

MEDICAL VALUE BY **MEDICAL VALLEY**

Two Decades of Evidenced-based Outcomes Research: The Erlangen Stroke Registry

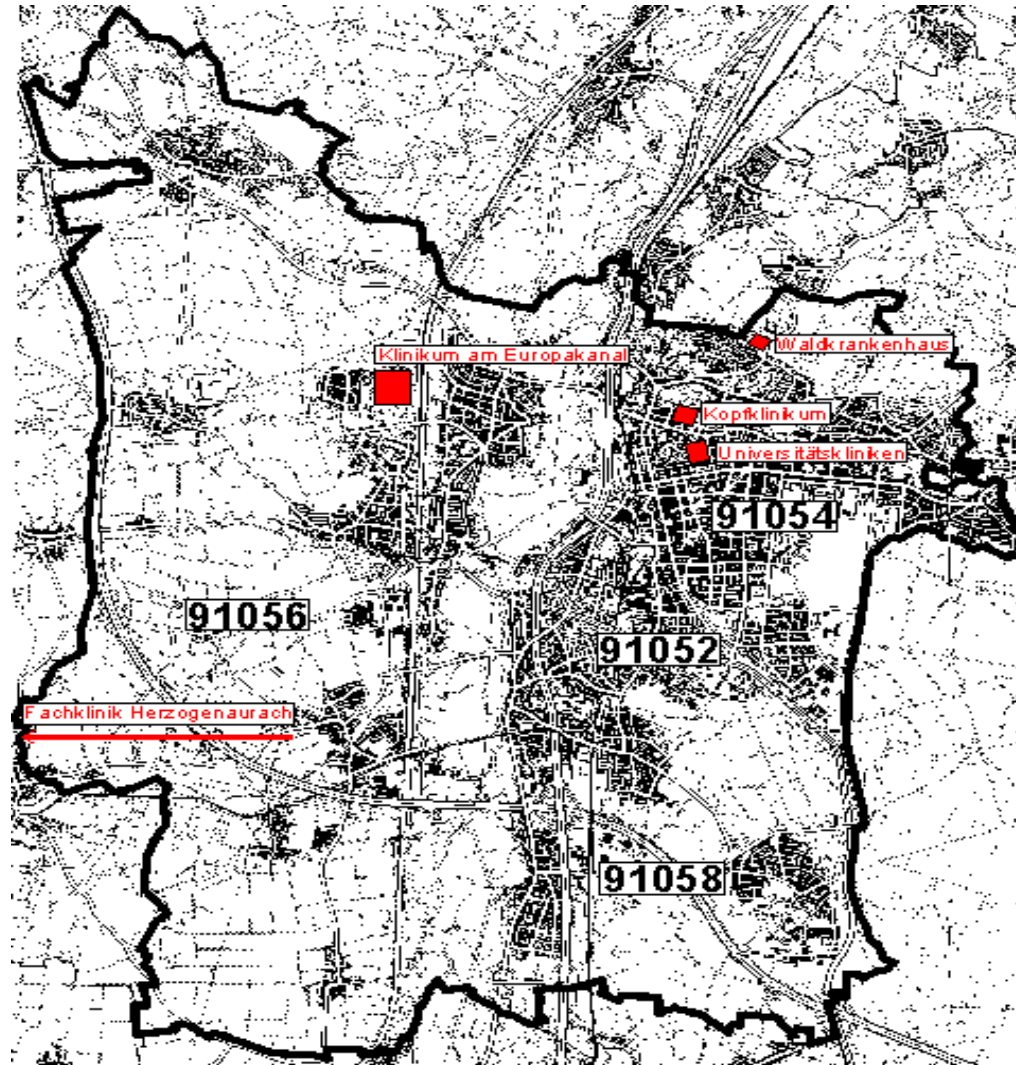


Prof. Dr. Peter Kolominsky-Rabas, MD, PhD, MBA
Interdisciplinary Center for Health Technology Assessment (HTA) and Public Health
Friedrich-Alexander-University Erlangen-Nürnberg, Bavaria, Germany
National Cluster of Excellence 'Medical Technologies - Medical Valley EMN'

