Mobile apps: an emerging tool to improve acute stroke care

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In acute illnesses like stroke the treating team has to coordinate a complex care plan efficiently, within a limited time frame. This makes the consistent delivery of high-quality care a challenge. International guidelines recommend that the 'door-to-needle time' for intravenous thrombolysis in acute ischemic stroke should not exceed 1 hour.[1,2] However, a recent review noted that less than one-third of patients receive treatment within this stipulated time.[3] There is, therefore, room for improvement in the delivery of acute stroke care.

Approaches to reducing the door-to-needle time, including improving patient movement times and administering the drug in the imaging room, have been tried with varying success. An example is the 'Helsinki model', which was reported to improve door-to-needle times by 25 min in Melbourne.[4] This included 1) prenotification from the ambulance of patient details, alerting the stroke team to meet the patient on arrival; 2) patients transferred directly from triage onto the CT scan table on the ambulance stretcher; and, 3) tissue plasminogen activator delivered in CT scan room immediately after imaging. These approaches are, however, limited by availability of suitable manpower and resources, and are yet to overcome logistical difficulties in all settings. Several studies have reported on the challenges of achieving a short door-to-needle time from various centres.[5,6]

In this context, the current widespread availability of smart phones and connected devices provides an opportunity to exploit their unique capabilities for improving the aforementioned aspects and, thereby, optimise the execution of such acute care pathways.

We have had experience with the development and use of a mobile application (app)-based strategy to optimise acute stroke care at our centre since 2017 (now available for download and trial from www.mcareapps.com). For the previous several years we had been struggling to keep the door-to-needle time for intravenous thrombolysis in acute ischaemic stroke under the recommended 1 hour. Our large tertiary care hospital in South India is spread over three blocks, with the emergency department and imaging centres located in separate buildings. The strategy was to use the mobile app to enable the clinicians in the emergency department to enter the patient details, National Institutes of Health stroke scale and start a timer, which immediately notifies all team members, including the stroke neurologist, radiologist and interventionist, who could then open the app from their site and follow the progress of the patient. As the patient was moved to imaging and results were available they could also be instantly communicated to the entire team. Thereby, the team members were up to speed regarding the patient's progress and could plan their timely entry into the appropriate care pathway (Figure 1).

Over the 1.5 years after deploying the app we had an improvement of mean door-to-needle time from 57 to 41 min, which was statistically significant, and the percentage thrombolysed under 1 hour improved to 89% from 67%.[7] An average improvement of 16 min in door-to-needle time was thus achieved, which would amount to around 32 million neurons.[8] The app helped to improve team performance and identify causes of delay.

Mobile apps are an emerging tool to improve thrombolysis programmes in stroke centres. There have been other reports of mobile apps being successfully deployed with similar results.[9,10] Increased visibility of team performance and immediate feedback from the app are additional motivators for improvement.

