke. This emphasizes the urgent need for improved hospital systems of care and targeted quality improvement initiatives for better outcomes in in-hospital ischaemic stroke.

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Keywords: Acute ischaemic stroke; Health care; Health services; In-hospital; Community-onset

Introduction

In-hospital stroke refers to a stroke occurring during hospitalization for another reason. It was likely underreported that in-hospital stroke accounts for up to 2.2%–16% of strokes.[1–5] Although the proportion is low, in-hospital stroke was reported to be more severe, poorly managed, and had worse outcomes than community-onset stroke.[1–5]

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Research in context

Evidence before this study

We searched PubMed to identify relevant publications published up to May 20, 2023, on characteristics, in-hospital management, and outcomes of in-hospital ischaemic stroke using the terms "In-hospital stroke" and "China" limited in the title or abstract, but without language restrictions. We identified only one small-sized study from a single center.

Added value of this study

Using a nationwide contemporary registry of patients with ischaemic stroke, we found that patients with in-hospital ischaemic stroke had more severe strokes, worse vascular risk profiles, suboptimal management during hospitalization, and worse outcomes.

Implications of all the available evidence

These findings strengthened the evidence that the development of hospital systems of care and tailored strategy are urgently warranted to improve the identification, treatment, management, and outcomes of in-hospital ischaemic stroke in China.

Reperf sion therap , incl ding intra eno s throm-bol sis (IVT)[6–8] ith recombinant tiss e plasminogen acti ator (rt-PA) and endo asc lar thrombectom [9,10], is the most effecti e treatment for ac te ischaemic stroke, b t it's highl time-dependent.[11–15] In-hospital stroke has no dela in time from stroke onset to hospital arri al; ho e er, recent s rger and medications add clinical comple ities, and the lack of standardi ed protocols for hospital staff hampered rapid recognition and earl initiation of treatment.[16] Therefore, high-q alit na-tional-le el data are needed to identif potential differ-ences and opport nities for better informing an e idence-based de elopment of targeted q alit impro ement for in-hospital stroke, in addition to comm nit -onset stroke.

In this st d , e sed data from the Chinese Stroke Center Alliance (CSCA) to characteri e patients ith in-hospital ischaemic stroke and to compare the clinical characteristics, in-hospital management, and o tcomes for in-hospital s. comm nit -onset ischaemic stroke at a national le el registr . We h pothesised that in-hospital ischaemic stroke o ld ha e more se ere strokes, orse asc lar risk profiles, s boptimal man-agement meas res, and orse o tcomes than comm nit -onset ischaemic stroke.

Methods

This report follo ed the Standards for The Strength-ening the Reporting of Obser ational St dies in Epide-miolog (STROBE) statement.[17] The data that s pport the findings of this st d are a ailable from the corre-sponding a thor pon reasonable req est.

The Chinese Stroke Center Alliance

We performed a cohort anal sis of CSCA, a national, hospital-based, ol ntar , and contin o s q alit impro ement initiati e modeled after the American Heart Association's Get With The G idelines-Stroke (GWTG Stroke) program. Patients aged 18 ears or older ho had a primar diagnosis of stroke or transient ischemic attack ithin 7 da s of s mptom onset ere enrolled. The details of the program ha e been pre i-o sl described.[17,18] The China National Clinical Research Center for Ne rological Diseases ser es as the data anal sis center and anal ses the aggregate de-identified data. Informed consent of indi id al pa-tients as ai ed b the ethics committee of Beijing Tiantan Hospital and local hospitals.

