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## Improving outcomes for rural stroke patients: a South Australian success story

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We need to design a system where everyone who is eligible can access hyper-acute stroke services; this should not be determined by age or postcode. (A/Prof Timothy Kleinig, Head Stroke Unit, Royal Adelaide Hospital and Country Health South Australia Local Health Network Clinical Director Stroke).

### Background

Stroke is one of the leading causes of death and disability for Australians, with approximately 100 people experiencing a stroke on any particular day (Australian Institute of Health and Welfare 2018). People living in regional and remote areas of Australia are 19% more likely to experience a stroke than those living in metropolitan areas<sup>1</sup>. During 2016/17, 1078 country residents were admitted to an SA public hospital because of a stroke. The *No Postcode Untouched—Stroke in Australia* outlines the challenges of provision of acute stroke care for all Australians and highlights the fact that ‘Patient outcomes from stroke vary widely depending on where you live and your access to a stroke unit’.<sup>2</sup>

Rapid access to specialist stroke care is vital to ensure strokes are adequately diagnosed and treated. Different sorts of strokes require different treatments, and these treatments can only occur following medical assessment and neuroimaging (usually a CT (computed tomography) scan).

Most strokes (80%) are ischaemic, caused by a vessel occlusion, and rapid reperfusion therapy (by thrombolysis and/or endovascular thrombectomy (EVT)) can in many patients limit the damage caused by vessel occlusion, if administered in a timely fashion<sup>3,4</sup>.

Prior to 2018, people experiencing a stroke in country South Australia were able to access registrar-supported acute stroke treatment advice for thrombolysis (+/- EVT) at only three country hospitals, Mount Gambier, Whyalla and Riverland General (Berri) Hospitals, and only in ‘business hours’ (between 830–430, Monday to Friday).

However, there are 61 public hospitals in country South Australia with community and acute health services provided in approximately 220 sites. Covering 1 million square kilometres, Country Health SA Local Health Network (CHSA) is the largest geographical health service in SA and the second largest in Australia behind WA. CHSA provides services to a population of more than 470,000 people. Of the 61 public country hospitals, 12 have neuroimaging (CT scan) capacity with vast distances between a majority of the larger centres and from Adelaide.

Given that country patients faced such restricted access to stroke treatments, and given that recent trials have demonstrated the benefit of EVT in selected patients up to 24 hours' post-onset<sup>5</sup> we redesigned our stroke systems of care with the goal of minimising rural-metropolitan stroke treatment disparities.

## Method

CHSA in partnership with metropolitan Stroke Units, Neurologists, SA Ambulance Service (SAAS), MedSTAR and country clinicians and consumers sought to design and evaluate a whole-of-state telestroke service in SA integrated simultaneously with expansion of thrombolysis treatment hours to 24/7 in the three country stroke services. With the assistance of SAAS, stroke patient pathways were improved (either to the closest country acute stroke service or a metropolitan stroke unit.)

This was supported by the development of consistent pathways and protocols, by stroke education for country clinicians, by the parallel roll-out of the digital telehealth network to all SA country hospital emergency areas, and by the installation of telehealth software on supporting clinician's digital devices (laptops and mobile phones).

In addition, Tenecteplase for thrombolysis eligible patients with proven or suspected large vessel occlusion was introduced.

This process 'went live' from June 2018, supported by a 24/7 telestroke roster of Adelaide-based vascular neurologists. All rural stroke patients potentially eligible for reperfusion therapies were assessed remotely by a metropolitan stroke neurologist, using the Digital Telehealth Network (DTN) videoconference system and remote access to neuroimaging (where available). This assisted clinicians at country hospitals in determining the best care pathway for each patient, in administering treatment locally and/or initiating timely transfer of the patient to an appropriate hospital.

The results of each consultation and associated treatment recommendations were recorded and supplied to the treating rural clinician.

## Results

In the first two 'pilot' months of operation (ie June and July 2018) 36 consults occurred for 35 patients. Stroke mimics comprised nearly a third (11 consults). Following 25 consults for 24 stroke patients, 8 (33%) received reperfusion therapy—3 both EVT and thrombolysis, 3 EVT alone and 2 thrombolysis alone. Following the 36 consults, 1 patient (3%) required a metropolitan transfer that otherwise might not have occurred and 12 underwent expedited transfer (33%). These transfers were offset by another 12 patients (33%) for whom transfer was avoided, and 1 patient who was transferred to a more appropriate service (a non-endovascular centre, with pathways to country rehabilitation).

The whole of state telestroke service has led to a substantial percentage (33%) of acute stroke patients from country SA accessing acute stroke treatments they otherwise would not have received. This did not appear to increase transfer rates to Adelaide, although some extra expedited transfers occurred. It is likely that additional retrieval and metropolitan hospital costs are more than offset by avoiding transfers through provision of a non-stroke diagnosis.

