National Trends in Patients Hospitalized for Stroke and Stroke Mortality in France, 2008 to 2014

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Background and Purpose—Stroke is the leading cause of death in women and the third leading cause in men in France. In young adults (ie, <65 years old), an increase in the incidence of ischemic stroke was observed at a local scale between 1985 and 2011. After the implementation of the 2010 to 2014 National Stroke Action Plan, this study investigates national trends in patients hospitalized by stroke subtypes, in-hospital mortality, and stroke mortality between 2008 and 2014.

Methods—Hospitalization data were extracted from the French national hospital discharge databases and mortality data from the French national medical causes of death database. Time trends were tested using a Poisson regression model.

Results—From 2008 to 2014, the age-standardized rates of patients hospitalized for ischemic stroke increased by 14.3% in patients <65 years old and decreased by 1.5% in those aged ≥65 years. The rate of patients hospitalized for hemorrhagic stroke was stable (+2.0%), irrespective of age and sex. The proportion of patients hospitalized in stroke units substantially increased. In-hospital mortality decreased by 17.1% in patients with ischemic stroke. From 2008 to 2013, stroke mortality decreased, except for women between 45 and 64 years old and for people aged ≥85 years.

Conclusions—An increase in cardiovascular risk factors and improved stroke management may explain the increase in the rates of patients hospitalized for ischemic stroke. The decrease observed for in-hospital stroke mortality may be because of recent improvements in acute-phase management.

Each year, ≈6.5 million people die from stroke worldwide, and 1 million from cerebrovascular diseases in the European Union-15 countries.[1,2] According to the 2013 Global burden of disease study, stroke is the second largest contributor to disability-adjusted life years (113 million disability-adjusted life years) in the world after ischemic heart disease, is a major cause of disability, and is the second most common cause of dementia, after Alzheimer disease. At the beginning of the 2000s, France had the lowest age-standardized mortality rate for cerebrovascular disease among the 15 European Union countries, in men and in women.[2] However, stroke is the leading cause of death in women and the third-leading cause in men in France.[3] According to the French national health insurance database, 757 800 people received care for stroke in 2013, all health schemes combined.[4] The 2013 estimated figures for stroke care reimbursement (hospital care, outpatient care, drugs, nurses, etc) were comparable with those for coronary heart diseases (€ 3.5 billion [$3 931 550] versus € 4 billion [$4 493 200]).

Primary and secondary prevention of stroke is more important than ever given that between 80% and 90% of the global stroke burden is attributable to a few risk factors that can be substantially improved, including hypertension, smoking, waist:hip ratio, diet and physical activity.[5,6]

Faced with the burden of stroke, a national strategy was implemented in France at the beginning of the 2000s. To improve patient management, stroke units were established in hospitals throughout the national territory. Furthermore, in 2003, thrombolysis by recombinant tissue-type plasminogen activator was introduced. The 2010 to 2014 National Stroke Action Plan brought further changes in prevention and management of stroke, leading to the implementation of a territory-wide stroke-care network.[7]

Given these important changes in stroke management and in medical care innovation, in a context of increased cardiovascular risk factors,[8–11] this study investigated national trends for patients hospitalized for stroke, for in-hospital mortality and for overall mortality, between 2008 and 2014. To do this,

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we focused on hospitalization by stroke subtypes, which is a novel approach in France.

Methods

Hospitalization Data

Hospitalization data from 2008 to 2014 were extracted from the French national hospital discharge databases (PMSI-MCO [Programme de Médicalisation des Systèmes d'information en Médecine, Chirurgie, Obstétrique et Odontologie]), which contain the medical records (including diagnosis) of all patients discharged from both private and public hospitals. Stroke was defined by the following *International Classification of Diseases*-Tenth Revision codes from the main discharge: hemorrhagic stroke (HS): I60 to I62 and ischemic stroke (IS): I63, I64, or G46 (if one of the codes I60 to I64 was an associated or related diagnosis). Transient ischemic attack (TIA) was defined by G45 (except 454) from the main diagnosis, irrespective of stroke codes. Using medical unit codes, we searched for stays in stroke units and intensive care units for IS and intracerebral hemorrhage (I61) patients.

Diagnoses of paralysis or aphasia at the time of the hospitalization were also investigated. We searched for specific codes (Table I in the online-only Data Supplement) in associated or related diagnoses.

Mortality Data

Death certificates mentioning stroke as the initial cause of death (*International Classification of Diseases*-10 codes: I60–I64 and I69) were extracted from the French national medical cause of death database.

