

# Patient Safety Tip of the Week

## May 12, 2015 More on Delays for In-Hospital Stroke

Though the “window” for thrombolytic therapy for acute ischemic stroke may be as long as 4.5 hours, those stroke patients who do best are those who receive thrombolytic therapy within the first 60 minutes from onset of symptoms, termed the “**golden hour**”. Yet only a small minority of acute stroke patients arrive at the hospital within the golden hour. There is one group of patients who theoretically should be ideal for thrombolytic therapy within the golden hour: those **patients having a stroke while already an inpatient** in the hospital. But we’ve lamented in several of our columns that times to diagnosis and treatment may be paradoxically prolonged in patients having in-hospital strokes. In our March 18, 2014 Patient Safety Tip of the Week “[Systems Approach Improving Stroke Care](#)” we noted a study that mentioned times to treatment are often paradoxically increased in patients having in-hospital strokes ([Meretoja 2012](#)). And in our September 23, 2014 Patient Safety Tip of the Week “[Stroke Thrombolysis: Need to Focus on Imaging-to-Needle Time](#)” we noted a study ([Sausser 2014](#)) that had the interesting observation that decisions take longer when the physician has more time available. Those authors also noted prior studies have demonstrated patients with shorter onset-to-arrival (OTA) times often have longer door-to-needle (DTN) times.

Then in our January 27, 2015 Patient Safety Tip of the Week “[The Golden Hour for Stroke Thrombolysis](#)” we reiterated the seeming paradox that patients having an in-hospital stroke tend to get delays in evaluation and management compared to those having community-onset strokes. One of the studies we highlighted had only been reported in an abstract presented at the Canadian Stroke Congress 2014 ([Saltman 2014](#)). Results of that study have now been published in their entirety and provide considerable insight into the complex nature of the problems associated with in-hospital stroke and demonstrate that the issue is not so clear-cut ([Saltman 2015](#)).

The study was a prospective cohort study conducted in Ontario, Canada and included almost 1000 patients with in-hospital stroke compared to almost 29,000 patients with community-onset stroke. Patients with in-hospital stroke had significantly longer times from symptom recognition to neuroimaging (median, 4.5 vs 1.2 hours) and both lower use of thrombolysis (12% vs 19%) and longer time from stroke recognition to administration of thrombolysis (median 2.0 vs 1.2 hours). Those with in-hospital stroke had a longer median length of stay following stroke onset (17 vs 8 days), were more likely to be dead or disabled at discharge (77% vs 65% with modified Rankin Scale score of 3-6), and were less likely to be discharged home from the hospital (35% vs 44%). However, after adjustment for age, stroke severity, and other factors, mortality rates at 30 days and 1 year after stroke were similar in those with in-hospital stroke and community-onset stroke.

So the results confirm previous observations that patients with in-hospital strokes seem to get less timely and less appropriate interventions. But a real highlight of the study is that **patients having in-hospital stroke may be a significantly different patient population** than those having community-onset stroke. Though the two groups had similar rates of independent functional status prior to admission, those with in-hospital strokes were generally older, had more comorbidities and vascular risk factors, and greater stroke severity. In those cases where no thrombolytic therapy was given the stated reason was contraindication to thrombolytic therapy in 46% of in-hospital stroke patients compared to 9% in community-onset patients. This may reflect a high percentage of patients that had just recently had surgery during their hospital admission.

But very few of the in-hospital stroke patients were cared for on a specialized stroke unit or even had their stroke care being primarily overseen by a neurologist. They also tended to have lower rates of evaluations usually done in stroke patients (eg. swallowing evaluations, carotid imaging, etc.).

There were also differences with regard to the location where the patient had their in-hospital stroke. As you might expect, those having a stroke in the angiography suite had shorter median times to neuroimaging and were more likely to receive thrombolytic therapy whereas those on cardiac surgical services had the longest median time to neuroimaging and were least likely to receive thrombolytic therapy.

So Saltman and colleagues really come to two conclusions: (1) there is considerable room for improvement of diagnosis and care of patients having in-hospital stroke and (2) there are unique characteristics of the patients having in-hospital stroke. They suggest that there probably should be special protocols and algorithms for management of patients with in-hospital stroke, with appropriate education and training of all parties involved, and activation of stroke teams to deal with such patients expediently.

