

# RIKSSTROKE

QUALITY OF THE SWEDISH STROKE CARE 2023



A BRIEF SUMMARY OF DATA FOR THE FULL YEAR 2023

## PREFACE

The national quality stroke register Riksstroke publishes annual reports on the quality of Swedish stroke care. This report is a short summary of the Riksstroke annual report (in Swedish).

The term stroke includes ischemic stroke, intracerebral hemorrhage, and subarachnoid hemorrhage. Ischemic stroke and intracerebral hemorrhage have very similar onset and require radiological examination to be safely distinguished. Subarachnoid hemorrhages (meningeal hemorrhages) usually present with acute onset severe headache. Most subarachnoid hemorrhages are caused by a ruptured aneurysm.

In the case of a TIA, all symptoms and findings must have resolved fully within 24 hours. In the case of a stroke, symptoms and findings persist even after 24 hours. TIA and stroke are a continuum. Preventive treatment of acute ischemic stroke and TIA are essentially the same and all aim to reduce the incidence of a new stroke. It is very important in both TIA and stroke that the patient quickly seeks and receives care, is correctly diagnosed and receives the right treatment. Both the national guidelines and the person-centered and structured care pathway include both stroke and TIA.

Riksstroke is part of the European Stroke Organization's (ESO's) work on the Stroke Action Plan for Europe (SAP-E) 2018–2030 and reports aggregated data on various key indicators in an open benchmarking exercise with the European countries. This data is reported openly in SAP-E's Stroke Service Tracker (<https://actionplan.eso-stroke.org/sap-e-stroke-service-tracker>).

Endovascular treatment, usually thrombectomy, in ischemic stroke, together with thrombolysis treatment, has revolutionized acute stroke care. Riksstroke has developed a close collaboration with the EVAS registry (EndoVascular treatment of Acute Stroke), which registers variables related to endovascular treatment of acute ischemic stroke, in addition to the basic variables registered in Riksstroke. Linkage of data on endovascular treatment from Riksstroke and EVAS is carried out annually and an active research collaboration is ongoing.

Many people have contributed to reports from Riksstroke and behind the figures shown, there is a lot of work aimed at maintaining and improving stroke care in Sweden. I would especially like to thank everyone who worked with registering data at the different hospitals, the Riksstroke office, and the Riksstroke steering committee!

There are several areas for improvement, but the data we present testify to a generally good stroke care in Sweden at a high international level. This reflects diligent and hard work at the reporting hospitals. A work aimed at providing patients with quality care.



Mia von Euler, professor and Chair of Riksstroke

# TIA

## Number of recordings and coverage

- During 2023, there were 9,161 TIA events registered in 71 out of the 72 emergency hospitals that treat acute TIA.
- The ratio between ischemic strokes and TIAs is approximately 2:1. A previous estimate, that the number of patients with TIA in Sweden is about 10,000, remains.
- The coverage of the register for TIA was 85% in 2023 (register entries compared with official administrative data).

## Demographics, risk factors, type of care and length of stay

- Slightly more men than women were registered (52% men and 48% women). The mean age was 75 years (73 for men and 76 for women).
- At time of onset, 62% of the patients with TIA had treatment for high blood pressure, 22% had atrial fibrillation, 20% diabetes mellitus, and 8% were smokers.
- Of the registered TIA patients, 46% arrived at the hospital within three hours from symptom onset and 89% within 24 hours. Few patients, 5%, arrived later than 24 hours and for 6% data was missing. Roughly half (54%) of the patients arrived by ambulance.
- 82% of the TIA patients were directly admitted to a stroke care unit. The median length of stay was three days.

## Diagnostics

- Almost all (97%) of the patients had a CT scan examination, while 18% had an MRI scan. Of the patients having a MRI, a brain infarction was identified in 8%, despite the clinical diagnosis being a TIA.
- During the last years there has been an increasing trend for the use of CT angiography, and this is now the most common vascular examination method. In all, 84% were examined and the most common method to visualize the carotid arteries was CT angiography (57%), followed by ultra-sonography (36%) and MR angiography (3%).
- For cardiac arrhythmia detection, 77% of the patients without known atrial fibrillation had a long-term ECG recording. An additional 12% had a planned long-term ECG recording after discharge.

## Secondary prevention

- Of the TIA patients with atrial fibrillation 89% were prescribed oral anticoagulants at discharge, mainly NOACs (82%). There was no significant geographical variation in OAC treatment.
- For those with no atrial fibrillation, 97% were prescribed antiplatelets. Aspirin in monotherapy was used in 40%, clopidogrel in monotherapy in 15%, and a combination of aspirin and clopidogrel in 44%. There was a considerable regional variation in choice of antiplatelet regime between hospitals.

- Antihypertensive medicine was prescribed for 73% of the patients and 89% with statins. There was still a considerable regional variation in usage.
- Roughly half of the smokers, 55%, received advice about smoking cessation and 66% of those with a driver's license received advice about driving after TIA. Information about smoking cessation or driving was missing in 28% and 11% of TIA patient, respectively.
- As previous year, almost all TIA-patients, 96%, had a planned follow-up visit at the hospital or in primary care.

## STROKE

### Number of registrations and coverage

- During 2023 there were 19,923 stroke events registered in Riksstroke. All hospitals treating acute stroke reported to Riksstroke. Even with an increasing population, the number of stroke continuous to decrease (Figure 1). Most (80%) were first time stroke and 20% were recurrent strokes
- The coverage of the register was 86% (calculated as register entries compared with official administrative data, first ever strokes for both sources).

