Epidemiological Analysis to Inform Stroke Clinical Practice Guidelines Development

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Disclosure

– I have no conflicts of interest

Aims

- to analyse epidemiology of prevalence and incidence of ischaemic stroke

- main causes

- brain imaging using MRI

- recanalization therapies

- secondary prevention with antiplatelet and anticoagulants

- mortality data

- to inform development of Czech clinical practice guideline in stroke

YLLs = years of life lost

Leading causes 1990	Leading causes 2005	% change	Median all-age % change	Age-standardised % change	Leading causes 2015	% change	Median all-age % change	Age-standardised % change
1 Lower respiratory infections	1 Ischaemic heart disease	25·8	2·3	−12·6	1 Ischaemic heart disease	−10·2	−2·5	−14·8
2 Neonatal preterm birth complications	2 Lower respiratory infections	−37·3	−49·0	−37·5	2 Cerebrovascular disease	−0·9	−12·4	−23·0
3 Diarrhoeal diseases	3 Cerebrovascular disease	21·2	−1·4	−13·3	3 Lower respiratory infections	−23·9	−32·7	−31·1
4 Ischaemic heart disease	4 HIV/AIDS	597·5	467·3	458·7	4 Neonatal preterm birth complications	−25·9	−34·5	−29·8
5 Cerebrovascular disease	5 Neonatal preterm birth complications	−39·4	−50·7	−37·4	5 Diarrhoeal diseases	−29·2	−37·4	−35·8
6 Neonatal encephalopathy	6 Diarrhoeal diseases	−38·5	−50·0	−40·4	6 Neonatal encephalopathy	−16·1	−25·8	−20·5
7 Malaria	7 Malaria	21·1	−1·5	19·1	7 HIV/AIDS	−33·9	−41·5	−41·4
8 Measles	8 Neonatal encephalopathy	−3·5	−21·6	−0·3	8 Road injuries	−8·1	−18·7	−18·5
9 Congenital anomalies	9 Road injuries	11·0	−9·7	−7·8	9 Malaria	−40·1	−47·0	−44·7
10 Road injuries	10 COPD	−4·6	−22·4	−30·1	10 COPD	−3·0	−14·2	−25·0

1990

Communicable, maternal, neonatal, nutritional

Non-communicable disease

Injuries

YLLs = years of life lost

Leading causes 1990	Leading causes 2005	% change	Median all-age % change	Age-standard-ised % change	Leading causes 2015	% change	Median all-age % change	Age-standard-ised % change
1 Lower respiratory infections	1 Ischaemic heart disease	25·8	2·3	−12·6	1 Ischaemic heart disease	−10·2	−2·5	−14·8
2 Neonatal preterm birth complications	2 Lower respiratory infections	−37·3	−49·0	−37·5	2 Cerebrovascular disease	−0·9	−12·4	−23·0
3 Diarrhoeal diseases	3 Cerebrovascular disease	21·2	−1·4	−13·3	3 Lower respiratory infections	−23·9	−32·7	−31·1
4 Ischaemic heart disease	4 HIV/AIDS	597·5	467·3	458·7	4 Neonatal preterm birth complications	−25·9	−34·5	−29·8
5 Cerebrovascular disease	5 Neonatal preterm birth complications	−39·4	−50·7	−37·4	5 Diarrhoeal diseases	−29·2	−37·4	−35·8
6 Neonatal encephalopathy	6 Diarrhoeal diseases	−38·5	−50·0	−40·4	6 Neonatal encephalopathy	−16·1	−25·8	−20·5
7 Malaria	7 Malaria	21·1	−1·5	19·1	7 HIV/AIDS	−33·9	−41·5	−41·4
8 Measles	8 Neonatal encephalopathy	−3·5	−21·6	−0·3	8 Road injuries	−8·1	−18·7	−18·5
9 Congenital anomalies	9 Road injuries	11·0	−9·7	−7·8	9 Malaria	−40·1	−47·0	−44·7
10 Road injuries	10 COPD	−4·6	−22·4	−30·1	10 COPD	−3·0	−14·2	−25·0

2017

Non-communicable disease

Communicable, maternal, neonatal, nutritional

Injuries

Leading ten causes of YLLs

	1	2	3	4	5	6	7
Global	IHD (0·98)	Stroke (0·98)	LRI (0·67)	NN preterm (0·72)	Diarrhoea (0·74)	NN encephalitis (1·18)	HIV (0·63)
High SDI	IHD (1·58)	Stroke (1·09)	Lung C (1·08)	Self-harm (0·94)	Alzheimer's (0·98)	LRI (0·81)	Colorect C (0·86)
High-middle SDI	IHD (0·88)	Stroke (0·92)	Road injuries (0·9)	Lung C (0·93)	LRI (0·81)	HIV (0·51)	COPD (1·12)
Middle SDI	IHD (0·8)	Stroke (1·15)	Road injuries (0·73)	COPD (1·37)	LRI (0·6)	NN preterm (0·7)	Congenital (0·74)
Low-middle SDI	LRI (0·77)	NN encephalitis (1·5)	Diarrhoea (1·02)	NN preterm (0·79)	IHD (1·02)	HIV (0·71)	Malaria (15·93)
Low SDI	LRI (0·53)	Malaria (2·96)	Diarrhoea (0·45)	HIV (1·62)	NN preterm (0·51)	NN encephalitis (0·68)	Congenital (0·93)
High income	IHD (1·08)	Lung C (1·05)	Stroke (0·7)	Alzheimer's (1·04)	Self-harm (0·81)	COPD (1·46)	LRI (0·75)

TYPES OF STOKES
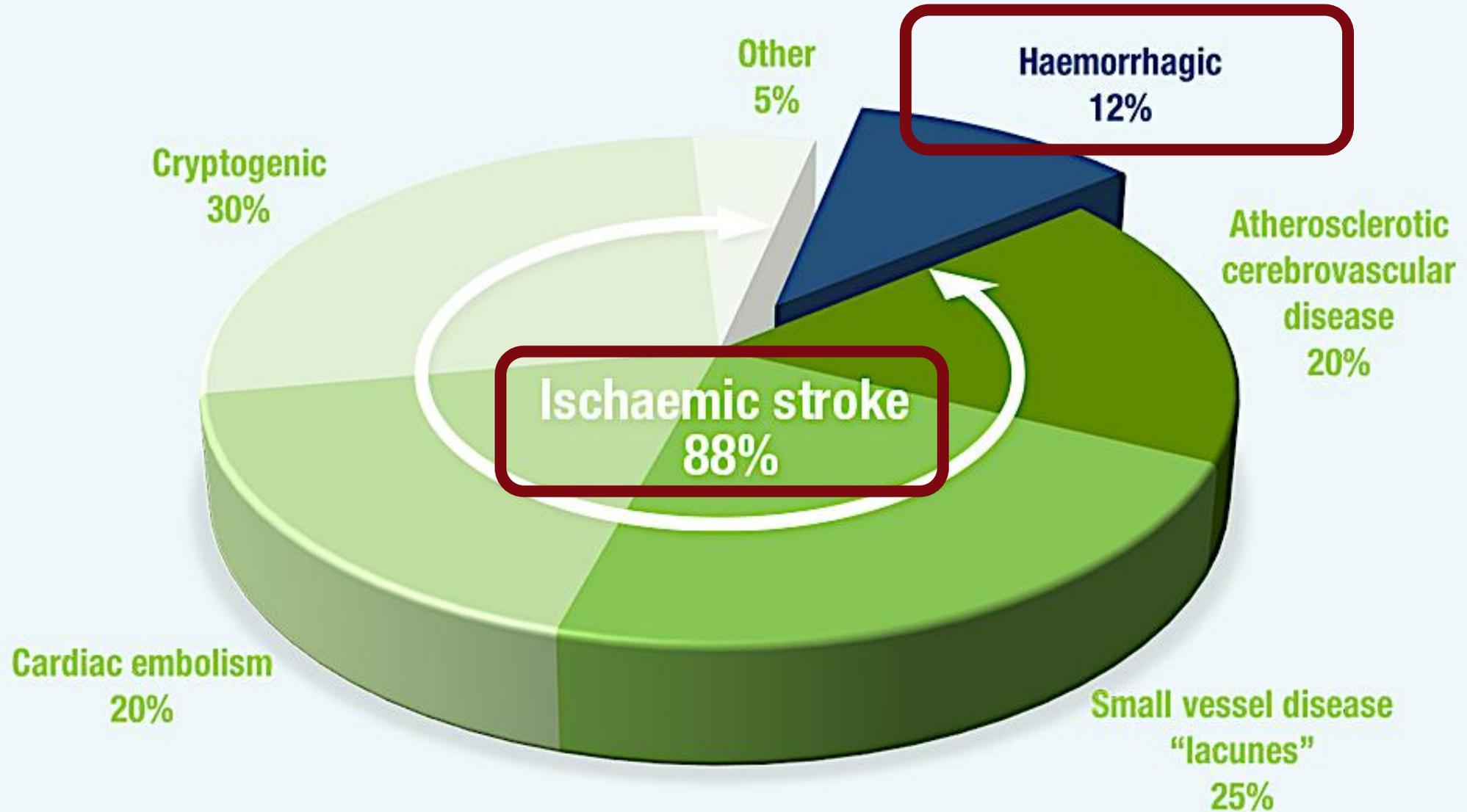
TYPES AND CAUSES OF STOKES
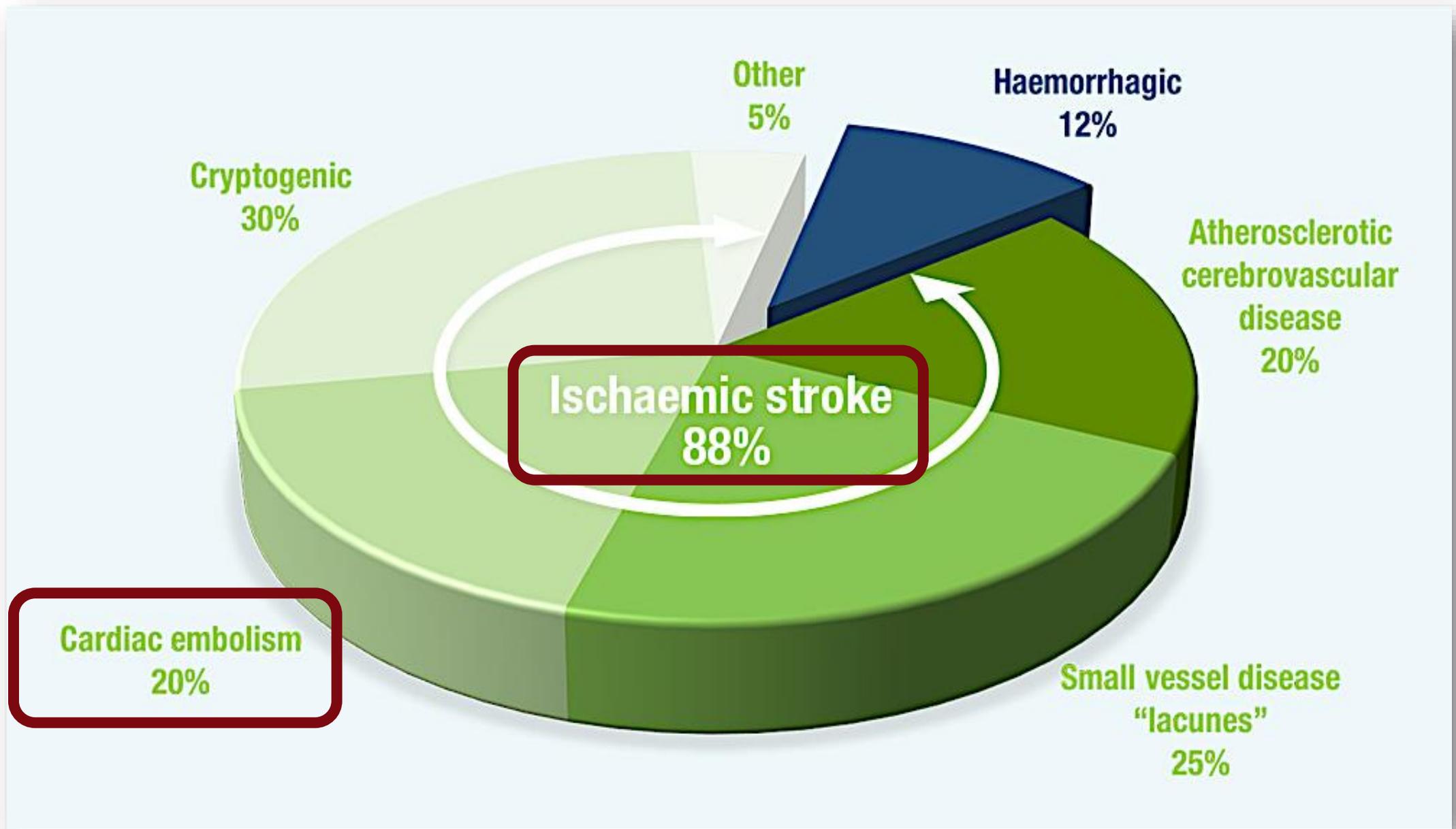
Other 5%

