Addressing Unwarranted Clinical Variation – Stroke
The NSW Stroke Clinical Audit Process (SCAP)

Addressing Unwarranted Clinical Variation in Stroke. 7th December, 2016.

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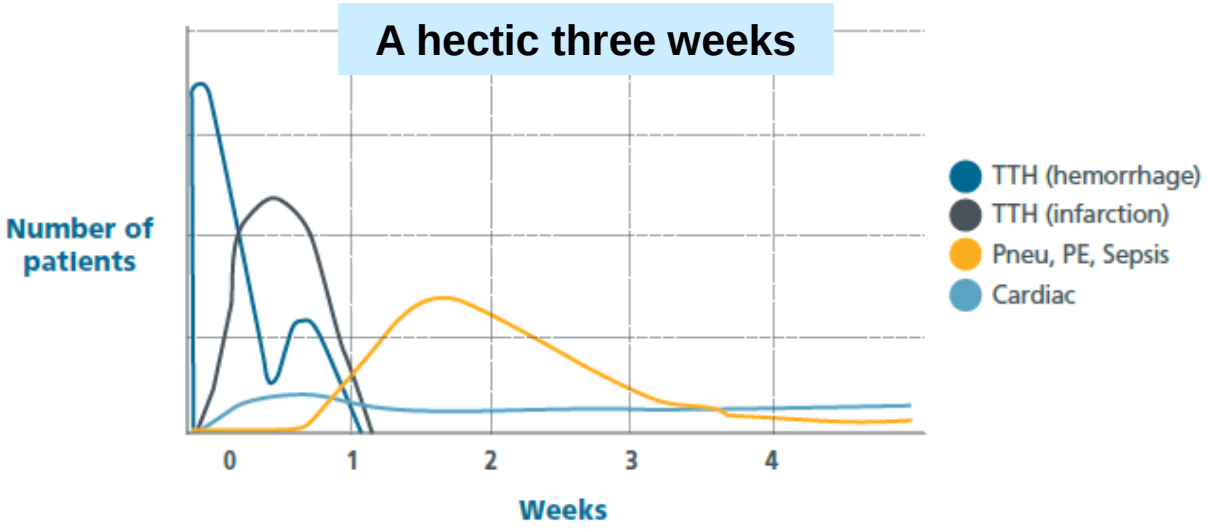
The ACI Stroke Network and ACI have taken BHI's UCV data to the bed-side in search of local solutions to unwarranted clinical variation

Collaboration.
Innovation.
Better Healthcare.

Causes of death after stroke



Diagramatic representation of the causes of death following supratentorial infarction and hemorrhage. (TTH = transtentorial herniation; Pneu = pneumonia; PE = pulmonary thomboembolism). Source: Silver et al.[28]

Figure 9. Causes of death in the weeks after stroke

Management in the first 2-3 weeks has a major impact on mortality, long-term function and discharge destination

Determinants of poor outcomes

- Aspiration, sepsis and fever
- Venous thrombosis
- Hypoxia
- Dehydration
- Tachycardia eg: poor AF rate control

Stroke requires close attention from an experienced multidisciplinary team in a stroke unit of co-localised beds over days and weeks

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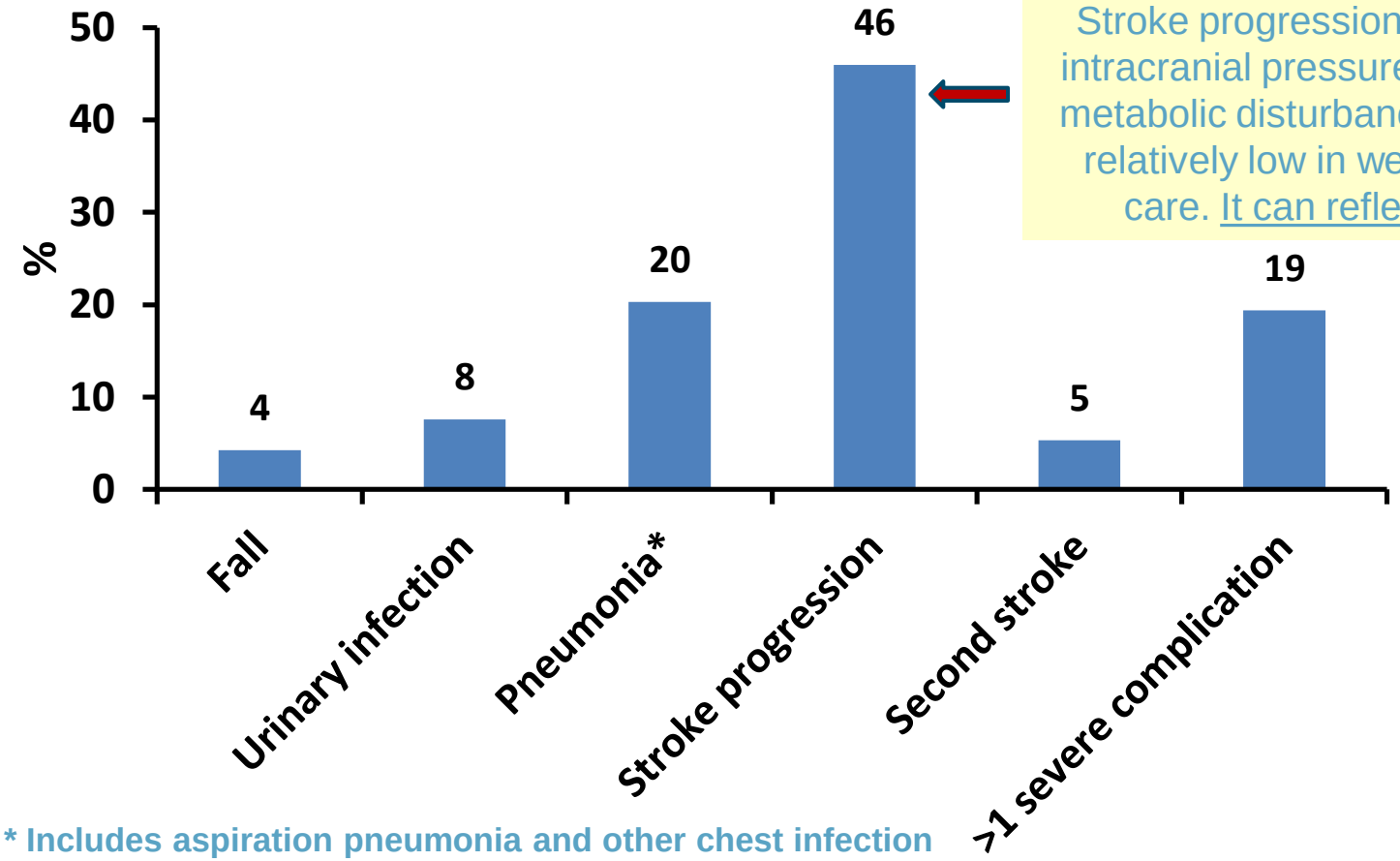
ACI Audit: Proportion of stroke complications in NSW 2000-14*

