



Analysis of a Two-tiered Triage System for Ischemic Stroke and Factors Associated with Delay in Thrombolytic Treatment



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Introduction

A two-tiered nursing triage system for acute stroke patients is utilized at our emergency department enabling time-sensitive treatment and appropriate resource allocation. Patients presenting with limb weakness within six hours of symptom onset are immediately evaluated by the stroke and ED team and designated "activated strokes". All other stroke presentations are designated "non-activated" and initially evaluated by only the emergency medicine physician, with neurology evaluation when needed. Activated stroke status identifies patient who are likely to be thrombolytic candidates while non-activated stroke status identifies patients less likely to be candidates. An ideal ED triage system would be able to immediately identify all thrombolytic eligible patients and non-eligible stroke patients.

Methods

A retrospective chart review evaluating acute ischemic stroke patients at our emergency department from June 2013- June 2015 was performed yielding 1623 patients (896 activated and 727 non-activated). A total of 15.5% (n=251) were eligible and treated (IV thrombolytic +/- endovascular intervention). Of all treated patients, 12% (n=30) were designated as non-activated. The presenting symptoms of the non-activated group were analyzed. Considering the standard of care for Door-to-needle time to be <60 minutes, we applied Chi-square testing to determine if non-activated designation was associated with >60 minutes door-to-needle time. Demographics of this cohort were examined.

Results

Of the 30 treated patients in the non-activated cohort, 66% (n=20) were female and mean age was 75.3 years. Nursing triage and stroke team assessment were congruent in 30% (n=9) of patients. The remaining 70% (n=21) were not considered activated strokes due to mild of fluctuating motor symptoms in 80% (n=17) and mild aphasia in 62% (n=13). Mean door-to-needle times were shorter in the activated compared to the non-activated group (60 vs.67 minutes) (p=<0.01). In this two-tiered triage system, approximately 1 in 4 activated and 1 in 24 non-activated stroke patients received thrombolytic treatment. The positive and negative predictive values (PPV, NPV) for patients receiving thrombolytic in this model was 24.6% [95% confidence interval (CI) 21.87-27.62] and 95.87% [95% CI 94.16-97.20] respectively.

	Treated with tPA	Not treated with tPA	
Activated	221	875	896
Non-activated	30	697	727
	251	1372	1623

Protocol Performance	Value	95% Confidence Interval
Sensitivity	88.05%	83.38 - 91.79 %
Specificity	50.80%	48.12 - 53.48 %
Positive Likelihood Ratio	1.79	1.67 - 1.92
Negative Likelihood Ratio	0.24	0.17 - 0.33
Positive Predictive Value	24.67%	21.67- 27.62 %
Negative Predictive Value	95.87%	94.16 - 97.20 %

Limitations

- Retrospective data analysis
- Although all the nurses were equally trained, their experience and background training could not be controlled
- We could not identify the number of patients who actually did not receive tPA because they were not identified as ischemic stroke to begin with.

Conclusion

The current triage model was successfully able to screen acute ischemic stroke patients eligible for thrombolytic treatment with 95.87% NPV. We have modified our triage protocol to include aphasia in the "activated stroke" designation and improved nursing triage education (particularly motor deficits) to improve the PPV and NPV of this model. On average, non-activated stroke status was associated with a 7 minute delay in thrombolytic treatment. Careful evaluation of aphasia and limb weakness in triage is imperative to capturing all potential treatment candidates, avoid delays in treatment and balance resource utilization.

References

- Boden-Albala, B., Stillman, J., Roberts, E.T., Quarles, L.W., Glymour, M.M., Chong, J., Moats, H., Torrico, V. and Parides, M.C., 2015. Comparison of Acute Stroke Preparedness Strategies to Decrease Emergency Department Arrival Time in a Multiethnic Cohort The Stroke Warning Information and Faster Treatment Study. *Stroke*, 46(7), pp.1806-1812.
- Bratina, P., Greenberg, L., Pasteur, W. and Grotta, J.C., 1995. Current emergency department management of stroke in Houston, Texas. *Stroke*,26(3), pp.409-414.
- Jurf, J.B., Hemmen, E., Delima, T., Virrey, E., Ojeda, L., Morales, V., Snyder, A.G. and Hemmen, T.M., 2015. Abstract T MP100: Improving Timeliness of TPA Administration: Re-vamping Emergency Department Processes to Decrease Door to Needle Times. *Stroke*, 46(Suppl 1), pp.ATMP100-ATMP100.