Haemorrhagic 12%

Cryptogenic 30%

Atherosclerotic cerebrovascular disease 20%

Ischaemic stroke 88%

Cardiac embolism 20%
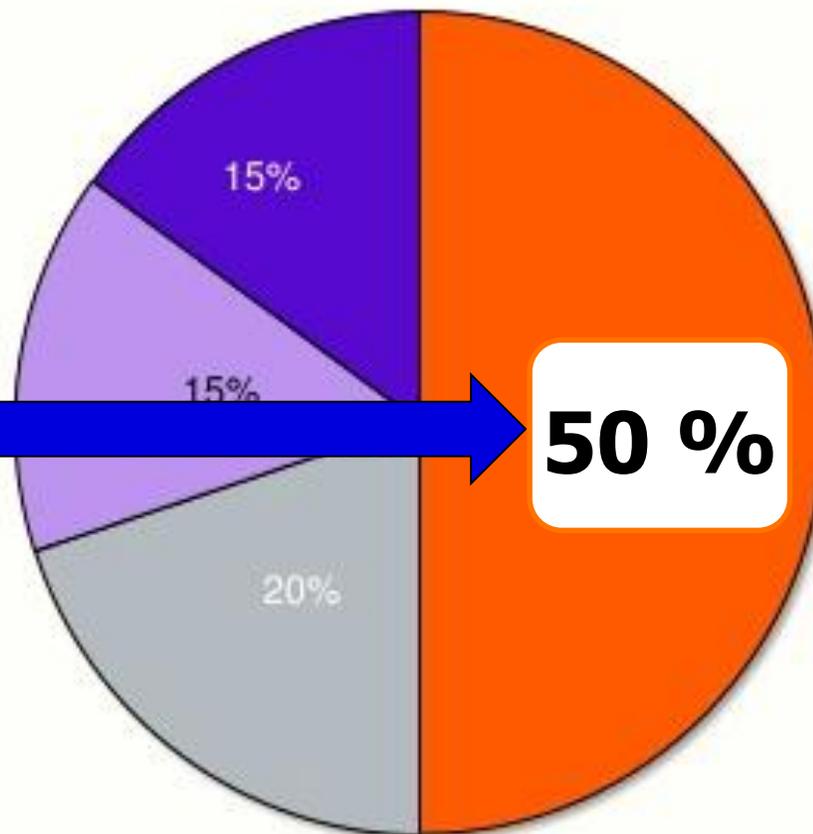
Small vessel disease "lacunes" 25%
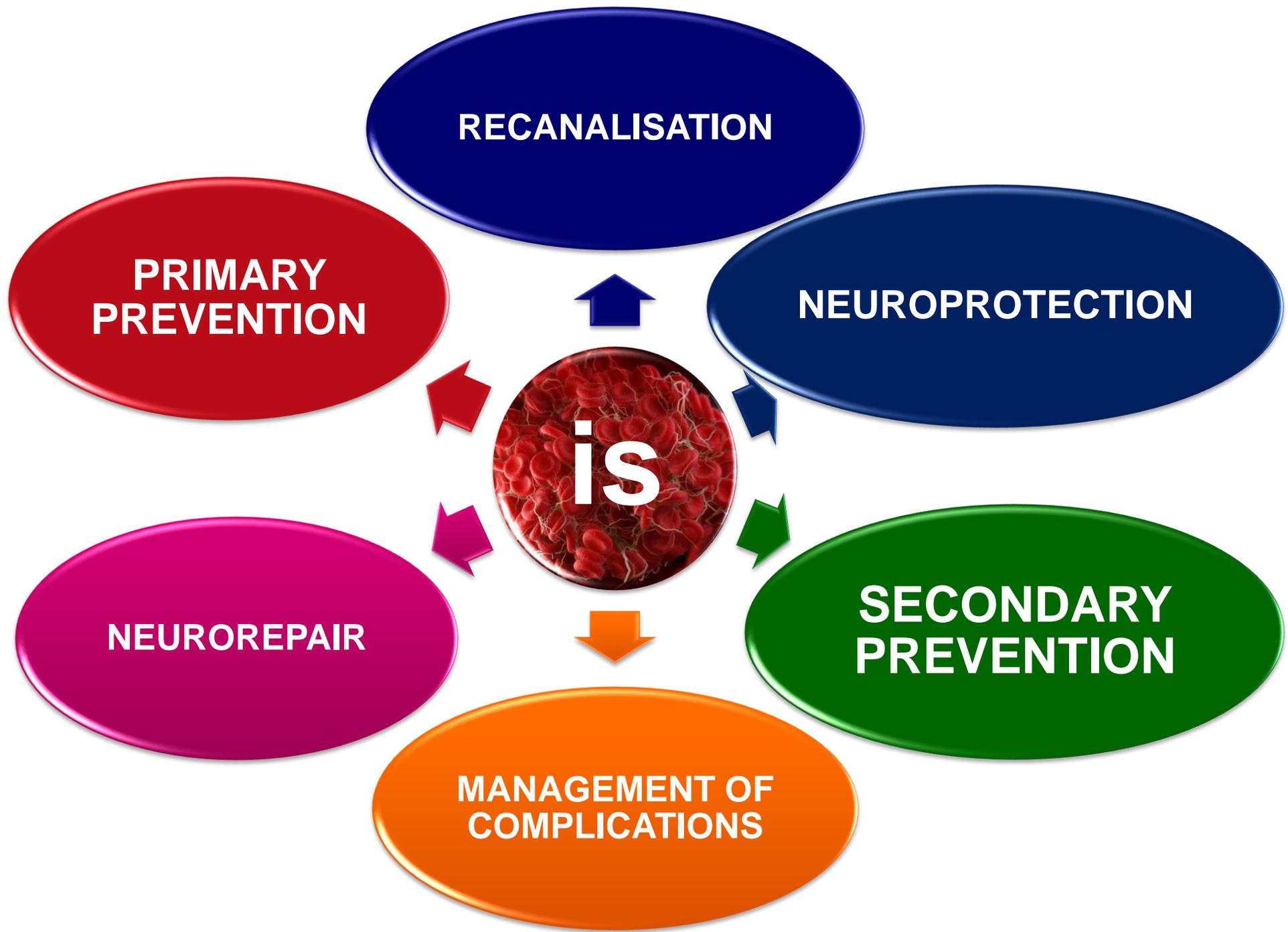
Methods

- Institute of Health Information and Statistics of the Czech Republic data

- Primary source of data – National Register of Reimbursed Health Services

  from health insurance companies

  - *In-patients & out-patients settings*

- Data linked with data from death certificates

- *From 2015 to 2017*

Methods

- Main diagnosis I63 (cerebral infarction)

- Secondary diagnosis:

  I48 (atrial fibrillation and flutter)

  I35.9 (non-specified aortic valve disease)

  Q21.1 (atrial septal defect)

  I33.0 (acute and subacute endocarditis)

Methods

- Patients with ischaemic stroke and **MRI head** performed in the same year as a diagnosis of stroke was entered into the registries.

- Patients with ischaemic stroke who underwent **intravenous thrombolysis** or **mechanical thrombectomy** and a specific ATC group B01AD02 medication or intervention (89321, 90952) was entered into the registries.

- Patients with ischaemic stroke and of following medication were prescribed and reimbursed: **Anopyrin** (B01AC06), **Trombex** (B01AC04), **Warfarin** (B01AA03), **Xarelto** (B01AF01), **Pradaxa** (B01AE07) or **Eliquis** (B01AF02).

