Navigating Stroke in the Young: Insights, Challenges, and Future Directions

Dr Célina Ducroux

Stroke Physician

Regional Stroke NETWORK Réseau Régional DES AVC CHAMPLAIN

Disclosures

ChatGPT to create images

PLAN

I. EPIDEMIOLOGY

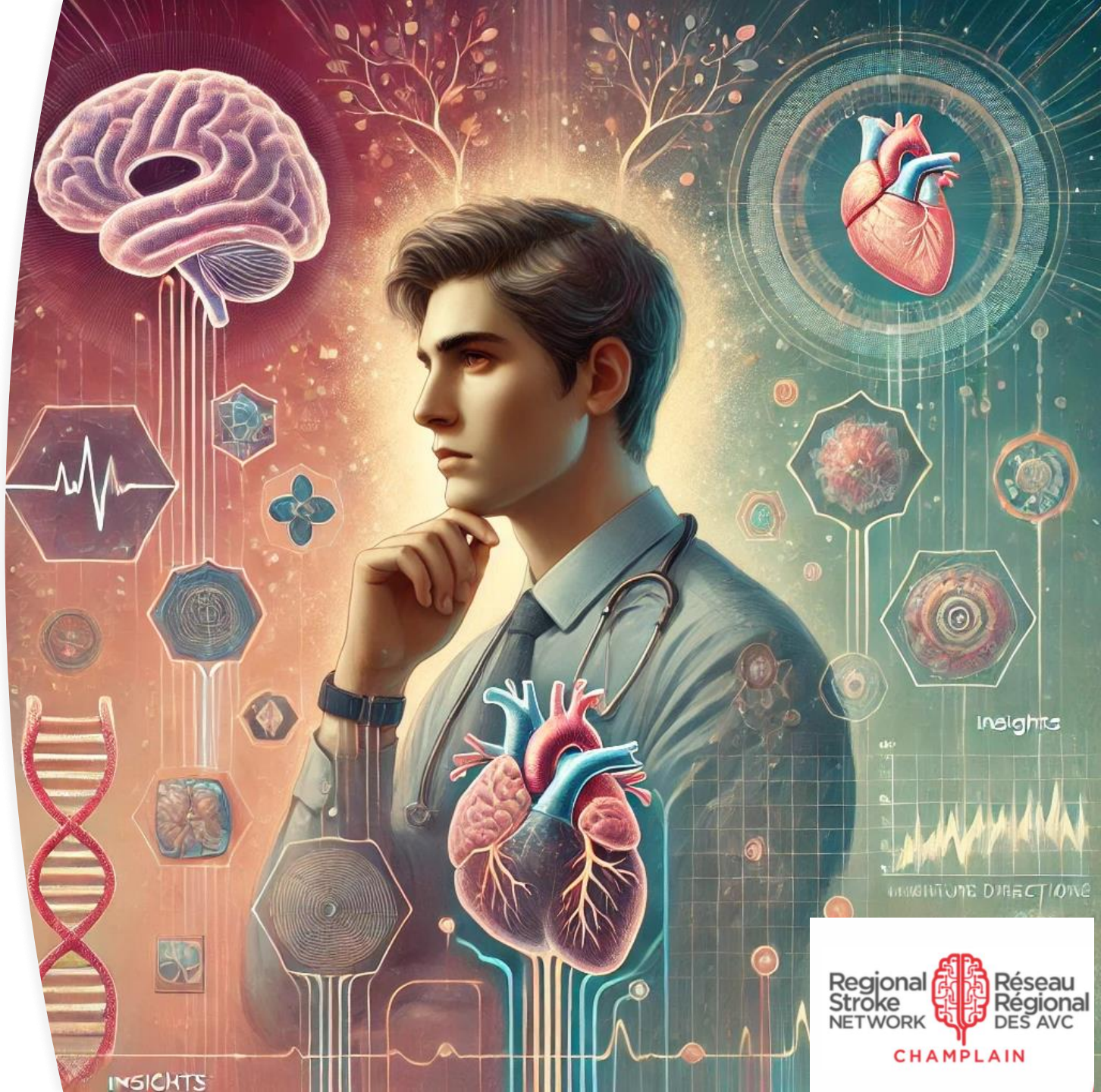
II. ETIOLOGY

III. RISK FACTORS

IV. ACUTE MANAGEMENT

V. WOMEN AND STROKE

VI. CHALLENGES



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DEFINITION

18 years old ≤

≤ 50 years old

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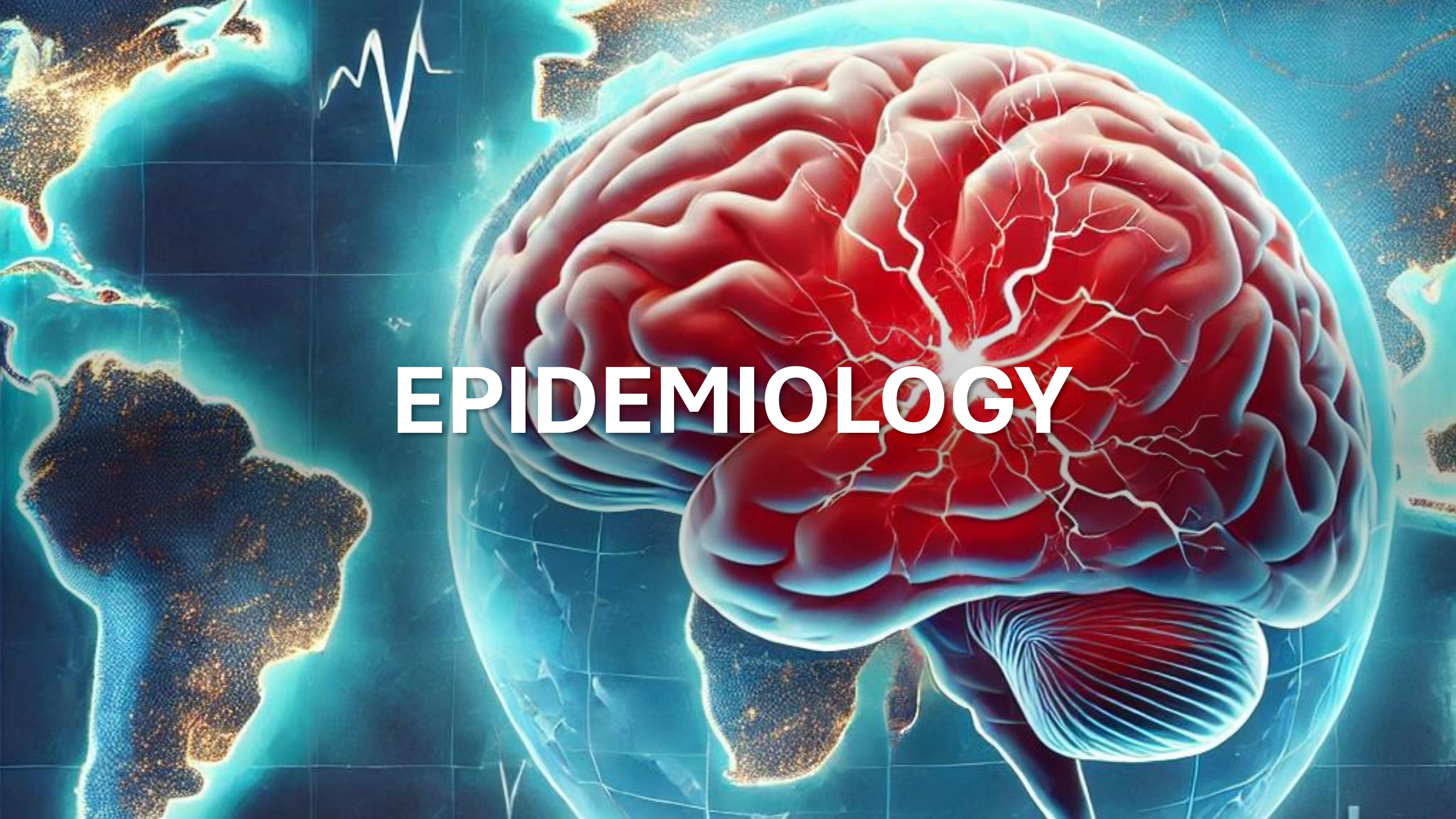
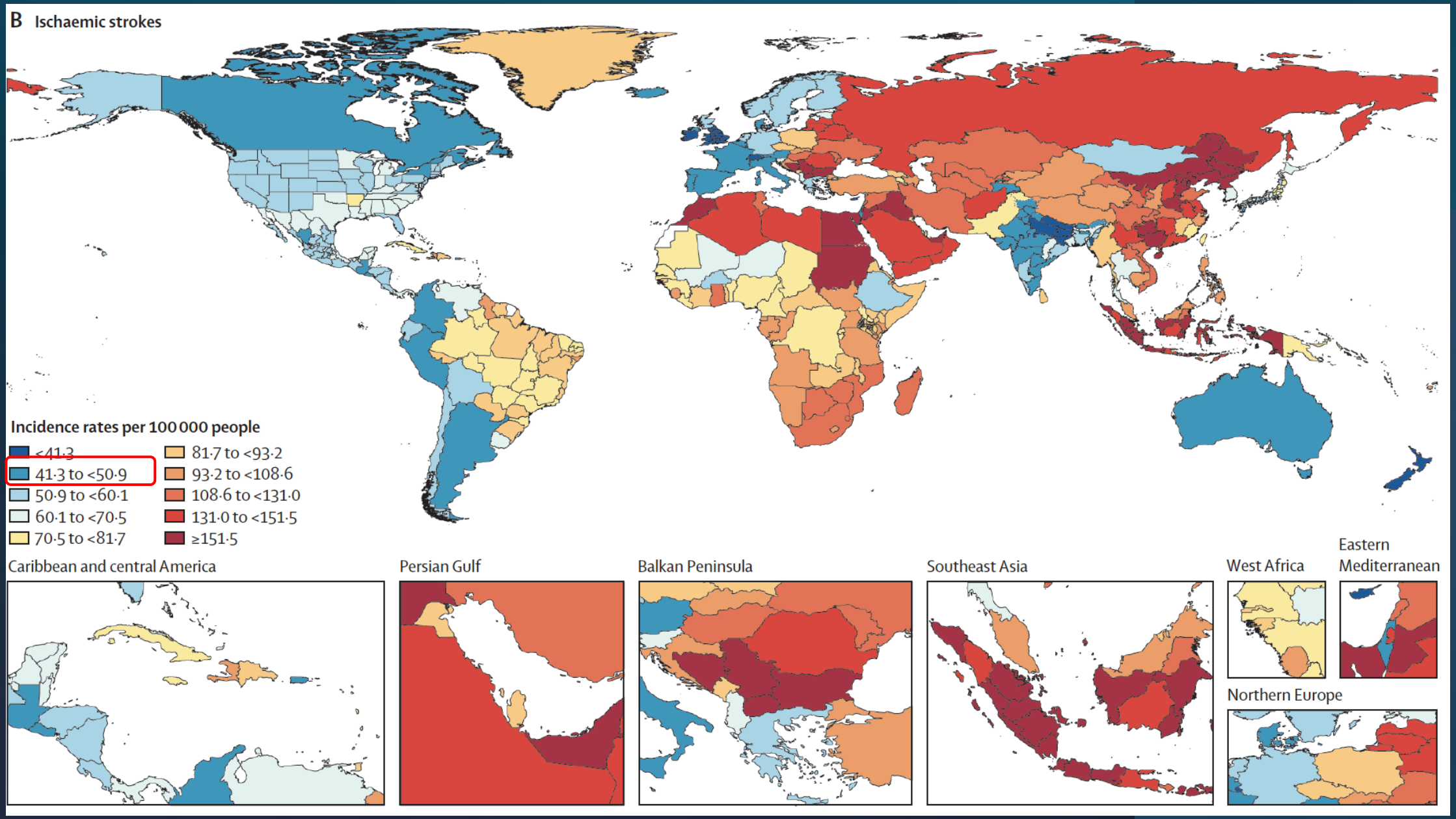
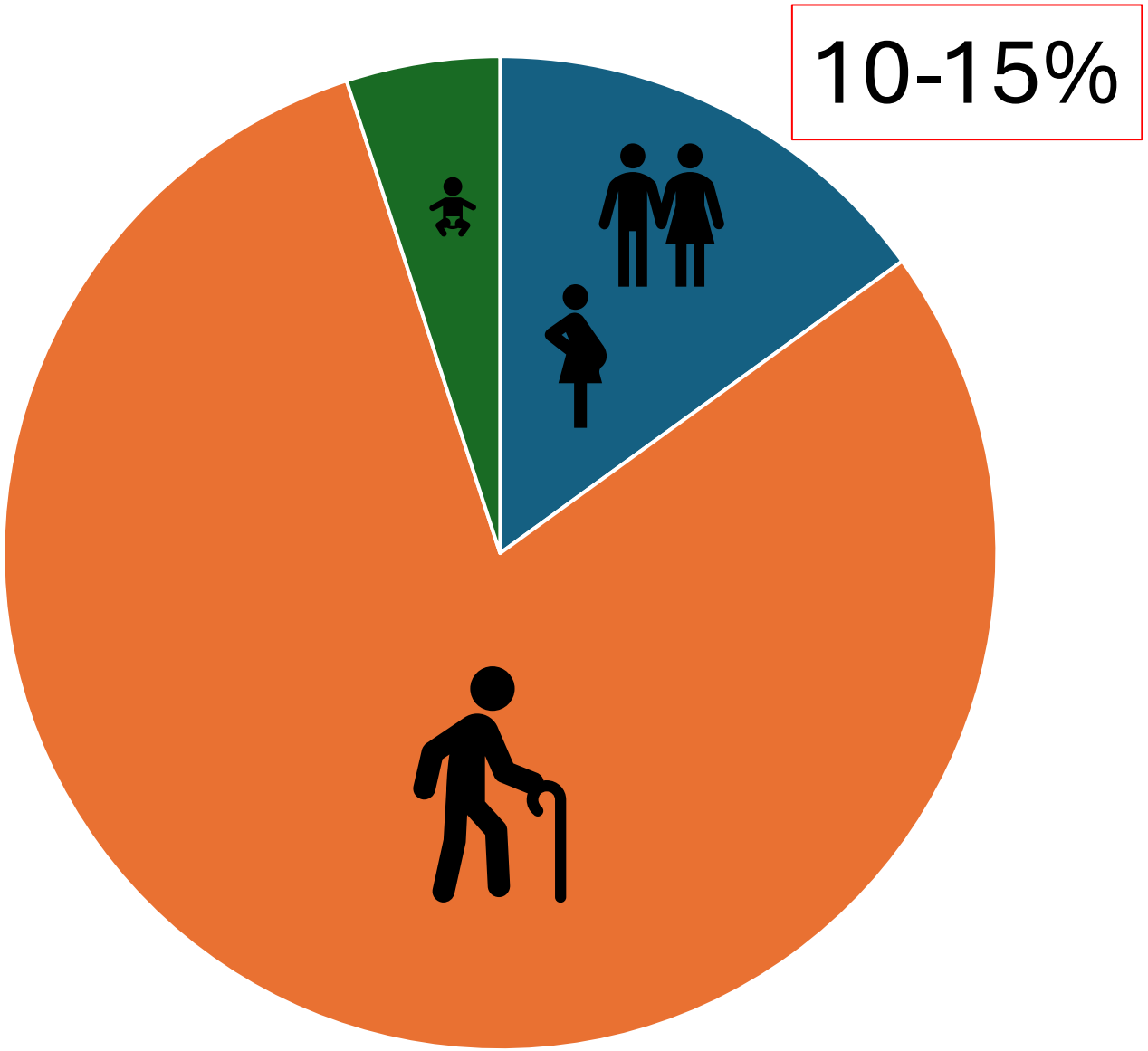
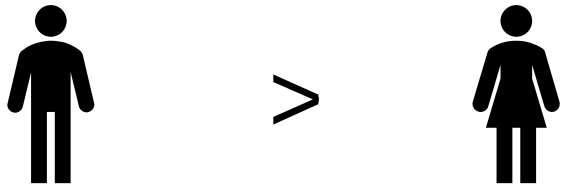