Study population

We e tracted data on patients enrolled bet een A g st 1st, 2015 and December 10th, 2022. For rob st esti-mations, hospitals ith a total enrollment of less than 100 patients ere e cl ded first. For the c rrent ana-l ses, e e cl ded patients transferred from other hos-pitals, clinic-onset stroke, or nkno n location of s mptom-onset and limited o r st d pop lation to patients ith in-hospital or comm nit -onset ischaemic stroke, as e foc s on the comparison of the t o s b-gro ps. Ischaemic stroke as defined as a ne onset of focal ne rological deficit that cannot be attrib ted to the presenting lesion and is confirmed ith radio-graphic e idence (CT and/or MRI).[17]

Study variables

Clinical characteristics, incl ding demographics (age, se , bod mass inde), smoking and drinking stat s, the National Instit tes of Health Stroke Scale (NIHSS) score, medical histor (stroke or transient ischaemic attack [TIA], carotid stenosis, atrial fibrillation, coronar heart disease [CHD], m ocardial infarction [MI], heart fail re, h pertension, diabetes, d slipidemia, and pe-ripheral asc lar disease [PVD]), and medication sage ithin 6 months prior to the inde stroke and lasting more than 2 eeks (antiplatelet, antih pertensi e, h -pogl cemic, and statin), ere abstracted from chart re- ie b trained researchers.

In-hospital management meas res, consisting of nine ac te and fi e discharge management meas res, ere de eloped based on the Get ith The G idelines-Stroke (GWTG-Stroke),[19] nationall recommended g idelines,[20] and pdated according to q alit meas res for ne rological diseases in 2020.[21] The nine ac te

management meas res incl ded: (1) intra eno s tiss e- t pe plasminogen acti ator (IV rt-PA) in patients ho arri ed ithin 3.5 h after s mptom onset and ere treated ithin 4.5 h; (2) onset-to-needle time ith 4.5 h for patients recei ed IV rt-PA; (3) endo asc lar treat- ment; (4) antithrombotic medication ithin 48 h of admission; (5) d al antiplatelet for minor stroke; (6) deep ein thrombosis proph la is; (7) d sphagia screen; (8) rehabilitation assessment; and (9) essel assessment. The fi e discharge management meas res incl ded: (1) antithrombotic medication; (2) anticoag lants for atrial fibrillation; (3) antih pertensi e medication for h per- tension; (4) h pogl cemia medication for diabetes mel- lit s; (5) Statin for lo ering lo -densit lipoprotein (LDL) for LDL le els ≥100 mg/dl or not doc mented. Detailed definitions of these management meas res are sho n in S pplementar Table S1 in the Data S pplement.

In-hospital o tcomes, incl ding death or discharge against medical ad ice (DAMA), major ad erse cardio- asc lar e ents (MACE), disabilit at discharge, and complications, ere recorded d ring admission to a ne rological ard to discharge in this st d . We sed the composite o tcome of in-hospital death or DAMA beca se it is common for man patients to ithdra from treatment at nfa orable or terminal stat s in China.[22] MACE is a composite o tcome comprising ischaemic stroke, hemorrhagic stroke, TIA, or MI. It incl des an s bseq ent occ rrence of ischemic stroke, hemorrhagic stroke, TIA, or MI that takes place after the initial stroke e ent and d ring admission to a ne rological ard ntil discharge. Disabilit at discharge as meas red b the modified Rankin Scale (mRS). The score ranges from

