Stroke patients benefit from carmaker's efficiency

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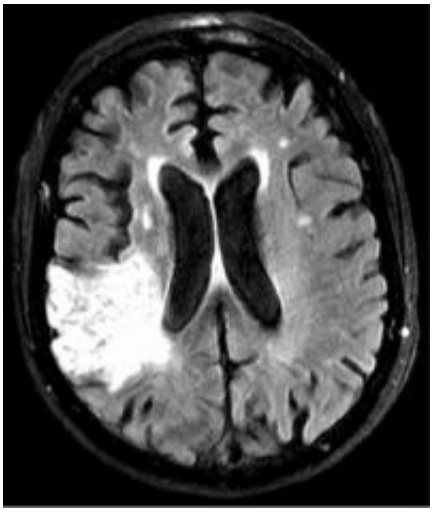

Physicians have sharply reduced stroke treatment time by applying a process for improving efficiency originally developed by carmakers. Early treatment helps prevent or reduce brain damage, shown in white in the scan. Credit: Jin-Moo Lee, MD, PhD

A process developed to increase efficiency and productivity in Japanese car factories has helped improve stroke treatment at Barnes-Jewish Hospital, report researchers at Washington University School of Medicine in St. Louis.

By applying the principles of Toyota's lean manufacturing process, doctors sharply reduced the average time between patient arrival and

treatment, known as door-to-needle time, from 58 to 37 minutes.

The findings are reported Oct. 18 in the journal Stroke. In an average year, the medical school's physicians treat 1,300 stroke patients at Barnes-Jewish.

Beginning stroke treatment earlier can help prevent the brain damage that causes paralysis and loss of speech after a stroke. The researchers say the drop in treatment time results from applying a key component of lean manufacturing to patient care: getting input from all members of the team to identify inefficient steps involved in the process.

"We sought suggestions from everyone involved, from the paramedics who bring in patients, to admitting clerks, radiology technologists, nurses and physicians," says senior author Jin-Moo Lee, MD, PhD, associate professor of neurology at Washington University School of Medicine in St. Louis and director of the cerebrovascular disease section in the Department of Neurology. "Once the inefficient steps were identified, we developed a completely new protocol that eliminated them. This new treatment protocol helped us achieve one of the fastest door-to-needle times in the country."

Barnes-Jewish has a dedicated stroke team capable of quickly evaluating and treating patients with tPA, which breaks up blood clots in the brain that cause strokes. The earlier it is given, the more effective tPA is at preventing permanent brain damage caused by stroke.

Because tPA can cause dangerous bleeding in the brain and throughout the body, the drug can no longer be given if too much time elapses after a stroke begins. At that point, its risk outweighs the potential benefit. Ideally, the drug must be given within 60 minutes after a stroke begins, a period known as the "golden hour."

"We already had very good door-to-needle times, but we thought that we could do better," Lee says. "So we put all of our team members in a room for two days and asked them to evaluate each step in the door-to-needle process."

Experts at Barnes-Jewish with experience using the principles of lean manufacturing in a healthcare setting helped facilitate the discussion.

"Identifying steps that are wasteful and do not add value is a primary goal of lean manufacturing," says David Jaques, MD, vice president of Surgical Services at Barnes-Jewish Hospital and a professor at the School of Medicine. "Lean has made it possible to speed the delivery of medication or blood, improve teamwork and communication and ensure that those caring for patients always have easy access to supplies and equipment."

One problem identified by the group was repeatedly moving patients from one location to another and back again. The staff decided it would be more efficient for paramedics to bring patients directly to the emergency department's CT scanner for evaluation rather than to a patient examination room.

The group also noted that some aspects of patient care performed in sequence instead could be carried out simultaneously with the addition of extra staff. With two treatment nurses per patient, for example, one nurse can put in an IV while another gets medications. A neurologist and an emergency department physician also were assigned tasks that could be performed at the same time to speed patient care.

"We also added new specialties to the treatment team," Lee says. "We asked social workers to help identify people who were with the patient when the suspected stroke began. While they are talking with family members or co-workers, we can begin the initial assessment."

Finally, lab work for the patients was taking too long.

"Where we could, we instituted lab tests that could be performed at the bedside in minutes instead of sending the blood to the lab and waiting 30 minutes or more for results," Lee says.

The new treatment procedures were implemented in February 2011. The changes not only lowered average door-to-needle times by nearly 40 percent, but they also increased the percent of patients treated within "the golden hour" from 52 - 78 percent.

After the new procedures were put in place, the researchers monitored patients for side effects of treatment, including hemorrhages, and to make sure the accelerated process did not result in more patients getting the clot-busting drug when they were later determined to be stroke free. Neither of these negative outcomes increased.

Accelerating door-to-needle times for stroke treatment is only one example of how lean principles can be applied to improve patient care. Barnes-Jewish has already used lean principles to improve the delivery of blood products to patients, enhance patient access to radiological procedures, create more efficient operating room procedures and shorten hospital stays, according to Jaques.

"Lean principles used in manufacturing can be applied to patient care to create a higher quality, safer and more efficient hospital," Jaques says.

More information: Ford AL, Williams JA, Spencer M, McCammon C, Khoury N, Sampson T, Panagos P, Lee J-M. Reducing door-to-needle times using Toyota's lean manufacturing principles and value stream analysis. *Stroke*, Oct. 18, 2012.