Erlangen Stroke Registry – Study Design

- Location in south of Germany, northern Bavaria
- longitudinal study (started in 1994)
- prospective
- population of 108.000 inhabitants
- well-defined geographic area

Erlangen Stroke Registry - Geographical Area



Erlangen Stroke Registry - Study Criteria

- Source population all residents of Erlangen (Community Registration Office)

- Age no restriction of age

- Case ascertainment hospitalized
 non-hospitalized stroke-patients

- Follow-up 3 months
 12 months
 yearly follow-up (according to Helsingborg Declaration)
 home visits with f2f interviews

Gold Standards for an “Ideal” Stroke Study

1. Complete case ascertainment

Concept of ‘overlapping sources of information’ to ensure complete case ascertainment

Regular checks of:

- hospital wards
- residential and nursing homes
- records of ambulance and emergency services
- general practitioners
- death certificates

Reference: Malmgren et al., Lancet 1987; Sudlow & Warlow, Stroke 1996; Feigin et al., Lancet 2004

Gold Standards for an “Ideal” Stroke Study (Cont.)

2. Specification of diagnosis/ exclusion of stroke-like events

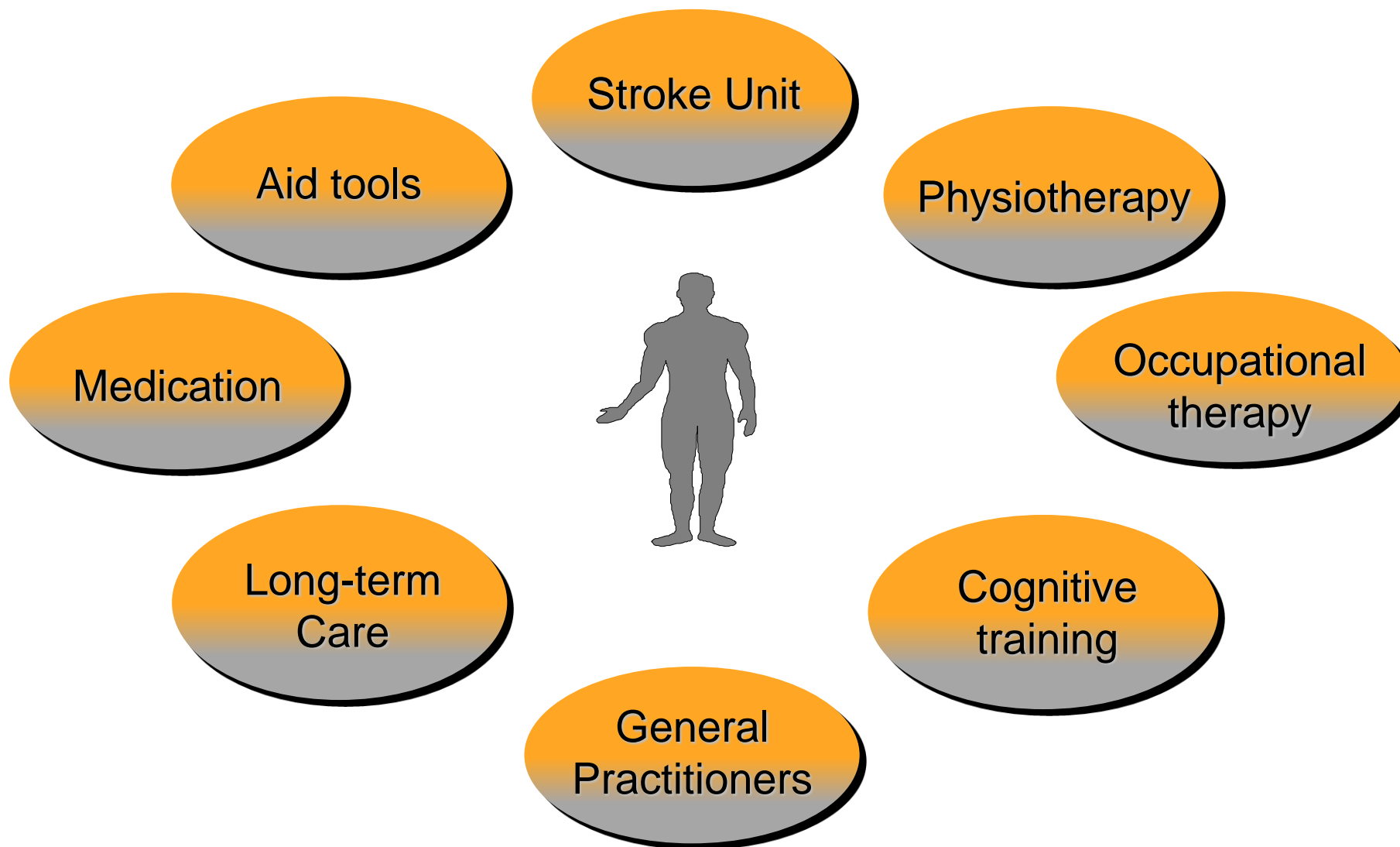
- Diagnosis of stroke
Diagnostic criteria
WHO stroke definition
- Classification of stroke subtypes
Brain CT-scan at admission
CT scan rate of 98%
- Etiology of ischemic stroke
TOAST-classification