Results

Patients with a diagnosis I63 and one of the secondary diagnosis I48, I35.9, Q21.1 or I33.0 (2015 – 2017)

N = 159 344 patients with diagnosis I63
N = 16 946 patients with a diagnosis I63 and one of the secondary diagnosis

% of patients with I63 and I48, I35.9, Q21.1 or I33.0

Age group	%
Celkem	10.6%
< 50	2.0%
50-54	2.5%
55-59	3.2%
60-64	4.5%
65-69	6.5%
70-74	9.1%
75-79	12.2%
80-84	16.1%
85-89	20.2%
90-94	22.8%
95+	22.2%
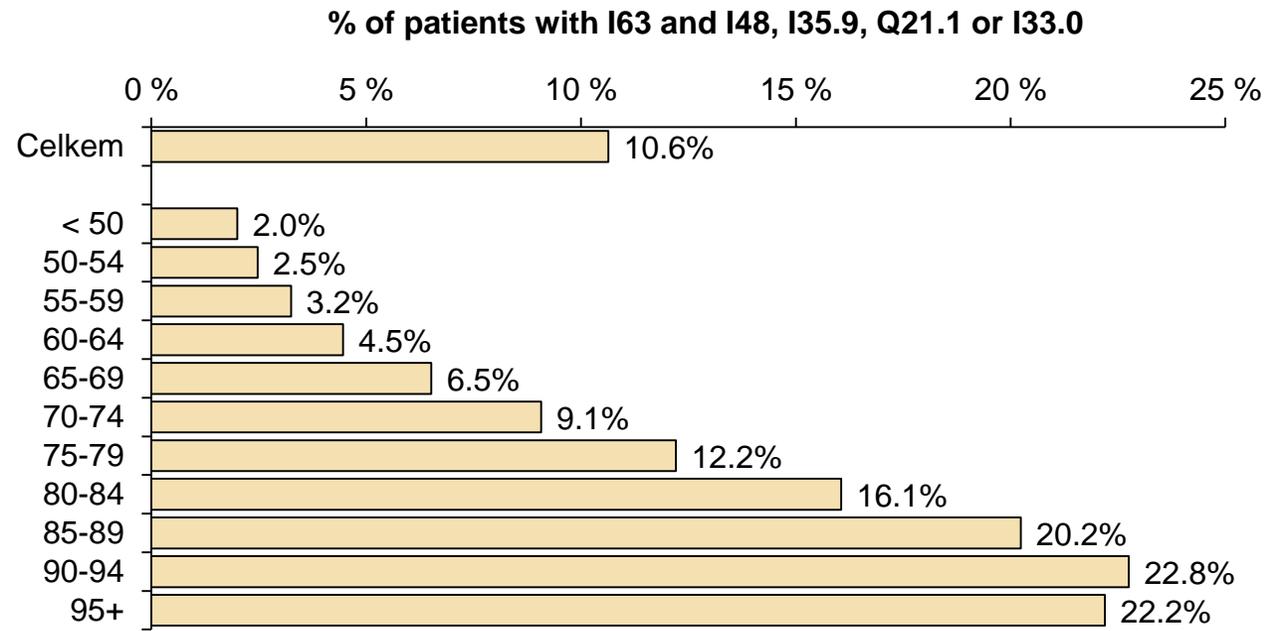
Main diagnosis I63 claimed and secondary diagnosis I48, I35.9, Q21.1 or I33.0

Percentage of secondary diagnosis in patients with I63 2015 – 2017 (N = 16 946)

% patients

I48 - fibrilace a flutter síní	16 599; 98,0 %
Q21.1 - vrozený defekt síňového septa	293; 1,7 %
I33.0 - akutní a subakutní infekční endokarditida	48; 0,3 %
I35.9 - nespecifikovaná nerevmatická onemocnění aortální chlopně	43; 0,3 %
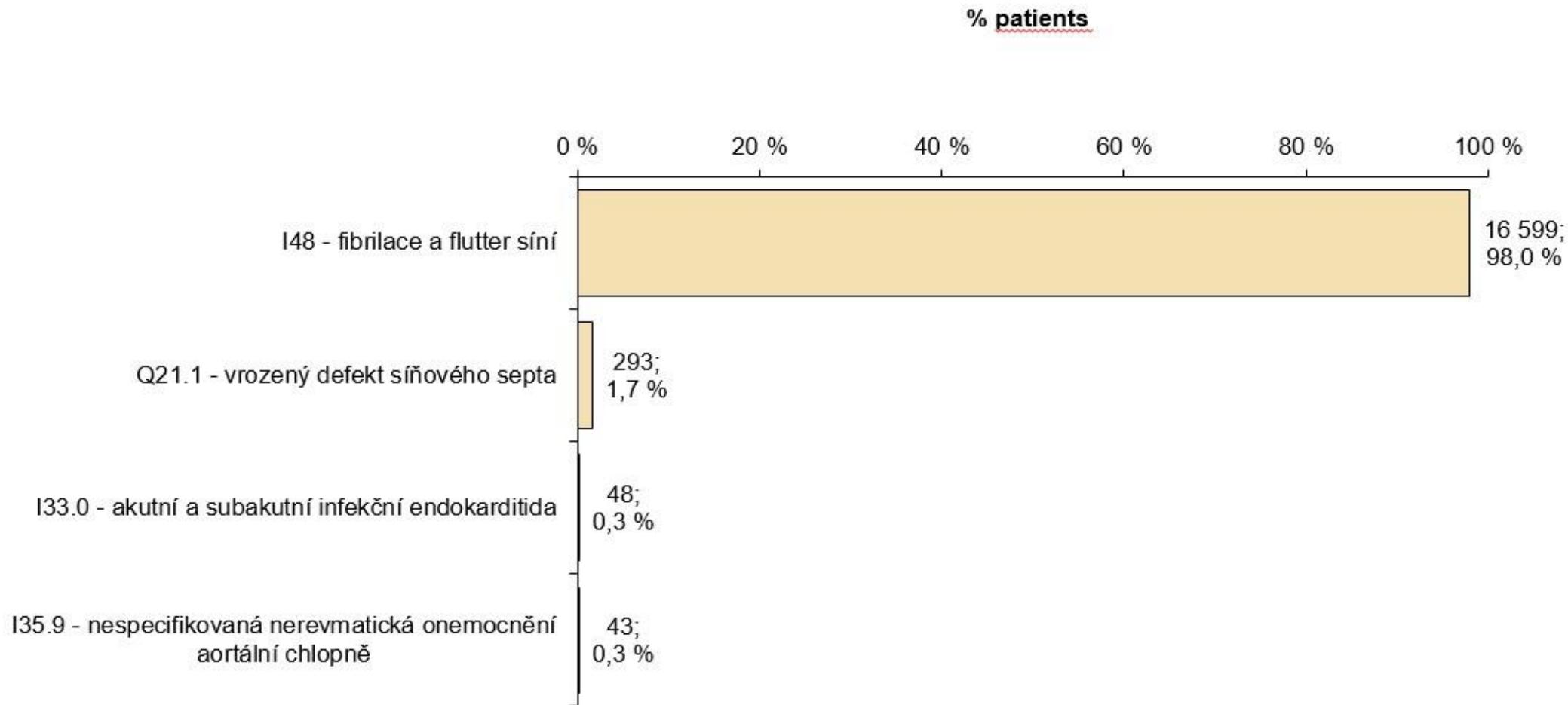
Main diagnosis I63 and some of the other secondary diagnosis

2015 – 2017 (N = 16 946)

% patients

| Diagnosis	%
I10 Esenciální (primární) hypertenze	66,5 %
I25 Chronická ischemická choroba srdeční	27,0 %
E11 Diabetes mellitus 2. typu	24,3 %
E78 Poruchy metabolizmu lipoproteinů a jiné lipidemie	22,3 %
G81 Hemiplegie	17,2 %
N39 Jiná onemocnění močové soustavy	12,9 %
R47 Poruchy řeči NJ	10,8 %
J18 Pneumonie, původce NS	9,8 %
I50 Selhání srdce	9,7 %
I69 Následky cévních nemocí mozku	7,9 %
E87 Jiné poruchy tekutin, elektrolytů a acidobasické rovnováhy	7,2 %
B96 Jiná urč. bakteriální agens, jako příčina nemoci zařazené do j.kapitol	6,6 %
Z92 Lékařská léčba v osobní anamnéze	6,2 %
I70 Ateroskleróza	6,2 %
E03 Jiná hypotyreóza	5,9 %
I67 Jiná cévní onemocnění mozku	5,7 %
Z98 Jiné pooperační stavy	5,5 %
N18 Chronické onemocnění ledvin	5,3 %

Patients with stroke and secondary diagnosis and their region of residence in 2017

(N = 5 817)

Patients with stroke per 100.000 inhabitants

Stroke centres

Region of residence	Patients with stroke per 100.000 inhabitants	Stroke centres
Moravskoslezský kraj	70,7	6
Zlínský kraj	66,0	2
Jihočeský kraj	66,0	2
Královéhradecký kraj	63,7	3
Olomoucký kraj	62,5	2
Kraj Vysočina	55,2	2
ČR	54,9	45
Jihomoravský kraj	53,8	6
Liberecký kraj	53,5	2
Ústecký kraj	53,4	5
Pardubický kraj	52,2	2
Středočeský kraj	47,0	4
Plzeňský kraj	44,4	1
Hlavní město Praha	42,8	6
Karlovarský kraj	30,7	2

Legend:
- > 65,0
- 55,1–65,0
- 45,1–55,0
- ≤ 45,0

Demographic profile of patients with a stroke and a secondary diagnosis in 2017

(N = 5 817 patients)

42.8 % ■ Muži
57.2 % ■ Ženy
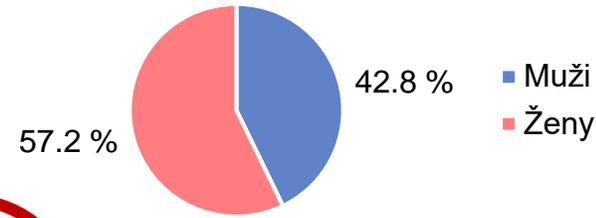
Male:	N	Mean (SD)	Median (IQR)
Age	2 491	75,4 (10,2)	76 (70; 83)