The pilot program has therefore been continued, and as of October 2018, 75 patients had been supported by the 24/7 telestroke support service.

## Impact for patients and country clinicians

Examples of the immediate impact of this service change on peoples' lives and for country clinicians

Thanks—my first time using the video conferencing (for stroke)—brilliant service! Thanks so much for your help. (country GP)

..so glad to hear it went well for the patient. I was worried that even our best efforts may succumb to the tyranny of distance. Port Lincoln did an amazing job. And agree, us in Medstar absolutely love the [emergency area configuration cameras linked to the Digital Telehealth Network videoconferencing system] as well. (Chief Medical Officer, SA Ambulance Service and Senior Staff Specialist SAAS MedSTAR Emergency Medical Retrieval Service)

Bruce Martin, a 53-year-old working in a remote part of Yorke Peninsula, 266 kms or over 3 hours' drive from Adelaide credits the country stroke service with saving his life:

Luckily for me, the staff at Yorketown Hospital made immediate contact with the...stroke service and I believe that saved my life. Because there was specialist support on hand immediately I was transferred to the RAH and walked out of the stroke unit just four days later with no ongoing affects.

## Rapid translation of research into practice

Research published in April 2018<sup>6</sup> on the superiority of the thrombolytic Tenecteplase over Alteplase in stroke patients presenting with 'large vessel occlusion' strokes prior to clot removal has been rapidly translated into practice in country SA resulting in immediate benefits for patients.

Essentially all rural hospitals in SA have access to Tenecteplase but not Alteplase.

Tenecteplase is easier to administer than Alteplase and many clinicians are already familiar with using it for cardiac patients. Given the proven superiority of this treatment for patients with large vessel occlusion SA stroke clinicians decided that Tenecteplase should be authorised for use in country hospitals under metropolitan stroke clinician guidance (when a CT scan has excluded haemorrhage and a large vessel occlusion is proven or suspected).

Therefore, during 2018, education was provided to medical staff at designated country hospitals which had previously not been thrombolysis centres, but where there was access to neuroimaging (ie Port Lincoln, Port Augusta, Port Pirie and Naracoorte). This included the latest evidence in acute stroke management focusing on the rationale for Tenecteplase. A Readiness Checklist was developed to assist sites to prepare for this change of practice and to become Country Stroke Thrombolysing services. Following a period of consultation, alterations have been made to the existing drug management protocol to include both indications for Tenecteplase and communicated to all country clinicians.

One example that highlights the impact of the translation of this evidence into clinical practice is the story of Janette a 76 -year-old old woman from Yorke Peninsula who had a stroke. Her husband noticed something was wrong and took her straight to the Wallaroo Hospital. Janette was assessed by the doctor and sent for a brain scan (CT). A phonecall was made to the 24/7 stroke support line to connect with a metropolitan neurologist.

The metropolitan Stroke Neurologist on the 24/7 telestroke service linked into the Wallaroo Hospital emergency area via his laptop and the digital telehealth network to assess Janette and provide

support to the local clinicians. The Neurologist was also able to remotely access the brain scan (CT image). Jeanette had complete aphasia and a dense hemiparesis. Imaging demonstrated a terminal internal carotid artery clot, an occlusion which leads to a death or nursing home disability in 70-80% of cases.

I can't remember half of my time at Wallaroo Hospital, but I remember the nurses at Wallaroo dialling into a specialist at the Royal Adelaide Hospital. The specialist asked me a range of questions over the video conferencing equipment, and determined I should be airlifted to Adelaide. Within 40 minutes, I was on my way in a helicopter for treatment at the RAH [Royal Adelaide Hospital]. (country stroke patient).

The locum country GP was guided by the neurologist about appropriate treatment including the administration of Tenecteplase to optimise blood flow to her brain. Retrieval to the RAH was initiated via a conference call to the Emergency Operation Centre at SA Ambulance Service. MedSTAR were able to dispatch a helicopter to airlift Janette from Wallaroo to the RAH.

When I was met by the stroke team in Adelaide, there were so many people waiting for me I felt like royalty.

Imaging demonstrated that Tenecteplase, while not dissolving the clot completely, had shifted the clot from the carotid terminus to the middle cerebral artery, improving blood flow to the brain sufficiently to keep the brain temporarily viable. Janette underwent a clot retrieval, removing the clot that was blocking blood supply to her brain.

Once in Adelaide, I had a series of tests, before going into surgery and having my clot removed. I was kept in hospital for two nights, before being discharged.

Janette was able to walk out of the RAH two days later with only minor weakness in her right side, from a stroke which probably would otherwise have resulted in her requiring nursing home care or potentially her death.

