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Neurovascular Disease

Impact of a direct-admission stroke pathway on delays of admission, care, and rates of intravenous thrombolysis

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ABSTRACT

Introduction. – This study examined the impact of a ''direct potential thrombolysis'' pathway with direct admission to a neurological stroke unit (SU) on delays of admission, stroke care and proportion of patients with ischemic stroke (IS) treated with intravenous (IV) rtPA.
Methods. – This prospective study included all patients admitted in the intensive SU for potential thrombolysis over a 2-month period. Data collected included the time of symptom onset, mode of transport, National Institutes of Health Stroke Scale (NIHSS) score on arrival, delays of care, delays of imaging and modalities, diagnosis and therapeutic data.
Results. – During the 2-month study period, 81 patients (mean age of 65 years) were included in the study. The Emergency Medical Services (EMS) were involved in 86% of admissions, with a median delay of admission of 1 h 48 and access within 4.5 h in 84% of cases. Every patient underwent immediate neurovascular assessment and imaging examination, which was a MRI in 80% of cases. Only 70% of patients had a final diagnosis of stroke. Intravenous rtPA therapy was administered to 26 patients (32%), and 58% of patients with IS. The median door-to-needle time delay was 63 min.
Conclusion. – A direct 'potential thrombolysis' pathway, based on EMS and located in the SU, can result in earlier admission, reaching the recommended care delay, and a large proportion (58%) of IS patients receiving rtPA therapy. On the other hand, the proportion of patients with stroke mimics is high, thereby increasing the chances of intermittent periods of saturation of this specific pathway.

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1. Introduction

The management of stroke patients at stroke units (SUs) has demonstrated its efficiency in terms of reduced mortality and functional improvement of patients, independently of specific therapies [1,2].

Stroke care for all patients in such units has been recommended for years in French and international procedural reports [3,4]. However, although published French data are scarce, access to a SU for acute stroke patients remains limited due to the undersizing and scarcity of such dedicated units. An institutional French study of stroke care pathways demonstrated that only 37% of stroke patients were admitted to a SU in 2012 [5]. More recently, it was shown that there are wide discrepancies across French regions, with 25–80% of stroke patients admitted to a SU [6].

Furthermore, in most French hospitals, stroke patients eligible for intravenous (IV) recombinant tissue plasminogen activator (rtPA), treatment are primarily addressed to the emergency departments (ED), where they are either managed by a mobile stroke team or secondarily transferred to the SU closest to emergency and radiology departments. Direct admission of suspected stroke patients to a SU located in a neurology department is an exception to the rule.

The University Hospital of Tours serves an urban area of 470,000 inhabitants within a French administrative department of 600,250 inhabitants (Indre-et-Loire). In 2003, our hospital was split in two separate sites 11 km apart, a geographical situation that placed the ED at some distance from the neurology, neuroradiology and neurosurgery departments and intensive care units (ICUs). This geographical configuration, along with European authorization of IV rtPA, generated a demand for a direct thrombolysis pathway. This was initially located in the ICU department, then in the SU of the neurology department, for all patients suspected of acute stroke who might benefit from IV rtPA therapy [7,8].

Six neurology ICU beds, located near the department of neuroradiology, were reserved for receiving only patients 'under thrombolysis alert' after telephone contact with the neurologist, who is on duty '24/7' (24 h a day, 7 days a week).

In our institution, patients under thrombolysis alert are predominantly addressed by the Emergency Medical Services (EMS), hospitals of other departments of the region, and less often by general practitioners (GPs) or physicians from the ED. Patient transfers are usually performed by paramedical ambulance teams to reduce delays, except when a helicopter flight is necessary [9]. On admission, the patient is assessed by a neurologist, who calculates the National Institutes of Health Stroke Scale (NIHSS) score, and the patient is then transferred to the imaging department for magnetic resonance imaging (MRI), using the protocoled sequences, or for computed tomography (CT) scans, with perfusion in cases of clear MRI contraindications, following adequate biological sample-taking.

The aim of the present study was to describe the impact of such a direct 'thrombolysis-alert' pathway on admission and care delays, and on the proportion of patients treated with IV rtPA.

2. Material and methods

The included patients were considered under thrombolysis alert if they presented with a neurological deficit compatible with a vascular pathology, and were eligible for transfer to the appropriate intensive SU within 4h30 of the onset of symptoms (OS), or were suspected to have 'stroke on awakening', with no age limit (the modified Rankin Score should be ≤ 2 when age was > 80 years). Our present prospective study was conducted from 3 March to 3 May 2014, with data collected for each patient addressed in the ''potential thrombolysis pathway'' on a record card filled out by the neurologist. These recorded data were:

- demographic, transport-related and clinical details, including age, institutionalization, OS, regulation by EMS, means of transport, time of arrival (as 'opening hours' [8:30 AM–6:30 PM] or 'outside opening hours' [6:30 PM–8:30 AM and weekends]), NIHSS score on admission and type of imaging;
- delays from OS to admission (onset to door) and from door to imaging, duration of imaging, and delays from OS to thrombolysis treatment (onset to needle) and from door to needle;
- final diagnosis and therapy (IV rtPA/thrombectomy).

3. Results

Over the 2-month study period, 81 patients were directly admitted as cases under thrombolysis alert (Table 1). For 11 of these patients, the time of OS was unknown; admissions were predominantly outside opening hours.

Emergency imaging examinations were performed for all patients using either brain MRI (80% of cases) or a CT scan when MRI was contraindicated. The median door-to-imaging delay was 35 min (interquartile range [IQR]: 27–40 min) in the

Table 1 – Characteristics of participating patients during the 2-month study period.

Age (years)	
Mean	65
Median [IQR]	71 [51–79]
Institutionalized patients, *n* (%)	2 (2)
NIHSS score, median [IQR]	5 [2–15]
EMS regulation, *n* (%)	70 (86)
Admission outside opening hours, *n* (%)	47 (58)
Onset-to-door delay, median [IQR][a]	1h48 [1 h 15–2 h 44]
Admission delay < 3h00, *n* (%)[a]	60 (75)
Admission delay < 4h30, *n* (%)[a]	68 (84)
Door to imaging (min), median [IQR][b]	35 [27–41]
Duration of imaging (min), median [IQR][c]	13 [9–19]
MRI as first intention, *n* (%)	64 (80)
Vascular diagnosis, *n* (%)	57 (70)
Cerebral infarct, *n*	45
Cerebral hemorrhage, *n*	9
Transient ischemic attack, *n*	3

[a] Time of symptom onset unknown for 11 patients.
[b] One patient had imaging postponed due to incongruent clinical evaluation; one patient had imaging done at another hospital.
[c] Excluding four patients due to missing data