Female:	N	Mean (SD)	Median (IQR)
Age	3 326	81,1 (9,1)	83 (76; 87)
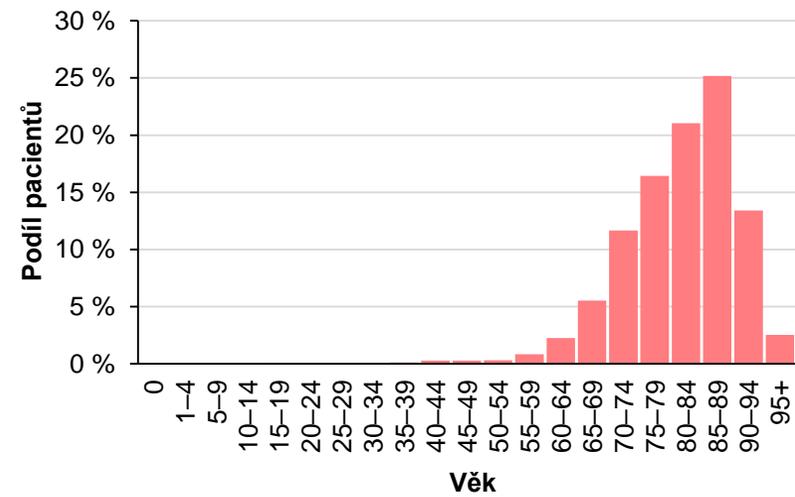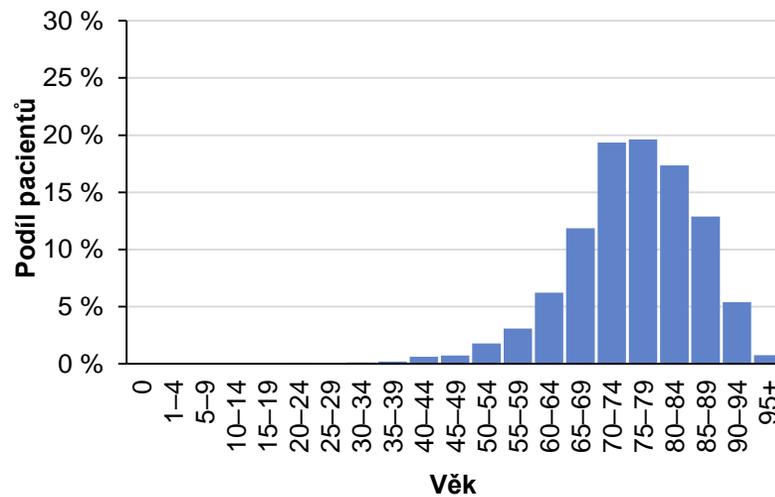
Patients with a stroke and MRI head performed between 2015 – 2017

N = 16 946 patients with I63 and a secondary diagnosis

NRHZS 2015–2017:
1 698 (10 %) patients with a stroke
and MRI head
in the same year

10.0 %

90.0 %

■ MR v tomtéž roce   ■ Bez MR

% ze všech pacientů s definovanou CMP v daném roce

0 %   5 %   10 %   15 %

Rok

2015 — 9.8 %

2016 — 8.6 %

2017 — 9.7 %
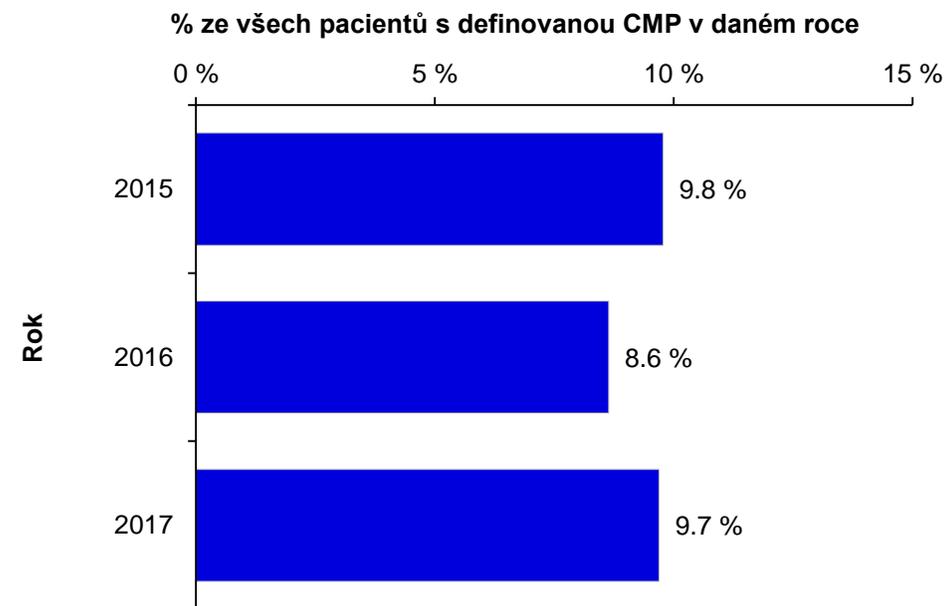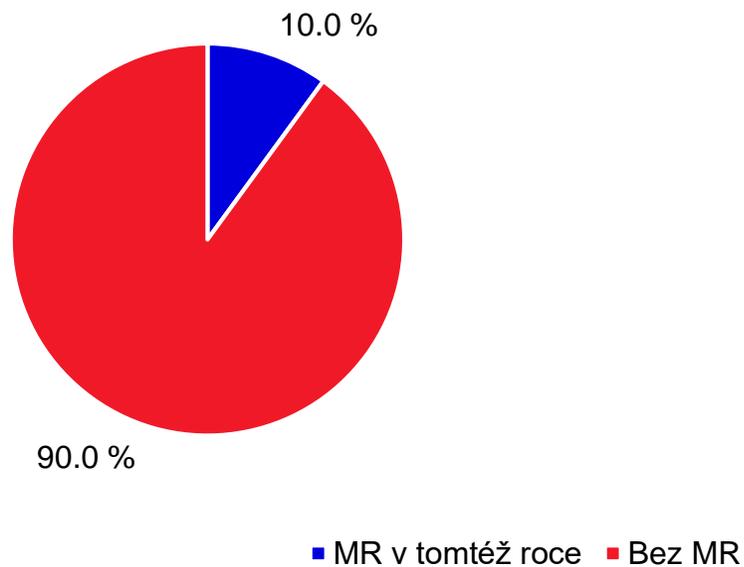
Demographic profile of patients with a stroke and MRI head in 2017

(N = 5 817 patients in 2017)

46.6 %   53.4 %

- ■ Muži
- ■ Ženy
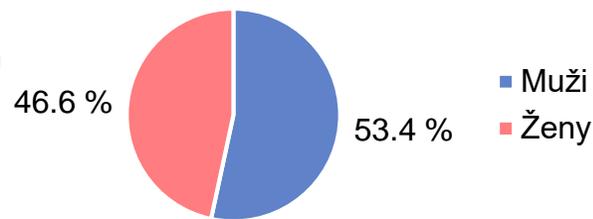
Male:	N	Mean (SD)	Median (IQR)
Věk	301	69,3 (11,0)	72 (64; 77)

Female:	N	Mean (SD)	Median (IQR)
Věk	263	72,5 (12,9)	75 (68; 81)
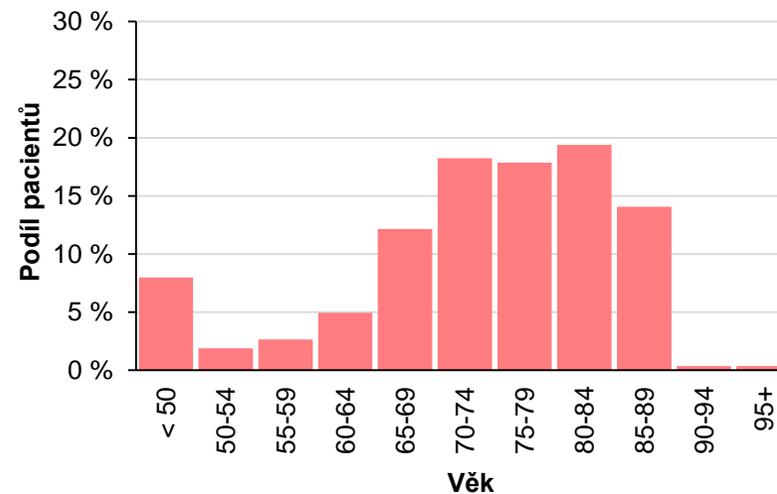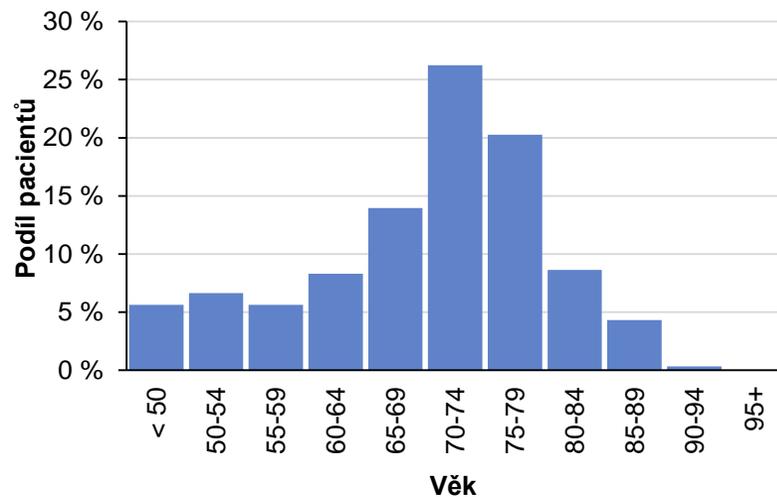
Demographic profile of patients with a stroke and MRI head

N = 5 817 patients with I63 and a secondary diagnosis, N = 564 patients with a stroke and MRI head