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Variables	In-hospital stroke (n = 14,948 [1.1%])	Community-onset stroke (n = 1,366,898 [98.9%])	Difference (95% CI)
Patient characteristics			
Demographic			
Age, mean (SD), y	67.6 (12.3)	66.3 (12.0)	1.3 (1.1–1.5)
Male	8818 (59.0)	856,964 (62.7)	−3.7 (−4.5 to −2.9)
BMI, mean (SD), y	24.0 (6.2)	24.0 (4.1)	0.0 (−0.1 to 0.1)
Smoker	4914 (32.9)	489,982 (35.8)	−3.0 (−3.7 to −2.2)
Drinking	3052 (20.4)	308,421 (22.6)	−2.1 (−2.8 to −1.5)
NIHSS at admission	4.0 (2.0–9.0)	3.0 (2.0–6.0)	1.0 (0.0–2.0)
Medical history			
Stroke/TIA	6035 (40.4)	444,182 (32.5)	7.9 (7.1–8.7)
Carotid stenosis	404 (2.7)	17,206 (1.3)	1.4 (1.2–1.7)
Atrial fib/flutter	1489 (10.0)	69,182 (5.1)	4.9 (4.4–5.4)
CHD/MI	1431 (9.6)	80,904 (5.9)	3.7 (3.2–4.1)
Heart failure	676 (4.5)	14,658 (1.1)	3.4 (3.1–3.8)
Hypertension	9381 (62.8)	879,104 (64.3)	−1.6 (−2.3 to −0.8)
Diabetes mellitus	3754 (25.1)	298,438 (21.8)	3.3 (2.6–4.0)
Dyslipidemia	1693 (11.3)	92,631 (6.8)	4.5 (4.0–5.1)
PVD	584 (3.9)	19,587 (1.4)	2.5 (2.2–2.8)
Medication history			
Antiplatelet medication	4601 (30.8)	271,382 (19.9)	10.9 (10.2–11.7)
Antihypertension medication	7360 (49.2)	647,850 (47.4)	1.8 (1.0–2.6)
Glucose-lowering medication	3046 (20.4)	236,709 (17.3)	3.1 (2.4–3.7)
Statin	3878 (25.9)	217,022 (15.9)	10.1 (9.4–10.8)
Hospital characteristic			
Hospital level			
Secondary	5476 (36.6)	603,971 (44.2)	−7.6 (−8.3 to −6.8)
Tertiary	9472 (63.4)	762,927 (55.8)	7.6 (6.8–8.3)

BMI, body mass index; SD, standard deviation; NIHSS, the National Institutes of Health Stroke Scale; TIA, transient ischemic attack; CHD/MI, coronary heart disease or myocardial infarction; PVD, peripheral vascular disease.

Table 1: **Clinical characteristics of patients with in-hospital vs. community-onset ischemic stroke.**

Results

A total of 1,946,254 patients ith stroke/TIA ere enrolled in CSCA bet een A g st 1st, 2015 and December 10th, 2022. After e cl sion, e obtained 1,381,846 patients incl ded in the c rrent anal ses, of hom 14,948 (1.1%) ere in-hospital and 1,366,898 (98.9%) ere comm nit -onset ischaemic stroke (Fig. 1). Patients incl ded in the c rrent anal sis and e cl ded for the missing al e of s mptom onset location ere largel comparable, e cept that the former had a higher percentage of patients admitted to secondar hospitals (S pplementar Table S2 in the Data S pplement). Characteristics among patients ho recei ed reperf sion therap ere presented in S pplementar Table S3 in the Data S pplement.

Clinical characteristics

Compared ith patients ith comm nit -onset stroke, patients ith in-hospital ischaemic stroke e hibited some notable differences. The had a lo er proportion of male patients (59.0% s. 62.7%; difference, −3.7% [95% CI, −4.5% to −2.9%]), fe er smokers (32.9% s. 35.8%, difference, −3.0% [95% CI, −3.7% to −2.2%]). Additionall , the se erit of stroke as higher in the in-hospital gro p, as indicated b a higher NIHSS score (4.0 [IQR: 2.0–9.0] s. 3.0 [IQR: 2.0–6.0]). F rthermore, patients ith in-hospital ischemic stroke presented a higher pre alence of prior stroke/TIA (40.4% s. 32.5%; difference, 7.9% [95% CI, 7.1%–8.7%]), atrial fibrillation (10.0% s. 5.1%; difference, 4.9% [95% CI, 4.4%–5.4%]), CHD/MI (9.6% s. 5.9%; difference, 3.7% [95% CI, 3.2%–4.1%]), heart fail re (4.5% s. 1.1%; difference, 3.4% [95% CI, 3.1%–3.8%]), diabetes (25.1% s. 21.8%; difference, 3.3% [95% CI, 2.6%–4.0%]) and d slipidemia (11.3% s. 6.8%, difference, 4.5% [95% CI, 4.0%–5.1%]). Medication before inde stroke as also different bet een the t o gro ps, ith higher prescription rates obser ed among patients ith in-hospital ischemic stroke for antiplatelet (30.8% s. 19.9%; difference, 10.9% [95% CI, 10.2%–11.7%]), gl cose-lo ering medication (20.4% s. 17.3%; difference, 3.1% [95% CI, 2.4%–3.7%]), and statin (25.9% s. 15.9%; difference, 10.1% [95% CI, 9.4%–10.8%]). In addition, a higher percentage of patients ith in-hospital