Reference: Malmgren et al., Lancet 1987; Sudlow & Warlow, Stroke 1996; Feigin et al., Lancet 2004

Erlangen Stroke Registry - Outcome variables

- Clinical assessment (acute)
 - NIHSS
 - modified Rankin Scale
 - ABDC2 score (TIA)
- Risk factors assessment
 - CHA2DS2-VASc Score
 - TOAST- classification (Adams et al. 1998)
- Clinical assessment (long-term)
 - Barthel Index
 - Functional Independence Measure
 - Frenchay Activity Index
 - Social Support Scale
- Cognitive assessment
 - MMST
 - Depression Status Inventory
 - SF-36
- Quality of Life
 - SF-36
 - Care Giver Burden Scale

Resource Use of Stroke Survivors



Direct cost of ischemic stroke by time horizon

Statutory Health Insurance in Germany

(Euros, discounted)

Horizon	Men	Women	All
1 y	15,566	14,799	15,140
5 y	30,159	29,582	29,837
10 y	37,711	36,176	36,873
Lifetime	45,549	41,304	43,129

35% of the lifetime cost

Reference: Kolominsky-Rabas et al., Stroke 2006

National Direct Ischemic Stroke Cost Projections

Statutory Health Insurance in Germany

Horizon	Men		Women		All	
	Strokes	Cost (Billion)	Strokes	Cost (Billion)	Strokes	Cost (Billion)
2006-2010	331,000	13.8	425,000	16.1	756,000	29.9
2006-2015	701,000	27.1	880,000	30.9	1,581,000	58.0
2006-2020	1,108,000	39.7	1,367,000	44.6	2,475,000	84.3
2006-2025	1,547,000	51.5	1,883,000	57.1	3,430,000	108.6

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Care needs and economic consequences after acute ischemic stroke: the Erlangen Stroke Project

A. Ward^a, K. A. Payne^b, J. J. Caro^{a,c}, P. U. Heuschmann^d and P. L. Kolominsky-Rabas^e

^aCaro Research Institute, Concord, MA, USA; ^bCaro Research Institute, Montreal, Quebec, Canada; ^cDivision of General Internal Medicine, Royal Victoria Hospital, McGill University, Montreal, Quebec, Canada; ^dInstitute of Epidemiology and Social Medicine, University of Muenster, Germany; ^eUnit for Stroke Research and Public Health Medicine, University of Erlangen, Bavaria, Germany

Keywords:

acute ischemic stroke, care needs, costs, Erlangen Stroke Project, Germany

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The objective was to determine the consequences in the first 3 months Stroke Project, (ESPro) information ischemic stroke. Three months after caregivers and function based on good function (95-100) were recorded with cost estimates for Germany (2004). Of 1,000 patients hospitalized, 383 were alive 3 months after stroke. A majority of patients with poor function with good function typically accrued costs (17,965) or not (11,032) compared with patients with moderate disability (28,19,350). Hospitalization and rehabilitation costs were higher at each level of function. Many patients died and the costs associated with providing care and the economic consequences of a stroke.

