RMH Stroke Thrombolysis Door-to-Needle Time Dramatically Reduced with Revised Protocol

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Time is Brain

- Stroke is an emergency
- Early intervention can significantly impact outcome
- Effective acute stroke management is rapid, streamlined and coordinated
  - multiple departments
  - multidisciplinary
tPA works by reperfusing the ischaemic penumbra, limiting infarct expansion.
Time is Brain

Our aim: shift patients up the curve!

Number needed to treat to achieve excellent recovery (mRS 0, 1)

- **< 90 mins**
  - NNT = 3.5

- **≤ 3 h**
  - NNT = 7

- **3-4.5 h**
  - NNT = 14

• Co-ordinated stroke team response via linked pagers

Aims:
• to increase tPA utilisation from 8% (national average then 3%) and
• increase proportion with door to needle <60min
Reducing in-hospital delay to 20 minutes in stroke thrombolysis

- **progressive improvement over a decade**
  - 24/7 neurologist in ED
  - ambulance prenotification direct to neurologist
  - history taken from witness whilst in transit
  - centralized electronic medical records
  - CT scanner moved to ED
  - patient transported direct to CT on ambulance stretcher
- **massive volume: tPA administered every day on average**
  (pre-mixed tPA)

“do as much as possible before the patient arrives and as little as possible afterwards”
2001
HOSPITAL PRE-NOTIFICATION VIA MOBILE
EMS contacts stroke physician directly via mobile phone.
CT and bloods ordered at pre-notification electronically.
Stroke physician interprets the CT scan, not waiting for formal neuroradiology report.

2003
CT RELOCATED TO ED
Pt transfers of several hundred meters, including elevators, were no longer needed.

2004
DIRECT TO CT
CT cleared prior to patient arrival, pt transferred directly onto CT table. Patient is examined upon arrival, on CT table.

2005

AQUISITION OF HISTORY DURING TRANSPORT
State-wide electronic patient records and eye-witness interview during transportation.

POINT-OF-CARE INR
Lab personnel draw blood while patient on CT table, and perform instant POC INR.

REDUCED IMAGING
Plain CT for all, more advanced imaging reserved for unclear cases only.

2006 – 2011
LEARNING BY DOING

Comparison of Helsinki and RMH door-to-needle times


Are elements of the Helsinki protocol transferrable?

- In Dec 2011 with Atte’s arrival to RMH early discussions to implement elements of the Helsinki protocol
- Planning and collaboration with ED and Ambulance Victoria 1-4/2012
- New “direct-to-CT” protocol implemented in-hours from May 2012
  - Ambulance pre-notification with patient details
  - Quicker triage and clerking in ED foyer
  - Direct to CT on ambulance stretcher
  - Pre-retrieval of tPA from pyxis medstation by stroke nurse and delivery on CT table
  - Point-of-care INR in select cases following purchase of machine and training undertaken by Stroke team

Before Arrival

• Name and date of birth: allows us to check/create a UR number → order/protocol CT in advance

• If existing records on hospital system → check bloods, relative/GP details for past history and contraindications to tPA

• Team ready – Stroke team, ED nursing, transport staff, transport equipment, Stroke Nurse retrieves tPA out of pyxis medstation, clear the CT scanner
After Arrival

Multiple parallel processes:

• Triage nurse

• Clerking/Patient Registration

• Clinical assessment
  – is it stroke?
  – is the deficit worth treating? (risk-benefit)

• Background information
  – re-check onset time
  – are there contraindications to tPA?
  – are they fit enough for research trials?

on the way to CT!
Parallel processes

Prenotification

Ambulance
- Ambulance Transport

ED
- ED preparation

Clerical
- Name/dob → registration
- Clinical background/CI

Stroke team
- Order CT, clear scanner

Radiology

Direct to CT

Arrival at Triage

Ambulance
- Triage/vitals
- Confirm details
- Examination
- Imaging

Treatment

+ what is not done:
- no waiting for blood results unless suspect abnormal
  (except fingerprick BSL ± POC INR if suspect anticoagulated)
- no waiting for radiologist to interpret CT
- no waiting for ECG and CXR – they happen after tPA is started
Helsinki model cut stroke thrombolysis delays to 25 minutes in Melbourne in only 4 months

ABSTRACT

Objective: To test the transferability of the Helsinki stroke thrombolysis model that achieved a median 20-minute door-to-needle time (DNT) to an Australian health care setting.

Methods: The existing “code stroke” model at the Royal Melbourne Hospital was evaluated and restructured to include key components of the Helsinki model: 1) ambulance prenotification with patient details alerting the stroke team to meet the patient on arrival; 2) patients transferred directly from triage onto the CT table on the ambulance stretcher; and 3) tissue plasminogen activator (tPA) delivered in CT immediately after imaging. We analyzed our prospective, consecutive tPA registry for effects of these protocol changes on our DNT after implementation during business hours (8 AM to 5 PM Monday–Friday) from May 2012.

Results: There were 48 patients treated with tPA in the 8 months after the protocol change. Compared with 85 patients treated in 2011, the median (interquartile range) DNT was reduced from 61 (43–75) minutes to 46 (24–79) minutes ($p = 0.040$). All of the effect came from the change in the in-hours DNT, down from 43 (33–59) to 25 (19–48) minutes ($p = 0.009$), whereas the out-of-hours delays remain unchanged, from 67 (55–82) to 62 (44–95) minutes ($p = 0.835$).

Conclusion: We demonstrated rapid transferability of an optimized tPA protocol to a different health care setting. With the cooperation of ambulance, emergency, and stroke teams, we succeeded in the absence of a dedicated neurologic emergency department or electronic patient records, which are features of the Finnish system. The next challenge is providing the same service out-of-hours.

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UPDATED RESULTS

In-hours delays cut from 43 to 25min in first 6 months and maintained at 20mins (June 2014)

In-hours door to needle time (DNT) reduction

Proportion treated in-hours with DNT<60min (USA benchmark guideline)
2011: 77%,
2012: 88%
2013: 92%
2014: 94%
UPDATED RESULTS
Out-of-hours delays cut from 67 to 62min in first 6 months and maintained at 60mins (June 2014); Overall delays cut from 61 to 46 mins in first 6 months and maintained at 40mins (June 2014)
Latest out-of-hours Strategies

• Pre-notification extended to out-of-hours

• Direct to CT out-of-hours with ED team initiating process

• Code Stroke Kit Introduced to reduce delays from CT to treatment initiation in out-of-hours
Conclusions

• Many components of the Helsinki tPA protocol are transferrable
  – Patient details before arrival and going direct to CT are key
  – Point-of-care INR is crucial in select cases
• DNT at RMH in-hours was halved to median 25 mins in just 4 months
  – Provides an equivalent of one month of extra disability-free life

• Further improvements should be focussed on achieving a higher total proportion of patients thrombolysed within 60 minutes
• Maintaining the in- hours median DNT 20min or less
• Expanding these improvements to our out-of-hours population