EPIDEMIOLOGY


B Ischaemic strokes
Incidence rates per 100 000 people
<41·3
41·3 to <50·9
50·9 to <60·1
60·1 to <70·5
70·5 to <81·7
81·7 to <93·2
93·2 to <108·6
108·6 to <131·0
131·0 to <151·5
≥151·5
Caribbean and central America
Persian Gulf
Balkan Peninsula
Southeast Asia
West Africa
Eastern Mediterranean
Northern Europe


10-15%

EPIDEMIOLOGY

An Increase up to **50%** in the incidence of stroke in a young



40 – 50 years old

Black/Hispanic > White

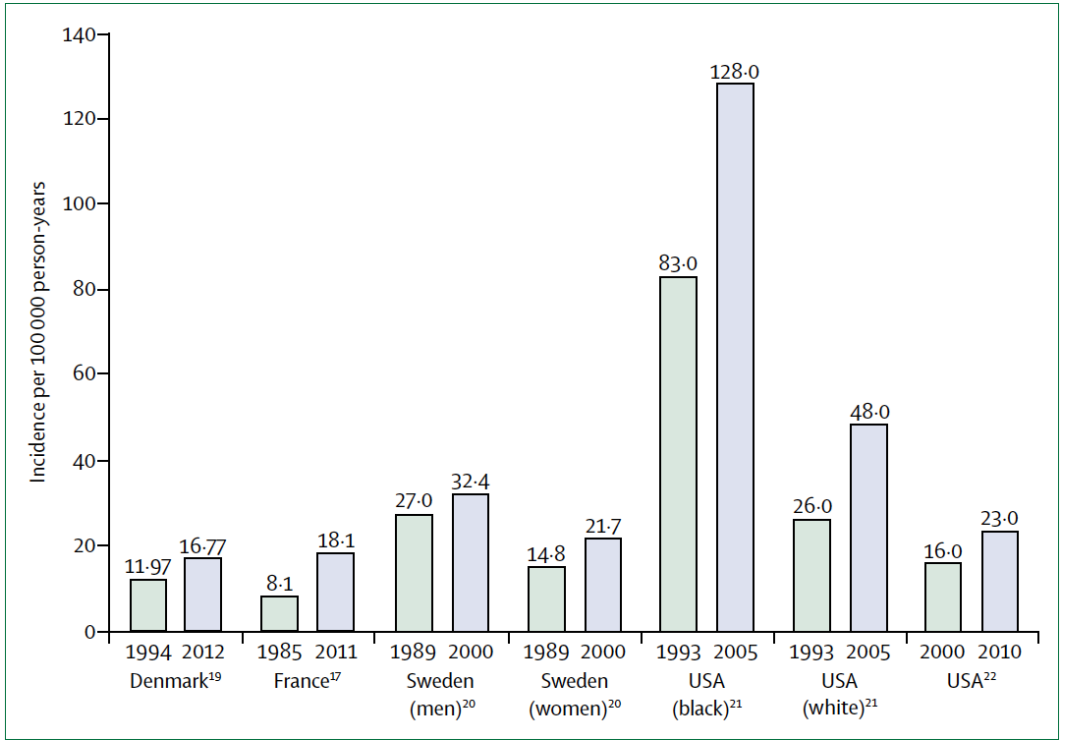


Figure 1: **The increasing incidence of stroke in young adults**

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Better Stroke Detection

Illicit and recreational drug use

Higher incidence
of
autoimmune disease

Oral contraceptives

Pregnancy and puerperium

Risk Factors

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ETIOLOGY

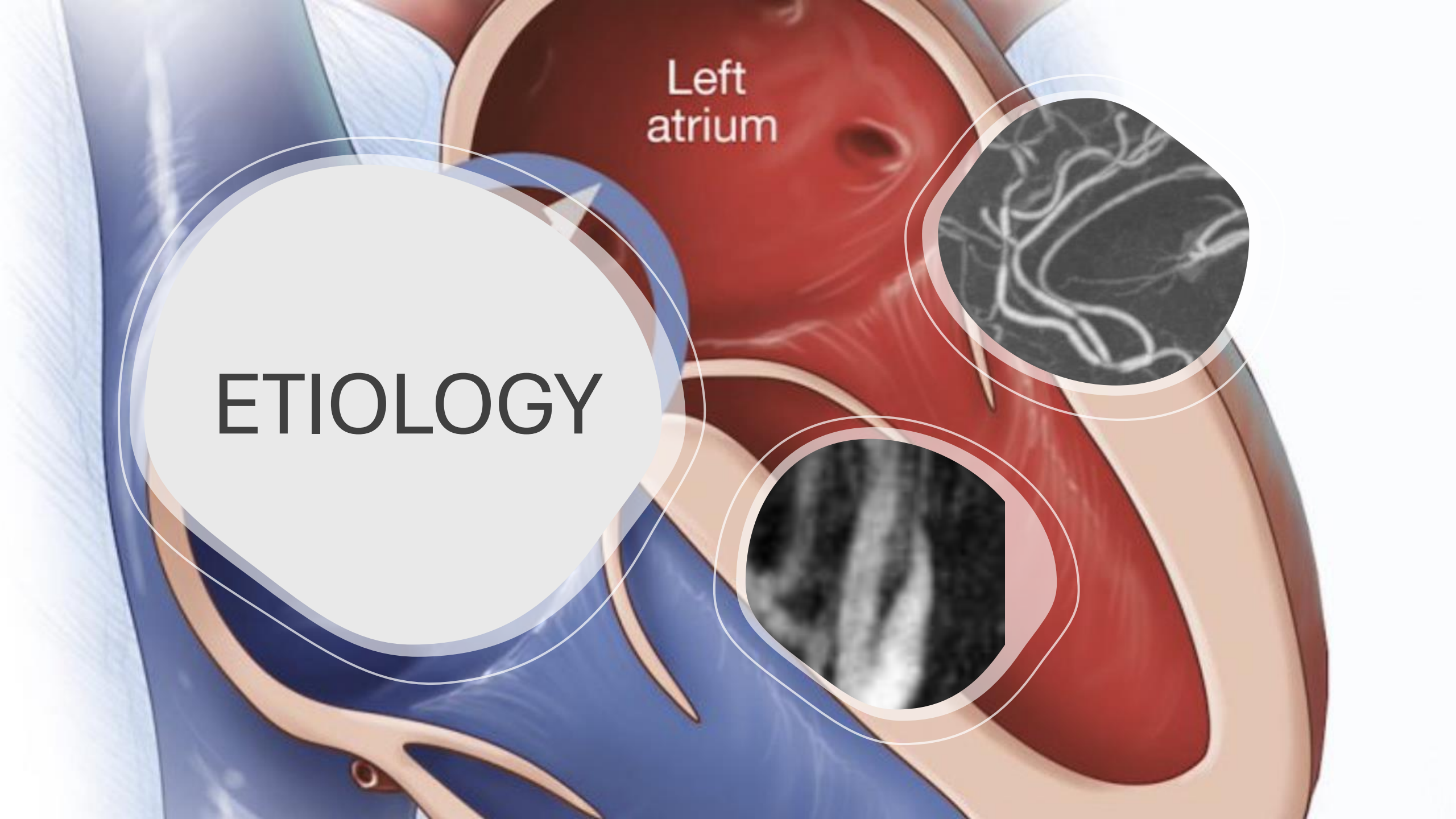

TABLE 1. TOAST Classification of Subtypes of Acute Ischemic Stroke

Large-artery atherosclerosis (embolus/thrombosis)*
Cardioembolism (high-risk/medium-risk)*
Small-vessel occlusion (lacune)*
Stroke of other determined etiology*
Stroke of undetermined etiology
a. Two or more causes identified
b. Negative evaluation
c. Incomplete evaluation

TOAST, Trial of Org 10172 in Acute Stroke Treatment.
*Possible or probable depending on results of ancillary studies.

Large Artery Atherosclerosis

Cardioembolism

Small-vessel Disease

Other etiology

Cryptogenic stroke

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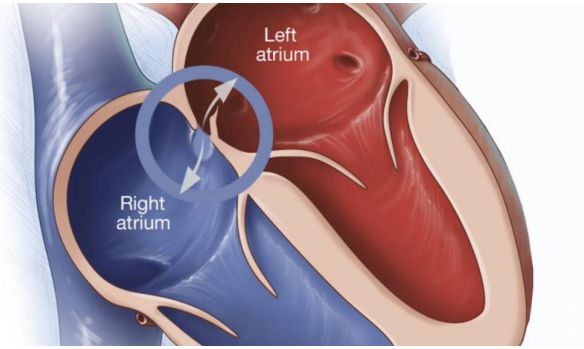
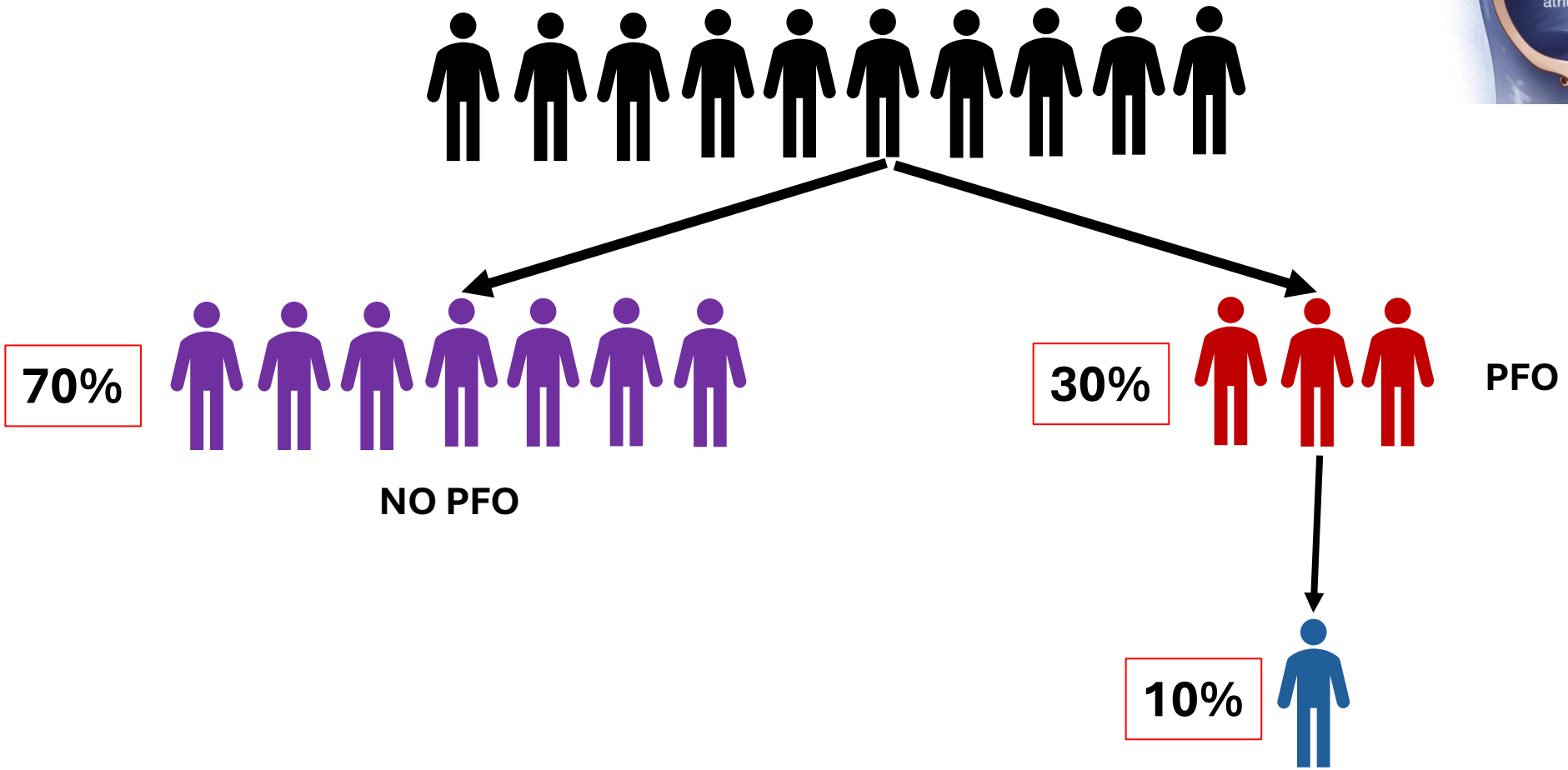
Cardioembolic
Permanent Foramen Ovale





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Cardioembolic
Permanent Foramen Ovale

