Rapid Diagnosis, Triage, and Treatment of a 59-Year-Old Man with Sudden-Onset Right-Sided Weakness and Difficulty Speaking

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Guest: Dr. Matthew Loftspring is an Assistant Professor of Neurology at the Washington University School of Medicine in St. Louis, Missouri.

Bob Barrett: Hello, and welcome to this edition of "JALM Talk," from the *Journal of Applied Laboratory Medicine*, a publication of the American Association for Clinical Chemistry. I am your host Bob Barrett, sitting in for Randye Kaye.

Stroke is a leading cause of death in the United States and worldwide. In those that survive a stroke, permanent brain damage may cause debilitating effects such as paralysis, speech and vision problems, and memory loss. It is critical to recognize and treat a stroke early such that patients will survive and the brain may be saved from injury. However, current stroke care algorithms rely heavily on advanced neuroimaging, and treatment may be delayed as patients are referred to specialty centers.

Thus, the availability of blood-based biomarkers for stroke particularly at the point of care is desired to allow for a more rapid and effective on-site treatment. A Case Report published in the January 2020 issue of the *Journal of Applied Laboratory Medicine* describes the case of a 59-year-old man, who presented to the hospital with an acute ischemic stroke. The report details the diagnosis, triage, and treatment of the man, and the authors use the case to call for rapid and accurate blood-based diagnostic tests to improve the management of suspected stroke patients.

The first author of the report is Dr. Matthew Loftspring. Dr. Loftspring is an Assistant Professor of Neurology at the Washington University School of Medicine in St. Louis, Missouri, and he is our guest in this podcast today. So, Dr. Loftspring, please, provide our audience with the brief overview of acute ischemic stroke. What is it? What diagnostic tools are currently available for the management of these patients?

Dr. Loftspring: Sure. So, acute ischemic stroke is the type of stroke where there is a blockage of a large or a small artery that sends blood to the brain. And depending on which blood vessel is affected by this blockage, which is often a blood clot, determines the symptoms that someone would have. And with respect to diagnosis of acute ischemic stroke, it's still a challenge. It's mainly a clinical diagnosis, meaning a

neurologist or emergency physician typically would evaluate the patient and determine whether or not the symptoms the patient is having is consistent with a stroke. Most likely, and most often, that would be weakness on one side or difficulty speaking.

Over time, there have been tools to help confirm that diagnosis. However, the tools that we have are primarily MRI, which takes time and there's cost involved in that, as well as a CT angiogram, which essentially looks for blocked blood vessels with a CT scanner and can also give us information about the amount of blood flow to a certain area of the brain. However, these two technologies are both imaging-based and they take time, and the longer that the patient is without blood or has reduced blood flow to the brain, the more damage that is done. That's why it's important to think about new technologies or point-of-care diagnostics that don't rely so heavily on imaging.

Bob Barrett: What are key points of intervention, where point-of-care testing technologies would be most useful?

Dr. Loftspring: So, as we went through our case in our Case Report of the gentleman with the acute ischemic stroke, we highlighted hypothetical point-of-care technologies that would be helpful at different stages. And really, the first stage would be identifying that this is in fact an acute ischemic stroke and not what we would call a mimic. Some examples of mimics would be seizures or even some types of migraines can produce weakness and numbness and mimic a stroke.

That would be the very first point where a point-of-care technology would be useful. The other primary point where a point-of-care technology would be helpful would be in determining whether the patient is able to, or a candidate for, undergo a procedure that we call "thrombectomy" which we discussed in our Case Report, which is where an interventional radiologist actually goes and threads the catheter into the brain and manually removes the blood clot.

And if there were biomarkers in the blood that could be tested quickly in a point-of-care setting, then, we could potentially make the diagnosis as well as get to the intervention more quickly.

Bob Barrett: How would you envision current or hypothetical technologiess being implemented in a practical setting?

Dr. Loftspring: There's always a challenge in implementing new technologies. One of the oldest point-of-care technologies is a point-of-care glucose monitor which has become essentially a standard of care in the emergency setting. And these hypothetical technologies would need to be tested

rigorously in a laboratory setting and they would need to be very sensitive and specific for biomarkers that may be released into the blood very early on in the setting of acute ischemic stroke.

And so, in a practical sense, if we were to have one of these hypothetical technologies, it could be used ideally before the patient reaches the hospital and it would be implemented in the ambulance. Most patients with a stroke will identify that they're having a stroke or that something is seriously wrong medically and will call 911.

And so, ideally, the emergency medical services would have some of these technologies available before the patient even reaches the hospital so that we could be better prepared to assess them when they arrive, and if they're a candidate for actually removing the blood clot that team of anesthesiologists and interventional radiologists could assemble more quickly and streamline the process.

Bob Barrett: Well, finally Dr. Loftspring, can you explain what are the barriers to the development, deployment, and interpretations of these testing technologies?

Dr. Loftspring: I think the biggest barrier, like I referenced earlier, was that these are technologies that are going to have to be very sensitive and specific for finding a marker in the blood that will answer the question that we're asking. So, if we asked the question, is this patient having an acute ischemic stroke, we would have to find a biomarker that is released, that is unique to acute ischemic stroke.

We do know that there are lots of chemicals and other markers released when someone does have a stroke. However, they're not specific and they may not be released early enough. So, the primary barrier, as with a lot of technologies, is something that's highly sensitive and something that's highly specific that can be used at an early time point.

Bob Barrett: That was Dr. Matthew Loftspring from the Washington University School of Medicine, discussing his Case Report from the January 2020 issue of JALM, entitled, "Rapid Diagnosis, Triage, and Treatment of a 59-Year-Old Man with Sudden-Onset Right-Sided Weakness and Difficulty Speaking." Thanks for tuning in to this episode of "JALM Talk." Tune in next time, and don't forget to submit something for us to talk about.