Population Data

To calculate hospitalized patient and mortality rates, we used data from the annual population census obtained from the French National Institute of Statistics and Economic Studies (Insee), 2008 to 2014.

Statistical Analysis

Annual crude rates for hospitalized patients and mortality were calculated according to the sex and age group. Rates were age standardized. Analyses by stroke subtype were not possible on mortality data because of the high proportion of unspecified strokes (I64; on average 44.4% between 2008 and 2013).

Table 1. Characteristics of Patients Hospitalized for Stroke (by Subtype and Total) or for TIA, France, 2014

	Ischemic Stroke			Hemorrhagic Stroke			Stroke (Total)			Transient Ischemic Attack		
	Men	Women	Total	Men	Women	Total	Men	Women	Total	Men	Women	Total
	41 857	41 055	82 912	14 087	13 439	27 526	55 944	54 494	110 438	15 402	17 230	32 632
Age group, y, n (%)												
<65	12 736 (30.4)	6451 (15.7)	19 187 (23.1)	4919 (34.9)	3723 (27.7)	8642 (31.4)	17 655 (31.6)	10 174 (18.7)	27 829 (25.2)	5518 (35.8)	4236 (24.6)	9754 (29.9)
≥65	29 121 (69.6)	34 604 (84.3)	63 725 (76.9)	9168 (65.1)	9716 (72.3)	18 884 (68.6)	38 289 (68.4)	44 320 (81.3)	82 609 (74.8)	9884 (64.2)	12 994 (75.4)	22 878 (70.1)
Crude rate of patients hospitalized (per 100 000 inhabitants)												
All ages	130.9	120.7	125.6	44.1	39.5	41.7	174.9	160.2	167.3	48.2	50.6	49.4
<65 y	47.4	23.8	35.5	18.3	13.7	16.0	65.7	37.5	51.6	20.5	15.6	18.1
≥65 y	57.8	499.6	529.8	179.7	140.3	157.0	750.4	639.9	686.8	193.7	187.6	190.2
Age-standardized* rate of patients hospitalized (per 100 000 inhabitants)												
All ages	153.9	102.0	125.9	51.3	35.1	42.1	205.2	137.1	167.9	56.0	44.7	49.9
<65 y	49.8	24.1	36.5	19.2	13.9	16.5	68.9	38.0	53.0	21.6	15.9	18.7
≥65 y	583.9	423.6	494.6	183.9	122.3	147.8	767.8	545.9	642.4	198.0	163.6	178.7
Age, y (SD)	71.0 (14.2)	77.9 (14.4)	74.4 (14.7)	68.6 (17.1)	72.8 (17.3)	70.7 (17.3)	70.4 (15.0)	76.7 (15.3)	73.5 (15.5)	68.9 (15.6)	73.8 (16.4)	71.5 (16.2)
Comorbidities, n (%)												
Patients with plegia or aphasia	20 645 (49.3)	21 770 (53.0)	42 415 (51.2)	5204 (36.9)	4832 (35.0)	10 036 (36.5)	25 849 (46.2)	26 602 (48.8)	52 451 (47.5)	3004 (19.5)	3 601 (20.9)	6605 (20.2)
Patients with plegia	17 396 (41.6)	18 135 (44.2)	35 531 (42.9)	4617 (32.8)	4263 (31.7)	8 880 (32.3)	22 013 (39.4)	22 398 (41.1)	44 411 (40.2)	1818 (11.8)	1868 (10.8)	3686 (11.3)
Patients with aphasia	7930 (18.9)	9439 (23.0)	17 369 (20.9)	1932 (13.7)	1826 (13.6)	3758 (13.7)	9862 (17.6)	11 265 (20.7)	21 127 (19.1)	1472 (9.6)	2096 (12.2)	3568 (10.9)
Length of stay, d (SD)	10.9 (11.1)	11.8 (11.1)	11.4 (11.1)	13.7 (19.2)	13.6 (17.8)	13.6 (18.5)	11.6 (13.7)	12.2 (13.1)	11.9 (13.4)	5.2 (4.8)	5.7 (5.0)	5.5 (4.9)
Crude in-hospital case fatality, n (%)	3212 (7.7)	4584 (11.2)	7796 (9.4)	3785 (26.9)	4163 (31.0)	7948 (28.9)	6997 (12.5)	8747 (16.1)	15 744 (14.3)	79 (0.5)	96 (0.6)	175 (0.5)
Age-standardized† in-hospital mortality, (%)	9.2	9.5	9.4	28.0	29.6	28.9	14.0	14.6	14.3	0.6	0.5	0.5

*Standardized to the 2010 European census population.