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Figure 1 App screenshots show screens for (a) entry of patient details, (b) imaging results, (c) notifications and (d) the view for the remote team members
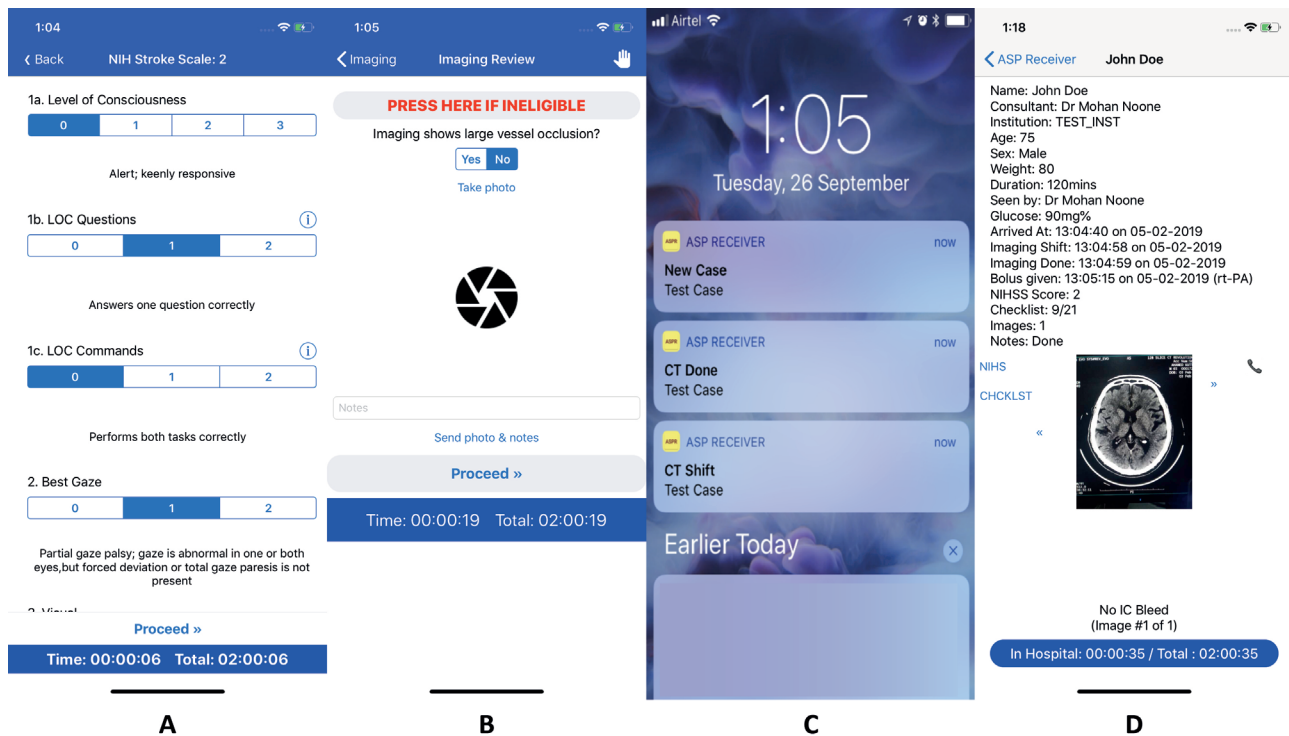
Stroke care is unique in that a considerable amount of evaluation over separate facilities is required in a relatively narrow window, thereby making such a mobile app-based strategy especially valuable. Similar app-based solutions are already available for myocardial infarction, trauma and sepsis. We envisage extended usage of similar apps in many other subspecialties of medicine.

References

1   Alberts MJ, Hademenos G, Latchaw RE et al. Recommendations for the establishment of primary stroke centers: Brain Attack Coalition. *JAMA* 2000; 283: 3102–9.

2   American Heart Association/American Stroke Association (2011). The Get With The Guidelines® – Stroke (GWTGStroke) program. http://www.strokeassociation.org/STROKEORG (accessed 14/09/13).

3   Fonarow GC, Smith EE, Saver JL et al. Improving door-to-needle times in acute ischemic stroke: the design and rationale for the American Heart Association/American Stroke Association's Target: Stroke initiative. *Stroke* 2011; 42: 2983–9.

4   Meretoja A, Weir L, Ugalde M et al. Helsinki model cut stroke thrombolysis delays to 25 minutes in Melbourne in only 4 months. *Neurology* 2013; 81: 1071–6.

5   Fonarow GC, Smith EE, Saver JL. Timeliness of tissue-type plasminogen activator therapy in acute ischemic stroke: patient characteristics, hospital factors, and outcomes associated with door-to-needle times within 60 minutes. *Circulation* 2011; 123: 750–8.

6   Mikita M. Reducing door-to-needle time for tPA use remains an elusive goal in stroke care. *JAMA* 2011; 305: 1288–9.

7   Noone M, Moideen F, Krishna RB et al. A mobile app based strategy to reduce door to needle time in acute ischemic stroke. World Stroke Congress Abstracts, 2018. *Int J Stroke* 2018; 13: 3–217.

8   Saver JL. Time is brain – quantified. *Stroke* 2016; 27: 263–6.

9   Dickson RL, Sumathipala D, Reeves J. Stop stroke© acute care coordination medical application: a brief report on postimplementation performance at a primary stroke center. *J Stroke Cerebrovasc Dis* 2016: 25: 1275–9.

10 Shkirkova K, Akam EY, Huang J et al.; UCLA Stroke Systems of Care Study Group. Feasibility and utility of an integrated medical imaging and informatics smartphone system for management of acute stroke. *Int J Stroke* 2017; 12: 953–60.