Počet pacientů s MR na 100 všech pacientů s definovanou CMP v daném kraji
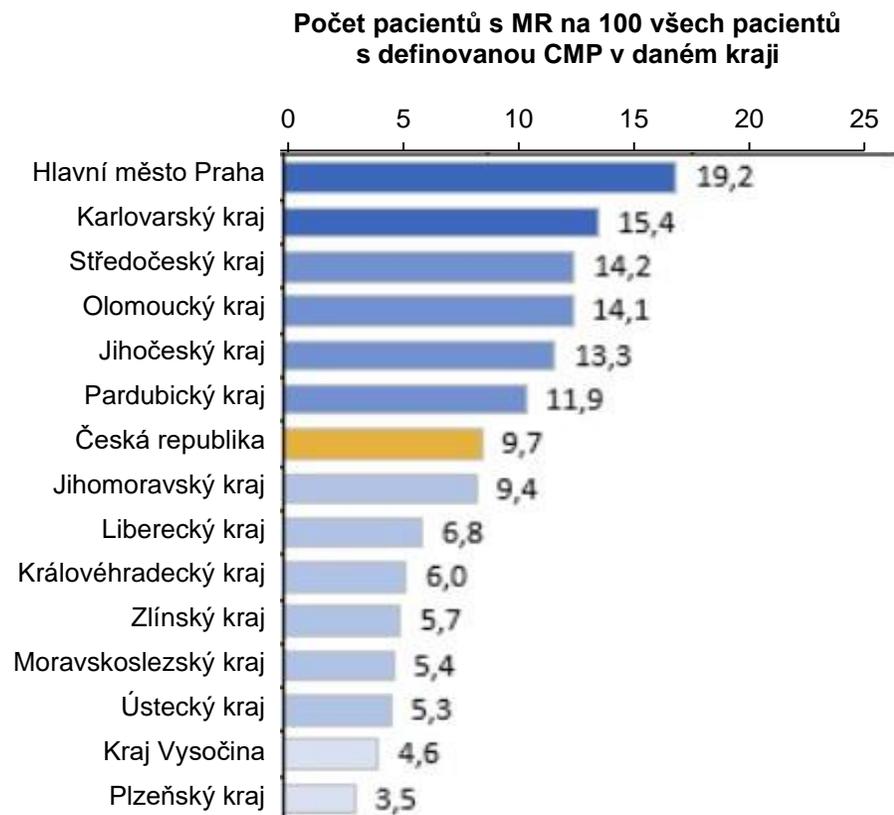
Region	Value	Stroke centres in a region	MRI scanners in a region
Hlavní město Praha	19,2	6	4
Karlovarský kraj	15,4	2	0
Středočeský kraj	14,2	4	1
Olomoucký kraj	14,1	2	0
Jihočeský kraj	13,3	2	1
Pardubický kraj	11,9	2	1
Česká republika	9,7	45	17
Jihomoravský kraj	9,4	6	5
Liberecký kraj	6,8	2	0
Královéhradecký kraj	6,0	3	1
Zlínský kraj	5,7	2	0
Moravskoslezský kraj	5,4	6	0
Ústecký kraj	5,3	5	2
Kraj Vysočina	4,6	2	0
Plzeňský kraj	3,5	1	2
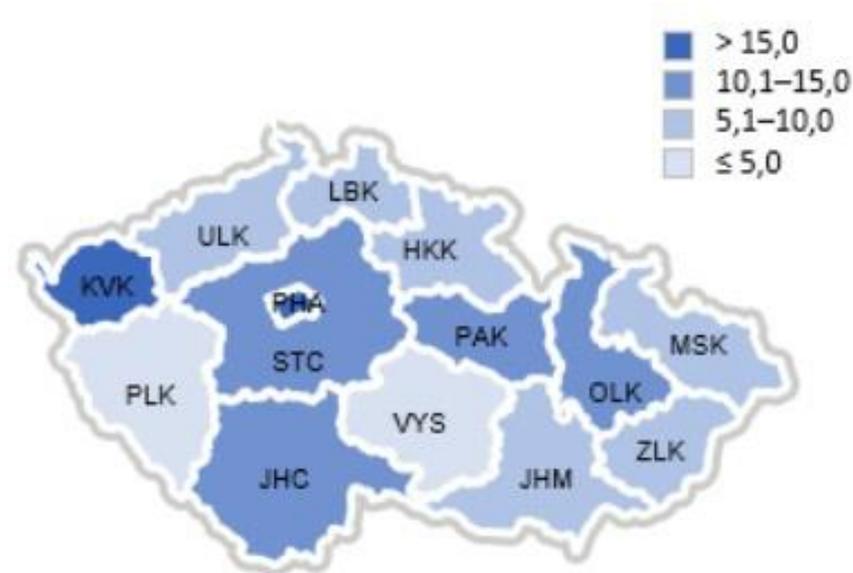
Patients with stroke received i.v. thrombolysis and/or embolectomy 2015 – 2017

Data NRHZS 2015–2017:
3 754 patients with a stroke received i.v. thrombolysis and/or embolectomy

Podíl pacientů s definovanou CMP a IVT/mechanickou rekanalizací v tomtéž roce na všech pacientech s definovanou CMP

22.2 %

77.8 %

- ■ IVT/mechnická rekanalizace v tomtéž roce
- ■ Bez IVT/mechanické rekanalizace

% ze všech pacientů s definovanou CMP v daném roce

Rok	%
2015	18.7 %
2016	21.2 %
2017	22.0 %

Patients with stroke received i.v. thrombolysis and/or embolectomy in 2017

Podíl pacientů

Počet pacientů s definovanou CMP

	Podíl pacientů	N
Celkem	22.0 %	N = 5 817
Pohlaví		
Muži	23.3 %	N = 2 491
Ženy	21.0 %	N = 3 326
Věkové kategorie		
< 50	44.3 %	N = 70
50-54	33.3 %	N = 54
55-59	18.1 %	N = 105
60-64	25.2 %	N = 230
65-69	26.3 %	N = 479
70-74	25.5 %	N = 870
75-79	21.5 %	N = 1 036
80-84	21.6 %	N = 1 132
85-89	19.7 %	N = 1 158
90-94	16.4 %	N = 580
95+	12.6 %	N = 103

Pie chart:
- 20.4 % — IVT i mechanická rekanalizace
- 66.7 % — Pouze IVT
- 12.8 % — Pouze mechanická rekanalizace
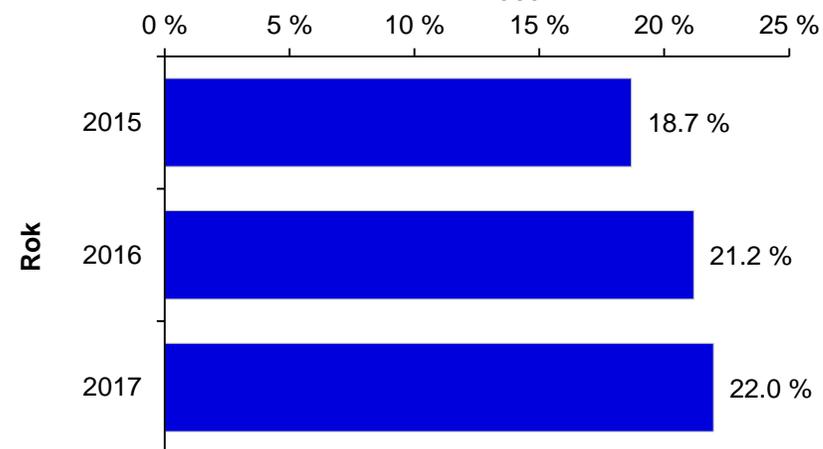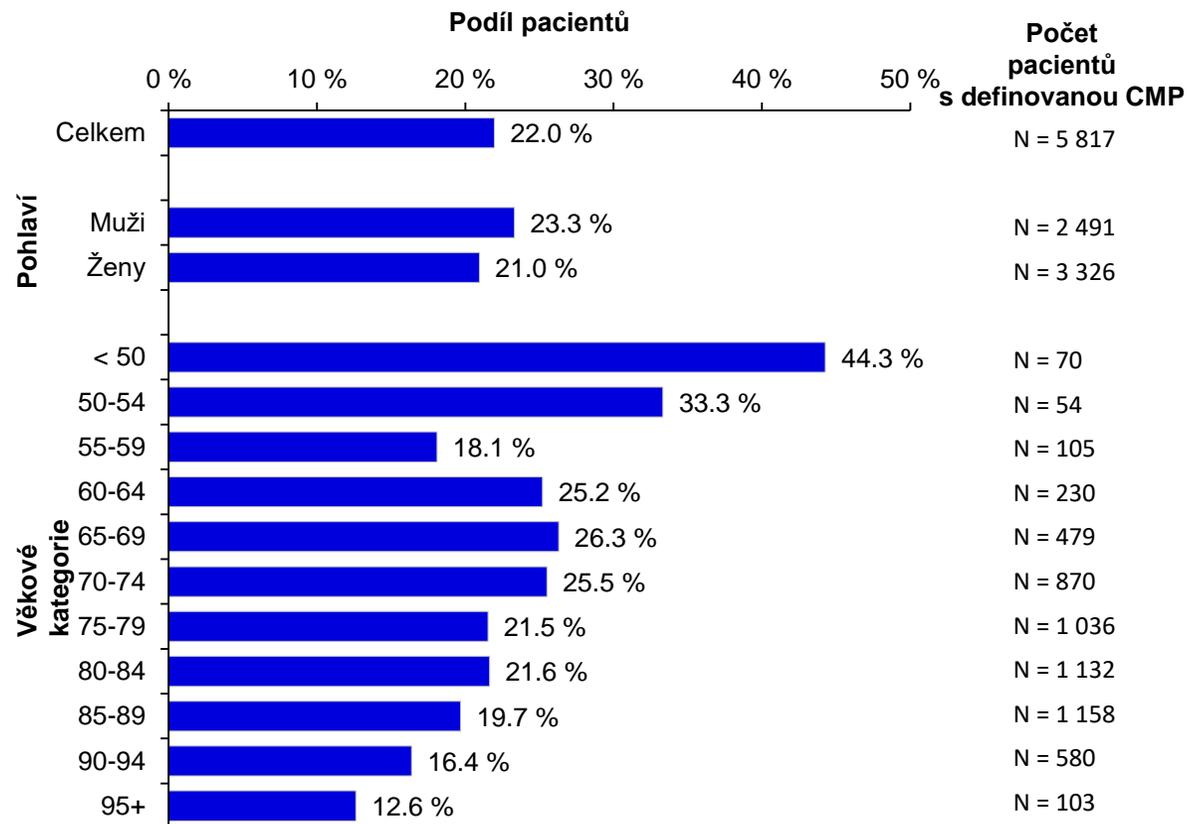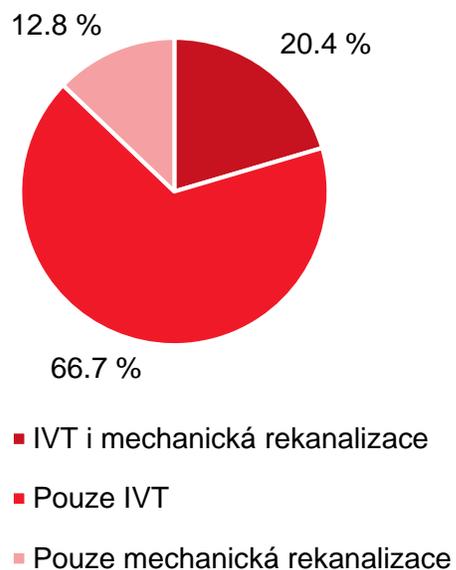
Demographic profile of patients with stroke and IVT and/or embolectomy in 2017