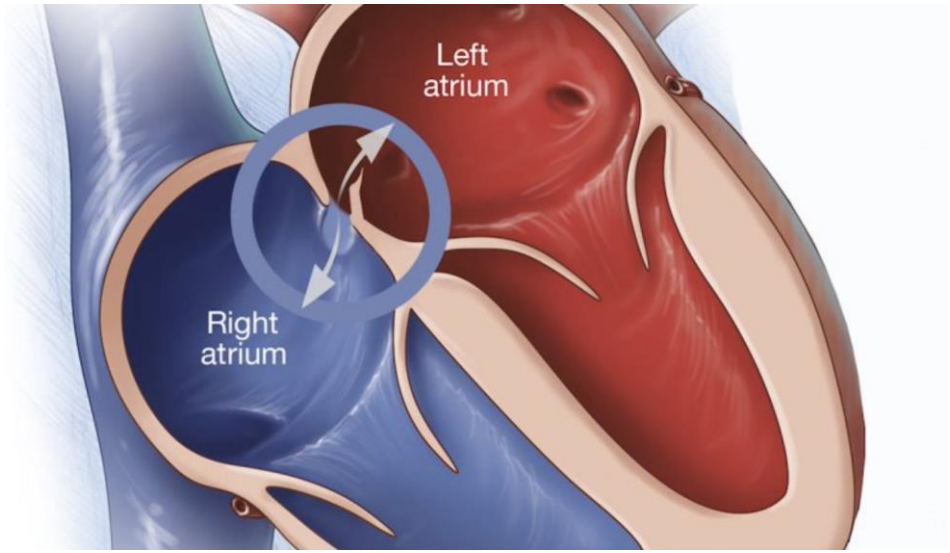
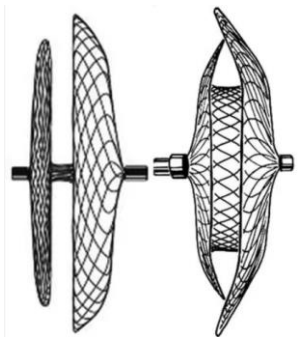


Table 1. Risk of Paradoxical Embolism (RoPE) Score and PFO-Associated Stroke Causal Likelihood (PASCAL) Classification System

Characteristic		Points
RoPE Score calculator[a]		
No history of		
Hypertension		1
Diabetes		1
Stroke or transient ischemic attack		1
Nonsmoker		1
Cortical infarct on imaging		1
Age, y		
18-29		5
30-39		4
40-49		3
50-59		2
60-69		1
>70		0
Total RoPE Score (sum of individual points) =		
PASCAL Classification System[b]		
High RoPE Score (≥7)	High-risk PFO feature (LS and/or ASA)	PFO-related stroke
Absent	Absent	Unlikely
Absent	Present	Possible
Present	Absent	
Present	Present	Probable

Patent Foramen Ovale Closure or Anticoagulation vs. Antiplatelets after Stroke

Authors: Jean-Louis Mas, M.D., Geneviève Derumeaux, M.D., Benoît Guillon, M.D., Evelyne Massardier, M.D., Hassan Hosseini, M.D., Ph.D., Laura Mechtouff, M.D., Caroline Arquizan, M.D., +41, for the CLOSE Investigators* Author Info & Affiliations



RoPE ≥ 7

Large PFO and/or Aneurysm Septum Apical

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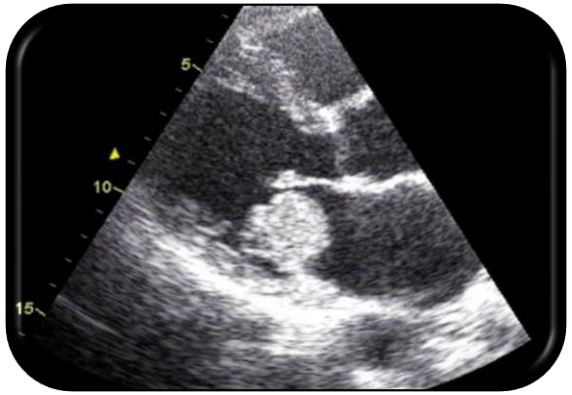
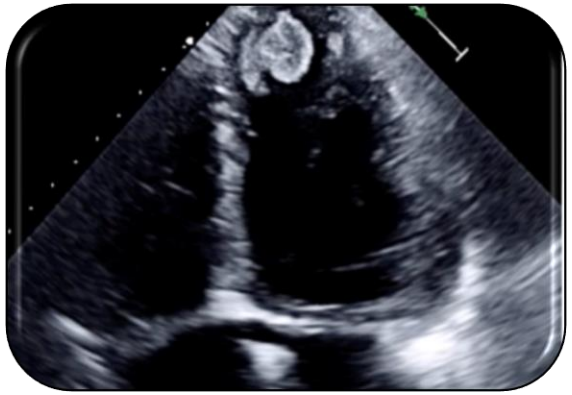
Cardioembolic

Atrial fibrillation

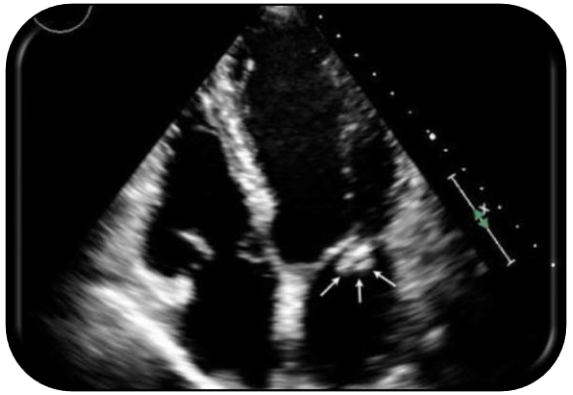


Cardiac tumours



Cardiomyopathy

Valvulopathy



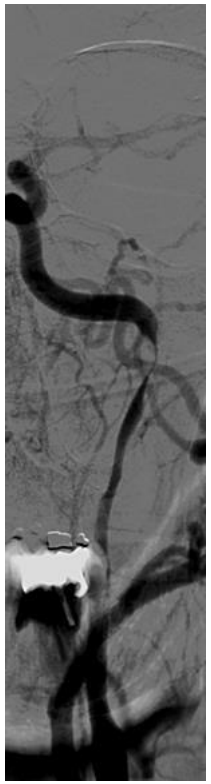
Endocarditis

Cervical dissection

- 2% of all ischemic stroke – **10% of stroke in young patient**
- <u>Risk factors</u>
  - Elher Danlos syndrome, Marfan syndrome, fibromyodysplasia
  - Migraine

- <u>Symptoms:</u>
  - Sudden neck pain and headache
  - Neurological symtoms

- CTA or MRI with protocol dissection



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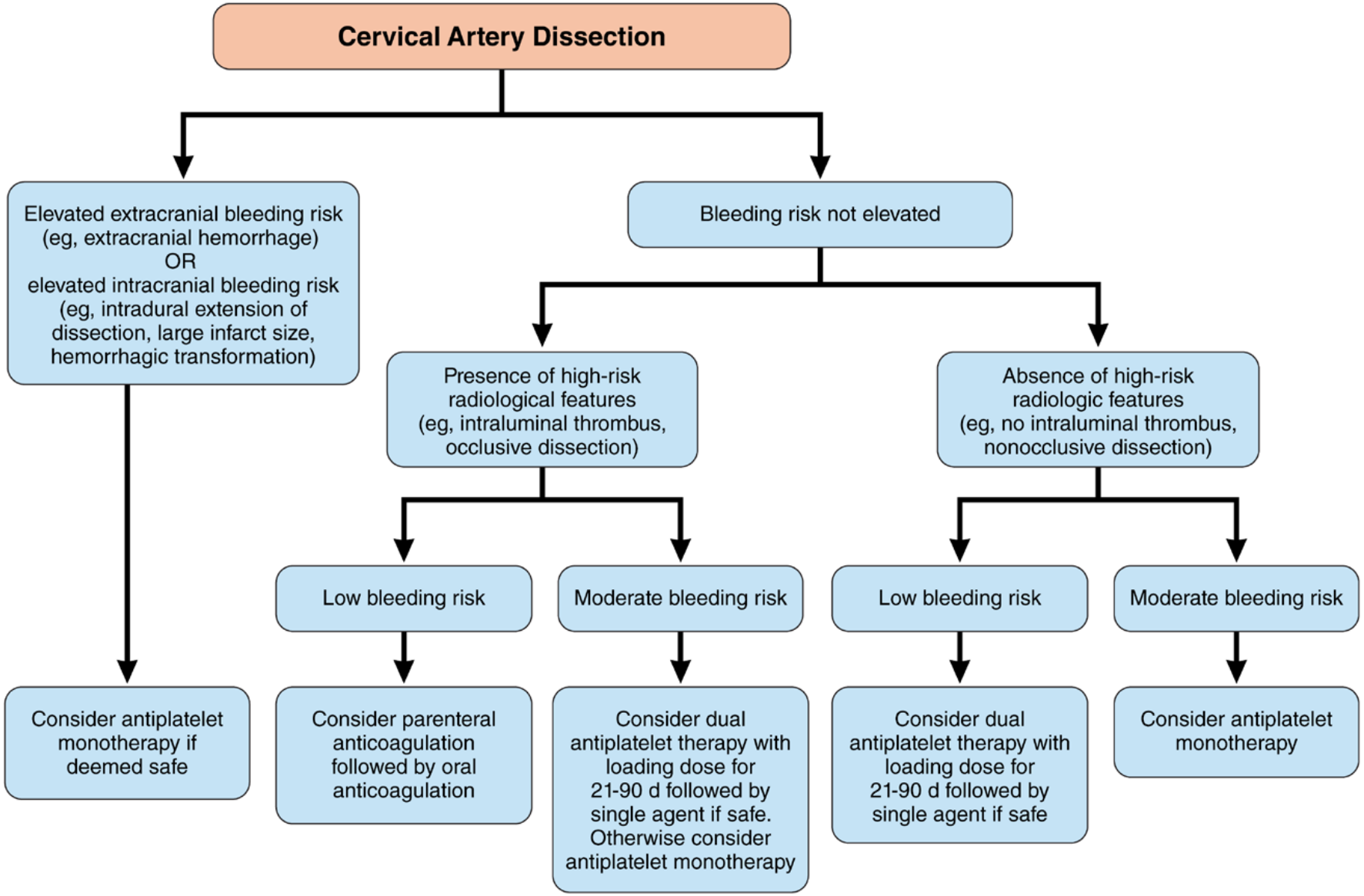

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Stroke of other determined causes

SYSTEMIC	METABOLIC	GENETICS	VESSELS
Antiphospholipid syndrome Autoimmune disease Factor II deficiency Factor V leiden Hyperhomocystenuria Vasculatis Malignancy	Fabry disease Mitochondrial disorders	CADASIL CARASIL COL4A1	RCVS Moya moya disease Intracranial dissection Post Radiation

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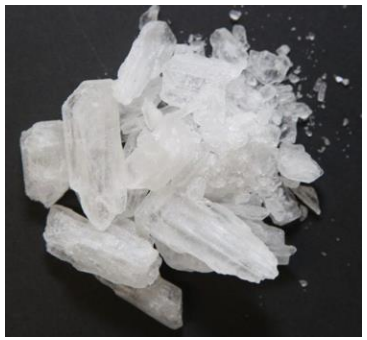
RISK FACTORS

Illicit Drugs

COCAINE

- 5% of all individuals aged 15-64 years

- Why Drugs cause stroke:
  - Cerebral vasospasm
  - Cardiac arythmias
  - Cardiomyopathy
  - Accelerated atherosclerosis
  - Vasculitis



AMPHETAMINES

CANNABIS

21% patients = positive screen without history of drug use

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Smoking

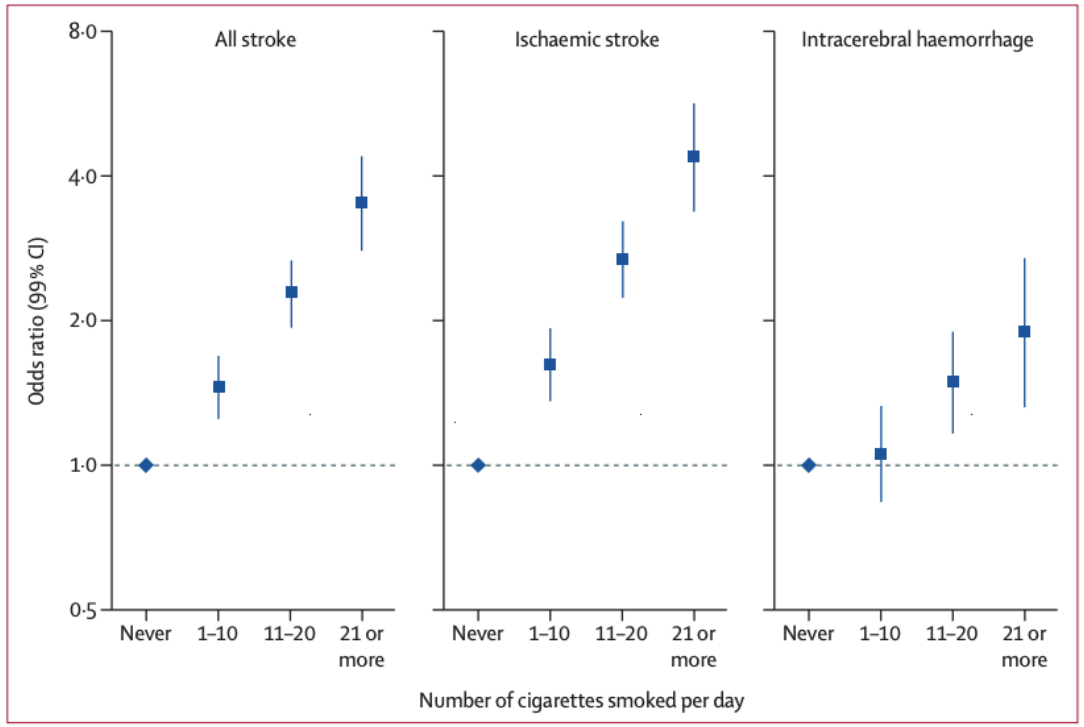
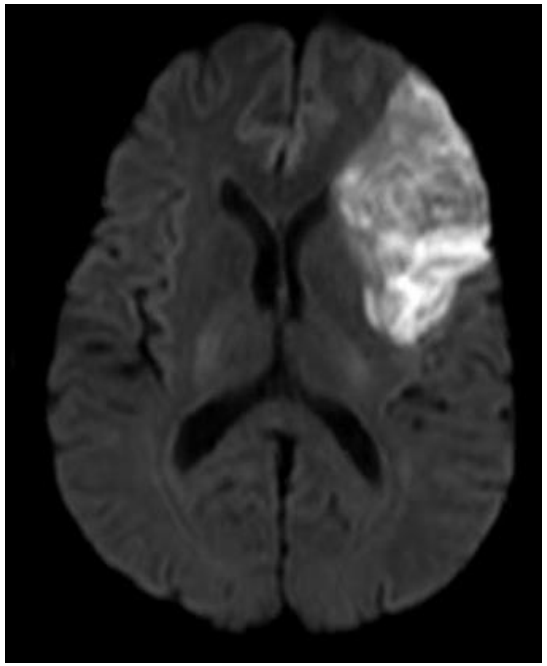


