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The International comparison of Systems of care and patient outcomes In minor Stroke and Tia (INSIST) study: a community-based cohort study.

Cover title

TIA and minor stroke in community practice

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Abstract

Rationale

Rapid response by health-care systems for transient ischaemic attack and minor stroke (TIAMS) is recommended to maximize the impact of secondary prevention strategies. The applicability of this evidence to Australian non-hospital-based TIAMS management is uncertain.

Aims

Within an Australian community setting we seek to document processes of care, establish determinants of access to care, establish attack rates and determinants of recurrent vascular events and other clinical outcomes, establish the performance of ABC2-risk stratification, and compare processes of care and outcomes to those in the UK and New Zealand for TIAMS.

Sample size estimates

Recruiting practices containing approximately 51 full-time-equivalent general practitioners to recruit 100 TIAMS per year over a 4-year study period will provide sufficient power for each of our outcomes

Methods and design

An inception cohort study of patients with possible TIAMS recruited from 16 general practices in the Newcastle-Hunter Valley-Manning Valley region of Australia. Potential TIAMS will be ascertained by multiple overlapping methods at general practices, after-hours collaborative, and hospital in-patient and outpatient services. Participants' index and subsequent clinical events will be adjudicated as TIAMS or mimics by an expert panel.

Study outcomes

Process outcomes: whether the patient was referred for secondary care; time from event to first patient presentation to a health professional; time from event to specialist acute-access clinic appointment; time from event to brain and vascular imaging and relevant prescriptions

Clinical outcomes: recurrent stroke and major vascular events; and Health-Related Quality of Life.

Discussion

Community management of TIAMS will be informed by this study.

Introduction and rationale

Transient ischaemic attack and minor stroke (TIAMS) comprise approximately 40% of all episodes of brain ischaemia^{1,2} and carry a significant risk of disabling or fatal stroke.³ Much of the stroke risk occurs very early after TIAMS⁴ and rapid specialist assessment and intervention has been shown to reduce this risk.^{5,6} Therefore a rapid response within the system of care for TIAMS is required to maximize the impact of secondary prevention strategies.^{6,7} Based on this international evidence, current Australian guidelines recommend universal rapid-access to specialist care.⁸

There are uncertainties regarding compliance with these guidelines and with the applicability of the current evidence and guidelines to the contemporary management of TIAMS in Australia beyond the hospital secondary care setting.

Rapid-access acute neurovascular clinics, one preferred model,⁶ were only available in 38% of Australian hospitals in 2015⁹ compared with 98% of UK hospitals 2010.¹⁰ Even in Australian areas with rapid-access clinics, service utilization is uncertain. Extrapolation of figures for populations served^{11,12} and TIAMS seen^{4,13} in acute neurovascular clinics in Oxfordshire and the Hunter region of Australia (where TIAMS are infrequently admitted to hospital) suggest that the majority of TIAMS in this Australian region are not referred for rapid-access management. Thus it is not clear if improvements in TIAMS outcomes evident in regions with more ready access to stroke specialist care⁷ are applicable to health systems such as Australia's.

There are uncertainties concerning TIAMS management and compliance with national guidelines in Australia. These include:

1. Contemporary management and processes of care for TIAMS have not been well characterized in Australia nor have they been compared to international benchmarks

2. The performance of the Australian health care system in the management of TIAMS has not been examined in sufficient detail to inform or update local guidelines and health policy. Variations in models of care, access to stroke specialist diagnostic and management support, factors influencing processes of care including resource utilization and comparison to the UK-based models (currently an important source of evidence for Australian guidelines) have not been evaluated.
3. The clinical outcomes of TIAMS have not been defined nor have the guideline-recommended tools for risk stratification been validated in contemporary Australian populations, where geographic access to specialist care can be limited and many elements of management need to be undertaken in primary care (contrary to the current Australian guideline recommendations⁸).

The aims of the International comparison of Systems of care and patient outcomes In minor Stroke and Tia (INSIST) study are to answer research questions related to these evidence gaps. Specifically:

1. What is the process of care for a prospective cohort of possible TIAMS patients interacting with the Australian primary and secondary care systems?
2. What are the determinants of access to care?
3. What are the determinants of recurrent vascular events?
4. What is the applicability of the internationally derived risk stratification tool ABCD2¹⁴ to management and referral processes in Australia?
5. How does the process of care for TIAMS in Australia influence clinical outcomes?
6. How do processes of care and outcomes for TIAMS in Australia compare to those in the UK and New Zealand?