Lifetime Cost of Ischemic Stroke in Germany: Results and National Projections From a Population-Based Stroke Registry The Erlangen Stroke Project

Peter L. Kolominsky-Rabas, MD, PhD; Peter U. Heuschmann, MD, PhD; Daniela Marschall, MSc; Martin Emmert; Nikoline Baltzer, Bnurs; Bernhard Neundörfer, MD, PhD; Oliver Schöffski, PhD; Karl J. Krobot, MD, PhD; for the CompetenceNet Stroke

Background and Purpose—The number of stroke patients and the healthcare costs of strokes are expected to rise. The objective of this study was to determine the direct costs of first ischemic stroke and to estimate the expected increase in costs in Germany.

Methods—An incidence-based, bottom-up, direct-cost-of-ischemic-stroke study from the third-party payer's perspective was performed, incorporating 10-year survival data and 5-year resource use data from the Erlangen Stroke Registry. Discounted lifetime year 2004 costs per case were obtained and applied to the expected age and sex evolution of the German resident population in the period 2006 to 2025.

Results—The overall cost per first-year survivor of first-ever ischemic stroke was estimated to be 18 517 euros (EUR). Rehabilitation accounted for 37% of this cost, whereas in subsequent years outpatient care was the major cost driver. Discounted lifetime cost per case was 43 129 EUR overall and was higher in men (45 549 EUR) than in women (41 304 EUR). National projections for the period 2006 to 2025 showed 1.5 million and 1.9 million new cases of ischemic stroke in men and women, respectively, at a present value of 51.5 and 57.1 billion EUR, respectively.

Conclusions—The number of stroke patients and the healthcare costs of strokes in Germany will rise continuously until the year 2025. Therefore, stroke prevention and reduction of stroke-related disability should be made priorities in health planning policies. (*Stroke*. 2006;37:1179-1183.)

Key Words: costs and cost analysis ■ cost of illness ■ ischemic stroke ■ resource use ■ stroke

Erlangen Stroke Registry - Long Term Outcome of Stroke

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ACTA NEUROLOGICA SCANDINAVICA

Incidence and predictors of post-stroke epilepsy

Jungehulsing GJ, Heuschmann PU, Holtkamp M, Schwab S, Kolominsky-Rabas PL. Incidence and predictors of post-stroke epilepsy.
Acta Neurol Scand: 2013; 127: 427-430.
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Gerhard J. Jungehulsing^{1,2}, Peter U. Heuschmann^{1,3}, Martin Holtkamp², Stefan Schwab⁴, Peter L. Kolominsky-Rabas^{4,5}

Background and aims – Stroke is the leading epilepsy in the elderly. The aim of this study was to determine the incidence of post-stroke epilepsy (PSE) based on the definition of the International League Against Epilepsy (ILAE) in a population-based study and to describe post-stroke epilepsy.

Methods – Data from the prospective population-based Erlangen Stroke Register (ESR) were analyzed.

Original Research Article

Dementia and Geriatric Cognitive Disorders

Dement Geriatr Cogn Disord 2011;31:291-299
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Changes in Cognitive Function over 3 Years after First-Ever Stroke and Predictors of Cognitive Impairment and Long-Term Cognitive Stability: The Erlangen Stroke Project

T.G. Liman^{a,c} P.U. Heuschmann^a M. Endres^{a-c} A. Flöel^{b,c} S. Schwab^d
P.L. Kolominsky-Rabas^{d,e}

^aCenter for Stroke Research Berlin, ^bCluster of Excellence in Neurodegeneration, ^cCharité – Universitätsmedizin Berlin, Berlin, ^dDepartment of Neurology, University of Erlangen-Nuremberg, Erlangen, Germany, ^eInterdisciplinary Centre for Health Technology Assessment, Erlangen-Nuremberg, Nuremberg, Germany

