PUBLICATION ALERT NEWSLETTER

Please be aware that the purpose of this Newsletter is to make you familiar with the most recent scientific publications, and you must keep in mind that all aspects may not be covered by the label. Please always refer to the current prescribing information as in force in your country.

Timely treatment of patients with AIS* requires coordinated, multidisciplinary teamwork. Variables such as team expertise, resource availability, and geographic location can all influence stroke care delivery, and it is important to consider these factors and how they interact with one another within the stroke care pathway. When developing strategies to improve stroke care, processes may need to be adjusted to fit with the needs of individual healthcare settings, and multifactorial interventions may be used to address several barriers at the same time.

In this issue of the Actilyse® Publication Alert Newsletter, we look at challenges faced when implementing stroke care interventions in different healthcare settings – public hospitals, medical centres, telestroke networks – and how these can be overcome. We also discuss the importance of standardized protocols and educational initiatives in delivering quality care.

*Abbreviations are defined at the end of the newsletter.

MULTIFACTORIAL INTERVENTIONS CAN BE IMPLEMENTED SUCCESSFULLY IN DIFFERENT CARE SETTINGS

Interventions to improve stroke care delivery ideally need to be adaptable for use in a variety of healthcare settings. A study in New Zealand set out to examine whether initiatives developed for specialist stroke centres are transferable to general hospitals lacking round-the-clock availability of on-site stroke specialists.[1]

In Christchurch Hospital, stroke is managed by general ED, neurology and radiology staff. Immediate CT scanning is not available overnight, and on-site neurologists are not available before 8 am or after 5 pm. In this setting, stepwise adoption of key elements of the Helsinki stroke care protocol, including EMS pre-notification and direct-to-CT transfer, resulted in significant improvements in rtPA delivery: more patients received rtPA, median DNT was reduced to 40 minutes, and almost 80% of patients were treated within an hour of arrival.

Regular, formal education of non-neurology residents and feedback from EMS were important components of the adopted model. Further improvements in DNT are anticipated when the CT suite is relocated from the first floor to the ED and when immediate 24/7 CT access is made available.

The authors conclude that the Helsinki stroke model can be applied successfully in healthcare settings with limited resources, and their results should encourage such hospitals to consider implementing similar stroke models to reduce stroke treatment delay.

Study details

- Analysis of registry data from 255 consecutive patients with presumed AIS who received rtPA at a tertiary hospital in New Zealand during a 6-year period (Jan 2012–Dec 2017), to evaluate the impact on DNT of two stages of protocol amendments:
  - Original protocol (up to Dec 2014): EMS pre-notification of ED but not of stroke team; no CT priority
  - Stage 1 (Jan 2015): EMS pre-notification of stroke team; priority CT imaging if deemed eligible for rtPA; rtPA administered in CT suite
  - Stage 2 (May 2017): direct transfer to CT scanner on first floor; parallel processing of laboratory results
- The number of patients who received rtPA increased from 23 in 2012 to 67 in 2017 (full calendar year)
- Use of advanced imaging increased over time: in 2017, multimodal imaging was used in 91% of rtPA-treated patients
- DNT decreased after introduction of the protocol amendments, from 87 min in the pre-intervention period, to 63 min during the pre-notification period, to 40 min in the period using the full stroke model (see table)
- The proportion of patients with DNT ≤60 min increased from 12% in the preintervention period to 79% in 2017
- Significant post-intervention improvements were also seen for door-to-CT time, CT-to-needle time, and onset-to-needle times (see table)
- Reductions in treatment delays were seen for both in-hours and after-hours care, despite on-site neurology support being limited to business hours and non-neurology medical residents providing out-of-hours support
  - In hours: median DNT improved from 87 min in 2012–2014 to 34 min in 2017
  - After hours: median DNT improved from 86 min in 2012–2014 to 47 min in 2017

Study details (continued)

OUTCOME	PRE-INTERVENTION (2012–2014)	STROKE PRE-NOTIFICATION (JAN 2015–APR 2017)	FULL STROKE MODEL (MAY 2017–DEC 2017)	*p* VALUE
ONT, median (IQR) min	168 (145–195)	130 (107–160)	120 (87–155)	**<0.01**
Door-to-CT time, median (IQR) min	49 (40–65)	35 (24–48)	19 (11–24)	**<0.01**
CT-to-needle time, median (IQR) min	32 (20–49)	26 (15–37)	20 (14–31)	**<0.01**
DNT, median (IQR) min	87 (71–112)	63 (48–84)	40 (30–51)	**<0.01**