Methods

Design

INSIST is an inception cohort study in which patients with possible TIAMS are followed for 12 months post-index event. INSIST records patients' outcomes and their interactions with health care systems.

Patient population

Participants will be recruited from the Hunter and Manning valleys regions of New South Wales, within the referral territory of the Acute Neurovascular Clinic (ANVC) at the John Hunter Hospital (the major teaching and referral hospital of the Hunter New England Local Health District). These patient participants will attend one of 16 general practices within the Hunter New England and Central Coast Primary Health Network (HNECCPHN). The HNECCPHN population includes 18.3% aged 65+ years (compared to 14.4% nationally) and has prevalence of diabetes (4.9%) lower than nationally (5.4%) and of circulatory system disease (18.5%) higher than nationally (17.3%).¹⁵ INSIST will recruit urban (11) and rural practices (5) – including rural practices (2) in which general practitioners (GPs) staff the local hospitals.

Recruitment, detailing and further engagement of general practices

Practices will be recruited by initial contact with individual GPs, the sampling frame being the membership list of the Hunter Medicare Local, a comprehensive list of GPs in the Hunter region. Subsequent recruitment processes are adapted to variability in practice size, organisation, governance and processes across the region. A requirement of recruitment is that the practice assign a practice nurse to work on the study.

Once a practice has agreed to participate in the study, a study investigator (PM) will visit the practice to orient the designated study practice nurse to the project. The study research manager (DQ) will then visit the practice to deliver comprehensive study procedures training

to the study practice nurse, including ascertainment strategies and data collection procedures.

Awareness of the study and of methods will be maintained with regular visits to recruiting practices by study investigators (CL, PM, DL) and periodic meetings with participating practice nurses where the progress of the study will be reviewed, organisational issues discussed, and clinical education on recognition of difficult TIAMS scenarios provided.

Ascertainment of events and recruitment of patients

The study aims to recruit all patients with possible TIAMS to ensure full case ascertainment. All patients where the attending GP considers TIAMS a possible diagnosis will be invited to participate. This strategy reflects the 'real world' clinical difficulty for GPs in distinguishing TIAMS from mimics¹⁶ and evidence that the incidence of transient neurological symptoms in the population is substantially greater than the specialist-diagnosed incidence of TIA in hospital-based and population-based studies.^{17,18} Furthermore, there is evidence of variation in the description of TIAMS features. Less conventional features of presentation are increasingly noted to be important where 'the physical phenotype of stroke that is used as the basis for clinical description of TIA may not capture all of the available diagnostic information'.¹⁹

Patients will be identified as potential entrants to the study cohort by multiple overlapping methods (see Appendix 1).

Study participant inclusion and exclusion criteria are detailed in Appendix 2

Recruitment of patients will be undertaken August 2012 to August 2016. Recruitment procedures are detailed in Appendix 3

Data collection

As far as possible data to be collected is harmonised with the Oxford (UK) and Auckland (New Zealand) based OXVASC²⁰ and ARCOS²¹ studies to enable international comparisons of systems of care for TIAMS.

Participant data

Participants will undergo baseline interview and follow-up interviews at three- and 12-months post-baseline assessment. The interviews will be either via phone or home-visit, depending on the participant's functional status. For details of participant data collected, see Appendix 4

Following collection of baseline data, index events will be adjudicated as stroke, TIA or a TIAMS mimic. The adjudication panel consists of three medical clinicians, at least one of which is a stroke physician and at least one of which is a GP. The adjudication panel will assess available information on the participant and index event, including the participant and witness narratives of events, past medical history/vascular risk factors, medications, imaging and other test results, general practice consultation notes, referral letters, specialist consultation notes, and emergency department or hospital discharge letters.

The nature of each TIAMS mimic will be adjudicated, as will be the territory of the TIAMS or mimic e.g. anterior (cortical, subcortical, retinal, uncertain) or posterior circulation. If the participant is adjudicated to have had a TIAMS, the likely mechanism will be determined using the TOAST classification²²

Practice data

Practice data collected will include practice size (both individual and full-time-equivalent GP numbers), rurality/urbanicity index of the practice,²³ after-hours care arrangements, practice GP staffing arrangements in the local hospital, and distance from the practice to the ANVC.