Neurourology and Urodynamics 22:322-327 (2003)

Impact of Urinary Incontinence After Stroke: Results From a Prospective Population-Based Stroke Register

Peter L. Kolominsky-Rabas,^{1,*} Max-Josef Hilz,^{1,2} Bernhard Neundoerfer,¹ and Peter U. Heuschmann¹

¹Department of Neurology, University of Erlangen-Nuremberg, Erlangen, Germany
²Department of Neurology, New York University, New York, New York

714 Originalarbeit

Schlaganfallursache und Pflegebedürftigkeit im Langzeitverlauf

Langzeitergebnisse aus einem bevölkerungsbezogenem Schlaganfallregister – dem Erlanger Schlaganfall Projekt (ESPro)

Stroke Etiology and Long-Term Need of Care in Ischemic Stroke Patients
Long-Term Results from a Community Based Stroke Register – the Erlanger Stroke Project (ESPro)

Autoren M. Dietl¹, R. Pohle^{1,2}, M. Weingärtner^{1,3}, R. Polgar¹, E. Gräbel¹⁻⁴, S. Schwab¹, P. Kolominsky-Rabas^{1,3}

Institute

¹ Interdisziplinäres Zentrum für Public Health (IZPH) der Universität Erlangen-Nürnberg (Geschäftsführer: PD Dr. P. Kolominsky-Rabas, MBA), Universitätsklinikum Erlangen
² Anästhesiologische Klinik (Direktor: Prof. Dr. J. Schüttler), Universitätsklinikum Erlangen
³ Neurologische Klinik (Direktor: Prof. Dr. S. Schwab), Universitätsklinikum Erlangen
⁴ Psychiatrische und Psychotherapeutische Klinik (Direktor: Prof. Dr. J. Kornhuber), Universitätsklinikum Erlangen

A Prospective Community-Based Study of Stroke in Germany—The Erlangen Stroke Project (ESPro)

Incidence and Case Fatality at 1, 3, and 12 Months

Peter L. Kolominsky-Rabas, MD; Cinzia Sarti, MD, PhD; Peter Ulrich Heuschmann, MD; Christian Graf, MD; Sven Siemonsen, MD; Bernhard Neundoerfer, MD, PhD; Alexandar Katalinic, MD; Erich Lang, MD, PhD; Karl-Günther Gassmann, MD; Theodor Ritter von Stockert, MD

Background and Purpose—In Germany, basic data on stroke in former East Germany is excluded, only routine mortality of stroke. Therefore, a population-based register of stroke case fatality in a defined German population.

Methods—The Erlangen Stroke Project (ESPro) is a prospective study of the city of Erlangen, Bavaria, Germany. Standard definitions identify all cases of first-ever stroke in all age-groups, October 31, 1996. All identified cases of first-ever strokes were confirmed by CT scan in 95% of cases. During 2 years of registration, 354 first-ever-in-a-stroke type were confirmed by CT scan in 95% of cases. The crude annual incidence rate was 1.21 per 1000 population per year. After age-adjustment to the European population, the incidence rate was 1.21 per 1000 population per year. The annual crude incidence rate of cerebral infarction was 0.66/1000, and unspecified stroke 0.08/1000, 28.5%, and at 1 year 37.3%.

Conclusions—The first prospective community-based stroke incidence rates of stroke similar to those reported from other countries, but lower than that observed in former East Germany.

Key Words: epidemiology ■ Germany

Variations in Stroke Incidence and Survival in 3 Areas of Europe

Charles D.A. Wolfe, MD; Maurice Giroud, MD; Peter Kolominsky-Rabas, MD; Ruth Dundas, MSc; Martine Lemesle, MD; Peter Heuschmann, MD; Anthony Rudd, FRCP; for the European Registries of Stroke (EROS) Collaboration

Background and Purpose—Comparison of incidence and survival in three European countries may improve our understanding of the etiology of the disease, its natural history, and the trend for governments to set targets for stroke prevention.

Methods—Population-based stroke registers, using multiple sources of information, were used to identify stroke between 1995 and 1997 for all age groups. The study included London, UK. Crude incidence rates were age-standardized to the European population. Case-fatality rates up to 1 year after the stroke were compared between the three countries.