"…key components of the Helsinki stroke thrombolysis model are transferrable with "real-world" resources."[1]

COORDINATING STROKE CARE VIA A SPECIALIZED APP CAN REDUCE IN-HOSPITAL TREATMENT DELAYS

Novel interventions are continually being designed to improve the efficiency stroke care delivery. With the widespread use of smartphones, these innovations now include dedicated medical apps for stroke teams. [2]

In 2013, a community medical centre ED department in Texas, USA, introduced a dedicated app designed to facilitate and coordinate care of patients with AIS. After the stroke team started using the app, DNT was reduced by 21 minutes (to 56 minutes) and the proportion of patients who received rtPA within an hour of ED arrival increased from 32% to 82%.

The authors conclude that the sizable effects of the app were due to increased awareness of suspected AIS and improved coordination of stroke care delivery, which resulted in a more efficient process.

Study details

- Analysis of data from 68 patients with AIS who received rtPA after presenting to the ED of a community medical centre, to evaluate the impact on DNT of a Stop Stroke app that was introduced in March 2013,
- The Stop Stroke app was used to coordinate care delivered by the stroke team (EMS, ED, radiologist and neurologist):
  - When a patient presented with suspected AIS, the app was activated by a member of staff (e.g. EMS or ED physician,) and all members of the stroke care team were alerted by a siren tone
  - Patient details were shared and updated in real time
  - Stroke care team members indicated via the app when they were ready to receive the patient
  - A universal clock indicated time elapsed vs targets
- After introduction of the app, DNT was significantly reduced, by 21 min, and more than 80% of patients received rtPA within an hour of ED arrival (see table)

PERFORMANCE INDICATOR	PRE-INTERVENTION (Feb 2012–Mar 2013)	POST-INTERVENTION (Mar 2013–Feb 2014)	*p* VALUE
Received rtPA, n	34	34	
DNT, mean min	77	56	**≤0.001**
DNT <60 min, n (%)	11 (32)	28 (82)	**0.0001**

"Utilization of Stop Stroke medical application by an acute stroke care program optimized the process, as demonstrated by improved time-to-treatment and percentage of cases treated in less than 60 minutes."[2]

REDUCING TREATMENT DELAYS MAY IMPROVE OUTCOMES IN PATIENTS WITH MILD ISCHAEMIC STROKE

Mild ischaemic stroke may be harder to recognize than severe stroke, and may also be viewed as relatively benign. Consequently, patients presenting with mild AIS symptoms may be less likely to receive timely rtPA treatment.

A retrospective analysis of data from a US telestroke network found that DNT was prolonged in patients with mild ischaemic stroke, with an additional delay of 10 minutes compared with patients with severe stroke.[3] Most patients (85%) with mild ischaemic stroke who received rtPA were discharged home, but the remainder had a poor functional outcome.

The authors observe that the 10-minute treatment delay may have contributed to the poor functional outcome seen in some patients. It is therefore important to treat all cases of AIS with urgency, regardless of symptom severity.

Study details

- Analysis of telestroke registry data from 454 patients with AIS treated with rtPA at a spoke hospital and then transferred to the hub hospital during a 4-year period (Jan 2013–Apr 2017), to evaluate the impact of stroke severity on DNT
  - Telestroke patients who did not transfer to the hub hospital were excluded from the analysis (n=674)
  - Patients deemed ineligible for rtPA after teleconsultation were excluded from the analysis (n=8832)
- Patients presenting with symptoms of mild ischaemic stroke had a DNT of 73 min, significantly longer than that of patients with severe stroke (see table)
- Functional outcomes of patients with mild ischaemic stroke were generally good: >85% were discharged home
  - However, 14% had poor outcome at discharge (see table)

CHARACTERISTIC AND OUTCOME	MILD ISCHAEMIC STROKE (n=98)	SEVERE STROKE (n=356)	*p* VALUE
Age, mean (SD) years	63 (16)	67 (15)	**0.025**
Admission NIHSS score, mean (SD)	3.7 (1.4)	14.4 (6.1)	**0.0001**
DNT, mean (SD) min	73 (31.5)	63 (28.8)	**0.002**
SICH, n (%)	1 (1.0)	15 (4.3)	0.13
Discharge mRS score ≥3, n (%)	14 (14.3)	173 (48.6)	**0.0001**
Discharge outcome, n (%)			**0.0001**
Home	84 (85.7)	178 (50.0)	
Rehabilitation/nursing home/hospice/other	14 (14.3)	163 (45.8)	
Death	0	9 (2.5)	

"Patients presenting with mild ischaemic stroke symptoms experience a significant delay in receiving rtPA."[3]

DELIVERY OF CONSISTENT CARE WITHIN HOSPITALS REQUIRES UNIFIED STROKE CARE PROTOCOLS

It can be difficult to implement and adhere to international stroke care recommendations when resources are limited and written protocols are lacking. When there are not enough neurologists to cover the number of patients, the burden of stroke care may fall upon other healthcare providers.