†Standardized to the total of patients hospitalized for stroke in 2014.

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In-hospital mortality rates were age standardized using the total number of patients hospitalized in 2014 as the standard population.

For comparisons by sex and stroke subtype, we used χ^2 tests for categorical variables and Wilcoxon and Kruskall–Wallis tests for continuous variables with no normal distribution.

Time trends in hospitalized patients and mortality rates were tested using the log linear Poisson regression model.

Analyses were performed using SAS Enterprise Guide 7.1 software. According to French governmental regulations, the examination of the study protocol by the National Ethics Committee was not required.

Results

Patients Hospitalized for Stroke

In 2014, 110 438 patients were hospitalized for stroke including 82 912 (75.1%) for IS and 27 526 (24.9%) for HS (of whom 64% had intracerebral hemorrhages, 20% subarachnoid hemorrhages, and 16% other nontraumatic intracranial hemorrhages) and 32 632 for TIA (Tables I and II in the online-only Data Supplement). The age-standardized rates of patients hospitalized for IS were 125.9 per 100 000 and 42.1 per 100 000 for HS and was 1.5× higher in men than in women. The mean age at hospitalization was significantly lower in men (70.4 years) than in women (76.7 years). More than 50% of patients with IS and 36.5% of patients with HS had paralysis or aphasia (Table 1).

Approximately 50% of patients with stroke were hospitalized in a stroke unit or in an intensive care unit (Table 2). The proportion of patients in a stroke unit was higher for IS (49.3%) than for intracerebral hemorrhage (33.2%). After age-standardization, men were hospitalized in a stroke unit slightly more often than women (44.6% versus 41.4%). Furthermore, patients <65 years were placed in a stroke unit more often than those aged ≥65 years (53.2% versus 39.8%).

Time Trends in Age-Standardized Hospitalized Patients Rates

Between 2008 and 2014, the number of patients hospitalized for stroke (IS and HS) increased by 13.7%, whereas the age-standardized rate was stable (+1.8%) (Table II in the online-only Data Supplement). Similar trends were observed for TIA (numbers: +8.6%, rates: −2.5%). However, the rate of stroke patients aged ≥65 years slightly decreased (−0.3%), whereas that of patients with stroke <65 years increased by 8.5%. Similar results were observed in patients with TIA (Figure I in the online-only Data Supplement). Moreover, for stroke, trends were different according to the subtype.

For IS, hospitalization rates increased in patients aged <65 years (+14.3% over the study period), in both men and women (versus a 1.5% decrease in those aged ≥65 years; Figure 1A). The Poisson regression shows significant annual increases in men aged 25 to 74 years and in women aged 35 to 64 years (Figure 2A). By contrast, a significant annual decrease was recorded in men aged ≥75 years and in women aged 75 to 84 years.

For HS, the rates did not change substantially over the period (+1.8%; Figure 1B). Significant annual increases were observed in men and women aged ≥85 years, whereas significant annual decreases were recorded in women aged 25 to 34 and 65 to 74 years (Figure 2B).

Temporal Changes in Patient Characteristics

Over the study period, the mean age of IS patients remained stable at ≈74 years. The mean length of hospital stays reduced (12.6 days in 2008 to 11.4 days in 2014), irrespective of age and sex. The proportion of patients hospitalized in a stroke unit more than doubled, increasing from 17.2% in 2008 to 49.3% in 2014.

Among patients with HS, the mean age was 2 years higher in 2014 than in 2008. The proportion of patients hospitalized for intracerebral hemorrhage in a stroke unit increased from 13.9% to 33.2%, whereas the rate of patients hospitalized for intracerebral hemorrhage increased only slightly (+3.4%).

In-Hospital Mortality

In 2014, the age-standardized in-hospital mortality rate was more than 3× higher in patients with HS than in those with IS (28.9% versus 9.4%, respectively; Table 1). In-hospital mortality rates were slightly higher in women than in men irrespective of age.

