Supplementary Methods 1. Workflow for the Stroke Alert Team project.

First, we identified factors causing an in-hospital delay for thrombolysis. These included a lack of preparation for ambulance arrival; delayed group messaging upon patient arrivals by emergency physicians; delayed examinations by neurologists; mandatory confirmation of laboratory test results prior to tissue plasminogen activator (tPA) infusion; obtaining written consent for tPA; lack of prepared tPA sets; outdated thrombolysis protocol; occasional long discussion on difficult cases; delayed acquisition of MRI; delayed discussion with intervention neuroradiologists; inefficient transportation flow among emergency room (ER), computed tomography (CT) room, magnetic resonance imaging (MRI) room, and angiography suite; and lack of prepared intra-arterial thrombectomy (IAT) sets in the angiography suite.

Second, we realized that we required ambulance prenotification to save time for thrombolysis preparation. Thus, we introduced a phone call by which emergency medicine technicians (EMTs) could make direct calls to the Stroke Alert Team (SAT) neurologists 24 h/day. We requested that EMTs call us whenever they were transporting stroke patients to our hospital. For this purpose, we provided every EMT from eight EMS stations repeated education on stroke symptoms, the face arm speech time (FAST) scale, representative phone numbers ("hot line"), and our SAT system (Supplemetary Table 1). We created posters describing the FAST scale and distributed them to EMTs who attended the education sessions and EMS stations, which were to be posted on each ambulance and EMS station (Supplementary Figure 1). We also attempted to obtain histories from the patients' families via telephone before ambulance arrival whenever possible.

Third, we reorganized each step as shown in Table 1. Upon ambulance arrival, the patients bypassed triage and moved directly to a resuscitation room, a dedicated space for the management of critically ill patients (e.g., cardiac arrest) in the ER, while the security guards made a hospital registration on behalf of the patients' families. In the resuscitation room, several emergency nurses checked vital signs, obtained finger-stick blood samples, and inserted a venous access to obtain blood samples and infused normal saline, while neurologists examined the patients, and emergency physicians activated the computerized physician order entry system and emptied the CT room. We introduced a device for point-of-care tests (POCT) for prothrombin time (the CoaguChek® XS Pro, Roche, Switzerland) and began to utilize a preexisting POCT device for glucose, electrolyte battery, a chemical battery, and hematocrits in the resuscitation room. Methods of delivering and testing routine blood samples were not altered, but conspicuous labels and audible alarms for blood samples were supplied to the laboratory technicians. The time limit for the patients to stay in the resuscitation room was 5 min, and the patients were to be transported to the CT room, which was emptied following the patients' arrival. The tPA kit contained the tPA vial, catheter, alcohol swab, gauze, and manual for tPA injection, and was prepared before transportation to the CT room. Verbal informed consent for tPA was obtained from patients and their families, and written informed consent was deferred when the patients' families were not present and the patients were not able to communicate following the initiation of a bolus injection of tPA. Neurologists mixed and injected tPA on the CT table immediately after obtaining the CT images. Follow-up group messages were sent to SAT members after the injection of tPA. Confirmation of routine laboratory tests, electrocardiography, and chest radiography were deferred after initiation of a maintenance infusion of tPA unless the patients experienced chest pain, hypotension, pallor, an uncertain medical history, and a history of malignancy, hematological disease, severe liver disease, or other contraindications to thrombolysis. The injection of tPA was also deferred after the MRI scan in cases of diagnostic uncertainty and an unclear risk–benefit ratio of thrombolysis. We requested that the MRI room be emptied within 5 min.

Fourth, we updated the written protocol for thrombolysis, which specified that NIH Stroke Scale (NIHSS) scores of 2 to 25 were to be included and an age of 81 years or more was to be excluded for intravenous thrombolysis (IVT) in accordance with the Korean Ministry of Food and Drug Safety approval and the Korean Health Insurance Review and Assessment Service guidelines. We also predefined strategies for dealing with difficult cases, such as pregnant woman, intracranial aneurysms, thoracoabdominal aneurysms, tumors, and endocarditis. If the patients did not arrive at the ER via ambulance or the EMTs missed prenotification, we could not prepare for patient arrivals, but other SAT processes were the same as those previously mentioned. No additional equipment, structures, or personnel were employed, except a cellular phone for the prenotification call and a POCT device for prothrombin time since SAT implementation.

Fifth, strategies to obtain an earlier initiation of IAT were also employed and included the neurologists' advance notification group messages to the neuroradiology intervention team and other SAT members, written protocol for IAT, and prepared IAT sets. SAT neurologists sent advance notification group messages for probable IAT candidates immediately after obtaining the noncontrast CT scans based on following criteria: (1) NIHSS were 8 or higher; or (2) cortical symptoms including aphasia, neglect symptoms, and eyeball deviations were observed; and

(3) it was <12 h after symptom onset. A written protocol for IAT included computer passwords in an angiography suite, as well as technical tips for duty attending intervention neuroradiologists, radiology fellows, and technicians. Prepared IAT sets were placed on a dedicated shelf in the angiography suite.

Sixth, feedback to SAT members was also applied. The SAT team leader (S.-B. J) provided real-time feedback to the SAT members. In addition, he reviewed every thrombolysis candidate and ambulance prenotification case with the SAT members during weekly meetings. SAT data were also posted in the online bulletin and were updated daily for SAT members.

https://doi.org/10.5853/jos.2016.01802