Analysis of stroke management records (2010 to 2013) from the only tertiary public hospital in Barbados revealed that:[4]

- 1646/1735 (95%) patients with stroke received a CT scan (1117 [68%] within 24 hours of symptom onset)
- Patients were managed mainly by emergency physicians and most were cared for on general medical wards
- 117/1406 (8%) patients with AIS had a documented neurologist referral, and only 6 patients (<1% of those eligible) received rtPA

During the analysed period, there was no stroke unit or stroke team and only one neurologist working at the hospital; there was also no specific, written stroke care protocol (no single standard was used by all staff).

The authors conclude that, even though resources were limited, diagnosis of AIS was consistent with international recommendations. Written stroke care protocols have since been prepared and a dedicated stroke unit has been introduced, which the authors believe will help to improve the treatment of AIS. Education of the public to raise awareness of stroke symptoms and the importance of timely medical contact should also improve stroke care.

NEUROLOGISTS AND STROKE COORDINATORS SUPPORT PREFERENTIAL TRIAGE OF NON-LVO STROKE TO rtPA-CAPABLE HOSPITALS

Getting different groups involved in stroke care to agree on best practice is essential when developing and adhering to standardized protocols. However, healthcare professionals who routinely care for stroke patients do not necessarily share the same views on how care may be best provided.

An online survey of 320 stroke care providers found different opinions on how patients with non-LVO stroke should be triaged.[5] Most (71%) of neurologists and stroke coordinators felt non-LVO patients should be transferred to the nearest rtPA-capable hospital, whereas more than half of ED and EMS physicians preferred to transport such patients to a hospital offering endovascular therapy, even if this involved an additional delay of up to 30 minutes.

Successful changes in clinical practice require involvement and engagement of all members of the stroke care pathway. Using multidisciplinary teams to develop interventions and protocols should ensure different aspects of care are considered, while educational initiatives may help to harmonize opinions on best practice.

MULTIPLE INTER-RELATED FACTORS AFFECT ACUTE STROKE CARE DELIVERY

A 'review of reviews' by Lachkhem *et al.* analysed 29 articles published over the past two decades and found that 27 factors, in four distinct categories, each have a significant impact on the acute stroke care pathway (see table).[6] These factors also interact with each other, increasing the complexity of stroke care that must be considered when developing new interventions.

CATEGORY	KEY FACTORS THAT SHORTEN DELAYS	INFLUENCE EXAMPLES
Patient	Greater stroke knowledge Presence of a bystander Greater stroke severity Stroke history or risk factors	Poor stroke knowledge and greater stroke severity are associated with low socioeconomic status, older age and non-white ethnicity
Space	Shorter distance to hospital Urban location Higher social level of neighbourhood	Geographic location may indicate patient education level as well as affecting coordination of services and determining access to a stroke unit
Organizational/logistical	EMS pre-notification Access to CT scanner Arrival by EMS Access to stroke unit	EMS pre-notification facilitates CT access Women, older patients and people from deprived areas are less likely to receive a CT scan Older patients are more likely to arrive by EMS
Training	Stroke recognition (by public, paramedics and physicians)	Women have better stroke knowledge Training improves co-ordination of care

The authors conclude that comprehensive analysis of the different factors affecting stroke care delivery and their relationships is essential for developing an effective stroke care pathway that is valid in different settings.

AIS, acute ischaemic stroke; CT, computed tomography; DNT, door-to-needle time; ED, emergency department; EMS, emergency medical services; IQR, interquartile range; LVO, large-vessel occlusion; mRS, modified Rankin Scale; NIHSS, National Institutes of Health Stroke Scale; ONT, onset-to-needle time; rtPA, recombinant tissue plasminogen activator; SD, standard deviation; SICH, symptomatic intracranial haemorrhage.

References

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