Figure 5: **Current smoking and risk of ischaemic stroke and intracerebral haemorrhage**



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	Controls		All-stroke cases			
	Men (N=8026)	Women (N=5446)	Men (N=8013)		Women (N=5434)	
			OR (99% CI)	PAR (99% CI)	OR (99% CI)	PAR (99% CI)
Self-reported history of hypertension or blood pressure ≥140/90 mm Hg	3634/8026 (45·3%)	2745/5446 (50·4%)	2·87 (2·55 to 3·23)	45·2% (41·8 to 48·7)	3·21 (2·74 to 3·76)	52·3% (47·8 to 56·7)
Current smoking	2596/8022 (32·4%)	421/5443 (7·7%)	1·61 (1·42 to 1·83)	16·6% (13·2 to 20·7)	1·87 (1·43 to 2·43)	5·3% (3·7 to 7·6)
Waist-to-hip ratio						
T2 *vs* T1	2671/7809 (34·2%)	1802/5307 (34·0%)	1·20 (1·03 to 1·39)	..	1·28 (1·08 to 1·53)	..
T3 *vs* T1	2559/7809 (32·8%)	1751/5307 (33·0%)	1·23 (1·04 to 1·46)	..	1·80 (1·47 to 2·19)	..
T2 + T3 *vs* T1	..	..	..	12·7% (6·4 to 23·7)	..	25·8% (18·3 to 35·1)
Diet, mAHEI score						
T2 *vs* T1	2729/8026 (34·0%)	1849/5446 (34·0%)	0·78 (0·68 to 0·89)	..	0·75 (0·63 to 0·89)	..
T3 *vs* T1	2648/8026 (33·0%)	1797/5446 (33·0%)	0·60 (0·51 to 0·69)	..	0·59 (0·49 to 0·72)	..
T1 + T2 *vs* T3	..	..	..	23·5% (17·4 to 31·0)	..	22·9% (15·3 to 32·7)
Regular physical activity	1446/8((18·0%)				0·50 to 0·85)	32·4% (18·4 to 50·4)
Self-reported history of diabetes or HbA_{1c} ≥6·5%	1746/8((21·8%)				0·98 to 1·38)	4·1% (1·4 to 11·7)
Alcohol intake	..	..	..	10·0% (6·4 to 15·3)	..	−0·7% (−4·5 to 3·1)
Low or moderate	1537/8018 (19·2%)	609/5441 (11·2%)	1·20 (1·05 to 1·37)	..	0·92 (0·70 to 1·21)	..
High or heavy episodic	571/8018 (7·1%)	131/5441 (2·4%)	2·15 (1·67 to 2·77)	..	1·71 (0·72 to 4·07)	..
Psychosocial factors	..	..	2·59 (1·96 to 3·43)	18·5% (13·4 to 25·1)	1·77 (1·27 to 2·47)	15·0% (8·5 to 25·2)
Cardiac causes	430/8026 (5·4%)	238/5446 (4·4%)	2·73 (2·21 to 3·37)	7·8% (6·5 to 9·3)	4·06 (3·06 to 5·40)	11·1% (9·4 to 12·9)
ApoB/ApoA1 ratio						
T2 *vs* T1	2413/7083 (34·1%)	1637/4843 (33·8%)	1·24 (1·08 to 1·42)	..	1·33 (1·11 to 1·59)	..
T3 *vs* T1	2332/7083 (32·9%)	1598/4843 (33·0%)	1·81 (1·57 to 2·10)	..	1·88 (1·57 to 2·25)	..
T2 + T3 *vs* T1	..	..	..	25·1% (19·4 to 31·9)	..	29·2% (21·9 to 37·7)
Composite PAR for all ten risk factors	..	..	..	90·6% (88·0 to 92·7)	..	90·6% (87·1 to 93·3)

A Wald test was used to test for interaction between risk factor × sex for all stroke, and $p_{interaction}$ was significant (p<0·01) for waist-to-hip ratio, and cardiac causes using logistic regression. Apo=apolipoprotein. mAHEI=modified Alternative Healthy Eating Index. OR=odds ratio. PAR=population attributable risk. T=tertile.

***Table 3*: Risk factors for all stroke (ischaemic and intracerebral haemorrhage) in men and women**

MALE > FEMALE

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	Controls		All-stroke cases			
	≤55 years (N=4234)	>55 years (N=9238)	≤55 years (N=4216)		>55 years (N=9231)	
			OR (99% CI)	PAR (99% CI)	OR (99% CI)	PAR (99% CI)
Self-reported history of hypertension or blood pressure >140/90 mm Hg	1334/4234 (31·5%)	5045/9238 (54·6%)	4·51 (3·77–5·41)	49·7% (46·0–53·4)	2·55 (2·27–2·85)	46·0% (42·2–49·8)
Current smoking	1242/4231 (29·4%)	1775/9234 (19·2%)	1·66 (1·36–2·02)	16·3% (11·6–22·3)	1·70 (1·47–1·97)	10·9% (8·6–13·7)
Waist-to-hip ratio						
T2 *vs* T1	1386/4133 (33·5%)	3087/8983 (34·4%)	1·42 (1·15–1·75)	..	1·16 (1·01–1·33)	..
T3 *vs* T1	1203/4133 (29·1%)	3107/8983 (34·6%)	1·56 (1·23–1·98)	..	1·39 (1·20–1·62)	..
T2 + T3 *vs* T1	..	..	..	23·5% (15·2–34·5)	..	16·0% (9·7–25·2)
Diet, mAHEI score						
T2 *vs* T1	1460/4234 (34·5%)	3118/9238 (33·8%)	0·78 (0·64–0·95)	..	0·76 (0·67–0·87)	..
T3 *vs* T1	1313/4234 (31·0%)	3132/9238 (33·9%)	0·68 (0·55–0·86)	..	0·56 (0·48–0·64)	..
T1 + T2 *vs* T3	..	..	..	16·4% (7·9–30·9)	..	26·5% (20·9–33·0)
Regular physical activity	688/4232	1510/9231	0·60 (0·45–0·80)	35·3% (21·0–52·8)	0·60 (0·50–0·72)	35·9% (26·4–46·7)
Self-reported hist HbA$_{1c}$≥6·5%						3·6% (1·4–8·8)
Alcohol intake						4·1% (1·7–9·4)
Low or moderate	797/4229 (18·8%)	1349/9230 (14·6%)	1·27 (1·03–1·56)	..	1·09 (0·94–1·27)	..
High or heavy episodic	231/4229 (5·5%)	471/9230 (5·1%)	2·20 (1·49–3·23)	..	2·14 (1·54–2·96)	..
Psychosocial factors	..	..	2·36 (1·60–3·50)	22·8% (14·8–33·3)	2·06 (1·59–2·68)	15·3% (10·5–21·8)
Cardiac causes	73/4234 (1·7%)	595/9238 (6·4%)	4·56 (2·81–7·41)	4·9% (3·8–6·3)	2·94 (2·45–3·53)	10·8% (9·4–12·4)
ApoB/ApoA1 ratio						
T2 *vs* T1	1219/3702 (32·9%)	2831/8224 (34·4%)	1·30 (1·06–1·60)	..	1·28 (1·13–1·46)	..
T3 *vs* T1	1275/3702 (34·4%)	2655/8224 (32·3%)	2·01 (1·62–2·49)	..	1·79 (1·56–2·05)	..
T2+T3 *vs* T1	..	..	..	30·8% (22·6–40·5)	..	25·6% (20·1–31·9)
Composite PAR for all ten risk factors	..	..	..	92·2% (88·8–94·6)	..	90·0% (87·3–92·1)

A Wald test was used to test for interaction between risk factor × age subgroup for all stroke, and $p_{interaction}$ was significant (p<0·01) for hypertension, waist-to-hip ratio, diet, and cardiac causes using logistic regression. Apo=apolipoprotein. mAHEI=modified Alternative Healthy Eating Index. OR=odds ratio. PAR=population attributable risk. T=tertile.

***Table 4*: Risk factors for all stroke (ischaemic and intracerebral haemorrhage) by age group**

≤ 55 years old ⟶ PAR 16%

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Tobacco type	All stroke	Ischemic stroke					ICH
		Cardioembolism	Large vessel	Small vessel	Other/Undetermined TOAST	Total	
All type of tobacco	1.64 (1.46–1.84)	1.56 (0.99–2.46)	2.16 (1.63–2.87)	1.66 (1.37–2.01)	1.97 (1.55–2.50)	1.85 (1.61–2.11)	1.19 (1.00–1.41)
Cigarettes							
Filter	1.73 (1.50–1.99)	1.62 (0.97–2.71)	2.59 (1.83–3.67)	1.94 (1.53–2.45)	1.85 (1.39–2.46)	2.01 (1.70–2.36)	1.10 (0.89–1.37)
Non-filter	2.59 (1.79–3.77)	2.02 (0.35–11.61)	5.73 (2.29–14.33)	2.26 (1.18–4.32)	3.31 (1.55–7.11)	3.37 (2.16–5.24)	2.04 (1.15–3.63)
Both	2.81 (1.87–4.22)	1.67 (0.30–9.22)	4.12 (1.63–10.44)	3.02 (1.57–5.83)	3.09 (1.42–6.71)	2.87 (1.84–4.48)	2.23 (1.16–4.30)
Beedie	2.39 (1.58–3.61)	1.54 (0.04–64.83)	3.69 (1.28–10.65)	3.45 (1.66–7.17)	3.27 (1.46–7.33)	3.39 (2.06–5.57)	1.00 (0.56–1.79)
Pipes/Cigars	1.96 (0.58–6.61)	1.19 (0.13–11.21)	0.28 (0.01–9.46)	4.49 (0.25–82.14)	3.65 (0.19–69.27)	1.81 (0.50–6.60)	2.72 (0.18–40.34)
Chewing Tobacco	1.27 (0.93–1.71)	5.13 (0.27–97.97)	1.04 (0.44–2.47)	0.97 (0.61–1.56)	1.57 (0.77–3.23)	1.15 (0.79–1.68)	1.53 (1.03–2.27)

Data are OR (95% CI) of all stroke or stroke subtype with control, in different tobacco type with never smoke as reference. ORs were adjusted for age, self-reported hypertension or blood pressure≥140/90 mm Hg, physical activity, diet and alcohol intake. Filter: filter cigarettes among current smokers; Non-filter: non-filter cigarettes among current smokers; both: both filter and non-filter cigarettes among current smokers; Beedie: use beedie alone among current smokers; Pipes/Cigars: use pipes/cigars alone among current smokers; Chewing Tobacco: use chewing tobacco alone among current smokers.

Table 3: **Risk of stroke associated with type of tobacco used in current smoker.**

Among never smokers, longer exposure hours to ETS increased the odds of ischemic stroke and ICH.

Over 10 h exposure weekly increased:

- the risk of all stroke (OR 1.95; 1.69–2.27)
- ischemic stroke (OR 1.89; 1.59–2.24)
- ICH (OR 2.00; 1.60–2.50)

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Supplementary Table 1: Risk of stoke associated with numbers of cigarette smoked, by genders

Risk	All Stroke	Ischemic Stroke					ICH
		Cardioembolism	Large vessel	Small vessel	Other/Undeterminded TOAST	Total	
Female							
Former Smoker vs Never	0.92(0.72-1.16)	0.90(0.54-1.52)	1.32(0.69-2.55)	1.05(0.63-1.76)	0.92(0.58-1.46)	1.00(0.77-1.29)	0.68(0.40-1.18)
Current Smoker+1-19cig/day vs Never	1.50(1.10-2.04)	0.73(0.31-1.72)	2.41(1.16-4.98)	2.18(1.14-4.17)	1.71(0.92-3.20)	1.71(1.21-2.41)	0.83(0.45-1.50)
Current Smoker,>=20cig/day vs Never	3.74(2.35-5.96)	2.29(0.72-7.25)	8.65(2.72-27.5)	3.50(1.41-8.71)	4.03(1.58-10.3)	4.05(2.44-6.70)	2.24(0.94-5.35)
Male							
Former Smoker vs Never	0.99(0.86-1.14)	1.13(0.78-1.63)	1.22(0.86-1.71)	0.87(0.65-1.15)	1.04(0.79-1.36)	1.03(0.88-1.20)	0.89(0.69-1.14)
Current Smoker+1-19cig/day vs Never	1.54(1.33-1.79)	2.06(1.15-3.71)	2.14(1.45-3.14)	1.43(1.07-1.92)	1.60(1.17-2.17)	1.67(1.41-1.99)	1.19(0.94-1.52)
Current Smoker,>=20cig/day vs Never	2.31(1.96-2.72)	2.33(1.09-4.98)	3.55(2.28-5.53)	2.64(1.97-3.52)	2.79(1.94-4.01)	2.85(2.35-3.45)	1.34(1.03-1.74)

Obesity and Sedentarity

Table 2. Odds Ratios* for Stroke by Body Mass Index Category, Under 3 Models, With Stratification by Sex and Race

	Reduced Model (Age, Sex, and Race)	Intermediate Model (Age, Sex, Race, and Smoking)	Full Model (Age, Sex, Race, Smoking, HTN, and DM)
All (n=2291)			
Overweight	1.12 (0.91–1.38)	1.13 (0.92–1.40)	1.02 (0.82–1.27)
Obese	1.57 (1.28–1.94)	1.65 (1.33–2.04)	1.21 (0.96–1.51)
Men (n=1147)			
Overweight	1.13 (0.84–1.53)	1.22 (0.90–1.66)	1.04 (0.76–1.43)
Obese	1.73 (1.27–2.40)	1.92 (1.40–2.65)	1.34 (0.96–1.88)
Women (n=1144)			
Overweight	1.13 (0.84–1.52)	1.06 (0.78–1.44)	0.99 (0.72–1.36)
Obese	1.46 (1.10–1.95)	1.42 (1.06–1.91)	1.07 (0.79–1.46)
Whites (n=1221)			
Overweight	1.05 (0.80–1.40)	1.07 (0.80–1.42)	0.99 (0.74–1.33)
Obese	1.37 (1.02–1.82)	1.40 (1.04–1.88)	1.04 (0.76–1.43)
Blacks (n=958)			
Overweight	1.08 (0.76–1.53)	1.09 (0.76–1.54)	0.96 (0.67–1.38)
Obese	1.62 (1.16–2.25)	1.71 (1.22–2.39)	1.26 (0.89–1.79)

DM indicates diabetes mellitus; and HTN, hypertension.
*Reference category is normal body mass index.

