

Proposed *International Classification of Diseases Eleventh Revision* Classification and Its Effects on Stroke Unit Care

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Over the past 2 decades, significant advances have been made in understanding the underlying pathogenesis of stroke, leading to the development of more effective treatments including thrombolysis, thrombectomy, hemicraniectomy, early secondary prevention, and dedicated care.^{1,2} These understandings were realized within Stroke Unit Care settings where patients are more likely to survive, be independent, and living at home at 1 year after stroke, without any observed systematic increase in the length of inpatient stay, compared with patients receiving general medicine care.¹ Stroke Unit care also includes comprehensive rehabilitation, which has been shown to contribute to better outcome and improved disability.³ Stroke Unit Care treats stroke as an acute brain disease, by focusing on the assessment of neurovascular features.

These accomplishments within the Stroke Unit have been realized independent of the *International Classification of Diseases and Related Health Problems, Tenth Revision (ICD-10)*. Once thought to be only a vascular disease, it has become clear that stroke outcomes and many of its complications such as epilepsy or dementia are related to the type, size, number, and site of brain lesions.^{4,5} Indeed, stroke affects the function and structure of the blood–brain barrier, leading to the loss of cerebral blood flow regulation, and therein increases in oxidative stress, inflammation, and the loss of neural connections. Moreover, the coexistence of cerebral ischemia and neurodegenerative pathologies profoundly impacts the development of dementia, suggesting a reciprocal interaction between ischemia and neurodegeneration.⁶ In light of this, it is evident that the most appropriate classification for stroke is as a brain disease.

In 2011, the Neurology and Circulatory topic advisory groups, with a contribution from World Health Organization classification representatives and relevant World Health Organization departments, agreed that in the *ICD-11*, all types of stroke should form a single block and that this block should be placed in the Nervous System Diseases chapter. This decision seems to have been based on the acceptance

that cerebrovascular diseases are brain dysfunction disorders. However, in September 2016, this classification decision was overturned, and the cerebrovascular block was relegated back to the Vascular Chapter.⁷

In doing so, the World Health Organization sustained that ICD is essentially a pathogenic classification.⁸ However, the clinical features of stroke are neurological and not vascular. In fact, the types and sites of damaged brain vessels are associated with distinct clinical poststroke disabilities.^{9,10}

The positive results from randomized controlled trials on thrombectomy on stroke outcome¹¹ could be interpreted as an argument in favor of classifying stroke as a vascular disease, because of the reported association between revascularization and better outcome. However, these results were achieved within Stroke Unit Care settings, where stroke is treated as a brain disease.

By treating stroke as a brain disease over the past 20 years, we have been able to organize a more coherent and effective approach to treatment, leading to improvements across all age groups and sex. In fact, recent research is focusing on determining a role of blood–brain barrier in acute stroke, disruption of which is shown to predispose to poststroke complications such as hemorrhagic transformation, massive vasogenic edema, infarct expansion, and poor clinical outcome,¹² and the use of stem cells in treating poststroke sequelae. Usage of stem cells after stroke is focused on functional recovery of stable or deteriorating neural systems.¹³

Moreover, a direct link between stroke and cognitive and depressive disorders has been demonstrated. There is conclusive evidence that stroke prevention leads to less dementia, highlighting the implication of the brain in stroke.

Furthermore, stroke survivors on average live up to another 20 years with neurological sequelae. So, the long-term treatment will require continued neurological research on recovery, such as dedicated neurorehabilitation, including virtual and robotic rehabilitation devices.

This proposed *ICD-11* classification, if realized, would hinder the direction of future Stroke Unit Care and Stroke Unit research as many grant agencies currently consider Stroke a circulatory disease, which is disadvantageous to funding Stroke research as it ignores a substantial portion of current investigation. Funding for stroke research unfortunately is still disproportional to its relative burden. There is an evident mismatch between the funds allocated to research and development and the burden of stroke, whether measured in terms of mortality or disability.¹⁴ The proposed classification also runs counter to current Stroke guidelines. As a result, many health-care managers and regulators could translate this message in a way that could worsen stroke outcome, which is not based solely on the results from reperfusion, but also the effects and influences of poststroke care.

The opinions expressed in this article are not necessarily those of the editors or of the American Heart Association.

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In conclusion, we implore the Neurology and Circulatory topic advisory groups to reconsider their proposal to classify stroke as a vascular disease.

Disclosures

None.

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