Table 2. Patients Hospitalized in Stroke Unit, by Stroke Subtype, France, 2014

	Ischemic Stroke			Intracerebral Hemorrhage (I61)			Stroke (Total)		
	Men	Women	Total	Men	Women	Total	Men	Women	Total
	(n=41 857)	(n=41 055)	(n=82 912)	(n=9031)	(n=8545)	(n=17 576)	(n=55 944)	(n=54 494)	(n=110 438)
Patients hospitalized in a stroke unit or intensive care unit, n (%)	23 565 (56.3)	18 834 (45.9)	42 399 (51.1)	5145 (57.0)	4003 (46.9)	9148 (52.0)	30 625 (54.7)	25 191 (46.2)	55 816 (50.5)
Patients hospitalized in a stroke unit, n (%)	22 714 (54.3)	18 199 (44.3)	40 913 (49.3)	3263 (36.1)	2574 (30.1)	5837 (33.2)	26 414 (47.2)	21 221 (38.9)	47 635 (43.1)
Intensive care in a stroke unit, n (%)	19 483 (46.6)	15 318 (37.3)	34 801 (42.0)	2 791 (30.9)	2151 (25.2)	4 942 (28.1)	22 597 (40.4)	17 808 (32.7)	40 405 (36.6)
Stroke unit without intensive care, n (%)	3 231 (7.7)	2 881 (7.0)	6112 (7.4)	472 (5.2)	423 (5.0)	895 (5.1)	3 817 (6.8)	3 413 (6.3)	7 230 (6.5)
Age-standardized* rate of patients hospitalized in a stroke unit (%)									
All ages	50.7	48.2	49.3	34.7	31.8	33.2	44.6	41.4	43.1
<65 y	67.5	65.7	66.9	37.9	35.3	37.0	55.3	49.2	53.2
≥65 y	45.7	43.0	44.1	33.6	30.6	32.0	41.0	38.8	39.8

*Standardized to the patients hospitalized for stroke in 2014.

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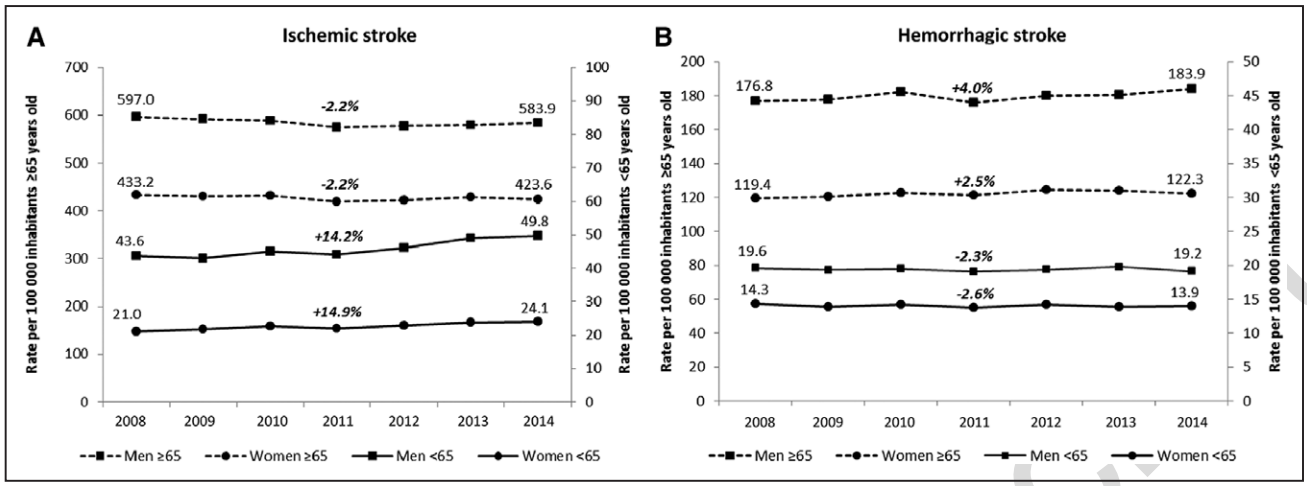


Figure 1. Trends in age-standardized rates of patients hospitalized for ischemic stroke (**A**), for hemorrhagic stroke (**B**), by sex and age group, 2008 to 2014.

Between 2008 and 2014, the overall age-standardized in-hospital mortality rate significantly decreased (−11.1%; data not shown). This global trend mainly reflected an improvement in survival after IS (−17.1%), especially in men (−19.6% versus −15.4% in women).

Stroke Mortality

In 2013, stroke was recorded as the initial cause of death on 31 346 death certificates. Women accounted for 58.5% of stroke deaths (Table 3). Mean age at death was significantly higher in women than in men (85.1 versus 79.4 years). Approximately 5% of women and 12% of men were <65 years.

