The “almost magical” mobile stroke unit revolution

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FACTS In acute stroke management, time equals brain. The benefit of IV recombinant tissue plasminogen activator (rtPA) is strongly time-dependent—maximal early after symptom onset, declining significantly during the next 4.5 hours. Consequently, ischemic stroke patients who present to the hospital within the first 60 minutes, the golden hour, of onset have the greatest opportunity to benefit from recanalization therapy. Because of the critical importance of rapid treatment, national recommendations for hospital emergency departments (EDs) that accept acute stroke patients include completing the clinical and imaging evaluation of the patient with an arrival-to-treatment initiation (door-to-needle) time of $\leq 60$ minutes. Yet, among acute ischemic stroke patients treated with rtPA within 3 hours of symptom onset in 1,082 hospitals participating in the Get With the Guidelines–Stroke Program (April 2003–October 2009), fewer than one-third of patients treated with IV rtPA had door-to-needle times $\leq 60$ minutes. With the current EMS system, just over half (55%) of Americans have access to a Primary Stroke Center within 60 minutes. Prehospital delay continues to contribute the largest proportion of delay time. A rapid triage allowing the accurate identification of those ischemic and hemorrhagic stroke patients who may benefit the most from acute therapies is a major challenge in our clinical practice.

REVOLUTION To improve the timeliness of early management in stroke, the almost magical “Mobile Stroke Unit” (MSU) has appeared. In this issue of Neurology®, Kostopoulos et al. report the preliminary experience of the MSU for prehospital triaging and treatment of suspected stroke. They describe 4 diverse stroke cases undergoing prehospital diagnostic stroke evaluation at the scene of the event, thus allowing reliable triage to target destinations. This report documents the first delivery of IV rtPA for acute ischemic stroke after head CT scan in the MSU in the prehospital phase of acute stroke.

The MSU concept offers a solution to the “time” issue in stroke management, providing evidence of the feasibility of a new era in EDs and EMS triage. Analogous to trauma systems, stroke cases could be taken directly to the most appropriate destination, bypassing potential delays of subsequent transfers. Any patient with hemorrhagic stroke could bypass hospitals without neurosurgical coverage while a telemedicine system on the rig could help achieve a prompt and more accurate, detailed assessment by EMS.

PROMISES The MSU is not just a mobile CT scanner—it is a mobile ED with both stroke and emergency personnel, telemedicine and point of care diagnostics, facilitating truly acute, remote diagnosis and management of stroke. This capability presents new opportunities and challenges to stakeholders to make clinical information, appropriate imaging, and laboratory data readily available, rapidly processed, and accurately interpreted.

Along with earlier diagnosis to implement rtPA treatment, earlier blood pressure management (likely to differ in ischemic vs hemorrhagic stroke) may also improve outcome. Treating acute stroke immediately at the site of the event has the potential to limit brain damage beyond our current systems of care, thereby further reducing disability and long-term costs for stroke care.

Delay in hospital-to-hospital transfer is a common reason that acute ischemic stroke patients are
excluded from interventional therapy. The likelihood of receiving intra-arterial therapies decreases rapidly with increasing transfer time.\(^9\) The MSU could improve this scenario as well as facilitating clinical trials as delayed time to delivery of experimental therapy has hindered past trials.\(^{10}\)

**UNCERTAINTIES AND LIMITATIONS**

Next steps in the “revolution” must address the myriad of practical issues that would bear on applying this method beyond this pilot “demonstration” project. European and American health systems are different, potentially limiting the generalizability of these preliminary results to one side of the Atlantic. A similar report of feasibility is necessary in the United States. Applying this approach in a larger population or geographic area would require more than 1 MSU, cooperation of EMS personnel, and overall an impeccable coordination within the system to overcome logistical issues. Randomized trials will have to show significant differences between the onset-to-treatment times achievable by the MSU and the standard triaging system and how this difference eventually relates to improved clinical outcomes. Cost-effectiveness of the MSU will need to be studied and compared with other strategies of remotely triaging stroke patients including the use of telestroke alone.\(^{11}\) Financial sustainability is a major issue.

In brief, critical barriers to this revolutionary approach are logistical and financial. “A difference to be a difference must make a difference …”; therefore, further studies are needed to establish the short- and long-term benefits in clinical outcomes.

The ongoing technology revolution has profoundly penetrated into society. Health care research must follow. Big high-tech companies should engage these “visionary” projects that herald the promise of bringing life-enhancing and even life-saving innovations to people who most need them. From magical thinking to a true paradigm shift is the stuff of dreams but might also be the stuff of genius that changes the world.

**DISCLOSURE**

The authors report no disclosures relevant to the manuscript. Go to Neurology.org for full disclosures.

**REFERENCES**