Hypotheses

1. That the majority of TIAMS patients in the Hunter region are managed exclusively in primary care.
2. That rural dwelling, lower socio-economic status and advancing age will be associated with lower rates of referral to specialist care.
3. That specialist care will demonstrate greater adherence to guideline-recommended investigation and management in comparison to exclusive GP management specifically for:
 - a) Brain imaging
 - b) Vascular imaging
 - c) Immediate anti-platelet, blood pressure and statin therapy
4. That referral to specialist care will result in lower recurrent vascular event rates.
5. That referral to specialist care will result in greater quality of life
6. That rates of recurrent vascular events will be lower than those in the international cohorts
7. That rates of recurrent vascular events will be higher in lower SES bands.
8. That the processes of care (time from event to presentation, time from presentation to referral to secondary care, time to secondary care assessment) will be associated with -
 - a) Risk stratum (ABCD2); b) Patient factors (age, SES status, risk factors and co-morbidities); c) Practice factors (geographical location, size of practice, out-of-hours care arrangements)

Outcome measures

Process and clinical outcomes will be determined.

- a) Process measures
- Whether a patient is referred for secondary care or is managed entirely in general practice.

- Time from event to first presentation to a health professional.
- For participants referred to the ANVC: time from event to clinic ANVC appointment. This composite outcome entails other study outcomes - time from first patient presentation to referral to the ANVC, time from event to referral, time from referral to ANVC appointment.
- Time from event to receiving brain imaging, vascular imaging and prescriptions of anti-platelet, anti-coagulant, antihypertensive and statin medications.

b) Clinical outcomes

- Recurrent stroke and major vascular events ascertained via:
 - Diagnosis by stroke physicians (in ANVC attendees).
 - Research nurse phone interviews with participants at baseline, 3, 6 and 12 months
 - Research nurse examination of GP clinical records of consenting participants at baseline and 12 months.
 - General practice records including imaging findings.
 - Cross-referencing with the Hunter Region Heart and Stroke Register.²⁴
- Health Related Quality of Life
- Disability
- Depression and anxiety
- Cognitive status
- Fatigue

(see Appendix 4 for details of instruments to be used)

Analyses and sample size calculations

The Hunter region population in 2011 was 620,530.¹¹ For reference, the OXVASC study is conducted across a population of 91,000 individuals registered with nine Oxfordshire general

practices and 63 GPs. The OXVASC catchment ascertains approximately 100 neurologist-adjudicated TIA and 100 minor stroke cases per annum.^{4,20,25,26} In the Hunter region, with a ratio of population to Full-Time Equivalent (FTE) GPs of 1500:1, and allowing for a participation response rate of 60%, we needed to recruit practices containing approximately 51 FTE GPs to recruit 100 TIAMs per year (and, thus 400 TIAMs during the study period).

See Appendix 5 for planned analytical methods and associated sample size calculations.

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Summary and conclusions

InSIST is an inception cohort study addressing the interactions of TIAMS patients with health care systems, including the primary-secondary care interface, and the outcomes of TIAMS in a community-based sample. It will compare processes of care and outcomes in three countries and provide data on which to base context-appropriate TIAMS management guidelines for Australian practice.

References

1. Bamford J, Sandercock P, Dennis M. A prospective study of acute cerebrovascular disease in the community: the Oxfordshire Community Stroke Project—1981–1986: methodology, demography and incident cases of first-ever stroke. . *J Neurol Neurosurg Psychiatry* 1988;51:1373–80.
2. Fischer U, Baumgartner A, Arnold M, et al. What is a minor stroke? *Stroke* 2010;41:661-6.
3. Coull AJ, Lovett JK, Rothwell PM, Oxford Vascular S. Population based study of early risk of stroke after transient ischaemic attack or minor stroke: implications for public education and organisation of services. *Bmj* 2004;328:326.
4. Rothwell PM, Giles MF, Chandratheva A, et al. Effect of urgent treatment of transient ischaemic attack and minor stroke on early recurrent stroke (EXPRESS study): a prospective population-based sequential comparison. *Lancet* 2007;370:1432-42.
5. Rothwell P, Warlow C. Timing of TIAs preceding stroke. Time window for prevention is very short. *Neurology* 2005;64:817–20.
6. Sehatzadeh S. Is Transient Ischemic Attack a Medical Emergency? An Evidence-Based Analysis. *Ont Health Technol Assess Ser* 2015;15:1-45.
7. Amarenco P, Lavalley PC, Labreuche J, et al. One-Year Risk of Stroke after Transient Ischemic Attack or Minor Stroke. *N Engl J Med* 2016;374:1533-42.
8. National_Stroke_Foundation. Clinical Guidelines for Stroke Management. Melbourne, Australia 2010.
9. National Stroke Foundation. National Stroke Audit – Acute Services Report 2015. Melbourne, Australia.
10. Royal College of Physicians of London. National Sentinel Stroke Audit 2010. Public Report for England, Wales and Northern Ireland. 2010.