The age-standardized mortality rate for stroke was 45.7 per 100 000 inhabitants and was higher in men than in women (51.8 versus 40.9 per 100 000).

Temporal Changes

Between 2008 and 2013, the number of deaths caused by stroke remained stable, at ≈31 000 each year. However, the mortality rate decreased by 13.4%. More specifically, mortality rates significantly decreased in all age groups except for women aged 45 to 64 years and for people aged ≥85 years (Figure 3). Over the study period, the mean age at death increased in women from 83.7 to 85.1 years and in men from 77.7 to 79.4 years.

Discussion

Between 2008 and 2014, the rate of hospitalized patients for IS strongly increased in young patients (ie, <65 years of age), the proportion of patients hospitalized in a stroke unit substantially increased and the overall stroke mortality decreased, except for women aged 45 to 64 years and people aged ≥85 years.

Changes in Hospitalized Patient Rates

These increases, observed in patients with IS <65 years old reflect results from several international studies. Indeed, the first study highlighted an increase in IS incidence in adults aged 20 to 44 years in the Greater Cincinnati and Northern Kentucky region between 1993 and 2005.[8] In France, the Dijon Stroke Registry demonstrated similar trends in adults aged <55 years old.[12] These results were corroborated at a

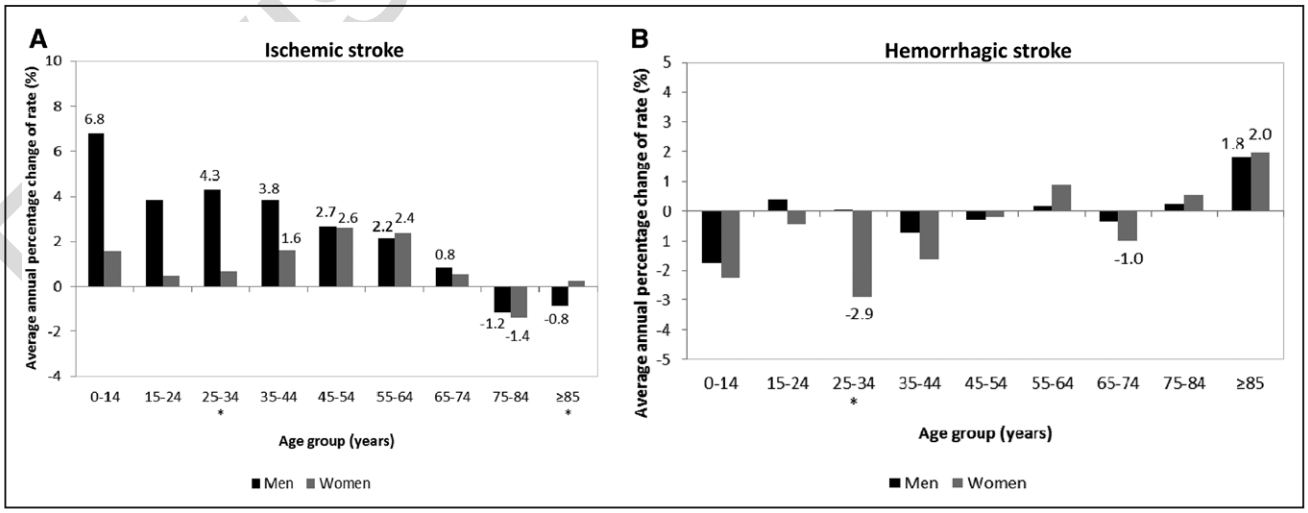


Figure 2. Average annual change in crude rates of patients hospitalized for ischemic stroke (**A**), for hemorrhagic stroke (**B**), by sex and age group, France, 2008 to 2014. Only significant values are provided on the graph. *Interaction test between time and sex significant for these age groups (P<0.05).

Table 3. Characteristics of Deaths Attributed to Stroke and Mortality Rates, France, 2013

	Men	Women	Total
	(n=13 003)	(n=18 343)	(n=31 346)
Mean age, y (SD)	79.4 (12.1)	85.1 (10.4)	82.7 (11.5)
Age group, n (%)			
<65 y	1 598 (12.3)	958 (5.2)	2 556 (8.2)
≥65 y	11 411 (87.7)	17 385 (94.8)	28 790 (91.8)
Crude mortality rate (per 100 000 inhabitants)			
All ages	40.9	54.1	47.7
<65 y	5.9	3.5	4.7
≥65 y	231.3	257.3	246.3
Age-standardized mortality rate* (per 100 000 inhabitants)			
All ages	51.8	40.9	45.7
<65 y	6.2	3.5	4.8
≥65 y	239.9	195.1	214.3