Results—A total of 2074 strokes were registered over the study period. The crude incidence rate was 100.4 (95% CI 91.7 to 109.1) per 100 000 in Dijon, 124.9 to 147.9 in Erlangen. Both crude and adjusted rates were significantly higher in Erlangen than in Dijon as the baseline comparison (1), was 1.21 (95% CI 1.07 to 1.36) per 1000 population per year in Erlangen ($P < 0.0001$). There were significant differences between the three countries, with London having lower rates of cerebral infarction, but higher rates of unspecified stroke ($P < 0.0001$). Case-fatality rates varied by stroke type and subtype of stroke (35% overall, 34% in Erlangen).

Conclusions—The impact of stroke is considerable, and the risk of death is high. The striking differences between the three countries suggest that stroke management may differ between north and south of Europe.

Key Words: epidemic

Original Contributions

Epidemiology of Ischemic Stroke Subtypes According to TOAST Criteria

Incidence, Recurrence, and Long-Term Survival in Ischemic Stroke Subtypes: A Population-Based Study

Peter L. Kolominsky-Rabas, MD; Margarete Weber, MD; Olaf Gefeller, MSc, PhD; Bernhard Neundoerfer, MD, PhD; Peter U. Heuschmann, MD, MPH

Background and Purpose—The purpose of this study was to describe the epidemiology of ischemic stroke subtypes by a mechanism-based classification (TOAST).

Methods—We identified all 583 residents of the city of Erlangen who had a first-ever stroke between 1994 and 1998. Multiple overlapping sources of information were used to identify strokes. The cause of ischemic stroke was classified according to TOAST criteria.

Results—The age-standardized incidence rates for the five TOAST subtypes were as follows: cardioembolism, 30.2 (95% CI 27.3 to 33.1); large-artery atherosclerosis, 15.3 (95% CI 13.8 to 16.8); small-artery disease, 9.2/100 000. Two years after onset, patients in the small-artery disease subtype had the highest mortality, whereas patients in the cardioembolism subtype had the lowest mortality. Ischemic stroke subtype had a significant impact on long-term survival, whereas subtype was not a significant predictor of recurrence after adjustment for age and sex.

Conclusions—Epidemiological observational studies that apply standardized etiologic classifications provide a more detailed description of stroke, recurrence, and mortality. (*Stroke*. 2001;32:275-281)

Key Words: epidemiology ■ incidence

Original Paper

Neuro
epidemiology

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Time Trends in Incidence of Pathological and Etiological Stroke Subtypes during 16 Years: The Erlangen Stroke Project

Peter L. Kolominsky-Rabas^a Silke Wiedmann^b Michael Weingärtner^a
Thomas G. Liman^c Matthias Endres^c Stefan Schwab^d Michael Buchfelder^e
Peter U. Heuschmann^{b,f}

^aInterdisciplinary Centre for Health Technology Assessment (HTA) and Public Health, Friedrich-Alexander University of Erlangen-Nürnberg, Erlangen-Nürnberg, ^bInstitute of Clinical Epidemiology and Biometry, Comprehensive Heart Failure Center, University of Würzburg, Würzburg, ^cDepartment of Neurology, Center for Stroke Research, German Center for Neurodegenerative Diseases (DZNE), German Center for Cardiovascular Research (DZHK), Partner Site, Charité – Universitätsmedizin Berlin, Berlin, ^dDepartment of Neurology, ^eDepartment of Neurosurgery, University Hospital Erlangen, Erlangen, and ^fClinical Trial Center Würzburg, University Hospital Würzburg, Würzburg, Germany

Contact:

Prof. Dr. Peter Kolominsky-Rabas, MD, PhD, MBA

Interdisciplinary Center for Health Technology Assessment (HTA) and Public Health

Friedrich-Alexander-University Erlangen-Nürnberg, Bavaria, Germany

National Cluster of Excellence 'Medical Technologies - Medical Valley EMN'

peter.kolominsky@uk-erlangen.de