### Demography, risk factors, type of care and length of stay

- Mean age and the distribution in terms of sex was basically the same as previous year. Slightly more men than women had a stroke (55% women and 45%, men). The mean age was 75 years (78 for women and 73 years for men).
- More women than men were single at time of stroke onset and more women than men, 9% and 5%, respectively, lived in assisted living. More women than men were dependent in activities of daily living (ADL) at time of stroke onset (13% vs. 8%).
- 85% of the patients were fully conscious when arriving at the hospital. Impaired consciousness was more common in patients with hemorrhagic stroke, 40% of women and 36% of men, compared to 13% of women and 9% of men with ischemic stroke.
- 24% had a wake-up stroke.
- The proportion of patients in whom NIHSS was registered was 75%. There was a considerable variation in the proportions of NIHSS registrations among the hospitals.
- Hypertension was the most common risk factor found in 64% of the stroke patients. Other risk factors included 28% atrial fibrillation, 24% diabetes, and 13% were smokers.
- Among the 2,660 patients with intracerebral bleedings, 24% had ongoing anticoagulant treatment. Of these, 85% had treatment with non-vitamin K oral anticoagulants and 15% with warfarin (Figure 2). In relation to the number of persons being treated with respective OAC that represents 0.18% of persons treated with warfarin and 0.13% of those treated with NOAC. Half of the patients were treated with reversal of anticoagulation.

- A third of the stroke patients (33%) arrived at hospital within three hours of stroke onset and an additional 6% arrived between 3 and 4.5 h of stroke onset. The majority, 75%, arrived by ambulance and of all, 45% arrived as a thrombolysis/thrombectomy alarm.
- The proportion of acute stroke patients receiving care at a stroke care unit at some point during their hospital stay remained high, 92% (Figure 3). However, stroke unit care was the first level of care for only 74% while 8% needed intensive care.
- Still, many of the stroke patients (17%) received treatment at an observation- or other non-stroke care unit during the first critical day (Figure 4).
- The median length of stay at the hospital was 6 days. There was a considerable variation in length of stay between the hospitals; an explanation could be various usage of early supported discharge with stroke rehabilitation at home and other differences in organization of rehabilitation.

### Diagnosics

- The use of computer tomography for diagnostic imaging was at a very high level (98%). The usage of MRI examinations of the brain was 36% with large variations between hospitals.
- CT-angiography in association to the initial computer tomography keeps increasing and was performed in 60% of the patients with ischemic stroke, with large variation between hospitals.
- CT perfusion to visualize potentially salvageable brain tissue was performed in around half of the hospitals and in 22% of the patients with ischemic stroke.
- For patients with ischemic stroke, CT-angiography was the most common method for vascular examination (71%), followed by ultra-sonography (25%) and MR-angiography (3%).
- The proportion of patients with ischemic stroke examined with long-term ECG with the purpose to diagnose an atrial fibrillation was 81% and an additional 6% had the investigation planned after discharge.
- A swallowing assessment was performed for 86% of the stroke patients.

### Reperfusion therapy (to restore the blood flow with thrombolysis and thrombectomy)

- The proportion of patients who received reperfusion therapy was 19% in 2023 (Figure 5). 11% received thrombolysis only, 3% thrombolysis + thrombectomy, and 5% thrombectomy only. A third (32%) of the treated patients were 80 years or older.
- There were 1,446 thrombectomies registered in Riksstroke for 2023. The absolute number of thrombectomies has increased with 98 patients compared with 2022 and the proportion of thrombectomies in 2023 was 8% of all patients with an ischemic stroke, with a variation between regions from 3% to 17% (figure 6).
- In all, there were 3,700 contacts (22%) with hospitals with a thrombectomy center from other hospitals. A bit more than a third of these resulted in a thrombectomy treatment.

- The differences in the proportions of patients who received reperfusion therapy varied substantially between the hospitals and the treatment still seems under-used in several hospitals.
- The time from arrival at the hospital to the start of thrombolysis treatment (door-to-needle time) show large variations between the hospitals. 45% of all patients had a door-to-needle time within 30 minutes, 17% in the interval 31-40 minutes, 18% in the interval 41-60 minutes and 20% more than 60 minutes.
- The majority of the ischemic stroke patients who received reperfusion treatment improved in NIHSS. In Figure 7 and 8, NIHSS before and after thrombolysis and thrombectomy, respectively, is shown.

### **Neurosurgical operation performed for patients with intracerebral hemorrhages**

- In patients with intracerebral hemorrhages, 7% had a neurosurgical procedure.

### **Physical therapy and occupational therapy**

- In all, 87 of the patients were evaluated by a physical therapist and 85% by an occupational therapist. Around half of them within 24 hours after arrival at the hospital.

### **Speech therapist**

- 42% of the patients had their speech- or swallow function evaluated by a speech therapist during the hospital stay. The variation between hospitals was very large, 13 to 96%.

### **Secondary prevention**

- 13% were smokers at time of stroke onset. Data on information about smoking cessation was missing in 30% and the efforts to encourage patients to not smoke seems to be insufficient at many hospitals. Half of the smokers were reported as receiving advice on smoking cessation.
- The proportion of patients with an embolic stroke (defined as ischemic stroke associated with atrial fibrillation, 28% of men and 30% of women) that received secondary prevention with oral anticoagulants was 84% with no difference between men and women (Figure ). 79% were treated with one of the non-vitamin K oral anticoagulants (NOAC) and 5% with warfarin at discharge.
- 95% of the patients with ischemic stroke and no atrial fibrillation were treated with antiplatelets after the stroke. A combination of Aspirin and clopidogrel was most common ( 47%), while 36% had monotherapy with Aspirin and 15% with clopidogrel.
- The proportion of patients with antihypertensive medicine at discharge remained at a relatively high level, 78%.
- The use of statins after an ischemic stroke increased further to 86% (88% in men and 81% in women).

