

Doctors in Training Grant

PRELIMINARY REPORT



PhD supervisors and Mobile Stroke Unit medical staff. From left: Prof Geoffrey Donnan (external supervisor), A/Prof Bruce Campbell, Prof Stephen Davis, Dr Henry Zhao (me), Dr Nawaf Yassi. Absent: Prof Patricia Desmond

Dr Henry Zhao

**Doctor of Philosophy (PhD)
in Clinical Acute Stroke Medicine**

**University of Melbourne
and Melbourne Health**
Melbourne, Australia



I cannot imagine a more exciting time to be undertaking clinical stroke medicine. The field is constantly evolving and is now far removed from the irrecoverable and hopeless stigma that it once carried. In fact, it has only been a few years since stroke introduced one of the most powerful treatments known to medicine, endovascular clot retrieval, where major arterial occlusions are mechanically removed and patients walk home the next day from a stroke that used to be fatal.

I am completing a Doctor of Philosophy at the Royal Melbourne Hospital (RMH) Comprehensive Stroke Centre with the University of Melbourne. RMH was Australia's first comprehensive stroke centre and an internationally renowned centre of research excellence that delivered one of the pivotal clinical trials that cemented the adoption of endovascular clot retrieval. I am lucky to work with superb supervisors who are internationally recognised and perform cutting edge research in advancing acute stroke care.

I am intimately involved as clinical coordinator of one of the most exciting new advances in stroke – the Melbourne Mobile Stroke Unit. This is a specialised ambulance that is fitted out with a portable CT scanner and carries a multidisciplinary team (including me as one of the neurologists onboard) able to assess and immediately start treatment at the patient's doorstep. To understand the importance of this, I must impress upon you just how critical early treatment of stroke is, with 1.9 million brain cells (neurons) lost for every minute of delay. Having the Mobile Stroke Unit come to a patient's house will halve the time from when triple zero is called to starting treatment such as clot-busting drugs. When every minute counts in saving patients from a life of disability, starting treatment onboard the Mobile Stroke Unit will buy precious time and minimise irreversible brain damage from stroke.

The Mobile Stroke Unit will be based at Royal Melbourne Hospital but will be dispatched by Ambulance Victoria to a radius of 20 kilometres from central Melbourne. Operational shifts are 8am to 7pm, Monday to Friday with future plans to also run on weekends. There will be five team members on board – two paramedics, a stroke neurologist, a stroke nurse specialist and a CT radiographer.

Using the portable CT on board, we will be able to complete a hospital grade scan of the brain to enable us to diagnose what type of stroke (clotting or bleeding) a patient has. The Mobile Stroke Unit will then allow us to administer a full suite of acute stroke treatments, equivalent to that of a hospital emergency department.

With treatment started, we will be able to speed the patient to the nearest stroke hospital, or instead rush off to the nearest mechanical clot retrieval or neurosurgical hospital as needed.

The project is chaired by my supervisors Prof Stephen Davis and Prof Geoffrey Donnan and involves many stakeholders – Royal Melbourne Hospital, Ambulance Victoria, The University of Melbourne, The Florey Institute of Neuroscience and Mental Health, the Stroke Foundation, and Victorian and Australian Commonwealth Governments just to name a few. The vehicle is currently being built in Penguin, Tasmania by an Australian manufacturer based there. The chassis and box body is a similar model to other complex Ambulance Victoria ambulances but the interior is a complete redesign from scratch. We have been working very closely with Ambulance Victoria engineers and the vendors supplying the CT scan and 4G communication hardware to ensure that it will meet our operational requirements. Key challenges have been how to securely fix the half tonne CT scanner during transport and managing radiation safety in the field. This is also the only current ambulance service where paramedics will work closely alongside hospital doctors and nurses who are not used to working in the community, so it will be a big learning experience for everyone.

The most exciting part for research is that the Mobile Stroke Unit will allow me to perform studies that were previously unthinkable. The average patient arrives in hospital two and a half hours after symptom onset and very few can be treated within the important first hour – the so called ‘golden hour’ where we think stroke can be most easily treated and reversed. When similar Mobile Stroke Units have been used overseas, the number treated in the first golden hour rose to a staggering 40%.

This therefore allows us for the first time to study patients in the ultra-early stages of stroke. We will conduct a study of a drug used commonly to stop bleeding in patients after surgery to see if this can also stop a bleeding stroke, if given within the first few hours. If successful, this will be the world first treatment for this debilitating condition. The study crucially depends on the Mobile Stroke Unit, as bleeding into the brain is fastest soon after the stroke starts. If patients are given treatment too late, the bleeding has already slowed and treatment will no longer alter prognosis.

Another novel study that we will be conducting on the Mobile Stroke Unit is recording how the symptoms of patients vary in ultra-early stroke. We think symptoms are very much related to important information about their stroke, such as what type of stroke they have and how good backup blood supply is.

Stroke doctors currently focus on symptoms present on arrival to hospital with little regard to the dynamic nature of symptoms. If we can better inform them about the important information that ultra-early symptoms carry, then patients will receive better care at the end of the day.

Many other research projects are planned, including trialling newer, better and easier to use drugs to dissolve clotting strokes and designing a blood test machine to detect certain types of stroke. We are also collaborating with our international research partners to conduct joint studies on Mobile Stroke Units in Europe and the USA. The opportunities are simply endless and the Mobile Stroke Unit has really opened up a new field of research in pre-hospital stroke medicine.

We expect operation late in the third quarter of 2017 and I look forward to updating you all on our experiences then.



1. Mock-up of the livery of the vehicle (not finalised)
2. Our portable CereTom CT scanner at the factory in Penguin, Tasmania
3. Wooden mock-up of the internal fit-out in Penguin, Tasmania

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