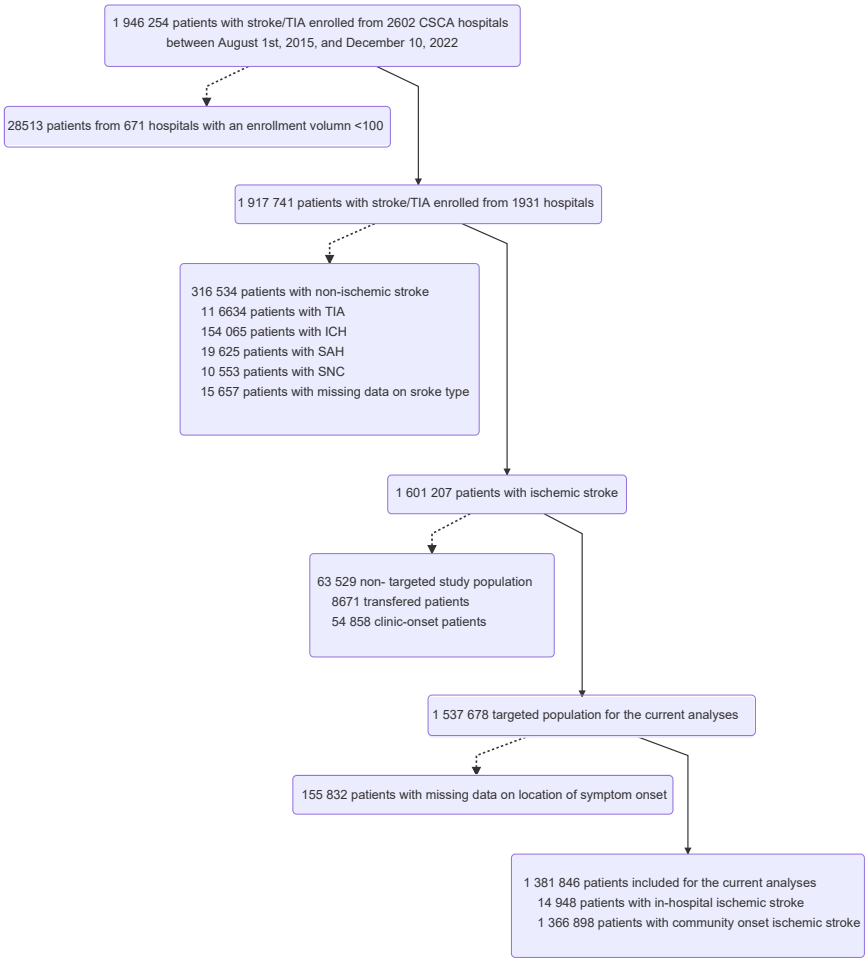

Fig. 1: Patient identification chart. CSCA, the Chinese Stroke Center Alliance; TIA, transient ischemic attack; ICH, intracerebral hemorrhage; SAH, subarachnoid hemorrhage; SNC, stroke not classified.

ischaemic stroke ere admitted to tertiar hospitals than those ith comm nit -onset stroke (63.4% s. 55.8%; difference, 7.6% [95% CI, 6.8%–8.3%]). Ho e er, other characteristics ere largel comparable (Table 1).