## Driving

- For patients with a driver's license, 60% had received information about driving after stroke. Data was missing for 11% of the patients.

## Accommodation after discharge and planned rehabilitation

- In all, 78% returned to their own home after discharge while 21% were discharged to an assisted living facility.
- Early supported discharge with rehabilitation at home from a multidisciplinary team associated to the stroke unit was planned for 20% of the patients who were discharged to their own home. There were large variations in the proportions with rehabilitation at home and in a hospital-based day rehabilitation clinic (Figure 10).
- 95% of the stroke patients had a planned follow-up visit at the hospital or in primary care.

## SUBARACHNOIDAL HEMORRHAGE

- The report includes data from five of seven neurosurgical departments and, therefore the numbers are not fully representative for Sweden and need to be interpreted with care.
- In all, 412 patients were reported, 62% women and 38% men.
- Of patients reported to the register with a SAH, 75% were admitted to a neurosurgical ward. Among these, ventricular drainage was inserted in 49% and 14% had invasive treatment for vasospasm.
- In 162 patients, a bleeding site was treated with neurointervention in 45 with neurosurgery, and in 10 patients with both neurosurgery and neurointervention. The remaining 92 patients had no treatment.
- At 3 months, 15% were deceased. The response rate to the follow up questionnaire was 42%, substantially lower compared to other stroke types. Increased fatigue stood out as a common problem.

## 3-MONTH FOLLOW-UP STROKE

### Follow-up

- Out of the 19,923 stroke events in 2023, 78% answered a follow-up survey or were deceased 3 months after their stroke.

### Survival

- In all, 16% of the patients were deceased within 90 days after their stroke and 32% were deceased or ADL dependent at the 3 months follow up after stroke.
- The proportion of deceased and deceased or ADL-dependent varied significantly between the hospitals, but the differences were small between the regions after statistical adjustment for age, sex, and level of consciousness.

## Function

- The proportion of patients who were dependent in ADL 3 months after stroke was 15% (Figure 11).
- Patient characteristics can partly explain the differences in proportion of ADL-dependent patients between the hospitals but there are still considerable differences between the hospitals even after statistical adjustment. Data might be affected by transfers between hospitals for thrombolysis and thrombectomy in the acute phase.

## Accommodation

- Three months after stroke, 78% of the patients lived in their own home without community service, 14% in their own home with community service, 6% in assisted living and 2% in some other living facility.

## Hospital interventions

- The proportion of patients who reported being satisfied or very satisfied with the rehabilitation during the hospital stay (among those who received rehabilitation) was high, 91%, for the whole nation, with a moderate variation between the regions. The proportion of patients who were satisfied or very satisfied with the rehabilitation after hospitalization was also high, 87%.
- Of the 13% who were smoking at time of stroke, 46% reported to have received advice on smoke cessation. At 3 months, 46% of the previous smokers had quit smoking.
- Of the patients who responded to the question about lifestyle changes, 53% reported receiving such advice, 48% and 59% of women and men, respectively.

## Symptoms and quality of life

- In all, 78% percent of the patients reported their general health to be very good or good 3 months after stroke, with substantial variation between the hospitals.
- 28% stated that they had gone back to the life and activities they had before their stroke, 41% percent answered “yes, but not quite like before” and 31% answered “no”.
- Concentration and memory difficulties are common after a stroke. However, about half of the patients report no such difficulties.
- Fatigue that inflicted on their ability to do ordinary daily activities was reported by 69 and 58% of women and men, respectively.
- Depression or anxiety was reported by 37% of the stroke survivors.
- A new type of pain was reported by 20% of stroke survivors.

## Acute care satisfaction

- Most of the stroke patients were satisfied with the acute care, and the differences in satisfaction between the hospitals were moderate.



### Need of support

- 43% of the patients were satisfied with the support from the hospitals and the municipality after discharge. The proportion of patients who were satisfied with the support varied substantially between the hospitals (34–78%).
- Of stroke survivors living in their own home 3 months after stroke, 57 and 66% of women and men under 80 years of age, respectively, reported that they were independent on the help from a relative. Of those over 80 years, 34 and 46% of women and men did not need help or assistance.

# Figures

## NUMBER OF STROKE EVENTS IN RIKSSTROKE 2010-2023

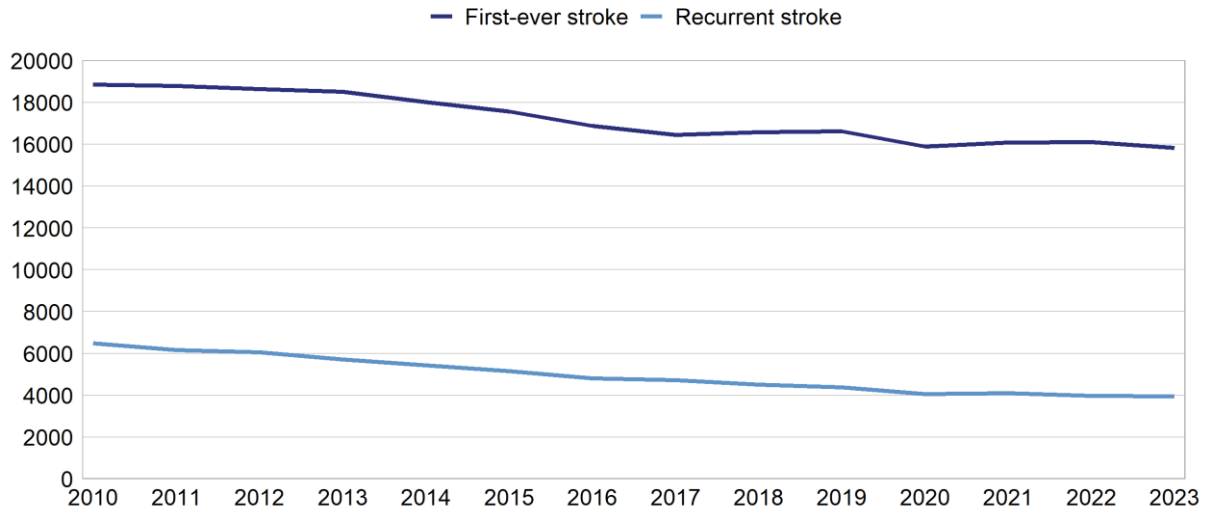


Figure 1. Number of stroke events registered in Riksstroke from 1994 to 2023. Separate lines for first-time events and recurrent stroke events.