Increased risk of ischemic stroke

Regional Stroke Network Réseau Régional des AVC Champlain

	Controls		All-stroke cases			
	≤55 years (N=4234)	>55 years (N=9238)	≤55 years (N=4216)		>55 years (N=9231)	
			OR (99% CI)	PAR (99% CI)	OR (99% CI)	PAR (99% CI)
Self-reported history of hypertension or blood pressure ≥140/90 mm Hg	1334/4234 (31·5%)	5045/9238 (54·6%)	4·51 (3·77–5·41)	49·7% (46·0–53·4)	2·55 (2·27–2·85)	46·0% (42·2–49·8)
Current smoking	1242/4231 (29·4%)	1775/9234 (19·2%)	1·66 (1·36–2·02)	16·3% (11·6–22·3)	1·70 (1·47–1·97)	10·9% (8·6–13·7)
Waist-to-hip ratio						
T2 *vs* T1	1386/4133 (33·5%)	3087/8983 (34·4%)	1·42 (1·15–1·75)	..	1·16 (1·01–1·33)	..
T3 *vs* T1	1203/4133 (29·1%)	3107/8983 (34·6%)	1·56 (1·23–1·98)	..	1·39 (1·20–1·62)	..
T2 + T3 *vs* T1	..	..	..	23·5% (15·2–34·5)	..	16·0% (9·7–25·2)
Diet, mAHEI score						
T2 *vs* T1	1460/4234 (34·5%)	3118/9238 (33·8%)	0·78 (0·64–0·95)	..	0·76 (0·67–0·87)	..
T3 *vs* T1	1313/4234 (31·0%)	3132/9238 (33·9%)	0·68 (0·55–0·86)	..	0·56 (0·48–0·64)	..
T1 + T2 *vs* T3				16·4% (7·9–30·9)		26·5% (20·9–33·0)
Regular physical activity	688/4232 (16·3%)	1510/9231 (16·4%)	0·60 (0·45–0·80)	35·3% (21·0–52·8)	0·60 (0·50–0·72)	35·9% (26·4–46·7)
Self-reported history of diabetes or HbA_{1c} ≥6·5%	727/4229 (17·2%)	2230/9233 (24·2%)	1·29 (1·04–1·61)	5·6% (2·5–12·1)	1·14 (1·01–1·30)	3·6% (1·4–8·8)
Alcohol intake	..	..	..	10·9% (6·1–18·7)		4·1% (1·7–9·4)
Low or moderate	797/4229 (18·8%)	1349/9230 (14·6%)	1·27 (1·03–1·56)	..	1·09 (0·94–1·27)	..
High or heavy episodic	231/4229 (5·5%)	471/9230 (5·1%)	2·20 (1·49–3·23)	..	2·14 (1·54–2·96)	..
Psychosocial factors	..	..	2·36 (1·60–3·50)	22·8% (14·8–33·3)	2·06 (1·59–2·68)	15·3% (10·5–21·8)
Cardiac causes	73/4234 (1·7%)	595/9238 (6·4%)	4·56 (2·81–7·41)	4·9% (3·8–6·3)	2·94 (2·45–3·53)	10·8% (9·4–12·4)
ApoB/ApoA1 ratio						
T2 *vs* T1	1219/3702 (32·9%)	2831/8224 (34·4%)	1·30 (1·06–1·60)	..	1·28 (1·13–1·46)	..
T3 *vs* T1	1275/3702 (34·4%)	2655/8224 (32·3%)	2·01 (1·62–2·49)	..	1·79 (1·56–2·05)	..
T2+T3 *vs* T1	..	..	..	30·8% (22·6–40·5)	..	25·6% (20·1–31·9)
Composite PAR for all ten risk factors	..	..	..	92·2% (88·8–94·6)	..	90·0% (87·3–92·1)

A Wald test was used to test for interaction between risk factor × age subgroup for all stroke, and $p_{interaction}$ was significant ($p<0·01$) for hypertension, waist-to-hip ratio, diet, and cardiac causes using logistic regression. Apo=apolipoprotein. mAHEI=modified Alternative Healthy Eating Index. OR=odds ratio. PAR=population attributable risk. T=tertile.

***Table 4*: Risk factors for all stroke (ischaemic and intracerebral haemorrhage) by age group**

RBC RACE FOR THE KIDS

CHEO

	Controls		All-stroke cases			
	≤55 years (N=4234)	>55 years (N=9238)	≤55 years (N=4216)		>55 years (N=9231)	
			OR (99% CI)	PAR (99% CI)	OR (99% CI)	PAR (99% CI)
Self-reported history of hypertension or blood pressure ≥140/90 mm Hg	1334/4234 (31·5%)	5045/9238 (54·6%)	4·51 (3·77–5·41)	49·7% (46·0–53·4)	2·55 (2·27–2·85)	46·0% (42·2–49·8)
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Waist-to-hip ratio						
T2 vs T1	1386/4133 (33·5%)	3087/8983 (34·4%)	1·42 (1·15–1·75)	..	1·16 (1·01–1·33)	..
T3 vs T1	1203/4133 (29·1%)	3107/8983 (34·6%)	1·56 (1·23–1·98)	..	1·39 (1·20–1·62)	..
T2 + T3 vs T1	..	..	..	23·5% (15·2–34·5)	..	16·0% (9·7–25·2)
Diet, mAHEI score						
T2 vs T1	1460/4234 (34·5%)	3118/9238 (33·8%)	0·78 (0·64–0·95)	..	0·76 (0·67–0·87)	..
T3 vs T1	1313/4234 (31·0%)	3132/9238 (33·9%)	0·68 (0·55–0·86)	..	0·56 (0·48–0·64)	..
T1 + T2 vs T3	..	..	..	16·4% (7·9–30·9)	..	26·5% (20·9–33·0)
Regular physical activity	688/4232 (16·3%)	1510/9231 (16·4%)	0·60 (0·45–0·80)	35·3% (21·0–52·8)	0·60 (0·50–0·72)	35·9% (26·4–46·7)
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Alcohol intake	..	..	..	[illegible]	..	[illegible]
Low or moderate	797/4229 (18·8%)	1349/9230 (14·6%)	1·27 (1·03–1·56)	..	1·09 (0·94–1·27)	..
High or heavy episodic	231/4229 (5·5%)	471/9230 (5·1%)	2·20 (1·49–3·23)	..	2·14 (1·54–2·96)	..
Psychosocial factors	..	..	2·36 (1·60–3·50)	22·8% (14·8–33·3)	2·06 (1·59–2·68)	15·3% (10·5–21·8)
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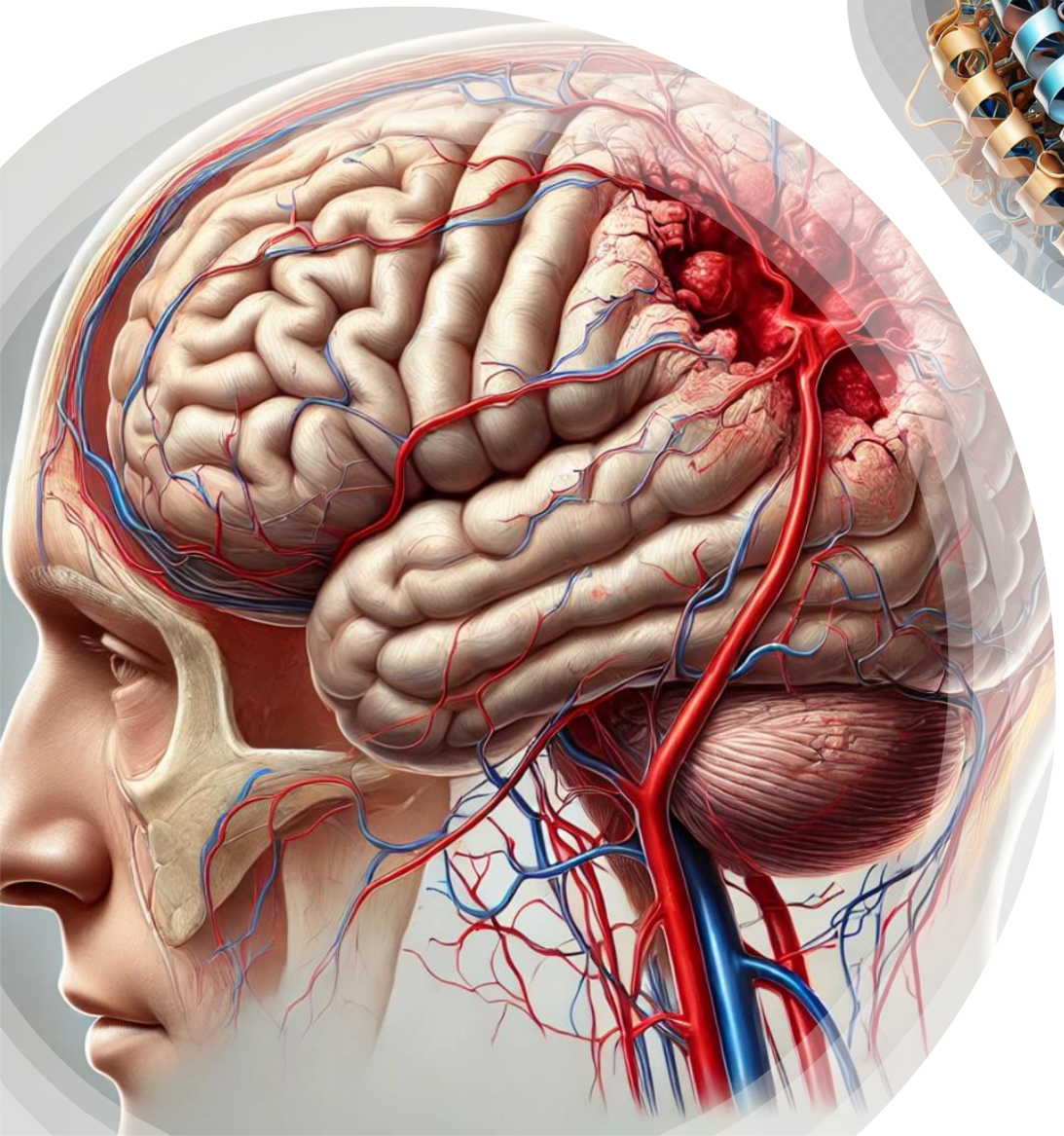
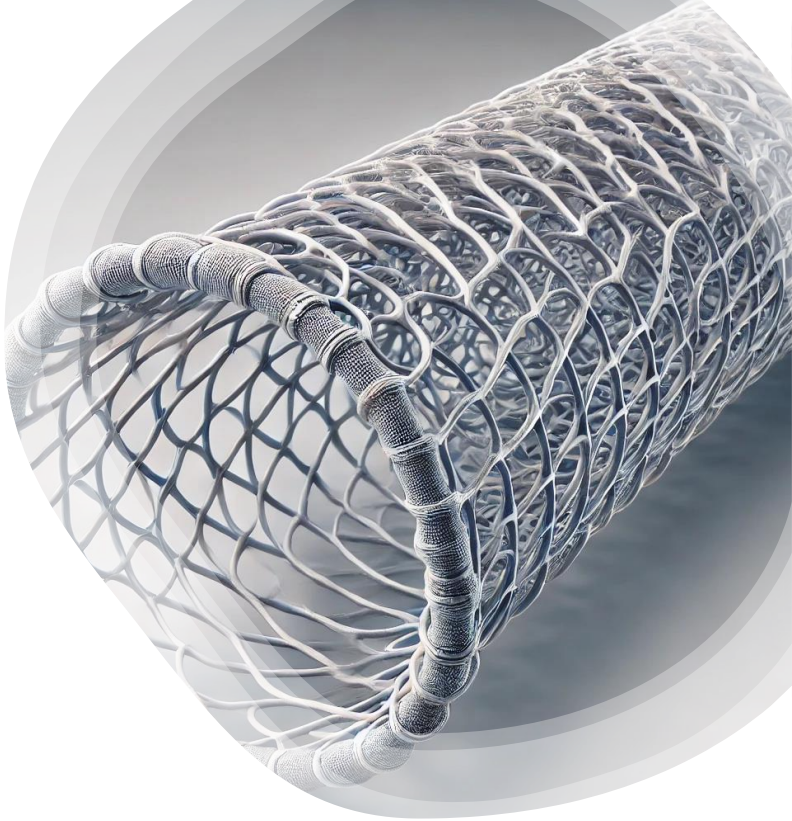
ApoB/ApoA1 ratio						
T2 vs T1	1219/3702 (32·9%)	2831/8224 (34·4%)	1·30 (1·06–1·60)	..	1·28 (1·13–1·46)	..
T3 vs T1	1275/3702 (34·4%)	2655/8224 (32·3%)	2·01 (1·62–2·49)	..	1·79 (1·56–2·05)	..
T2+T3 vs T1	..	..	..	30·8% (22·6–40·5)	..	25·6% (20·1–31·9)
Composite PAR for all ten risk factors	..	..	..	92·2% (88·8–94·6)	..	90·0% (87·3–92·1)

A Wald test was used to test for interaction between risk factor × age subgroup for all stroke, and $p_{interaction}$ was significant (p<0·01) for hypertension, waist-to-hip ratio, diet, and cardiac causes using logistic regression. Apo=apolipoprotein. mAHEI=modified Alternative Healthy Eating Index. OR=odds ratio. PAR=population attributable risk. T=tertile.

