

Hemorrhagic stroke code: the transition to comprehensive stroke code

Jorge Mario Gaspar-Toro^{1,2}  

As recommended by the working group of vascular and interventional neurology of the Colombian Association of Neurology (ACN), stroke is defined as a neurological emergency characterized by a sudden neurological deficit potentially of arterial origin. Upon confirmation via neuroimaging, the diagnosis is rendered as cerebral infarction (CI) or hemorrhage, either intracerebral (ICH) or subarachnoid (SAH). Additionally, it can be of venous origin, such as cerebral venous thrombosis (CVT).


The stroke code is currently widely recognized as a “time-is-brain” strategy that seeks to meet strict time goals for treating ischemic stroke (iS), which have substantially improved the outcomes of stroke patients. However, this has not been the case for hemorrhagic stroke (hS), which, given the conditions, is also admitted through the emergency department and clearly benefits from having a standardized protocol of care and time goals, like iS, to improve patient outcomes (1).

The strategy recommended by the ACN for the early identification of a stroke is CORRE+. This acronym (originally in Spanish) was created by neurologist Luis Roa and is designed to facilitate the identification of both ischemic and hemorrhagic strokes of anterior or posterior circulation. It comprises the following criteria: C: twisted face and/or worst headache; O: eye sudden alteration of vision; R: rapid weakness of an arm and/or leg; R: rare when speaking, E: altered balance + emergencies attend. The acronym is intended to be used by the general community and in different extra- and intra-hospital scenarios for immediate consultation.

Intracerebral hemorrhage (ICH) represents 20–30% of all strokes, yet is responsible for a significant proportion of mortality, with rates reaching 40% per month and 56% per year—a figure that surpasses that of cerebral infarction. The occurrence of hematoma expansion has been documented in 30% and up to 54% of cases when anticoagulation is employed. Additionally, the functional, cognitive, and quality of life disability associated with stroke is a notable concern (2,3).

In neuroimaging evaluation, it is of the utmost importance to consider the time of symptom onset, the presence of signs indicative of expansion, and the necessity for control neuroimaging at 24 hours or earlier if there are indications of hematoma expansion (6 hours). A recent study identified a predictor of ultra-early hematoma growth (uHG) that involves the initial ICH volume in milliliters over the time in hours from symptom onset to neuroimaging. This is represented by the following equation: $uHG = ICH \text{ ml/h}$. Some scales, such as BRAIN, have been developed to predict the percentage of hematoma growth (4–6).

- 1 Faculty of Medicine, Universidad Nacional de Colombia, Bogotá, Colombia
- 2 Neurosciences Unit, Centro de Excelencia Neurovascular, Fundación Clínica Shaio, Bogotá, Colombia

 **Correspondence/Correspondencia:**
Jorge Mario Gaspar Toro, Clínica Shaio, Dg. 115a #70c-75, Bogotá, Colombia.
Email: jmgaspart@unal.edu.co

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The data to be considered when activating an hS code are identical to those required for the standard Stroke code. However, some modifications must be made, as outlined in Table 1 (7-10).

The time goals proposed in the hS code are those delineated in Table 2 (11-13).

In the care bundles currently under development, it has already been demonstrated that the control and monitoring of parameters such as glucose levels (with a range of 100 to 140 in non-diabetics and 140 to 180 in diabetics) and temperature (lower

than 37.5 degrees) for more than 90% of the first week should also be included in the comprehensive Stroke code (11,14,15).

In a real-life study implementing a hemorrhagic code in a stroke center, 66% of patients were found to be eligible for antihypertensive treatment. Of those anticoagulated (20%), 88% were eligible for reversal and 14% for surgery. These findings highlight the importance of standardized medical management, which should be included in a comprehensive stroke code in teams that are already formed in a transdisciplinary manner and carry indicators and tracers in certified or undergoing certification stroke centers (16).

The designation of a stroke code implies the presence of not only infrastructure but also a motivated human capital, a culture of teamwork, effective communication, a rapid response, feedback, a weekly committee, standardization, and continuous education in search of quality. These elements collectively contribute to the establishment of centers of excellence in comprehensive stroke care.

One of the strategies that has contributed to a shift in perspective regarding the comprehensive management and treatment of this pathology is the certification of stroke centers by the World Stroke Organization (WSO) and the Ibero-American Society of Cerebrovascular Disease (SIECV), in collaboration with ongoing campaigns such as Angels, which must continue to advance.

It is therefore imperative to raise awareness and focus efforts on the inclusion of the entire spectrum of ischemic and hemorrhagic cerebrovascular disease in a single comprehensive stroke code, for the benefit of all.

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Table 1. Hemorrhagic code stroke activation

Stroke team 24/7

Exact time of onset of stroke symptoms

Last seen well

Background: emphasis on devices, use of antithrombotics, neurosurgeries or recent bleeding.

Physical, functional and cognitive condition prior to stroke

Scales: NIHSS, mRankin, ICH, ABC/2, CLAS ICH, Diagram+

Notes. ICH: scale, ABC/2: ICH volume, CLAS ICH: etiologic classification, Diagram+ macrovascular etiologies HIC

Source: Own elaboration.

Table 2. Time goals in hemorrhagic code stroke

Venous access < 15 minutes

Door - image < 30 minutes

Door - 1st anti-HPT < 30 minutes

Door - 1st reverser AC < 30 minutes

Door - SBP goal < 60 minutes

Door - Neurosurg < 60 minutes

Immediate dysphagia test

Evacuation/MIS/Craniectomy < 24 hours

Secondary prevention 24 hours

Neurorehabilitation 24 hours

Education < exit

Notes. AntiHPT: endovenous antihypertensives, Reverser AC: anticoagulation, SBP goal: systolic blood pressure 140, Neurosurg: neurosurgery consult, MIS: minimally invasive surgery if the patient is a candidate.

Source: Own elaboration.

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