## ANTICOAGULANTS AT ADMISSION AMONG PATIENTS WITH INTRACEREBRAL HEMORRHAGES

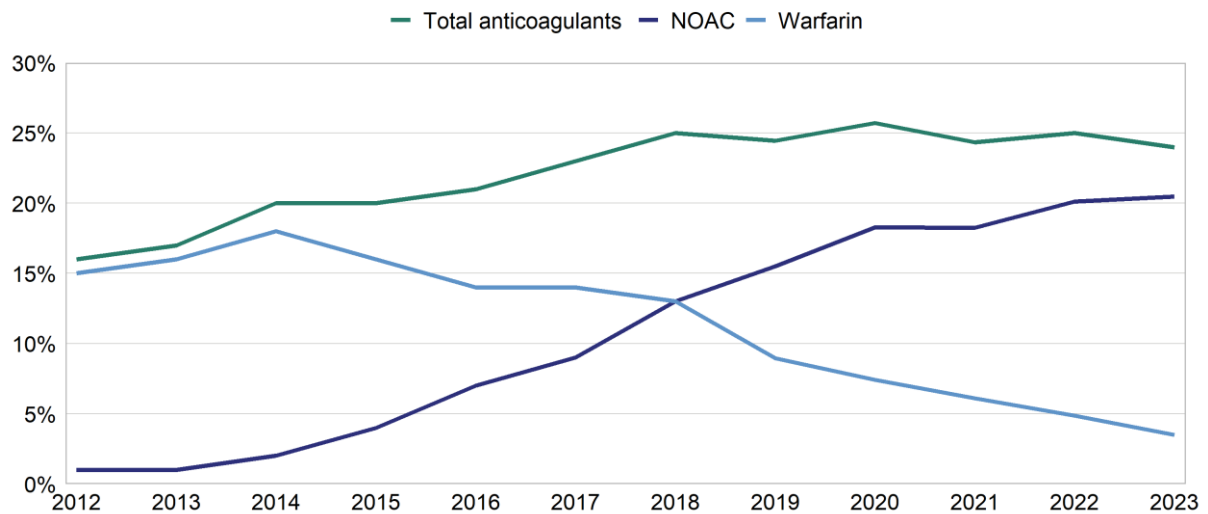
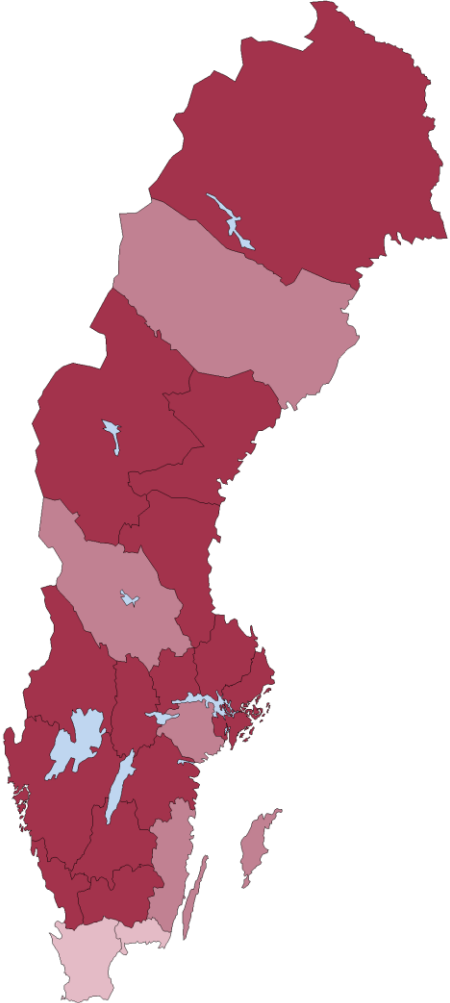


Figure 2. The proportion of patients with anticoagulant treatment at admission among intracerebral hemorrhages, 2012-2023.

**CARE AT A STROKE CARE UNIT, INTENSIVE CARE UNIT OR NEUROSURGICAL UNIT (AT SOME PERIOD DURING THE ACUTE PHASE)**



**Proportion of Stroke Patients Admitted to Stroke Care Unit During Hospital Stay**  
80-85% 85-90% 90-100% Lakes

*Figure 3. The proportion of patients with acute stroke receiving care at a stroke care unit/intensive care unit/neurosurgical unit or other ward in 2023.*