***Table 4*: Risk factors for all stroke (ischaemic and intracerebral haemorrhage) by age group**

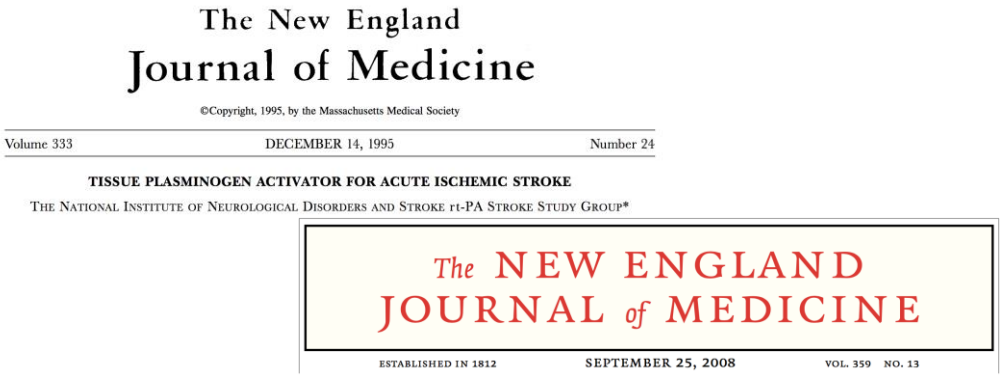
Regional Stroke Network
Réseau Régional des AVC
CHAMPLAIN





ACUTE MANAGEMENT

Thrombolysis


The New England
Journal of Medicine

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Volume 333 DECEMBER 14, 1995 Number 24

TISSUE PLASMINOGEN ACTIVATOR FOR ACUTE ISCHEMIC STROKE

THE NATIONAL INSTITUTE OF NEUROLOGICAL DISORDERS AND STROKE rt-PA STROKE STUDY GROUP*

The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 SEPTEMBER 25, 2008 VOL. 359 NO. 13

Thrombolysis with Alteplase 3 to 4.5 Hours after Acute Ischemic Stroke

Werner Hacke, M.D., Markku Kaste, M.D., Erich Bluhmki, Ph.D., Miroslav Brozman, M.D., Antoni Dávalos, M.D., Donata Guidetti, M.D., Vincent Larrue, M.D., Kennedy R. Lees, M.D., Zakaria Medeghri, M.D., Thomas Machnig, M.D., Dietmar Schneider, M.D., Rüdiger von Kummer, M.D., Nils Wahlgren, M.D., and Danilo Toni, M.D., for the ECASS Investigators*

Endovascular Thrombectomy

The NEW ENGLAND JOURNAL of MEDICINE

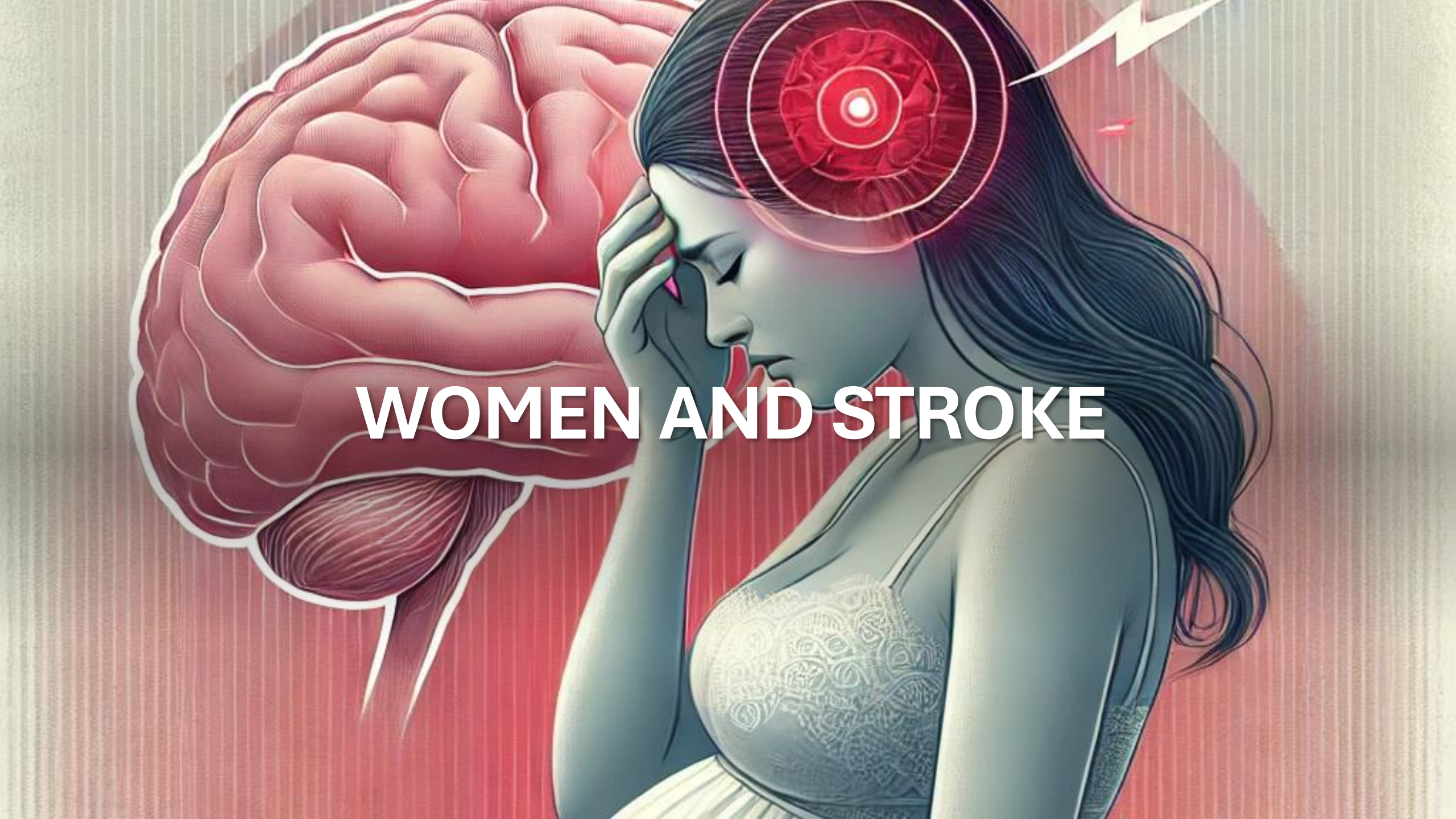
ESTABLISHED IN 1812 APRIL 6, 2023 VOL. 388 NO. 14

Trial of Endovascular Thrombectomy for Large Ischemic Strokes

LOWER MORTALITY AND MORBIDITY

Regional Stroke NETWORK Réseau Régional DES AVC

CHAMPLAIN


WOMEN AND STROKE

- 3rd trimester to 6 weeks post partum
- 12.2 per 100 000 pregnancies
- Etiologies:
  - Peropartum cardiomyopathy
  - Postpartum cerebral angiopathy
  - Amniotic fluid embolism
  - Hypertensive disorders
- Consider thrombolysis or EVT
- No contraindication for future pregnancy

MULTIDISCIPLINARY FOLLOW UP

- Migraines with Aura
  - **X2** risk of ischemic stroke

- Migraines with Aura + Oral contraceptive + Tobacco
  - **X9** risk of ischemic stroke

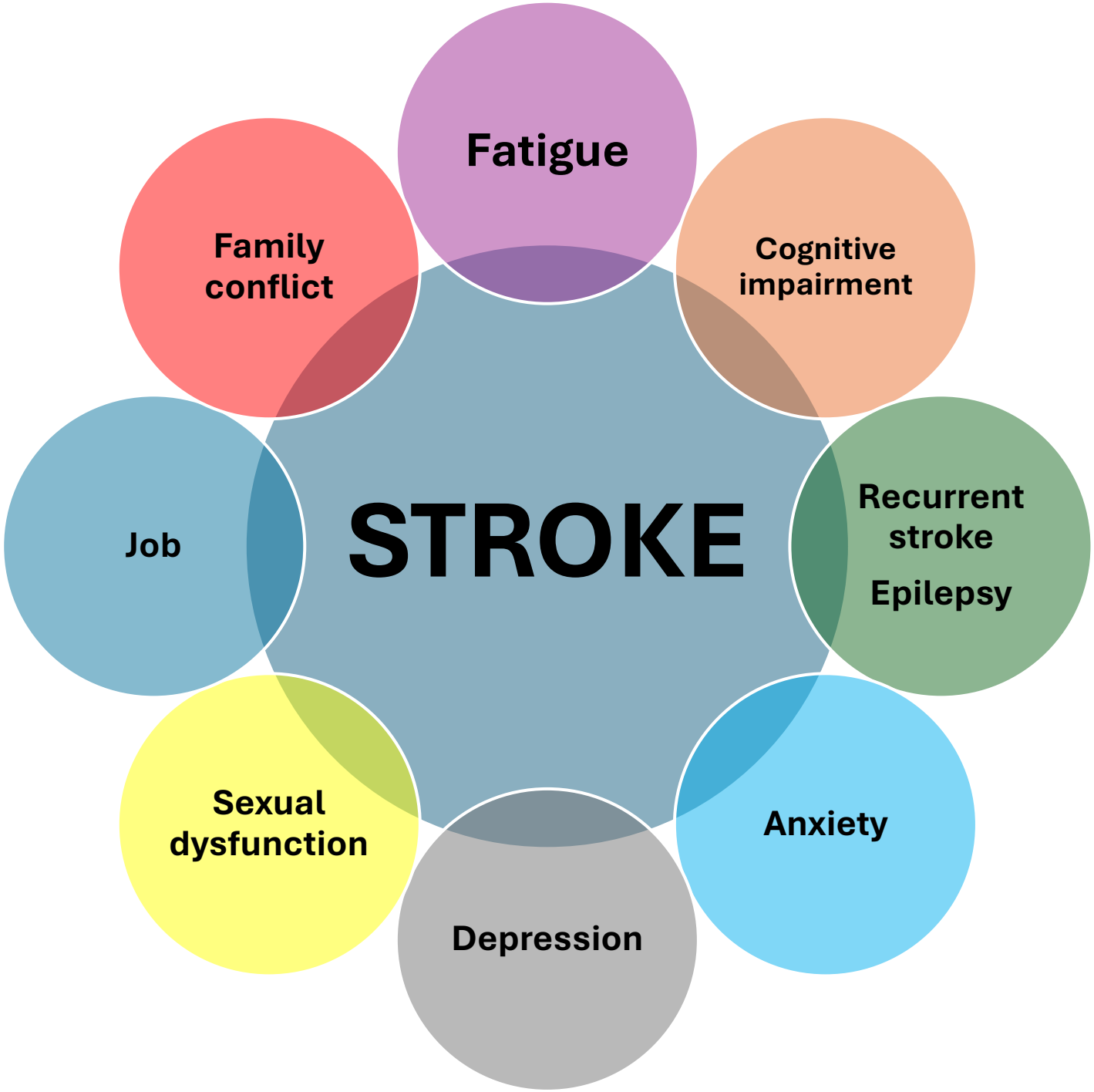
- Birth control containing oestrogen

PREVENTION

Regional Stroke NETWORK Réseau Régional DES AVC
CHAMPLAIN

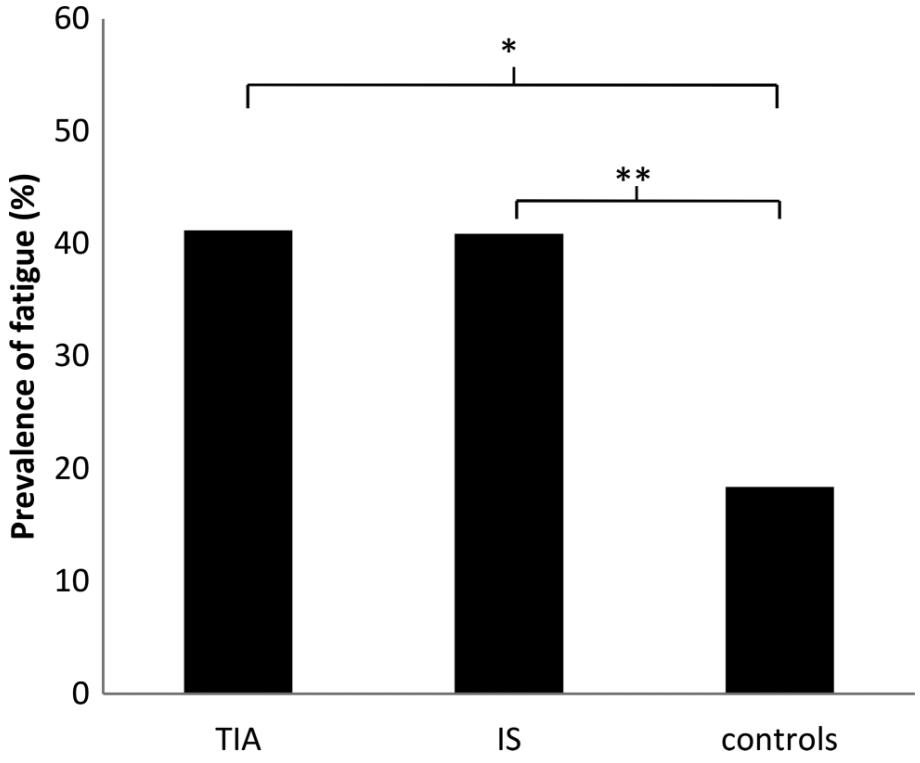
CHALLENGES

INVISIBLE DYSFUNCTIONS



Regional Stroke NETWORK Réseau Régional des AVC CHAMPLAIN

FATIGUE POST STROKE



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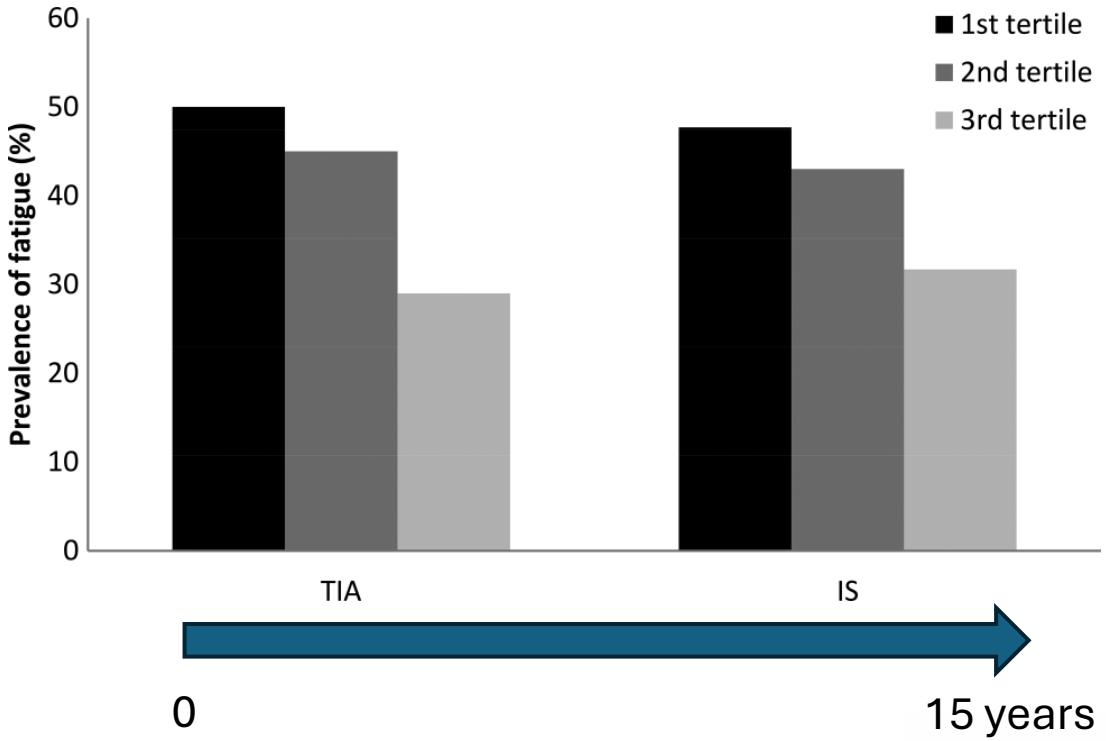