N = 1 278 in 2017

45.5 %

54.5 %

- Muži
- Ženy
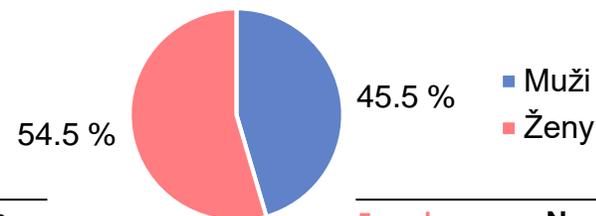
Male:	N	Mean (SD)	Median (IQR)
Věk	581	74,6 (10,3)	75 (69; 82)

Female:	N	Mean (SD)	Median (IQR)
Věk	697	79,1 (10,7)	81 (74; 87)
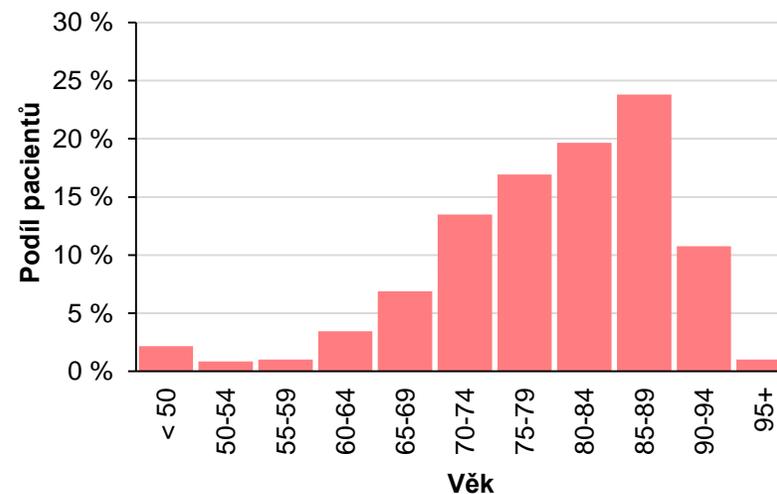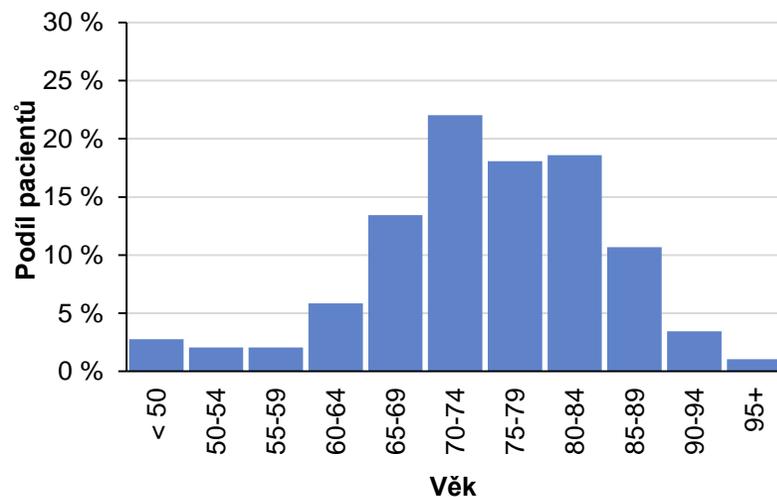
IVT/embolectomy performed in the Czech regions in 2017

N = 5 817 patients with stroke and secondary diagnosis
N = 1 430 patients with stroke and IVT and/or embolectomy

Počet pacientů s definovanou CMP a IVT/mechanickou rekanalizací na 100 všech pacientů s definovanou CMP v daném kraji

Stroke centres
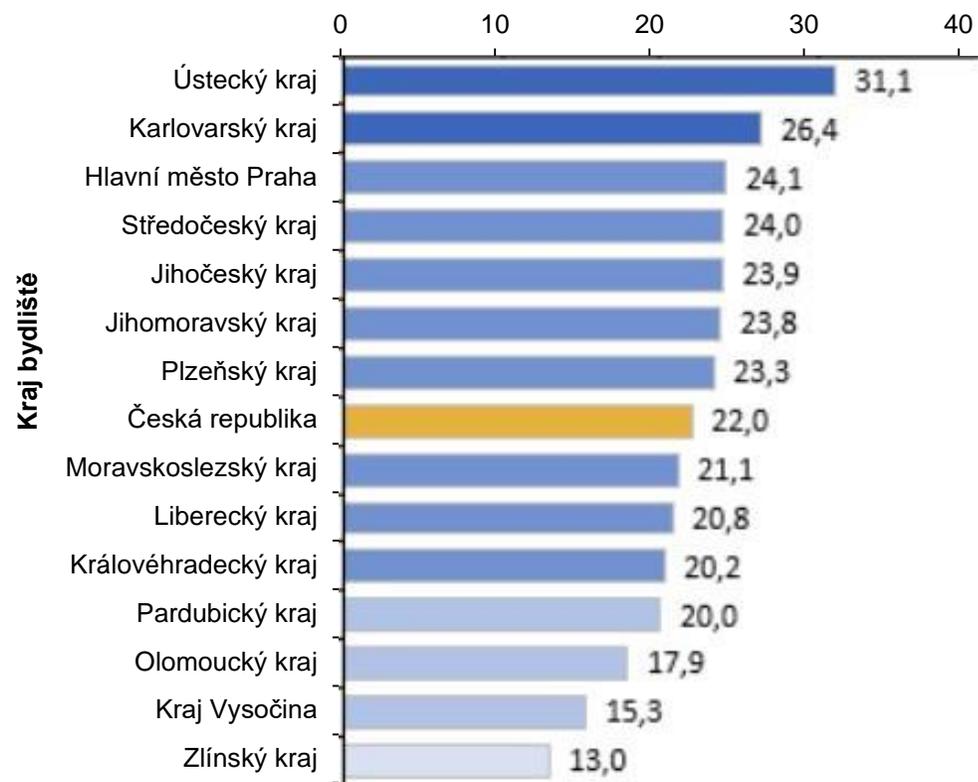
Kraj bydliště	Value	Stroke centres
Ústecký kraj	31,1	5
Karlovarský kraj	26,4	2
Hlavní město Praha	24,1	6
Středočeský kraj	24,0	4
Jihočeský kraj	23,9	2
Jihomoravský kraj	23,8	6
Plzeňský kraj	23,3	1
Česká republika	22,0	45
Moravskoslezský kraj	21,1	6
Liberecký kraj	20,8	2
Královéhradecký kraj	20,2	3
Pardubický kraj	20,0	2
Olomoucký kraj	17,9	2
Kraj Vysočina	15,3	2
Zlínský kraj	13,0	2

> 25,0
20,1–25,0
15,1–20,0
≤ 15,0
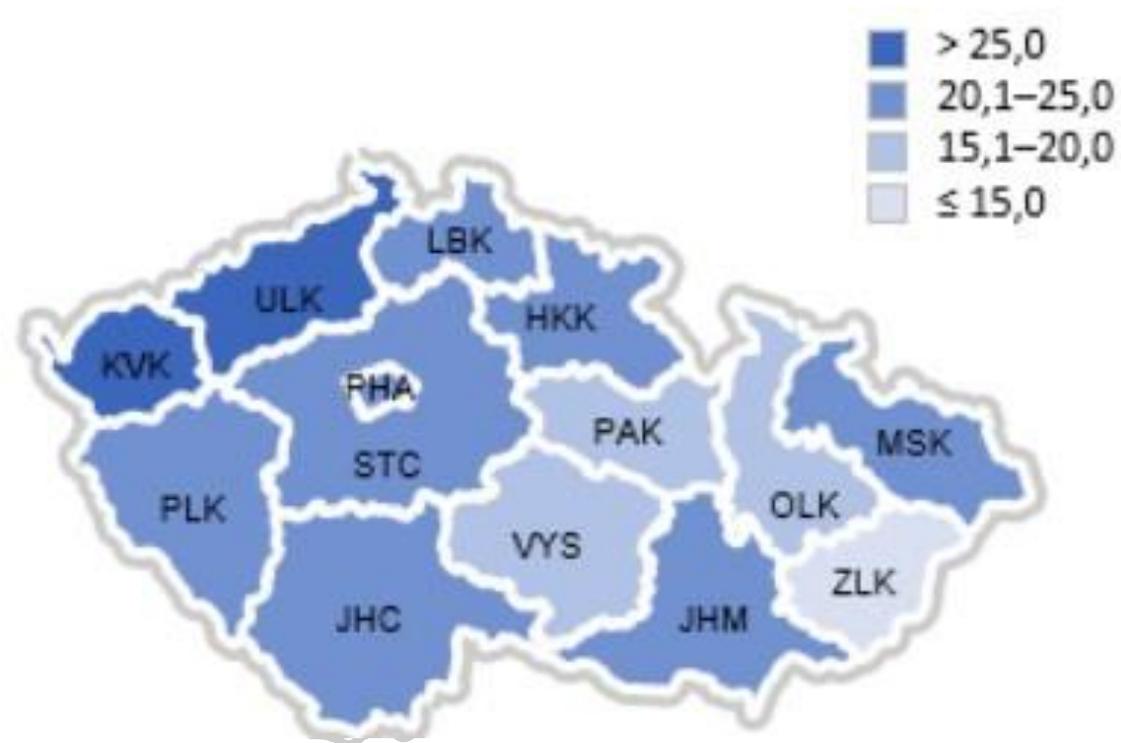
Patients with stroke treated with antiagregants / anticoagulants in 2015 – 2017

Data NRHZS 2015–2017:
14 088 patients with stroke and AA/AC

N = 16 946 of patients with a stroke and seconddary diagnosis

Data NRHZS 2015:
5 111 patients (48 per 1000 000)

Data NRHZS 2016:
5 174 patients (49 per 100 000)

Data NRHZS 2017:
4 814 patients (45 per 100 000)

Podíl pacientů s definovanou CMP a léčbou vybranými antiagregancii nebo antikoagulancii v tomtéž roce na všech pacientech s definovanou CMP
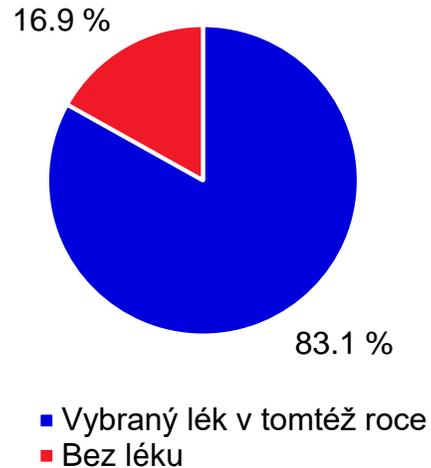
16.9 %