**DIRECT ADMISSION TO STROKE CARE UNIT (AS FIRST LEVEL OF CARE)**

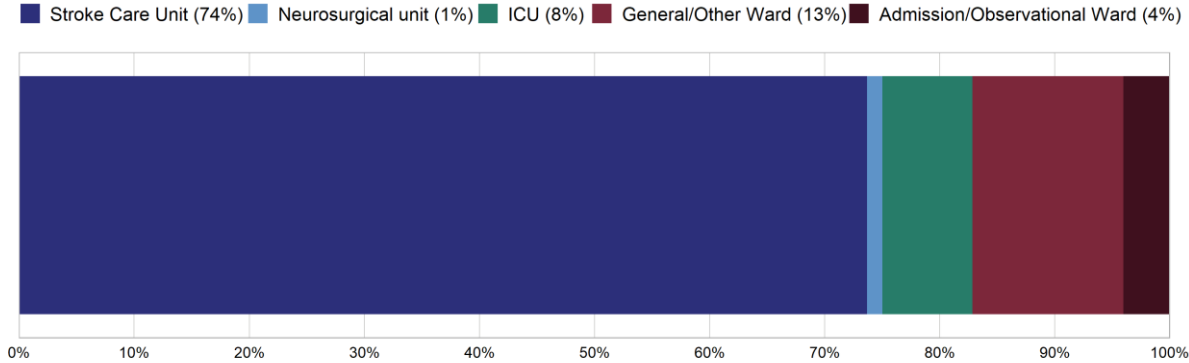


Figure 4. The proportion of acute stroke patients directly admitted to stroke unit, intensive care