11. Hunter Region at a Glance at http://www.hrf.com.au/uploads/HRF_HRAAG_2014.pdf (accessed 11/6/16). In: Foundation HVR, ed. Newcastle, NSW2014.
12. Rothwell PM, Coull AJ, Silver LE, et al. Population-based study of event-rate, incidence, case fatality, and mortality for all acute vascular events in all arterial territories (Oxford Vascular Study). *Lancet* 2005;366:1773-83.
13. Magin P, Lasserson D, Parsons M, et al. Referral and triage of patients with Transient Ischaemic Attacks to an acute access clinic: risk-stratification in an Australian setting. *International Journal of Stroke* 2013.
14. Johnston SC, Rothwell PM, Nguyen-Huynh MN, et al. Validation and refinement of scores to predict very early stroke risk after transient ischaemic attack. *Lancet* 2007;369:283-92.
15. Hunter New England and Central Coast PHN Health Profile 2015. at <http://www.hneccphn.com.au/media/13742/hnecc-2-page-infographic.pdf> (accessed 1/6/17).
16. Lasserson DS. Initial management of suspected transient cerebral ischaemia and stroke in primary care: implications of recent research. *Postgraduate Medical Journal* 2009;85:422-7.
17. Mavaddat N, Savva GM, Lasserson DS, Giles MF, Brayne J M. Transient neurological symptoms in the older population: report of a prospective cohort study— the Medical Research Council Cognitive Function and Ageing Study (CFAS). *BMJ Open* 2013;3:e003195.
18. Judd SE, Kleindorfer DO, McClure LA, et al. Self-report of stroke, transient ischemic attack, or stroke symptoms and risk of future stroke in the REasons for Geographic And Racial Differences in Stroke (REGARDS) study. *Stroke* 2013;44:55-60.
19. Kirkpatrick S, Locock L, Giles MF, Lasserson DS. Non-focal neurological symptoms associated with classical presentations of transient ischaemic attack: qualitative analysis of interviews with patients. *PLoS ONE* 2013;8:e66351.
20. Rothwell PM, Coull AJ, Giles MF, et al. Change in stroke incidence, mortality, case-fatality, severity, and risk factors in Oxfordshire, UK from 1981 to 2004 (Oxford Vascular Study). *Lancet* 2004;363:1925-33.

21. Anderson CS, Carter KN, Hackett ML, et al. Trends in stroke incidence in Auckland, New Zealand, during 1981 to 2003. *Stroke* 2005;36:2087-93.
22. Adams HP, Jr., Bendixen BH, Kappelle LJ, et al. Classification of subtype of acute ischemic stroke. Definitions for use in a multicenter clinical trial. TOAST. Trial of Org 10172 in Acute Stroke Treatment. *Stroke* 1993;24:35-41.
23. AustralianBureauofStatistics. Australian Standard Geographical Classification (ASGC) - 2006.
at
<http://www.abs.gov.au/AUSSTATS/abs@.nsf/Latestproducts/1AE106C101420508CA2571A90017074>
1 : (accessed 23/5/17). 2006.
24. Marsden DL, Spratt NJ, Walker R, et al. Trends in stroke attack rates and case fatality in the Hunter region, Australia 1996-2008. *Cerebrovasc Dis* 2010;30:500-7.
25. Lasserson DS, Chandratheva A, Giles MF, Mant D, Rothwell PM. Influence of general practice opening hours on delay in seeking medical attention after transient ischaemic attack (TIA) and minor stroke: prospective population based study. *BMJ* 2008;337:a1569.
26. Rothwell PM, Coull AJ, Silver LE, et al. Population-based study of event-rate, incidence, case fatality, and mortality for all acute vascular events in all arterial territories (Oxford Vascular Study). *Lancet* 2005;366:1773-83.