83.1 %

- Vybraný lék v tomtéž roce
- Bez léku

% ze všech pacientů s definovanou CMP v daném roce

Rok	
2015	81.4 %
2016	82.9 %
2017	82.8 %
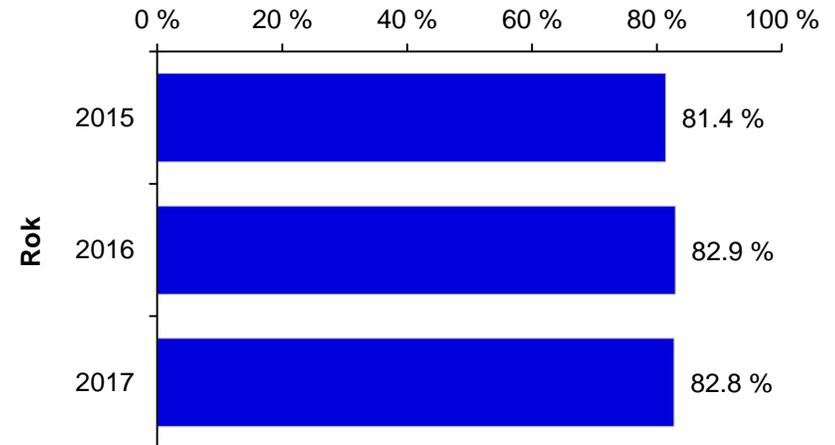
Patients with stroke treated with antiagregants / anticoagulants in 2015 – 2017

Patients treated with AA/AC - % from all stroke patients

Drug	2015	2016	2017
Anopyrin	46.1 %	45.9 %	42.5 %
Trombex	17.7 %	17.4 %	16.8 %
Warfarin	53.7 %	53.3 %	55.2 %
Xarelto	6.1 %	6.6 %	6.3 %
Pradaxa	9.7 %	10.2 %	10.2 %
Eliquis	6.4 %	7.5 %	9.9 %
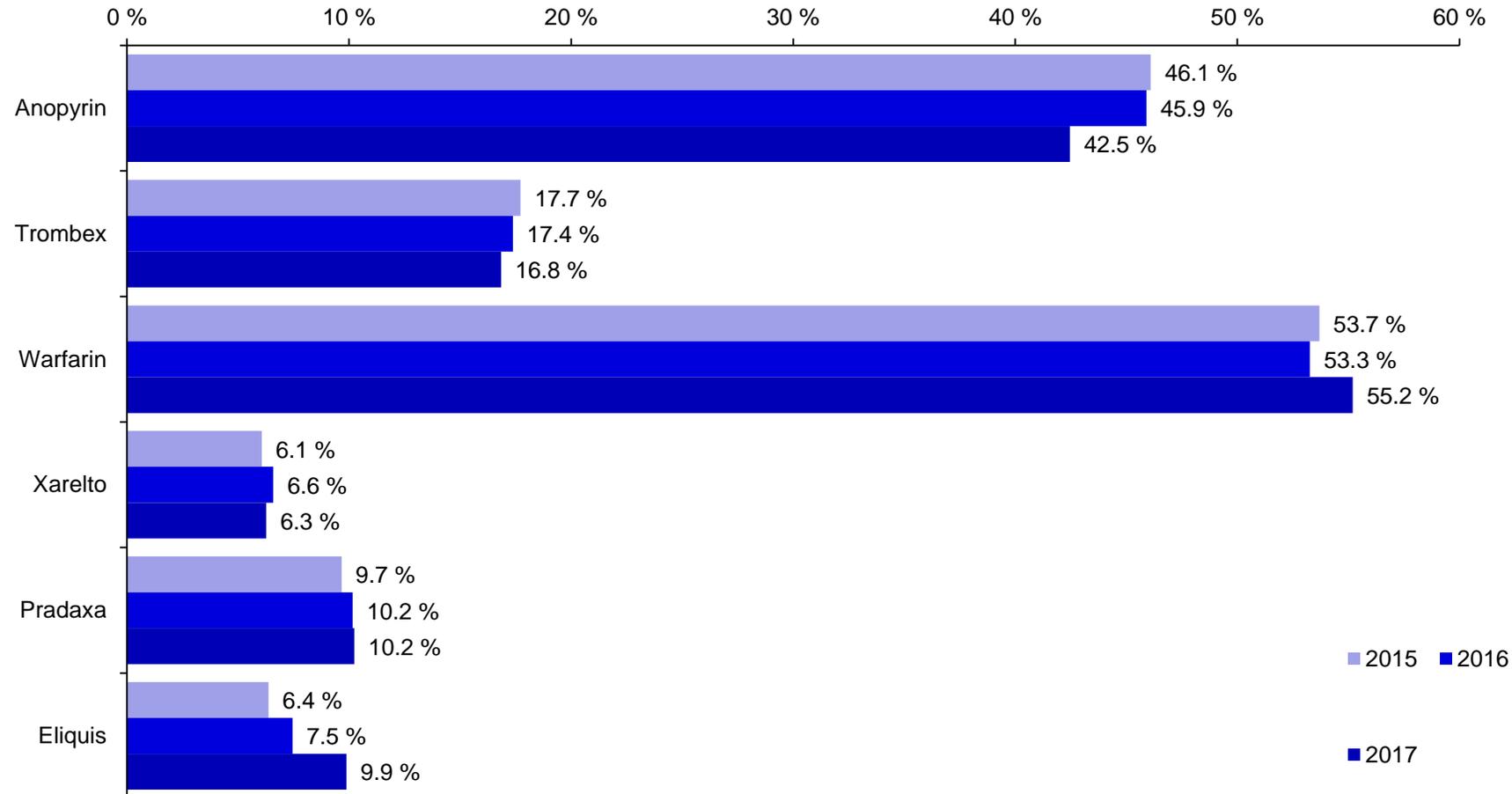
Patients with stroke treated with antiagregants / anticoagulants in 2017

N = 4 814 patients with stroke in 2017

Pie chart:
- Antiplatelets only: 28.7 %
- Anticoagulants only: 49.6 %
- Anticoagulants and antiplatelets: 21.7 %

Podíl pacientů s danou kombinací léčiv

Kombinace	%
Pouze Warfarin	32.1 %
Pouze Anopyrin	18.6 %
Warfarin + Anopyrin	10.6 %
Anopyrin + Trombex	5.6 %
Pouze Trombex	4.6 %
Pouze Pradaxa	4.3 %
Pouze Eliquis	3.8 %
Pouze Xarelto	2.3 %
Anopyrin + Trombex + Warfarin	2.3 %
Warfarin + Pradaxa	2.2 %
Trombex + Warfarin	2.0 %
Warfarin + Eliquis	1.9 %
Warfarin + Xarelto	1.6 %
Anopyrin + Eliquis	1.1 %
Anopyrin + Pradaxa	1.1 %

# Patients with stroke treated with antiagregants / anticoagulants in 2017 in the Czech regions

N = 4 814 patients with stroke in 2017

Počet pacientů s léčbou na 100 všech pacientů s definovanou CMP v daném kraji

Počet iktových center v kraji

Kraj bydliště

Kraj bydliště	Počet pacientů	Počet iktových center v kraji
Jihočeský kraj	88,4	2
Kraj Vysočina	87,2	2
Zlínský kraj	87,0	2
Liberecký kraj	85,6	2
Moravskoslezský kraj	84,9	6
Česká republika	82,8	45
Jihomoravský kraj	82,7	6
Královéhradecký kraj	81,8	3
Hlavní město Praha	81,7	6
Olomoucký kraj	81,6	2
Plzeňský kraj	80,9	1
Pardubický kraj	80,7	2
Ústecký kraj	79,5	5
Středočeský kraj	78,5	4
Karlovarský kraj	76,9	2

> 85,0
80,1–85,0
≤ 80,0

Acute hospital admission for stroke in 2017 – hospital stay

Acute hospital admission in 2017 coded I63 and some of the secondary diagnosis I48, I35.9, Q21.1 or I33.0 (N = 13 561 events)
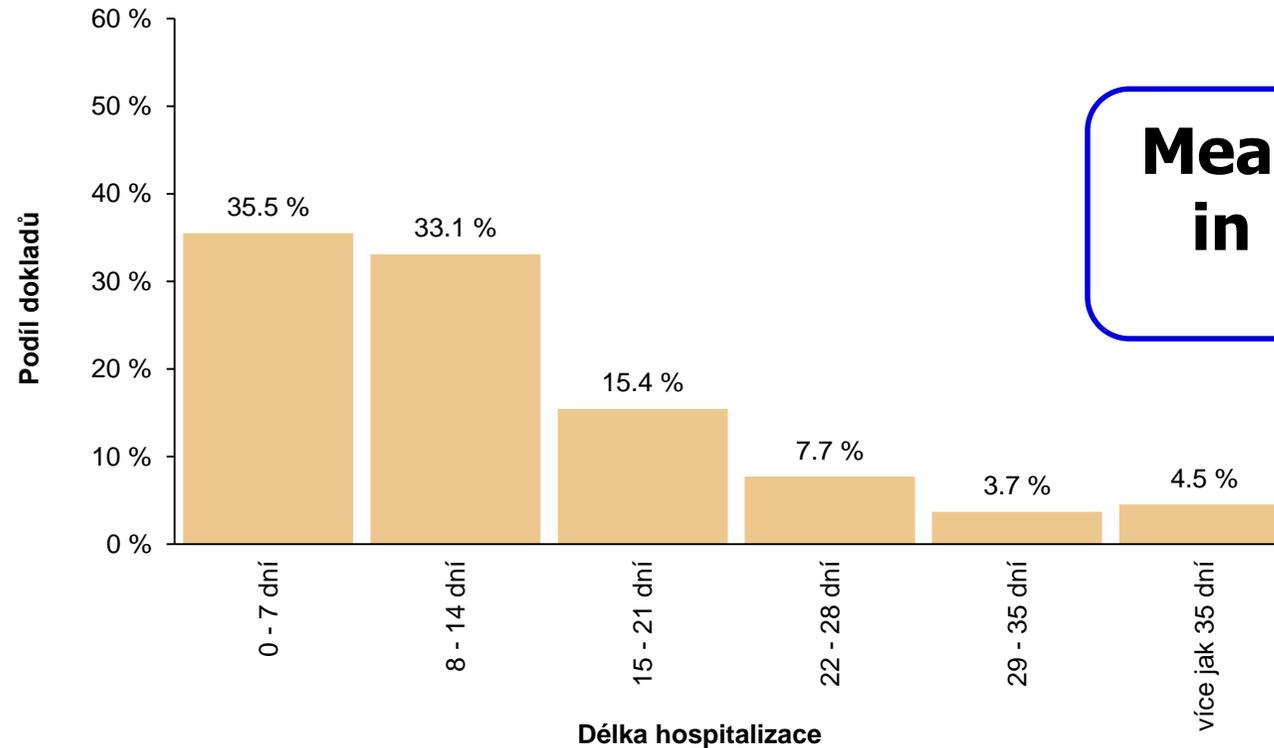
Mean acute hospital stay in 2017 was 13.7 days