unit, neurosurgical unit or other type of ward in 2023.

**REPERFUSION THERAPY**

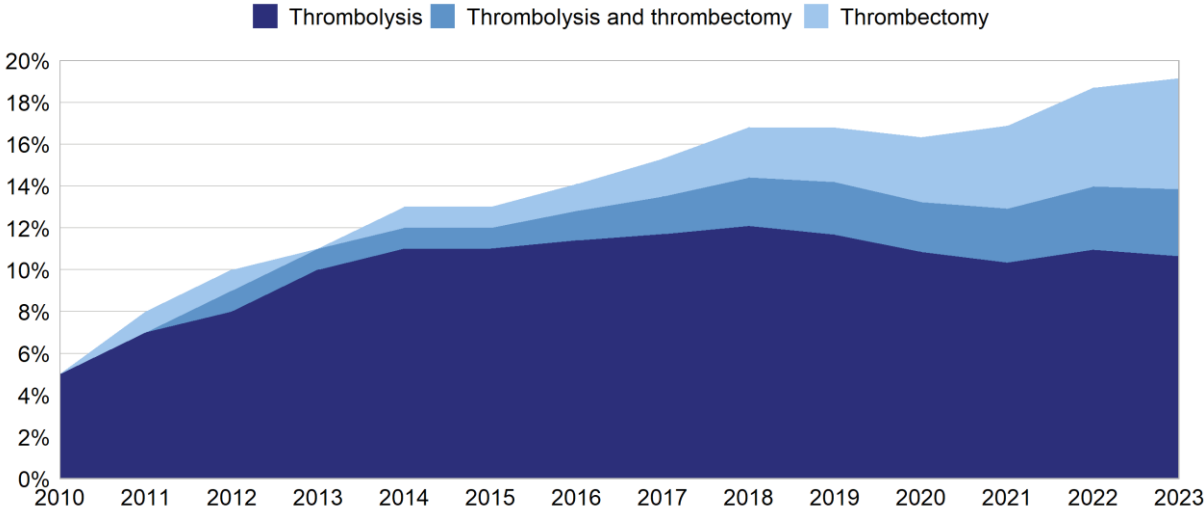
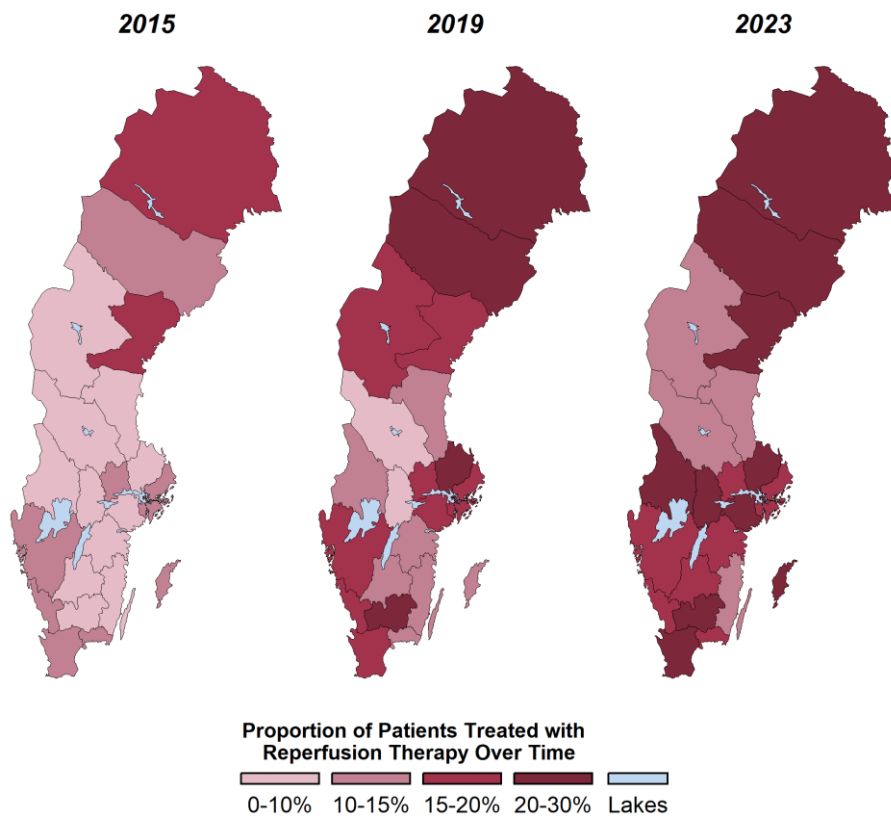
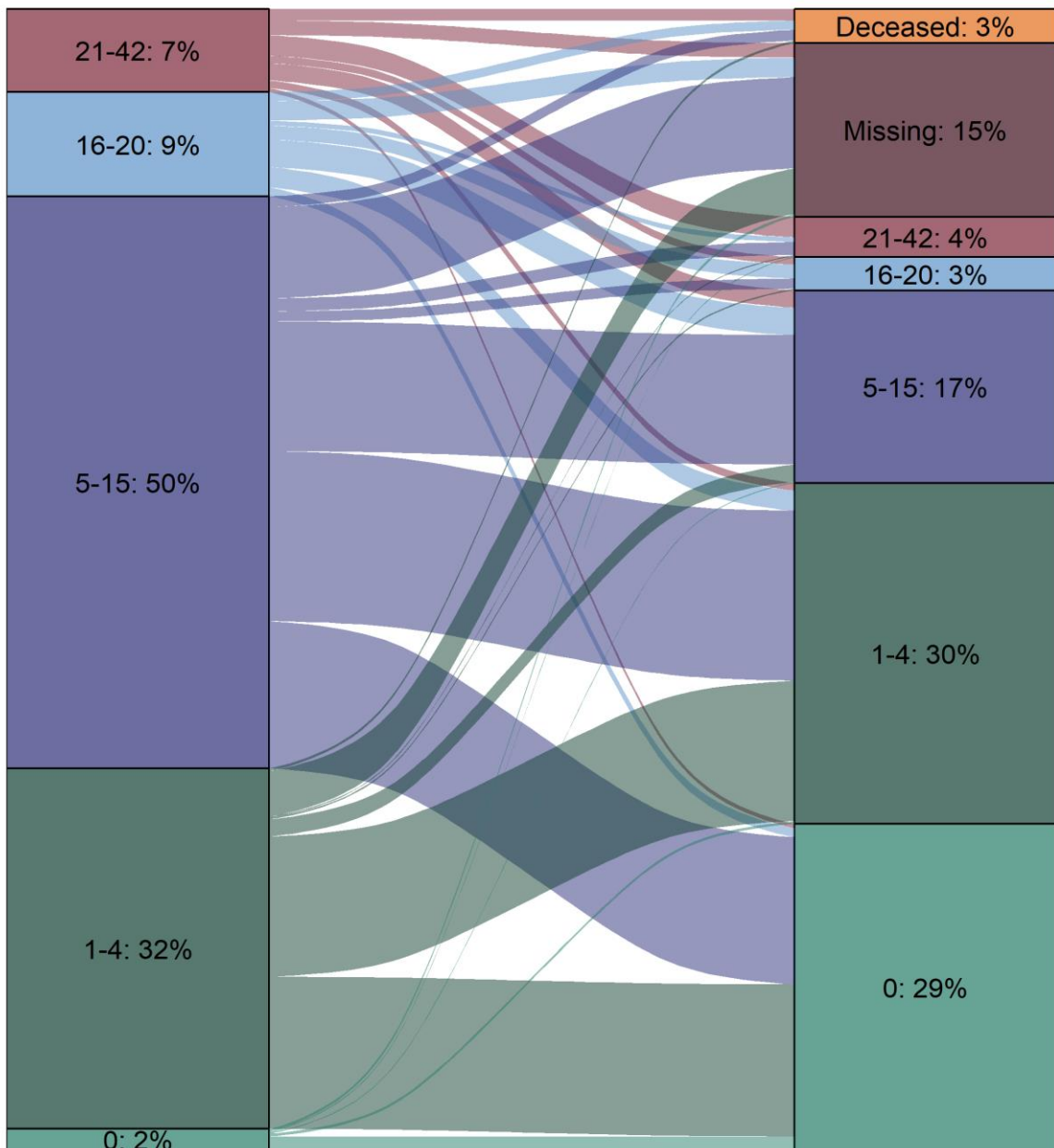