Regional Stroke Network
Réseau Régional des AVC
CHAMPLAIN

FATIGUE POST STROKE

Depression

Anxiety

cognitive Impairement

Table 3 Association between fatigue and cognitive impairment

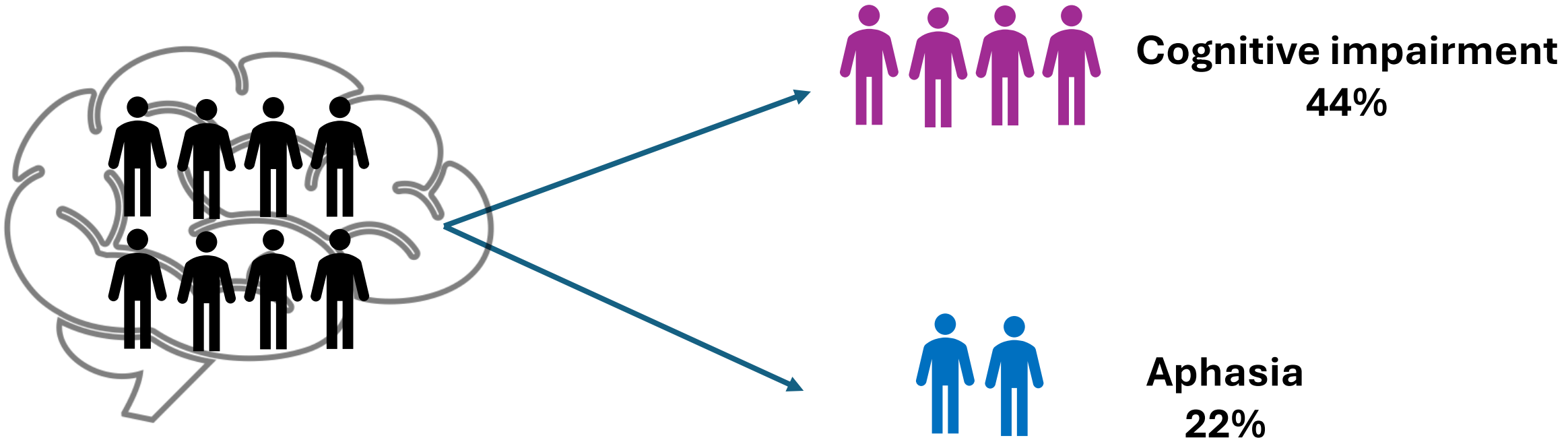
Cognitive domain	Association between impairment and fatigue; OR (95% CI)	p Value
Speed of information processing	2.2 (1.3 to 3.9)	0.006
Visuoconstruction	1.5 (0.8 to 2.8)	0.18
Working memory	2.3 (1.3 to 4.3)	0.007
Immediate memory	1.5 (0.8 to 2.9)	0.17
Delayed memory	0.7 (0.4 to 1.3)	0.25
Attention	1.6 (0.9 to 2.9)	0.12
Executive functioning	1.0 (0.6 to 1.9)	0.94

Multiple logistic regression analysis, showing associations between fatigue and cognitive impairment on seven cognitive domains. With Bonferroni correction, $p<0.007$ was considered statistically significant. ORS with 95% CIs and p values were adjusted for age, sex, stroke severity (National Institutes of Health Stroke Scale), duration of follow-up, presence of depressive symptoms and anxiety and recurrent cerebrovascular events.

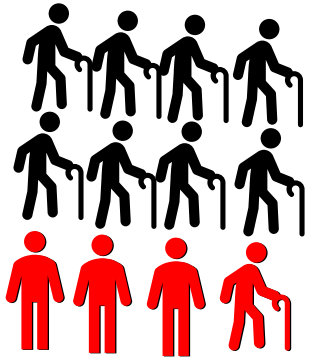
FATIGUE SEVERITY SCALE

During the past week, I have found that:	Strongly Disagree			Neither Agree Nor Disagree			Strongly Agree
1. My motivation is lower when I am fatigued.	1	2	3	4	5	6	7
2. Exercise brings on my fatigue.	1	2	3	4	5	6	7
3. I am easily fatigued.	1	2	3	4	5	6	7
4. Fatigue interferes with my physical functioning.	1	2	3	4	5	6	7
5. Fatigue causes frequent problems for me.	1	2	3	4	5	6	7
6. My fatigue prevents sustained physical functioning.	1	2	3	4	5	6	7
7. Fatigue interferes with carrying out certain duties and responsibilities.	1	2	3	4	5	6	7
8. Fatigue is among my three most disabling symptoms.	1	2	3	4	5	6	7
8. Fatigue interferes with my work, family, or social life.	1	2	3	4	5	6	7

COGNITIVE IMPAIRMENT



DEPRESSION AND ANXIETY



1/3 of patients = depression

X 3 in young patients

SCREENING

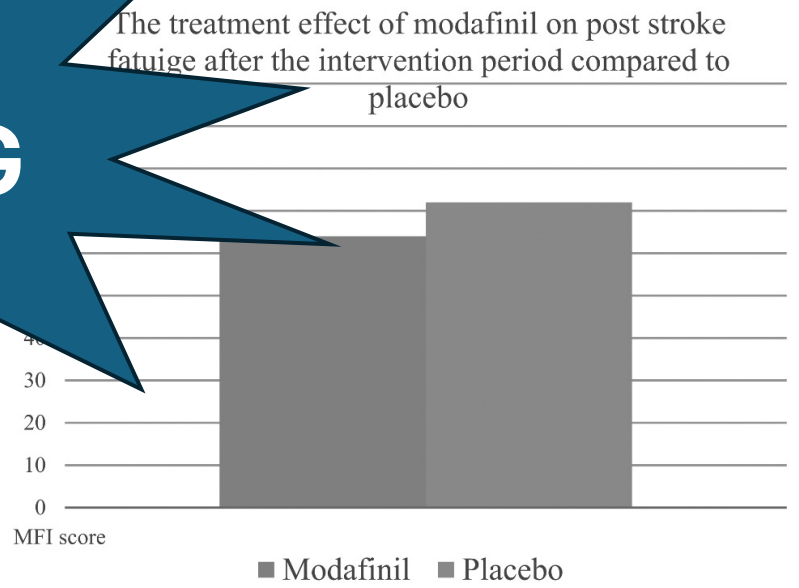
QUALITY OF LIFE

POOR OUTCOME

HIGHER RISK OF RECURRENT STROKE

MIDAS (Modafinil in Debilitating Fatigue After Stroke)
A Randomized, Double-Blind, Placebo-Controlled, Cross-Over Trial

ndrew Bivard, PhD; Thomas Lillicrap, PhD; Venkatesh Krishnamurthy, FRACP;
Eliza Holliday, PhD; John Attia, PhD; Heather Pagram, BSc; Michael Nilsson, PhD, FRACP;
Mark Parsons, PhD, FRACP; Christopher R. Levi, FRACP



COST

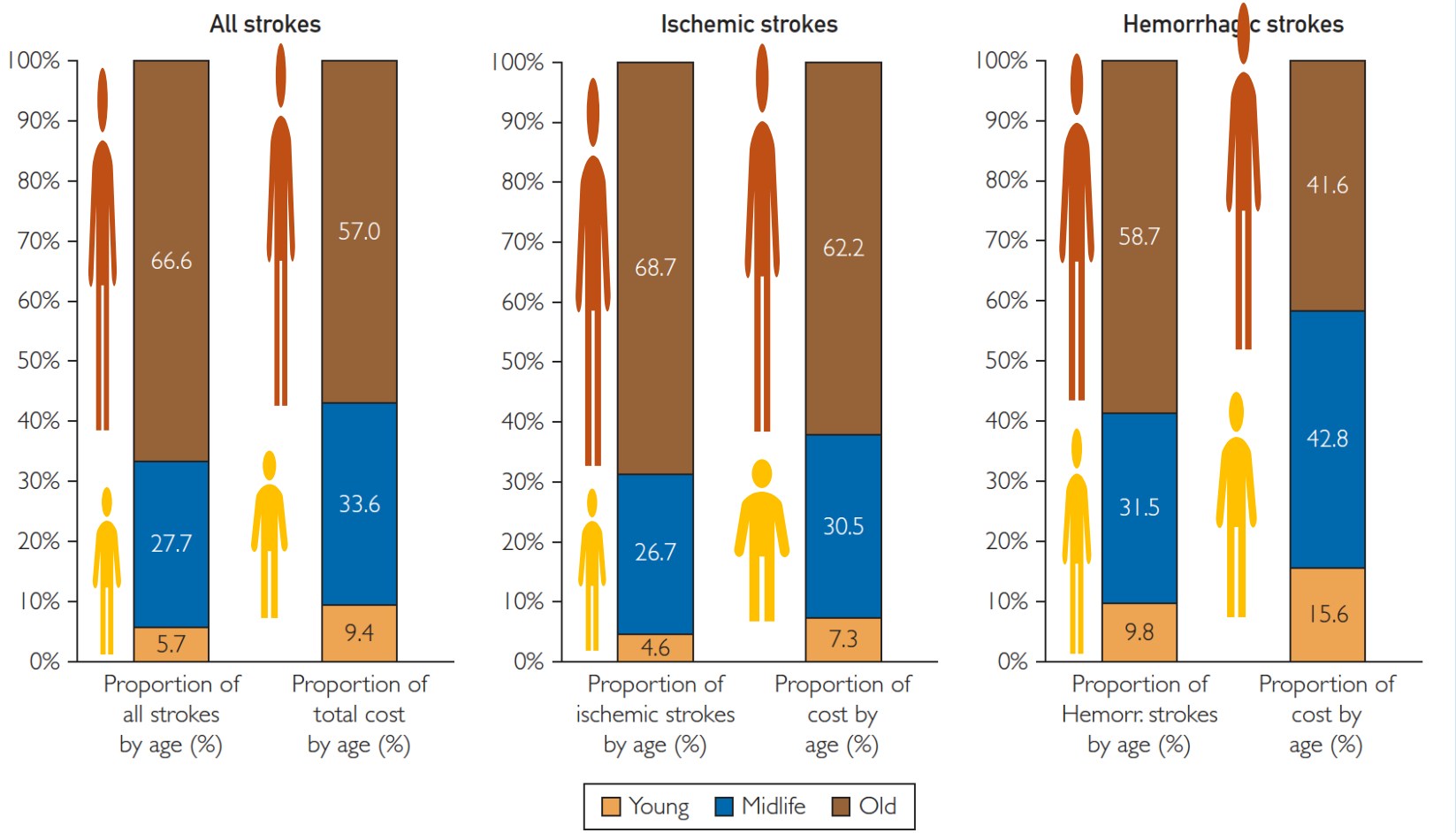
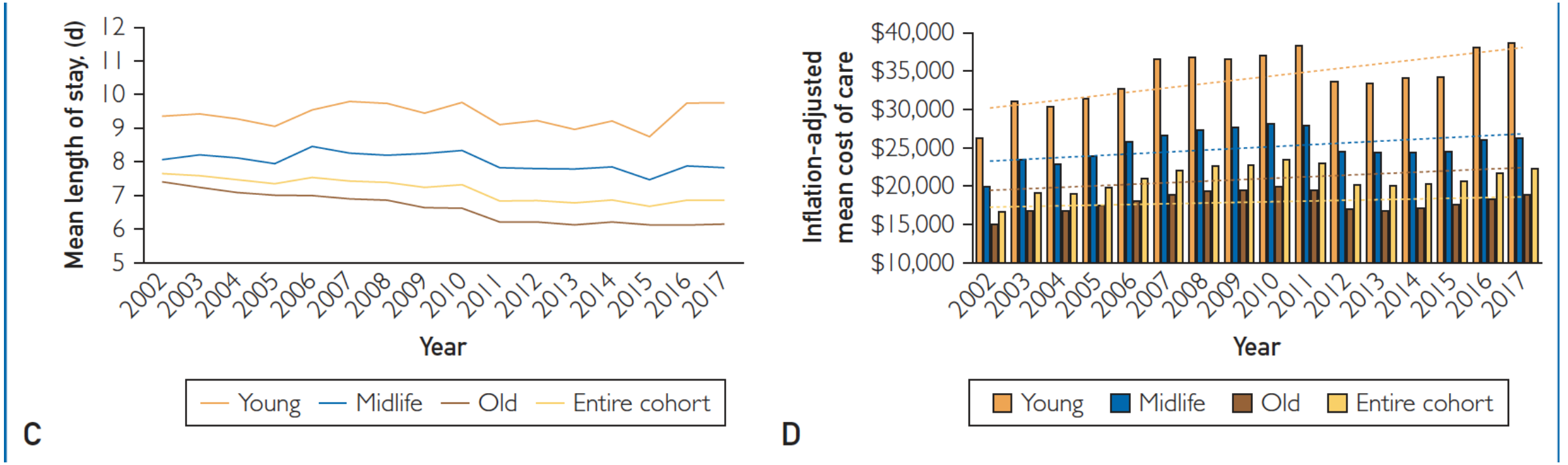


FIGURE 1. Contribution of young, midlife, and older adults in stroke and cost burden in United States.