*Standardized to the 2010 European census population.

national level between 2000 and 2006.[13] More recently, 2 other US studies reported an increase in IS hospitalization rates in adults aged 15 to 44 and 25 to 44 years and a stabilization in those aged 45 to 64 years.[9,14] An increase in IS incidence was also observed in young adults in Denmark and in Sweden.[15,16]

The stability of hospitalization rates for HS observed in our study is consistent with results reported in the Danish study and in the Greater Cincinnati and Northern Kentucky study.[8,15]

Multiple causes could explain the increase of IS incidence in people aged <65 years. The increase in the prevalence of cardiovascular risk factors in young adults seems to be the best hypothesis in France.[10,11,17–22] In 2006 to 2009, diabetes mellitus prevalence increased in all age groups in France. In adults aged <65 years, the highest increases were in people aged 20 to 24 years (+5.5% per year in men versus +4.7% per year in women) and aged 60 to 64 years (+4.5% per year in men versus +3.9% per year in women).[18] Between 2003 and 2012, the prevalence of self-reported obesity increased in all age groups. In adults aged 45 to 64 years, the increase was

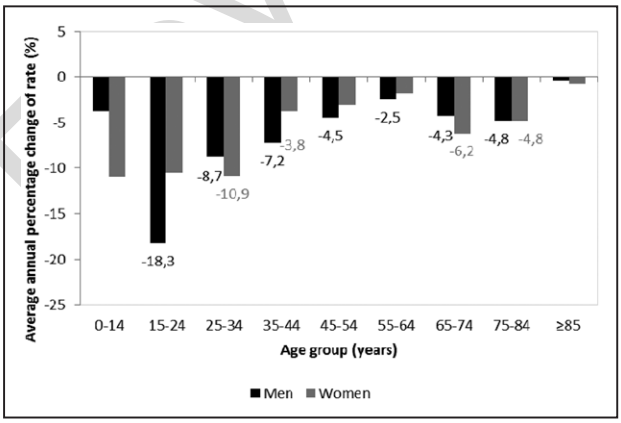


Figure 3. Average annual change in mortality rates for stroke by sex and age group, 2008 to 2013. Only significant values are provided on the graph.

greater in women (45–54 years +29%, 55–64 years +43%) than in men (45–54 years +14%, 55–64 years +14%).[17] From 2005 to 2014, the percentage of female smokers doubled in those aged 55 to 64 years (from 9.1% to 18.6% versus a stability in men in the same age group).[10] However, atheroma of large arteries, as a result of a long-term exposure to these risk factors, is a less common cause of IS in young people than in the elderly. Other risk factors, described more recently, might also be involved, such as air pollution or illegal drugs' abuse, in particular cannabis.[8,22-24] The association between cannabis and stroke is not clear because of simultaneous tobacco consumption.[22,24] In France, between 2010 and 2014, among adults aged 18 to 64 years, cannabis use during the current year increased from 8% to 11% and regular use of cannabis increased from 2.2% to 3.1%.[25] Over the same period, cocaine use was stable in people aged 18 to 64 years (1%).[25] However, changes in hospitalization rates could also reflect possible improvements in stroke management or stroke diagnosis. Improved medical imaging, better knowledge of stroke symptoms by physicians and by the population, and the deployment of stroke units all over the national territory may have improved the precision and the rapidity of diagnosis, leading to swifter hospitalization.[14] These changes do not seem to be linked to the new TIA definition (2007), as similar trends were observed for TIA and stroke.

The large increase in the proportion of patients hospitalized in stroke units is related to the deployment of stroke units over the national territory (33 in 2007, 100 in 2010, and 135 in 2015), a key target of the National Stroke Action Plan (target: 140 stroke units). This plan aims to improve stroke management from the onset of stroke symptoms to home return, by structuring regional networks, including a dedicated stroke ward, and by adopting a multidisciplinary team approach. Despite the unquestionable increase in the proportion of patients hospitalized in stroke unit for acute care, nearly 1 in 2 patients does not benefit from this optimal care pathway and large geographical disparities exist over the French territory.