Acute hospital admission for stroke in 2017

Acute hospital admission in 2017 coded I63 and some of the secondary diagnosis I48, I35.9, Q21.1 or I33.0 (N = 13 561 events)

|	N	Průměr (SD)	Medián (IQR)
Muži	6 178	14,3 (16,1)	10 (6; 17)
Ženy	7 383	13,2 (12,8)	10 (6; 16)
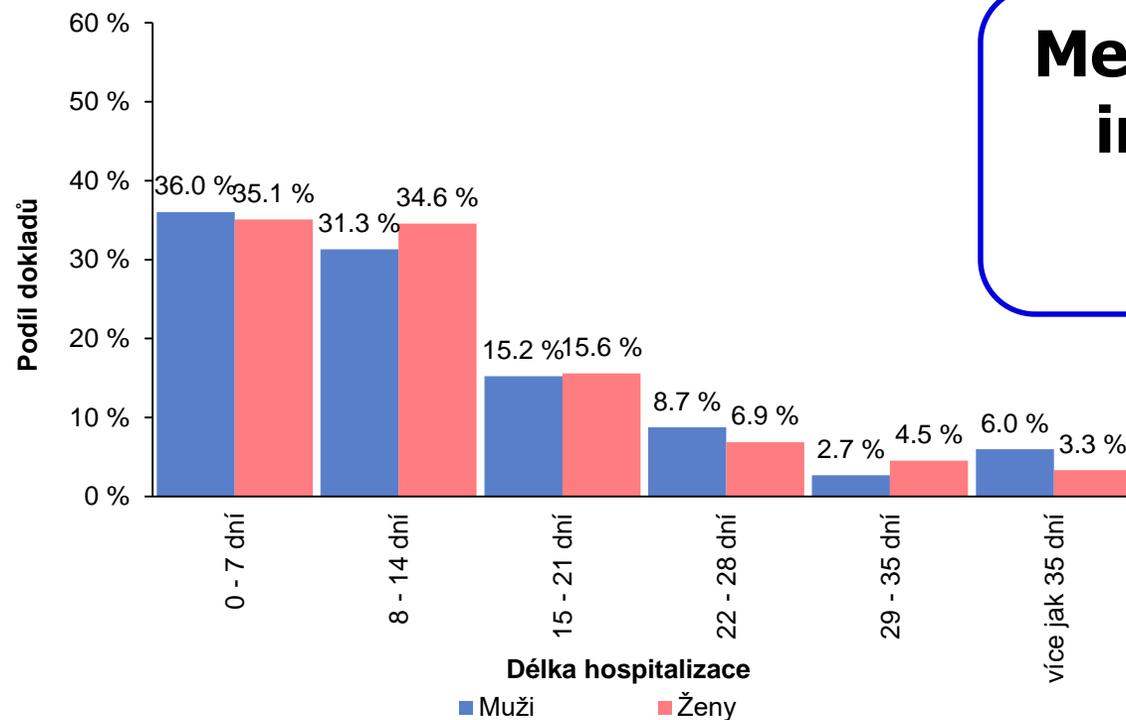
Mean acute hospital stay in 2017 was 1.1 days shorter in females

Mortality for stroke of cardioembolic cause

N = 16 946 patients with I63 and some of the secondary diagnoses in 2015 – 2017

N = 7 605 patients died in 2015 – 2017 (44,9 % of all diagnosed I63 and secondary diagnosis patients)

Data NRHZS 2015–2017:
7 605 died
44.9 %

55.1 %

44.9 %
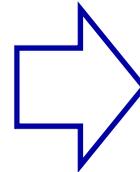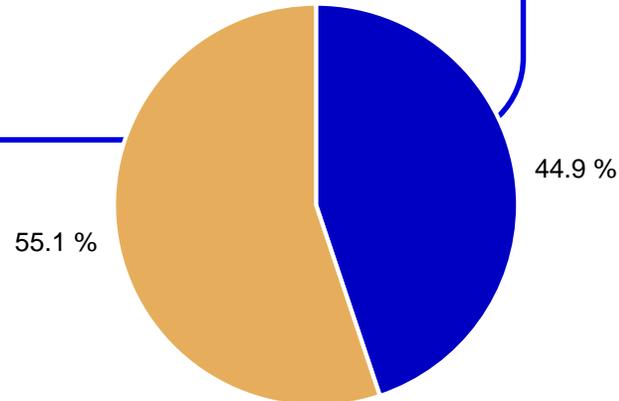
Data NRHZS 2015:
2 123 patients (20 per 100 000)

Data NRHZS 2016:
2 637 patients (25 per 100 000)

Data NRHZS 2017:
2 845 patients (27 per 100 000)

# Causes of death in patients with stroke in 2015 – 2017

N = 16 946 patients with I63 and some of the secondary diagnoses in 2015 – 2017
N = 7 605 patients died in 2015 – 2017 (44,9 % of all diagnosed I63 and secondary diagnosis patients)

Podíl na zemřelých pacientech

Diagnóza	%
I63 Mozkový infarkt	28.9 %
I25 Chronická ischemická choroba srdeční	20.9 %
I64 Cévní mozková příhoda (mrtvice) neurčená jako krvácení nebo infarkt	6.9 %
I48 Fibrilace a flutter síní	5.1 %
I50 Selhání srdce	3.2 %
I69 Následky cévních nemocí mozku	3.0 %
E11 Diabetes mellitus 2. typu s kómatem	2.4 %
I67 Jiná cévní onemocnění mozku	1.9 %
J18 Pneumonie, původce NS	1.9 %
I21 Akutní infarkt myokardu	1.8 %
I61 Intracerebrální (nitromozkové) krvácení	1.3 %
A41 Jiná sepse	1.3 %
J44 Jiná chronická obstrukční plicní nemoc	1.2 %
I11 Postižení srdce při hypertenzi	1.1 %
C34 Zhoubný novotvar průdušky (bronchu) a plíce	1.0 %
F01 Vaskulární demence	0.9 %
I70 Ateroskleróza	0.9 %
I10 Esenciální (primární) hypertenze	0.7 %
I35 Nerevmatická onemocnění aortální chlopně	0.5 %
E10 Diabetes mellitus 1. typu	0.5 %
Ostatní	14.6 %

Causes of death in patients with stroke in 2017

N = 1 118 males and N = 1 727 females with stroke and some secondary diagnoses in 2015 – 2017 who died in 2017.

Male/female mortality

CAUSE OF DEATH

Cause	Muži	Ženy
I63 Mozkový infarkt	23.1 %	26.7 %
I25 Chronická ischemická choroba srdeční	22.1 %	21.9 %
I64 Cévní mozková příhoda (mrtvice) neurčená jako krvácení nebo infarkt	4.6 %	6.7 %
I48 Fibrilace a flutter síní	4.3 %	5.2 %
I50 Selhání srdce	3.6 %	4.3 %
I69 Následky cévních nemocí mozku	3.0 %	3.3 %
E11 Diabetes mellitus 2. typu s kómatem	2.1 %	2.5 %
J18 Pneumonie, původce NS	2.7 %	1.8 %
I67 Jiná cévní onemocnění mozku	1.8 %	2.0 %
I21 Akutní infarkt myokardu	2.2 %	1.4 %
J44 Jiná chronická obstrukční plicní nemoc	2.2 %	0.9 %
C34 Zhoubný novotvar průdušky (bronchu) a plíce	1.9 %	0.8 %
I11 Postižení srdce při hypertenzi	0.8 %	1.5 %
A41 Jiná sepse	1.5 %	0.9 %
F01 Vaskulární demence	1.1 %	1.1 %
I70 Ateroskleróza	1.2 %	0.9 %
I61 Intracerebrální (nitromozkové) krvácení	1.1 %	0.9 %
I10 Esenciální (primární) hypertenze	0.7 %	1.1 %
Ostatní	19.9 %	16.0 %

- **61.464** events identified in the NRHZS database in 2015 – 2017 and **16.946** unique patients with I63 and some of the secondary diagnoses I48, I35.9, Q21.1 nebo I33.0 suggesting cardioembolic cause of a stroke.

- Prevalence of stroke and one of the cardiogenic diagnosis increases with an age and was 10.6 % in 2015 – 2017.

- 57,2 % of patient in 2017 were female, 2017, 42,8 % male.

- Onset of stroke is 5.6 years earlier on average in male than female patients.

- 564 patients with a diagnosis of stroke had MRI head performed in the same year of diagnosis; 9.7 % of all stroke patients in 2017. More MRI head scans were done for male and decreases with increasing age. MRI head has been performed in younger patients.

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CONCLUSIONS

- 1 278 patients received i.v. thrombolysis and/or embolectomy in 2017

  = **22 % of all stroke patients**.

- **66.7 %** received i. v. thrombolysis only, **20.4 %** received i.v. thrombolysis and embolectomy, and **12.8 %** underwent embolectomy only.

- 4 814 patients diagnosed with stroke in 2017 had prescribed anitplatelets or anticoagulants; **82.8 % of all stroke patients in 2017**.

- 49.6 % reveived anticoagulants, 28.7 % antiplatelets and 21.7 % had prescribed both.

- The most common combination was Warfarin and Anopyrin (10.6 %)

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CONCLUSIONS

- 2.845 patients with a stroke died in 2017. 60,7 % female and 39.3 % male.

- Average age at the time of death was 4.8 higher in females than males.

- The most common place of death was hospital.

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Thank you ☺

European JBI symposium of Evidence-Based Healthcare in Clinical Practice Guidelines, Decision making process and Evidence synthesis in the Czech Republic, Brno, 12th – 14th December 2018

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