## Discussion, lessons learned and enablers

Since February 2018, CHSA has been fortunate to have the clinical leadership of Associate Professor Tim Kleinig, Head of Neurology at the Royal Adelaide Hospital and Clinical Director, Stroke CHSA.

Tim's expertise in the area of stroke assessment and treatment as well as his involvement in stroke research has enabled Country Health SA to keep up with the latest developments in stroke care and country consumers to be able to access treatment options that were previously not available.

Being able to quickly identify patients who are eligible for the different treatments is crucial to ensure treatment is started locally within clinical timeframes and/or the patient is transferred in a timely manner. With stroke; Time = Brain.

For eligible country stroke patients, this service change has resulted in:

- improved access to timely clinical assessment, treatment options closer to home (including thrombolysis)
- improved pathways to thrombectomy
- preservation of function and reduced disability post stroke

- prevention of transfers when a non-stroke diagnosis was made

Through support provided by neurologists for country clinicians and stroke patients (via telephone and videoconference), faster and more accurate decision making is enabled. The use of telehealth/videoconferencing is especially important for sites where there are no CT scanning facilities available. Being able to videoconference with a neurologist allows the neurologist to remotely examine the patient and better determine the best care pathway.

Like the successful Victorian Stroke Telemedicine initiative<sup>7</sup>, the South Australian model provides remote neurologist support via videoconference for country clinicians and stroke patients. South Australia was able to utilise the existing Digital Telehealth Network which significantly reduced set-up costs, with the funding required for the additional after-hours Neurologist roster easily off-set by the significant savings realised through reduced need for long-term rehabilitation for patients and when transfers not required.

The effective implementation of this model has relied greatly on the availability of metropolitan Neurologists with subspecialty interest in stroke and their willingness to participate in a roster, independent of their metropolitan commitments. Activity has approximately doubled since the pilot period (and is likely to continue to increase). It is therefore important for the service to be closely monitored and appropriately resourced and funded to ensure ongoing vascular neurology commitment.

The state-wide approach to acute stroke management has enabled all stroke patients, no matter where they live, to be assessed, treated and/or transferred, improving efficiency and more significantly, outcomes for stroke patients. This enhanced stroke service allows appropriate patients to be selected for retrieval to Adelaide while allowing others to access specialised stroke care closer to home.

This model is highly transferable to other rural and regional areas across Australia. It is a useful model for many other clinical areas where a majority of the specialist services and expertise is based in larger centres and cities (such as Adelaide) and for other time critical services (for example trauma, complex medical conditions, cardiology, burns). Partnerships with skilled local clinicians are an essential element to ensure quality assessment and treatment plans can be undertaken.

## Recommendation

Appropriately resourced Telestroke services are required across Australia, to support all rural and remote areas 24 hours a day and seven days per week.

## References

1. Australian Institute of Health and Welfare, Australia's Health 2018: in brief, 2018
2. National Stroke Foundation, No Postcode Untouched, 2017
3. Emberson J, Lees KR, Lyden P et al, Effect of treatment delay, age and stroke severity on the effects of intravenous thrombolysis with Alteplase for acute ischaemic stroke: a meta-analysis of individual patient data from randomised trials. *Lancet*. 2014; 384: 1929-1935.
4. Goyal, M, Menon, BK, van Zwam, WH et al, Endovascular thrombectomy after large-vessel ischaemic stroke: a meta-analysis of individual patient data from five randomised trials. *Lancet*. April 2016; 387: 1723-1731.

5. Nogueira, RG, Jadhav, AP, Haussen, DC et al, Thrombectomy 6 to 24 hours after stroke with a mismatch between deficit and infarct. The New England Journal of Medicine, November 11, 2017, Vol 378: 11-21
6. Campbell, B.C.V, Mitchell, P.J, Yassi, N, Kleinig, T et al, Tenecteplase versus Alteplase before Thrombectomy for Ischaemic Stroke, The New England Journal of Medicine, April 26, 2018, Vol 378, No 17.
7. Bladin, CF, Molocijz N, Ermel, S et al. Victorian Stroke Telemedicine Project: implementation of a new model of translational stroke care for Australia. Internal Medicine Journal, 2015, Vol 45, 9, 951-956

## Presenter

**Karen Dixon** is the Manager Strategic Clinical Change for Country Health SA Local Health Network where a key aspect of her role is to identify and facilitate innovative opportunities for improving access to health services for people living in rural and remote South Australia. She oversees a range of programs and change processes while strongly advocating for country consumers and health workers. Karen seeks innovative ways to overcome the challenges faced by the tyranny of distance, with recent examples being the successful implementation of telehealth for acute stroke management and home tele-monitoring for people living with a chronic condition(s) in country SA. Karen has a background in occupational therapy and a strong commitment to reducing the disparities between health outcomes for people living in rural areas as compared to people living in cities, as evidenced by the 17 years she has worked in rural health.