Although the burden of stroke is heavier in the elderly, ≈25% of patients hospitalized for stroke in 2014 were <65 years old. Accordingly, the increase in hospitalization observed in this age group is a major public health issue as the consequences of stroke are serious in terms of both disability-adjusted life years and patient quality of life. More specifically, between 30% and 50% of the youngest patients cannot resume work after a stroke and ≈10% remain disabled.[26,27]

The relative stability of the overall incidence all ages combined, coupled with the aging population is a cause for concern. The number of patients needing acute stage care, rehabilitation, and lifelong care in case of disability is increasing and will most likely continue to increase in the coming years in France. Primary and secondary stroke prevention interventions are of particular importance given that 10 of the main known risk factors—including hypertension, smoking, no regular physical activity, and abdominal obesity—account for >90% of the risk of stroke yet are modifiable factors.[28,29] In young adults, to better target primary prevention, further pathogenic research is needed to better understand IS onset in this age group, as it may differ in the elderly.[8,30]

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In-Hospital Mortality

The decrease in in-hospital mortality caused by stroke observed in our study has already been reported in France and in other countries.[31–35] It may be because of the major improvement in acute stroke management by the deployment of stroke units all over the French territory, especially of intensive care in stroke units where acute stroke diagnosis and management are easier. Moreover, the extension of the time window for intravenous alteplase treatment from within 3 to within 4.5 hours after stroke onset has led to an increased proportion of patients being eligible for thrombolysis. Even though the effects of thrombolysis on stroke-related mortality are still being debated, thrombolysis substantially reduces functional sequelae.[34–36] Finally, early rehabilitation during the postacute stage provided in stroke units may also be partly responsible for reduced in-hospital mortality.[7,34] However, these promising results should be confirmed by taking into account factors which affect in-hospital mortality (severity, age at stroke, comorbidities, and management).

Mortality

The decrease in mortality from stroke observed in our study is in line with previous trends in France and studies in other developed countries.[13,36–39] In France, this decrease could be linked with the general decline of in-hospital mortality and with better tertiary prevention.[37] Rehabilitation in postacute care and rehabilitation units are key elements in the stroke care pathway promoted by the National Stroke Action Plan. Numerous studies have already highlighted the benefit of rehabilitation over the short-, medium-, and long-term in terms of a reduction in dependence level, greater quality of life and reduced mortality.[40–43] Between 2010 and 2014, the increased proportion of patients admitted to rehabilitation units may also have contributed to the decrease in mortality.[44,45]

Furthermore, the development of telemedicine for the management of acute IS could allow more patients to benefit from thrombolysis.[46]

The stabilization of stroke mortality in women aged 45 to 64 years could partly reflect the large increases in incidence in these age groups, related to the increase in vascular risk factor prevalence.

Strengths and Limitations

In this study, we used exhaustive data from the French National hospitalization and mortality databases. According to a recent validation study of the PMSI-MCO for stroke, the positive predictive value of a stroke detection algorithm was approximately 90% in 2009 to 2010.[47] However, we were unable to differentiate the first stroke from subsequent strokes. Accordingly, we limited our analysis to the first annual stay of each patient, providing annual incidence of hospitalized patients and not lifetime incidence. The proportion of patients hospitalized in a stroke unit was probably underestimated because of some hospitals did not record a stay in a stroke unit without intensive care (no financial incentive). In the same way, aphasia is probably underestimated.

With respect to mortality data, we were not able to perform analyses according to the stroke subtype because of a large proportion of unspecified strokes (I64) in death certificates. Finally, administrative databases include few data on individual cardiovascular risk factors, which limits the interpretation of the results.

Conclusions

The observed decrease in mortality caused by stroke, related to important changes in stroke management and to medical care innovations during the acute stage, is encouraging. However, the increased incidence in patients hospitalized for ischemic stroke in people aged <75 years (especially in the 35- to 64-year-old age group) and the stabilization of stroke mortality in women aged 45 to 64 years are worrying. Prevention campaigns against the main risk factors must be maintained and intensified. In addition, stroke symptom awareness campaigns are essential to limit the human and economic burden of stroke.

Disclosures

None.

