Maximizing the Population Benefit From Thrombolysis in Acute Ischemic Stroke : Implementation of a modelling study

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Background

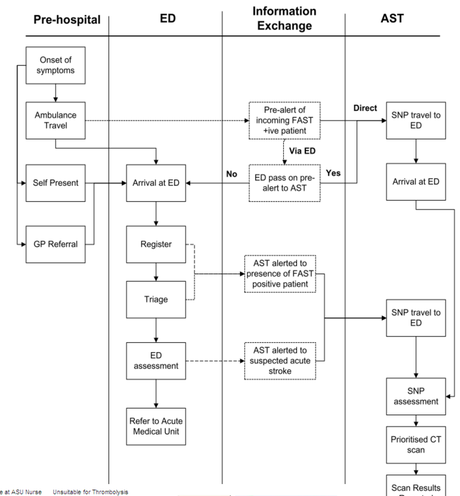
The benefit from Alteplase®, the only licensed treatment worldwide for acute ischaemic stroke, is critically dependent on the time to treatment.

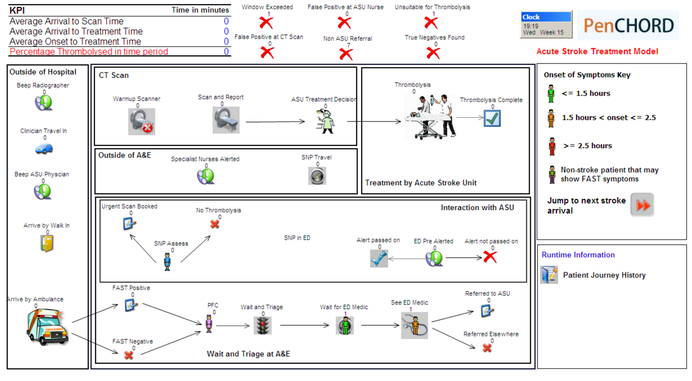
Treatment time	Treat to get one attributable patient with no or minimal disability
0-90 mins	
91-180 mins	
181-270 mins	

Our aim, using a simulation approach, was to identify and overcome the main causes of in-hospital delay prior to thrombolysis.

Method

We developed a simulation model that mimicked the emergency pathway for patients arriving with suspected stroke.





Outcome measures

Outcome measures were related to clinical performance or to workload at our hospital. Clinical performance includes the percentage of all strokes cases thrombolysed, the onset-to-treatment time interval, and disability outcomes at 90 days that are attributable to treatment.

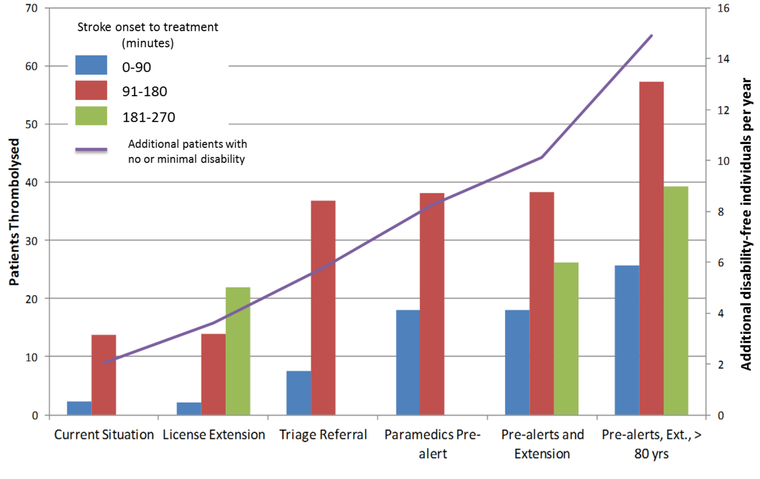
Scenarios

The following scenarios were simulated:

1. Current practice
2. Extension of treatment window to 4.5hrs
3. Triage alert to Acute Stroke Team (AST)
4. Ambulance pre-alert to ED/AST
5. Extension of treatment window with pre-alerts
6. As 5 and treat >80year olds

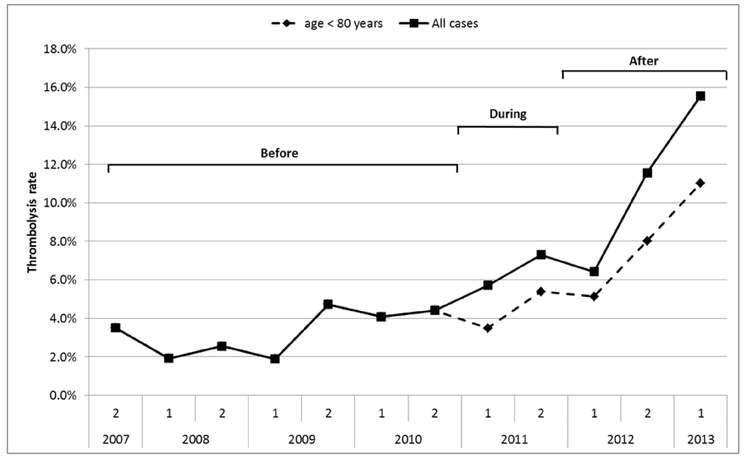
Simulation Results

The chart below shows the simulated number of patients thrombolysed with their onset-to-treatment times and the expected number of patients with no or minimal disability attributable to treatment. Maximum benefit is achieved by using licence extensions and by improving system performance through pre-alerts coming from ambulances.



Implementation

Following the simulation study the proposed changes (licence extension and pre-alerts) were implemented. In addition to thrombolysing more patients, the average arrival-to-treatment time was reduced from 90 minutes to 63 minutes (increasing the benefit of those thrombolysed). Compliance uptake was initially slow with an average compliance rate of about 50% in ambulance pre-alert over the whole study period, but rising to about 70% by the end of the study period.



Conclusions

Simulation modelling was used to identify how the use and effectiveness of thrombolysis therapy could be most readily improved: effective pre-alert systems which would reduce in-house delays were identified as more important than licence extensions due to the enhanced effectiveness of early treatment of stroke.

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