Recognition of stroke signs and symptoms in patients already hospitalized may be difficult in some cases due to things like sedation, mechanical ventilation, dressings and casts and arm boards impairing limb movement, etc. Also, staff on some services (eg. surgical services) may not be as aware of what to do when signs or symptoms of stroke appear. Compared to the emergency department, staff on such units may not know how to activate the “stroke team” or even be aware that a “stroke team” exists.

And, upon further review, it should not really be surprising that time to neuroimaging might be prolonged. In our numerous columns on application of LEAN techniques to stroke care (see list below) we’ve emphasized that hospitals performing well actually have the patient with community-onset stroke arrive directly at the imaging suite. But think about how long it takes to mobilize some of our most critically-ill inpatients for transport to radiology. They have multiple lines in place and may be on supplemental oxygen or mechanical ventilation and staffing arrangements need to be made for someone to attend to the patient in the neuroimaging suite. There are clearly patient safety issues that must be addressed for such in-hospital transports (see our October 22, 2013 Patient

Safety Tip of the Week “[How Safe Is Your Radiology Suite?](#)”). While the editorial accompanying the Saltman article ([Dulli 2015](#)) notes that neuroimaging facilities are only “an elevator ride” away in most hospitals, the actual situation for most in-hospital stroke patients is much more complicated than an “elevator ride”.

Informed consent may also be an issue since many stroke patients may be unable to communicate. Typically, community-onset stroke patients arrive at the hospital with some family who might be able to participate in informed consent. But for patients with in-hospital stroke it may take longer to contact family or health care proxies to participate in the informed consent process.

And the issue of contraindications for thrombolytic agents in patients with recent surgery is a difficult one. Quite frankly, the evidence base for when such could be used after surgery (and how it applies to specific surgeries) is not well developed. There probably are a number of circumstances where thrombolytic therapy could be given to patients with recent surgery but those need to be better defined. Those of you who have struggled just to get your surgeons to use low-dose heparin DVT prophylaxis post-op know what we are talking about! Most surgeons are very concerned about bleeding in such patients if they were to receive thrombolytic therapy.

And we understand that many patients with in-hospital stroke may not (or should not) be transferred to the stroke unit. They likely have need for the care expertise on the unit where they were (eg. surgical unit, ICU, etc.). But that does not mean they should not have access to the expertise of the stroke team. A hospital stroke team should be available not only for responding to stroke alerts from the emergency department but also to respond to alerts from anywhere in the hospital and **provide continuing consulting**. Importantly, the stroke team that would follow stroke patients on units other than the stroke unit should also have a **stroke nurse** as a critical team member. A stroke nurse may be more attuned to certain aspects of care (eg. swallowing dysfunction, avoiding contractures, etc.) than staff on a non-stroke unit.

So what should your hospital be doing? While we all need to wait for the stroke research community to help us develop protocols and algorithms for approach to in-hospital strokes occurring in various inpatient populations, at a minimum you should:

- Ensure your stroke team can be activated from anywhere within the hospital
- Ensure that staff on all hospital units are aware of that stroke team and how to activate it
- Make sure your stroke team is also capable of providing ongoing consultation for patients who have had a stroke but are on units other than the stroke service and that the team has a “stroke nurse” experienced in day-to-day care of stroke patients
- Review any cases of in-hospital stroke you may have had in the past and identify barriers to prompt assessment and management in those cases
- Consider doing a FMEA (failure mode and effects analysis) for in-hospital stroke on one or more units

- Do an analysis of how long it takes to get a patient from your ICU's or various med/surg units to the radiology or neuroimaging suite for any emergency, not just stroke
- Take a stab at developing your own protocol/algorithm for in-hospital stroke

Since at least 4% of strokes and probably more ([Saltman 2015](#) , [Kimura 2006](#)) occur in patients already hospitalized for other reason, hospitals need to be cognizant that they are likely to have such strokes occur in their facility and be prepared to deal with them promptly.

**Some of our previous columns on improving stroke care:**

November 6, 2012    “[Using LEAN to Improve Stroke Care](#)”  
 March 18, 2014     “[Systems Approach Improving Stroke Care](#)”  
 September 23, 2014 “[Stroke Thrombolysis: Need to Focus on Imaging-to-Needle Time](#)”  
 January 27, 2015    “[The Golden Hour for Stroke Thrombolysis](#)”

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