Figure 5. The proportion of patients with ischemic stroke receiving reperfusion therapy, 2010-2023.



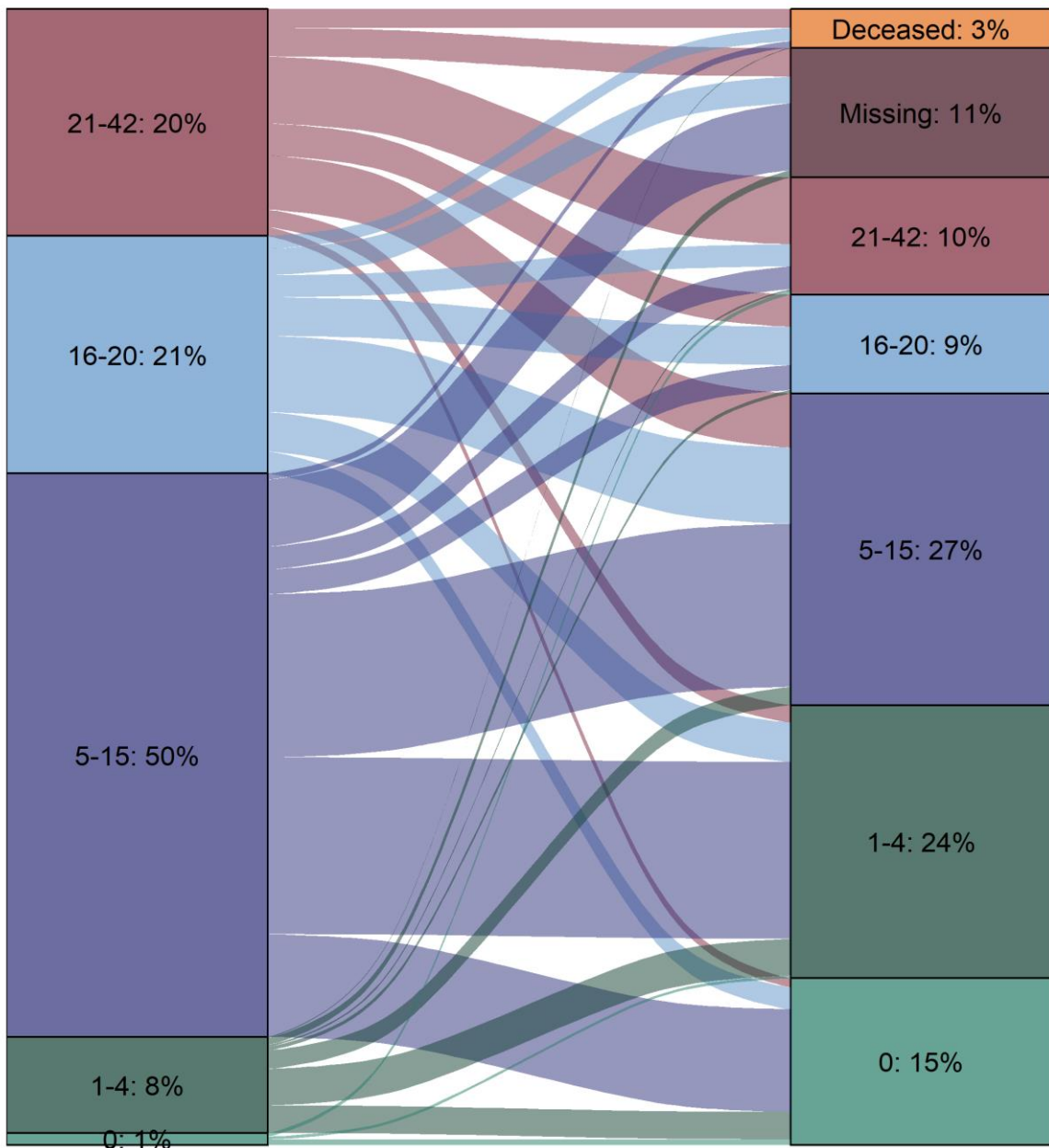
*Figure 6. The proportion of patients with ischemic stroke receiving reperfusion therapy 2015, 2019 and 2023 in the different regions of Sweden.*



NIHSS at arrival  
N = 2124

Post-thrombolysis  
NIHSS score  
N = 1737

Figure 7. NIHSS at arrival to hospital before and after thrombolysis.



NIHSS at arrival  
N = 1240

Post-thrombectomy  
NIHSS score  
N = 1056

Figure 8. NIHSS at arrival to hospital before and after thrombectomy.

## ANTICOAGULANTS AMONG PATIENTS WITH ISCHEMIC STROKE AND ATRIAL FIBRILLATION

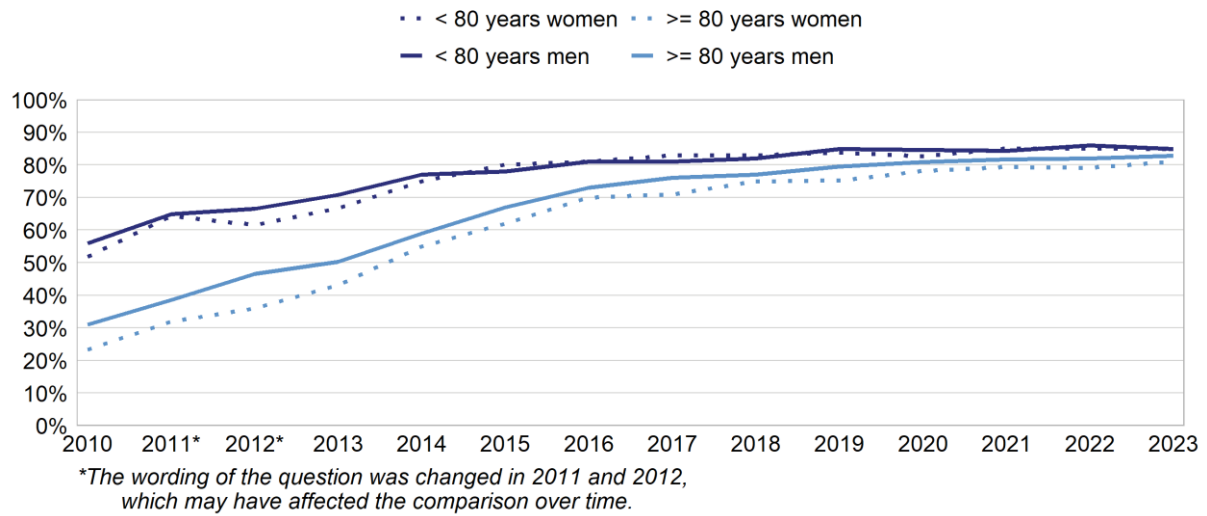


Figure 9. The proportion of patients with ischemic stroke and atrial fibrillation who were prescribed anticoagulant treatment (NOAC or warfarin) at discharge, 2001-2023.

