Healthcare resource use and economic burden of stroke among people with type 2 diabetes: A real-world evidence study in France

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Introduction

- The burden of diabetes is growing exponentially with approximately 537 million adults (20-79 years) living with type 2 diabetes (T2D)[1]; by 2045 this will rise to 783 million.[1]
- Stroke is a major cardiovascular event and people with T2D have a higher risk of stroke, especially ischemic stroke.[2] The risk of incident stroke has been reported to be 3-fold higher in people with T2D than in general population.T2D is also an independent risk factor for stroke recurrence (hazard ratio [HR] 1.45).[3,4]
- Cardiovascular diseases (CVDs) increase the costs in people with T2D; the median annual costs per patient for stroke were reported to be 322% higher in people with T2D.[5]
- Real-world evidence on stroke outcomes in T2D in Europe and awareness about health care resource utilisation (HCRU) and costs in this population is scarce.

Objective

- The aim of this study was to describe the HCRU and economic burden of stroke among people with T2D in France.

Methods

- A retrospective observational study was performed using data from the Echantillon Général des Bénéficiaires (EGB), a 1% representative sample of the French population derived from the national health database, the Système National des Données de Santé (SNDS).
- Adult people with T2D and stroke were identified between 1 January 2012 and 31 December 2018, where the index date was the incident stroke hospitalization date (Fig. 1). The baseline period was 24 months prior to the index date, the follow-up was until 31 December 2019. All patients had a minimum 12 months of follow-up, unless they died.
- HCRU and costs were evaluated from index date until end of follow-up or death and described per patient per year (PPPY).

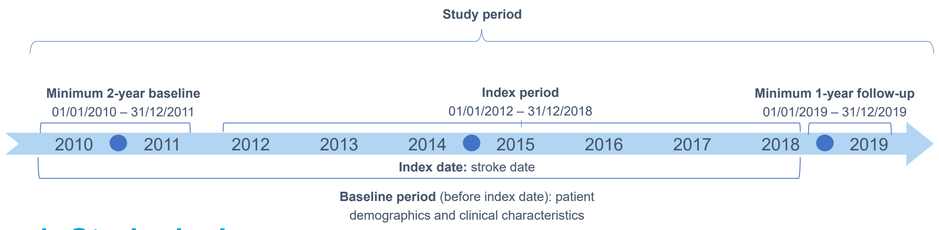
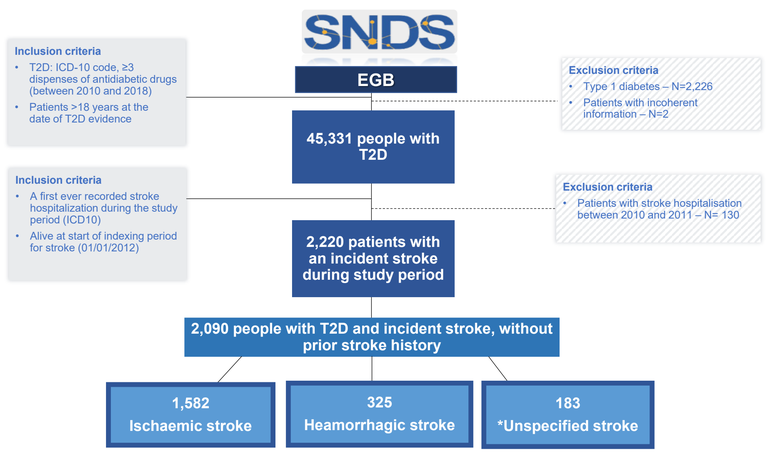


Figure 1. Study design

Results

- A total of 2,090 (4.6%) people with T2D with an incident stroke hospitalisation were identified (Fig. 2). 75.7% (n=1,582) had an ischaemic stroke, 15.6% (n=325) had a haemorrhagic stroke, and 8.6% (n=183) had an unspecified stroke. Unspecified stroke was excluded from the following results.



*Note that patients with unspecified stroke are not included in the following tables or figures as the patient count in this group is low.

Figure 2. Flow chart

- Mean (Standard Deviation [SD]) age at index date was 75.0 (11.4) years and 55.3% were male (Table 1).

Table 1. Baseline characteristics among people with T2D and stroke

	All	Ischaemic stroke	Haemorrhagic stroke
Number of patients in the study population, N (%)	2090	1582 (75.7%)	325 (15.6%)
Age at hospitalisation for first stroke, Mean (SD)	75.0 (11.4)	75.3 (11.3)	74.6 (12.0)
Length of stay of index hospitalization in days, Mean (SD)	12.2 (13.0)	11.9 (11.4)	13.3 (15.8)
Sex, Male, N (%)	1156 (55.3%)	846 (53.5%)	200 (61.5%)
Age adjusted Charlson Comorbidity Index, N (%)			
0 points	11 (0.5%)	10 (0.6%)	Freq < 10
1-2 points	155 (7.4%)	116 (7.3%)	28 (8.6%)
3-4 points	678 (32.4%)	522 (33.0%)	100 (30.8%)
≥ 5 points	1246 (59.6%)	934 (59.0%)	196 (60.3%)
Comorbidities within 24 months prior to index date, N (%)			
Hypertension	1734 (83.0%)	1319 (83.4%)	263 (80.9%)
Dyslipidaemia	1329 (63.6%)	1001 (63.3%)	200 (61.5%)
Myocardial infarction	292 (14.0%)	218 (13.8%)	42 (12.9%)
Obesity	249 (11.9%)	187 (11.8%)	35 (10.8%)
CKD and Renal failure	245 (11.7%)	166 (10.5%)	44 (13.5%)
Chronic Heart Failure	240 (11.5%)	172 (10.9%)	35 (10.8%)
Atherosclerosis	236 (11.3%)	172 (10.9%)	35 (10.8%)