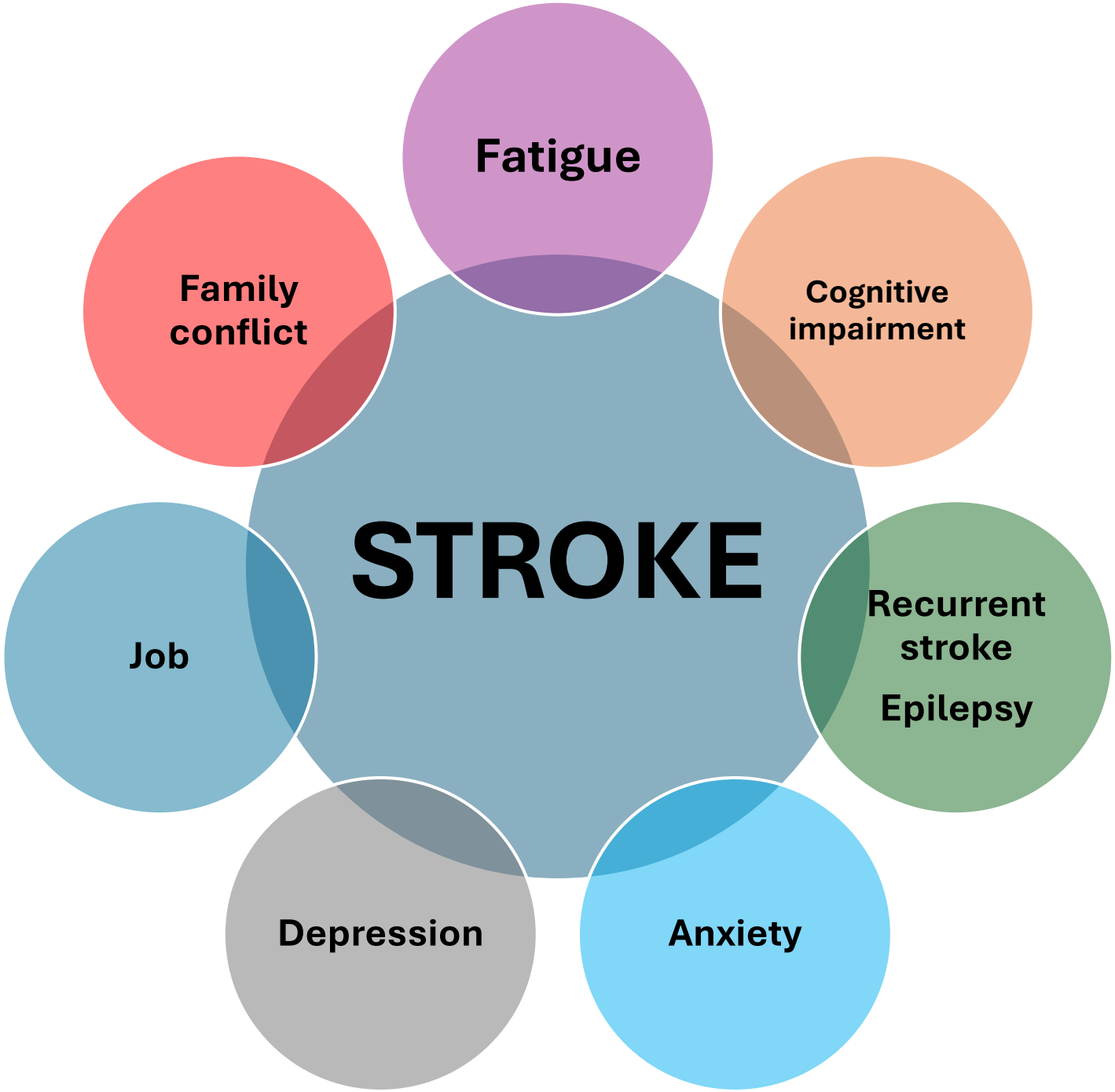
HIGHER COST

COST

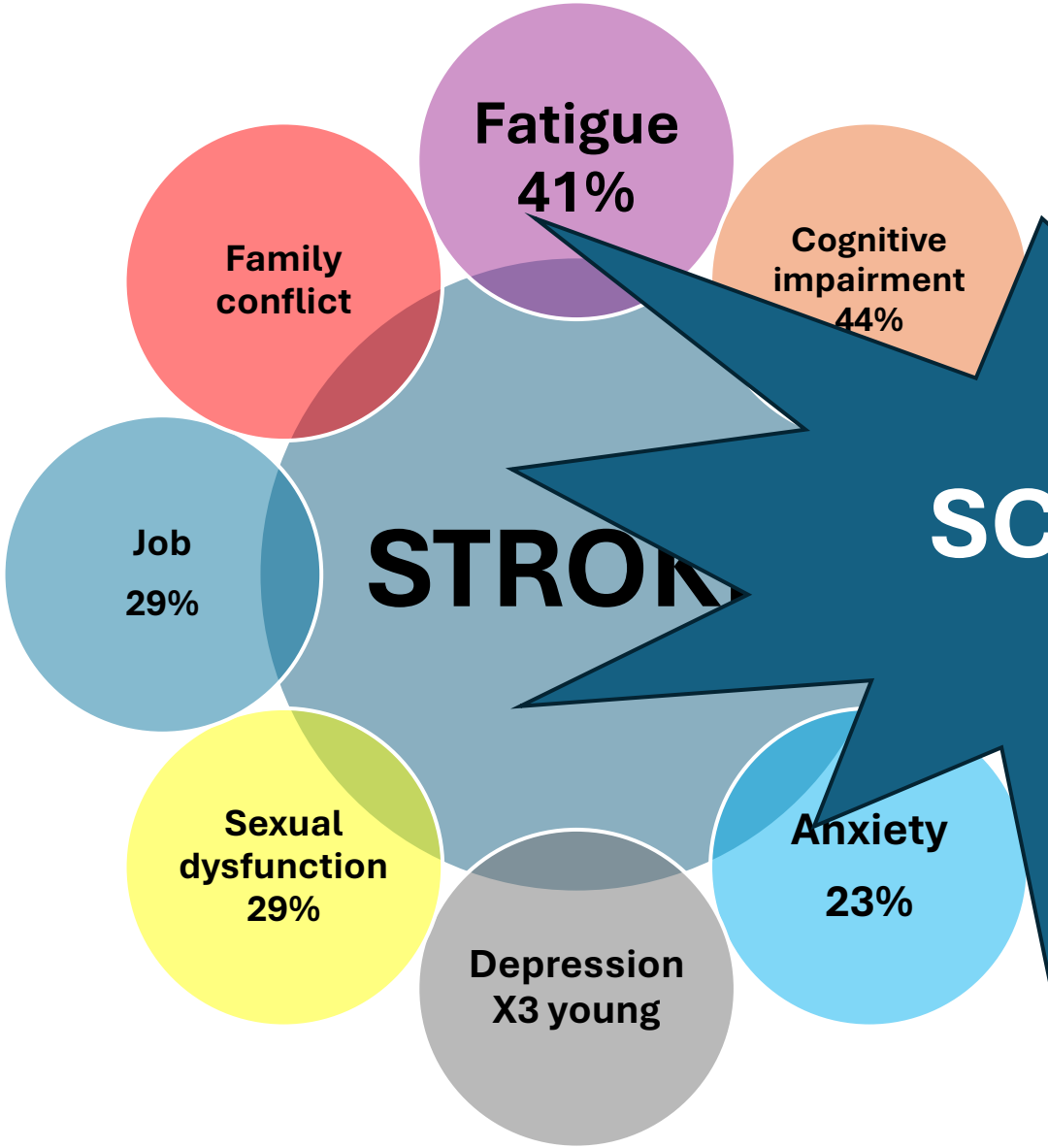


LONGER STAY IN-HOSPITAL

INCREASE COST OVER THE YEARS



Regional Stroke NETWORK Réseau Régional des AVC CHAMPLAIN



SCREENING

	Risk factors
Anxiety[110]	Lower educational level, history of depression, unemployment, and alcohol consumption
C roke pain[111]	Severe infarctions with haemorrhagic transformation
airment[112,113]	Supratentorial infarction
	ucational level and unemployment
	age (40–50 years), male sex, history of cardioembolic stroke, and existing cause of stroke
	troke caused by large-artery atherosclerosis, early of stroke), cortical involvement, and territory of middle involvement
	depressive symptoms, anxiety, and recurrent cerebrovascular events
	ars), male sex, history of cardiovascular risk factors, ardioembolic stroke, and lacunar stroke
	e sex, living alone at stroke onset, low income, lower educational level, e stroke (being drowsy or unconscious on hospital admission), and troke depression
unction[118]	ion and use of angiotensin-converting-enzyme inhibitors
ment[3,119]	Hig HSS at admission, a longer duration of follow-up, female sex, self-empl ment before stroke, and lower occupational status

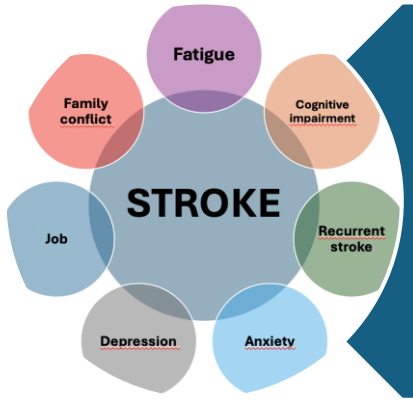
NIHSS= ational Institutes of Health Stroke Scale.

Table 2: **Prognosis and associated risk factors in young adults with stroke**

Regional Stroke NETWORK Réseau Régional DES AVC CHAMPLAIN

CONCLUSION

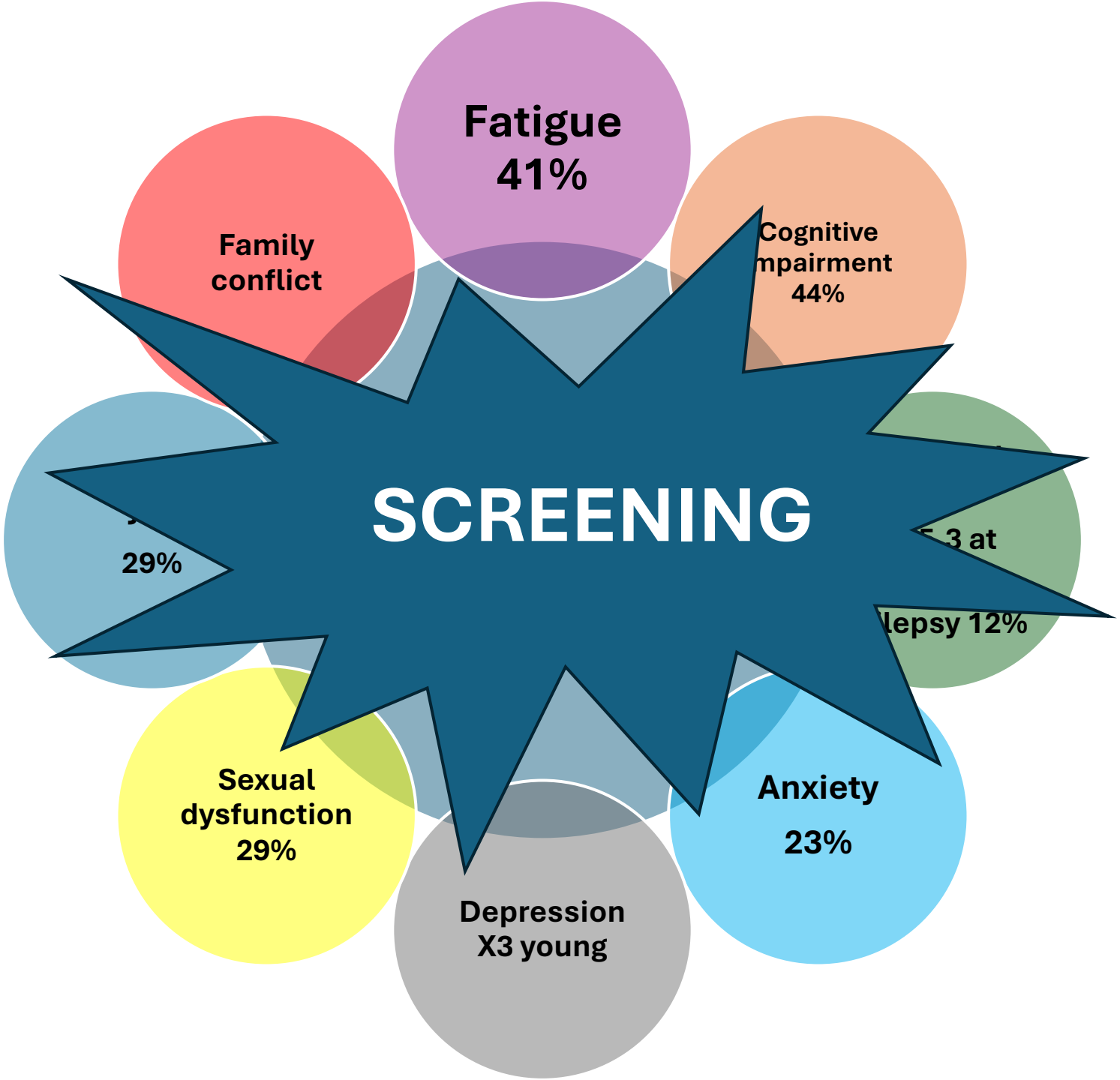
PREVENTION



POST STROKE MANAGEMENT

Regional Stroke NETWORK Réseau Régional DES AVC
CHAMPLAIN

Regional Stroke Network
Réseau Régional des AVC
CHAMPLAIN



Regional Stroke NETWORK Réseau Régional DES AVC CHAMPLAIN

Canadian Stroke
Best Practices