## PLANNED REHABILITATION AMONG PATIENTS DISCHARGED TO THEIR OWN HOME

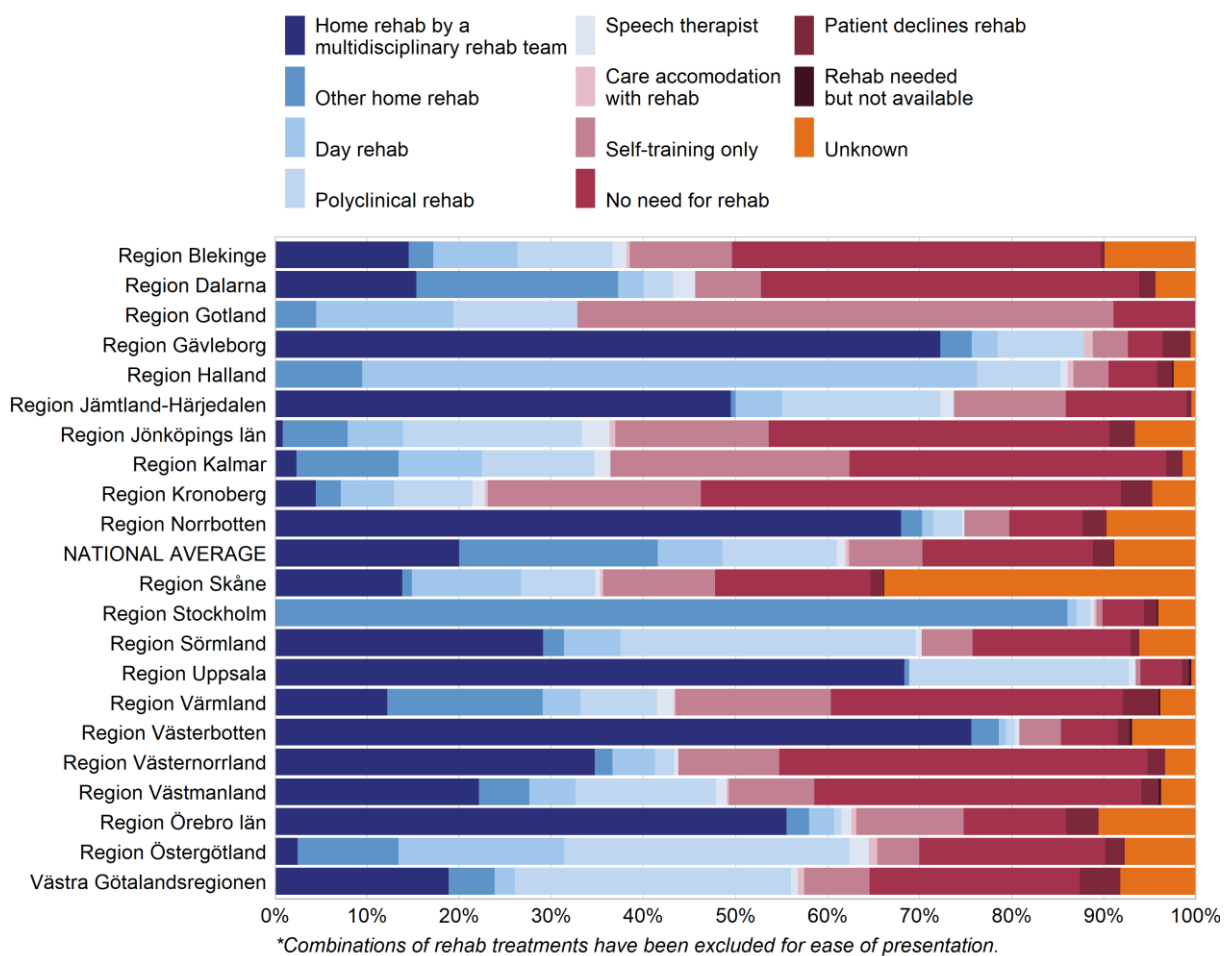


Figure 10. The proportion of patients with planned rehabilitation among those discharged to their own home, by region 2023.



### ADL-DEPENDENCY 3 MONTHS AFTER STROKE

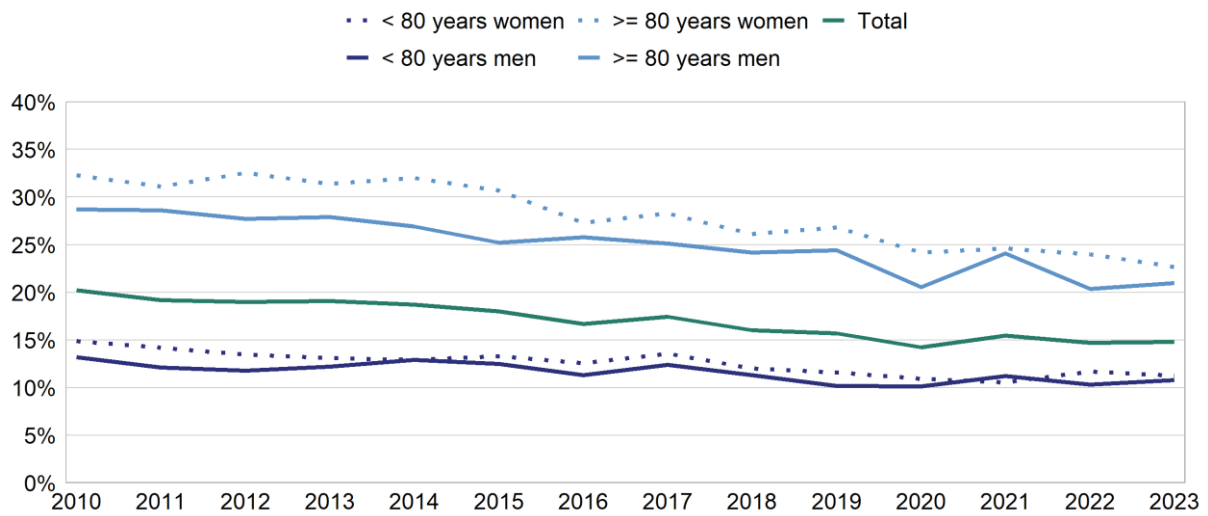


Figure 11. The proportion of patients who were ADL-dependent three months after stroke, 2010-2023. Patients who already were ADL-dependent before their stroke are excluded from the calculations.