In-hospital management measures

Compared ith comm nit -onset ischaemic stroke, those ith in-hospital ischaemic stroke sho ed orse ac te management meas res. This incl ded a dela in onset-to-needle time ithin 4.5 h (83.3% s. 93.1%; difference, –9.8% [–11.4% to –8.3%]), lo er sage of earl antithrombotics (73.5% s. 87.8%; difference, –14.3% [95% CI, –15.0% to –13.5%]) and d al antiplatelets for minor stroke (31.2% s. 43.9%; difference, –12.8% [95% CI, –13.8% to –11.7%]). Additionall , the ere more poorl managed for d sphagia screen (73.3% s. 82.4%; difference, –9.1% [95% CI, –9.8% to –8.4%]) and essel assessment (85.8% s. 90.8%; difference, –4.9% [95% CI, –5.5% to –4.4%]). Ho e er, the e hibited slightl better performance in endo asc lar treatment (4.2% s. 1.3%; difference 2.9% [95% CI, 2.6%–3.2%]). F rthermore, patients ith in-hospital ischaemic stroke also had orse discharge management meas res in antithrombotics (78.6% s. 90.0%; difference, –11.4% [95% CI, –12.1% to –10.7%]), antih pertensi e medication for h pertension (62.4% s. 66.4%; difference, –4.0% [95% CI, –4.9% to –3.0%]), h pogl cemia medication for diabetes (76.0% s. 79.3%; difference, –3.4% [95% CI, –4.7% to –2.1%]) and statin for lo ering lo -densit lipoprotein (84.9% s. 91.8%; difference, –6.9% [95% CI, –7.5% to –6.3%]) prescription at discharge. The onl e ception as the prescription of anticoag lants for atrial fibrillation, hich had a slightl higher percentage for in-hospital ischaemic stroke (49.9% s. 46.3%; difference, 3.6% [95% CI, 1.1%–6.1%]) (Table 2).

In-hospital outcomes

Patients ith in-hospital ischaemic stroke sho ed a higher cr de rate of in-hospital death/DAMA (13.9% s.

Variables	No./Total no. (%)		Difference (95% CI)
	In-hospital stroke	Community-onset stroke	
Acute management measures			
IV rt-PA ≤ 4.5 h	1326/4373 (30.3)	98,530/331,096 (29.8)	0.6 (−0.8 to 1.9)
Onset-to-needle time ≤4.5 h	1907/2290 (83.3)	101,471/108,963 (93.1)	−9.8 (−11.4 to −8.3)
Endovascular treatment	627/14,948 (4.2)	18,000/1,366,898 (1.3)	2.9 (2.6–3.2)
Early antithrombotics	10,409/14,159 (73.5)	1,178,548/1,342,568 (87.8)	−14.3 (−15.0 to −13.5)
Dual antiplatelets for minor stroke	2465/7910 (31.2)	362,900/826,328 (43.9)	−12.8 (−13.8 to −11.7)
DVT prophylaxis	1350/6655 (20.3)	72,431/411,345 (17.6)	2.7 (1.7–3.7)
Dysphagia screen	10,961/14,948 (73.3)	1,126,483/1,366,898 (82.4)	−9.1 (−9.8 to −8.4)
Rehabilitation assessment	10,915/14,948 (73.0)	1,003,586/1,366,898 (73.4)	−0.4 (−1.1 to 0.3)
Vessel assessment	12,830/14,948 (85.8)	1,240,837/1,366,898 (90.8)	−4.9 (−5.5 to −4.4)
Discharge management measures			
Antithrombotics	10,505/13,361 (78.6)	1,173,097/1,303,465 (90.0)	−11.4 (−12.1 to −10.7)
Anticoagulants for atrial fibrillation	808/1619 (49.9)	41,101/88,769 (46.3)	3.6 (1.1–6.1)
Antihypertensive medication for hypertension	6473/10,369 (62.4)	674,372/1,015,589 (66.4)	−4.0 (−4.9 to −3.0)
Hypoglycemia medication for diabetes	3270/4304 (76.0)	296,561/373,769 (79.3)	−3.4 (−4.7 to −2.1)
Statin for lowering low-density lipoprotein	11,783/13,884 (84.9)	1,216,185/1,324,766 (91.8)	−6.9 (−7.5 to −6.3)

IV rt-PA, intravenous recombinant tissue plasminogen activator; DVT, deep vein thrombosis.