Results

- During the follow-up period (mean time of 2.8 years), the subsequent hospitalization (after index hospitalization discharge) rate was 2.2 PPPY (3.1 PPPY for patients with haemorrhagic stroke and 1.9 PPPY for patients with ischaemic stroke).
- External consultation was observed among 73.3% of patients and outpatient consumption was observed among 94.7% of patients.

Table 2. Mortality and HCRU among people with T2D and stroke

	All	Ischaemic stroke	Haemorrhagic stroke
Number of patients in the study population, N (%)	2090	1582 (75.7%)	325 (15.6%)
Follow-up time			
Mean (SD)	2.8 (2.3)	2.9 (2.2)	2.1 (2.3)
Median (IQR)	2.4 (0.6-4.4)	2.6 (1.0-4.5)	1.2 (0.0-4.0)
People who died during follow-up, N (%)	952 (45.6%)	662 (41.9%)	196 (60.3%)
30-day mortality	341 (16.3%)	196 (12.4%)	115 (35.4%)
1-year mortality	591 (28.3%)	378 (23.9%)	153 (47.1%)
Subsequent hospitalisations, N (%)	1437 (68.8%)	1135 (71.7%)	168 (51.7%)
Overnight	1332 (63.7%)	1050 (66.4%)	157 (48.3%)
Day cases	738 (35.3%)	581 (36.7%)	80 (24.6%)
Subsequent hospitalisation rate (95% confidence interval) per person-year	2.2 (2.2-2.3)	1.9 (1.9-2.0)	3.1 (2.9-3.3)
External consultation at hospital, N (%)	1531 (73.3%)	1211 (76.5%)	189 (58.2%)
Outpatient consumption, N (%)	1980 (94.7%)	1520 (96.1%)	285 (87.7%)
Treatments	1698 (81.2%)	1345 (78.7%)	209 (64.3%)
Outpatient visit/consultation to healthcare professionals	1708 (81.7%)	1353 (85.5%)	206 (63.4%)
Rehabilitation/therapy visits	1140 (54.6%)	900 (56.9%)	141 (43.4%)
Medical act and procedures	1510 (72.2%)	1198 (75.7%)	182 (97.3%)

- Median (Interquartile Range Q1-Q3; IQR) hospital cost was €5,683 (2,634-11,292) PPPY. Median (IQR) outpatient cost, including visits, treatments, and procedures, was €4,890 (1,599-11,316) PPPY.
- Total median (IQR) cost was €12,199 (6,846-22,378) PPPY, with similar figures by type of stroke (€11,947 [6,851-21,764] and €11,985 [6,236-21,753] for haemorrhagic and ischaemic stroke, respectively). Median hospital cost was higher for haemorrhagic stroke, median outpatient cost was higher for ischemic stroke. Specific mean costs PPPY are also presented in Fig. 3.

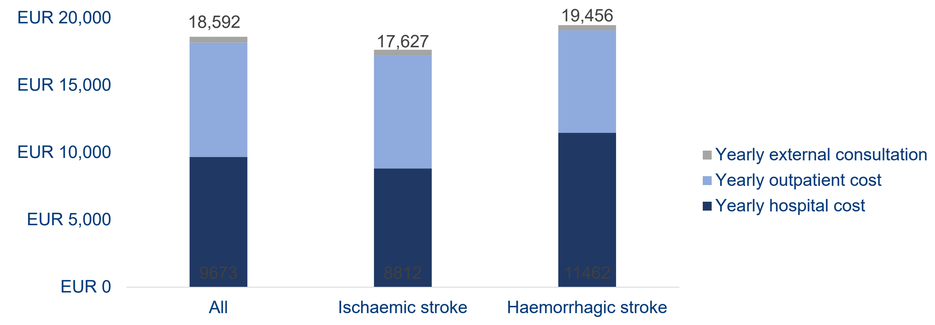


Figure 3. Mean cost per patient per year, overall and per stroke type

Conclusion

- The economic burden of stroke among people with T2D is high in France.
- Whilst patients with haemorrhagic stroke tend to present with more severe clinical outcomes compared to patients with ischaemic stroke, the total cost of stroke in people with T2D was driven in a substantial proportion by the high frequency of patients with ischemic stroke.
- Stroke risk reduction in people with T2D could lead to lower economic burden to the healthcare system.

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- HR, CM, LV, and SL are all full-time employees of Novo Nordisk.

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