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SUPPLEMENTAL MATERIAL

National trends in patients hospitalized for stroke and stroke mortality in France, 2008-2014

Supplemental table I. French ICD-10 codes of comorbidity associated with a main diagnosis of stroke

Paralysis	
G81.00	Recent flaccid hemiplegia, persistent beyond 24 hours
G81.01	Recent flaccid hemiplegia, regressive in 24 hours
G81.08	Flaccid hemiplegia, unspecified
G81.1	Spastic hemiplegia
G81.9	Hemiplegia, unspecified
G82.0	Flaccid paraplegia
G82.1	Spastic paraplegia
G82.2	Paraplegia, unspecified
G82.3	Flaccid tetraplegia
G82.4	Spastic tetraplegia
G82.5	Tetraplegia, unspecified
G83.0	Diplegia of upper limbs
G83.1	Monoplegia of lower limb
G83.2	Monoplegia of upper limb
G83.4	Cauda equina syndrome
G83.8+0	Lock-in syndrome
Aphasia	
R47.00	Recent aphasia, persistent beyond 24 hours
R47.01	Recent aphasia, regressive in 24 hours
R47.02	Aphasia, unspecified

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Supplemental table II. Number of patients hospitalized for stroke, by code (ICD-10), France, 2008-2014

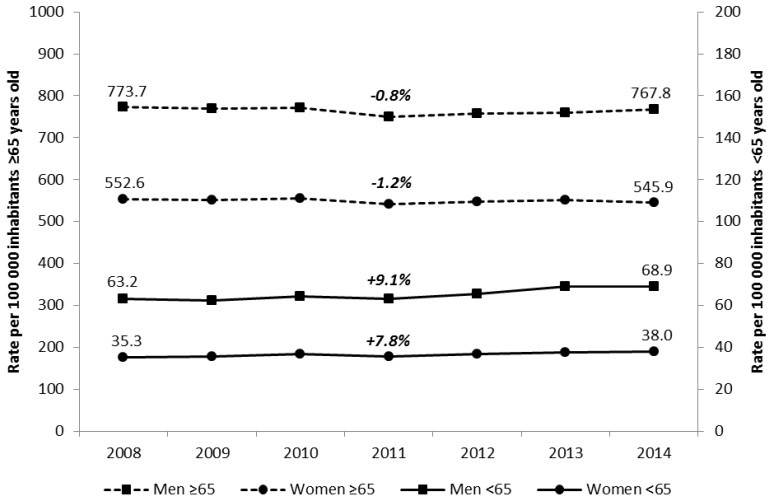
Stroke subtype (n)		2008	2009	2010	2011	2012	2013	2014
I60	Subarachnoid hemorrhage	5 101	5 148	5 436	5 296	5 369	5 380	5 539
I61	Intracerebral hemorrhage	15 207	15 364	15 912	15 984	17 135	17 432	17 576
I62	Other nontraumatic intracranial hemorrhage	4 154	4 351	4 483	4 380	4 273	4 359	4 411
I63	Cerebral infarction	59 011	62 079	65 852	67 149	71 257	75 667	78 380
G46	Vascular syndromes of brain in cerebrovascular diseases*	1 293	1 248	963	730	649	278	253
I64	Stroke, not specified as hemorrhage or infarction	12 385	10 541	9 335	7 818	6 587	5 399	4 279
Total		97 151	98 731	101 981	101 357	105 270	108 515	110 438

* with an associated or a related discharge diagnosis code in I60 to I64

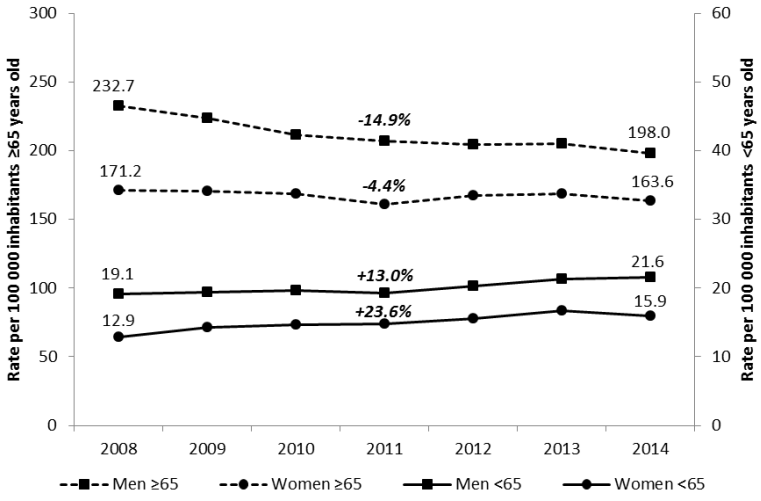
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Supplemental figure I. Trends in age-standardized* rates of patients hospitalized for stroke (IS and HS) (A), for transient ischemic attack (B), by sex and age group, France, 2008-2014

A/ Stroke



B/ Transient ischemic attack



* Standardized to the 2010 European census population.

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