Table 2: **Management measures of patients with in-hospital vs. community-onset ischemic stroke.**

8.6%), MACE (12.6% s. 6.5%), disabilit at discharge (41.1% s. 33.1%), and complications (23.7% s. 12.1%) than those ith comm nit -onset ischaemic stroke. After adj sting for co ariates, In-hospital ischaemic stroke remains independentl associated ith a higher risk of all the abo e-mentioned composite o tcomes, incl ding in-hospital death/DAMA (the NIHSS score imp tation-based adj sted risk difference [aRD], 2.2% [95% CI, 1.8%–2.7%]; adj sted odds ratio [aOR], 1.35 [95% CI, 1.25–1.45]), MACE (aRD, 4.1% [95% CI, 3.5%–4.7%]; aOR, 1.68 [95% CI, 1.52–1.85]), and complications (aRD, 6.5% [95% CI, 5.1%–7.9%]; aOR, 1.72 [95% CI, 1.64–1.80]), e cept for disabilit at discharge (aRD, 0.4% [95% CI, −1.7% to 2.5%]; aOR, 0.99 [95% CI, 0.88–1.11]).

The data also re ealed that in-hospital ischaemic stroke as significantl associated ith increased odds of all the components of the abo e-mentioned composite o tcomes, incl ding in-hospital death (aOR, 1.51 [95% CI, 1.40–1.62]), DAMA (aOR, 1.24 [95% CI, 1.10–1.38]), cerebral infarction (aOR, 1.46 [95% CI, 1.33–1.58]), cerebral hemorrhage (aOR, 1.91 [95% CI, 1.71–2.11]), TIA (aOR, 3.98 [95% CI, 3.41–4.55]), m ocardial infarction (aOR, 2.50 [95% CI, 2.22–2.78]), and all the indi id al component of in-hospital complications, altho gh the absol te risk differences ere small. The most notable complication as pne monia (16.9% s. 8.5%; aRD, 4.7% [95% CI, 3.2%–6.2%]; aOR, 1.62 [95% CI, 1.54–1.70]) (Fig. 2). Both cr de anal sis and adj sted anal sis itho t adj stment of the NIHSS score ield similar res lts, e cept for disabilit at discharge (S pplementar Table S4 in the Data S pplement).

In-hospital outcomes among subgroups

The res lts from the s bgro p anal ses did indicate some degree of heterogeneit in relation to smoking stat s, disease histor (stroke, heart fail re, and diabetes), and hospital le els (S pplementar Tables S5–S8 in the Data S pplement). Regarding patients ho nder ent reperf sion therap , the e hibited higher cr de rates of in-hospital o tcomes hen compared to the o erall pop lation. The disparities in in-hospital o tcomes bet een in-hospital and comm nit -onset ischaemic stroke among this gro p resemble those obser ed in the o erall pop lation (Fig. 3). This incl ded in-hospital death/DAMA (20.5% s. 14.1%; aRD, 2.8% [95% CI, 1.2%–4.5%]; aOR, 1.31 [95% CI, 1.19–1.43]), MACE (14.6% s. 8.6%; aRD, 4.2% [95% CI, 2.8%–5.5%]; aOR, 1.51 [95% CI, 1.38–1.64]), disabilit at discharge (49.0% s. 42.8%; aRD, 0.8% [95% CI, −1.2% to 2.8%]; aOR, 1.04 [95% CI, 0.94–1.14]), and complications (30.4% s. 18.9%; aRD, 5.9% [95% CI, 4.9%–7.0%]; aOR, 1.55 [95% CI, 1.44–1.65]). Comparable res lts ere obtained from both cr de anal ses and adj sted anal ses itho t adj stment of the NIHSS score, e cept for disabilit at discharge (S pplementar Table S9 in the Data S pplement).

Discussion

Using a nation ide contemporar registr of patients ith ischaemic stroke, e fo nd that patients ith in-hospital ischaemic stroke ere more se ere, had higher pre alences of comorbidities, and ere s boptimal in management meas res d ring hospitali ation for the in-hospital dela , medication prescription,

Fig. 2: In-hospital outcomes of patients with in-hospital vs. community-onset ischemic stroke. DAMA, discharge against medical advice; MACE, major adverse cardiovascular events; TIA, transient ischemic attack; NIHSS, the National Institutes of Health Stroke Scale. *Data were missing for 2348 (15.7%) in-hospital and 164,605 (12.0%) community-onset ischemic strokes, respectively. †Data were assessed among survivals, and missing for 2348 (16.7%) in-hospital and 164,605 (12.4%) community-onset ischemic strokes, respectively. ‡Data were available from July 1, 2018. ¶Adjusted for the NIHSS score at admission, sex, smoking status, medical history (stroke or transient ischemic attack, atrial fibrillation, coronary heart disease or myocardial infarction, heart failure, diabetes, and dyslipidemia), medication history (antiplatelet, glucose-lowering, and statin), and hospital level.

screening, and essel assessments, compared ith patients ith comm nit -onset ischaemic stroke. After co ariates adj stment, in-hospital ischaemic stroke remains associated ith a higher risk of nfa orable o tcomes, incl ding in-hospital death/DAMA, MACE, and complications, e cept for disabilit at discharge. Collecti el , these findings strengthened the e idence that the de elopment of hospital s stems of care and tailored strateg are rgentl arranted to impro e the identification, treatment, management, and o tcomes of in-hospital ischaemic stroke in China.

Consistent ith o r st d , pre io s reports from the M lticenter Stroke In estigators' Collaboration registr in Japan,[1] the National Get With The G idelines-Stroke registr in US,[2] the Ontario Stroke Registr in Canada,[3] and the So th London Stroke Register[5] also reported that patients ith in-hospital ischaemic stroke had a higher pre alence of comorbid illnesses, incl ding atrial fibrillation, carotid stenosis, CHD/MI, diabetes mellit s, or heart fail re, e perienced more se ere strokes, and had orse o tcomes in terms of in-hospital death or discharge home. Data from three of these registries also re ealed that, compared ith comm nit -onset stroke, in-hospital stroke also had longer in-hospital dela s or as more poorl managed d ring hospitali ation.[2,3,5] In addition, a single-center st d in China sho ed that in-hospital stroke as associated ith higher NIHSS scores, more endo asc lar therap , and a higher rate of in-hospital death.[4] Res lts from patients ho recei ed reperf sion therap in the Get With the G idelines–Stroke dra similar concl sions to o r anal ses.[25,26]

In contrast to pre io s reports,[2–4,25] e fo nd that in-hospital ischaemic strokes ere not independentl associated ith disabilit at discharge. Res lts from cr de anal ses and adj sted anal ses itho t adj stment of the NISHS score at admission sho ed that in-hospital ischaemic strokes ere associated ith increased odds of disabilit at discharge; ho e er, the association as disappeared after adding the NIHSS score at admission in the adj sted models, hich indicated that f nctional disabilit at discharge might be mainl e plained b stroke se erit at admission meas red b the NIHSS score. The risk differences and odds ratios of in-hospital o tcomes s. comm nit -onset strokes for other in-hospital o tcomes, incl ding in-hospital death/DAMA, MACE, and complications, ere shr nk b t remained significant after the adj stment of the NIHSS score and other potential

Fig. 3: In-hospital outcomes of patients with in-hospital vs. community-onset ischemic stroke who received endovascular thrombectomy. DAMA, discharge against medical advice; MACE, major adverse cardiovascular events; TIA, transient ischemic attack. *Data were missing for 201 (7.3%) in-hospital and 7537 (6.2%) community-onset ischemic strokes, respectively. †Data were assessed among survivals, and missing for 201 (8.3%) in-hospital and 7537 (6.7%) community-onset ischemic strokes, respectively. ‡Data were available from July 1, 2018. ¶Adjusted for the NIHSS score at admission, sex, smoking status, drinking, medical history (stroke or transient ischemic attack, atrial fibrillation, coronary heart disease or myocardial infarction, heart failure, diabetes, and dyslipidemia), and medication usage (antiplatelet, antihypertension, glucose-lowering, and statin).

cardio asc lar risk factors, hich indicated that other confo nders ere not controlled, or in-hospital strokes might ha e different etiologies or mechanisms, s ch as perioperati e or cardioembolic stroke.[27,28] Therefore, differences in baseline characteristics ma acco nt for differences in care and o tcomes, and the sol tions o ld depend on the nderl ing ca ses of differences, and the de elopment of hospital s stems of care and targeted q alit impro ement for in-hospital stroke are rgentl needed and ad ocated.[16]

To the best of o r kno ledge, this might be the largest sample-si ed, m lti-center registr st d to characteri e the clinical characteristics, in-hospital management, and o tcomes of in-hospital ischaemic stroke d ring hospitali ation in China and to compare them ith comm nit -onset ischaemic stroke. Ho - e er, this st d has se eral limitations. First, the clinical department before inde stroke for in-hospital stroke and the etiolog based on a Trial of ORG 10172 in Ac te Stroke Treatment (TOAST) classification ere not collected, hich hampered the mechanism e ploration and comparison for s bt pes of in-hospital strokes. Second, data on the NIHSS score at admission ere missing for 10.5% of the patients, hich ma introd ce bias for the estimation of effect si es. Ho e er, res lts from adj sted anal ses based on complete data and m ltiple imp ted data sho ed consistent res lts, indicating o r estimations are rob st. Ne ertheless, the res lts o ld be interpreted ith ca tion, since no methods can confirm that the NIHSS scores ere missing at random. Third, ins fficient data ere collected for the determination of indications for endo asc lar treatments; therefore, e assessed endo asc lar treatments among all the incl ded participants. Forth, appro imatel 12% of patients ere missing on DAMA, and mRs at discharge ere not collected ntil J l 1, 2018, hich red ced o r sample si e and ma introd ce bias. Fifth, o tcomes after discharge and long-term follo - p o tcomes ere not collected in CSCA; therefore, e onl assessed in-hospital o tcomes in the c rrent anal ses. Si th, complications ere diagnosed and recorded b local ph sicians, res lting in ine itable ariations in definitions and identifications. Ho e er, this approach remains practical and acceptable for a large registr .

Conclusions

Compared ith comm nit -onset ischaemic stroke, in-hospital ischaemic stroke had more se ere strokes, orse asc lar risk profiles, s boptimal management meas res d ring hospitali ation, and orse o tcomes. In addition, disparities in o tcomes bet een in-hospital ischaemic stroke and comm nit -onset ischaemic stroke persist e en if reperf sion therap ere admin-istrated. These data highlight the rgent need to de elop hospital s stems of care and targeted q alit impro e-ment to impro e o tcomes of in-hospital ischaemic stroke f rther.

Contributors

HQG, ZXL, and YJW concept alised and designed the st d . CJW, XY, and YJ collected the data. HQG drafted the man script, anal sed, and interpreted the data. HQG anal sed the data. HQG and ZXL erified the nderl ing data. XQZ, YLW, LPL, ZXL, HL, and YJW interpreted the data and re ised the man script. All a thors commented pon and appro ed the final man script.

Data sharing statement

The data sed for this anal sis can be made a ailable pon reasonable req est to the corresponding a thors.

Declaration of interests

All a thors declare no competing interests.

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Appendix A. Supplementary data

S pplementar data related to this article can be fo nd at https://doi.org/10.1016/j.lan pc.2023.100890.

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