Common severe complications in hospital shown as a percentage of all documented complications



Stroke progression results from raised intracranial pressure, dehydration, other metabolic disturbance and sepsis and is relatively low in well organised stroke care. It can reflect quality of care

*** Includes aspiration pneumonia and other chest infection**

*Retrospective medical record audit of 5,413 stroke patients in acute NSW public hospitals throughout 2000-2014. Median age 78 years (Q1: 68, Q3: 84), 51% male and 93% with ischaemic stroke.

Eight percent experienced a severe complication while in acute hospital care.

Purvis T, Longworth M, Kilkenny M, Worthington J, Pollack M, Levi C, Cadilhac D

Evidence based practice in ischaemic stroke

There is substantial evidence around what constitutes good ischaemic stroke care.

Major elements of good stroke care include:

- Stroke units. With co-localised stroke beds served by a multidisciplinary stroke team that uses evidenced-based pathways improve stroke outcomes by approximately 30%, at all ages, in NSW.[1] All are eligible for Stroke Unit care. New NWAU adjuster.
- Clot-busting. IV rt-PA within three hours, reduces death and disability by 44% (Cochrane), with more modest benefits at 3-4.5 hours (favourable Odds Ratio 1.34).[2,3] There is an all-hours cost-of-readiness and no DRG. Eligibility around 16% of all strokes in high performance settings. New IV Thrombolysis code.

[1]Gattellari et al Stroke 2009; 40: 10-7.
[2] Wardlaw et al, Cochrane Database of Systematic Reviews. 2003 (3).
[3.]Emberson et al. Stroke Thrombolysis Trialists' Collaborative Group. Lancet 2014, *Published online*.

Outcomes for ischaemic stroke before and after introduction of stroke units in 10 Non-Principal Referral NSW hospitals

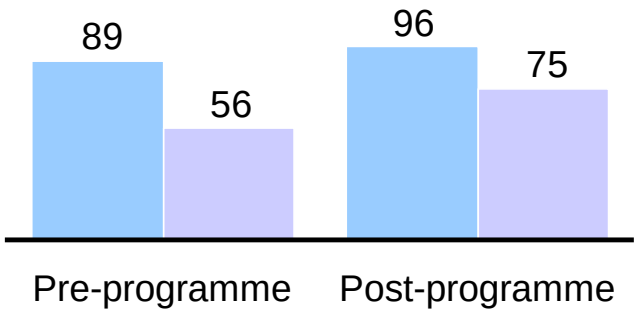
	DISCHARGE DESTINATION			
	Home	Nursing home	Death	Other*
10 NON-PRINCIPAL REFERRAL HOSPITALS (METRO) Age > 85 years				
Before ASU	20.3%	12.9%	26.8%	40.0%
After ASU	↑ 28.7%	↓ 10.3%	↓ 19.7%	41.4%
10 NON-PRINCIPAL REFERRAL HOSPITALS (METRO) All adults				
Before ASU	38.7%	6.3%	13.8%	41.2%
After ASU	↑ 44.5%	↓ 4.9%	↓ 10.5%	40.2%

*transfer to other hospitals/change in type

p<0.001 (significant main effect and interaction type*time). Controlling for: age, co-morbidity (modified Charlson Index), sex, marital status, country of birth, hours on mechanical ventilation, insurance status, and clustering of outcomes by hospital in GEE multivariate model. Gattellari et al Stroke, 2008.

Stroke units improve the quality of stroke care

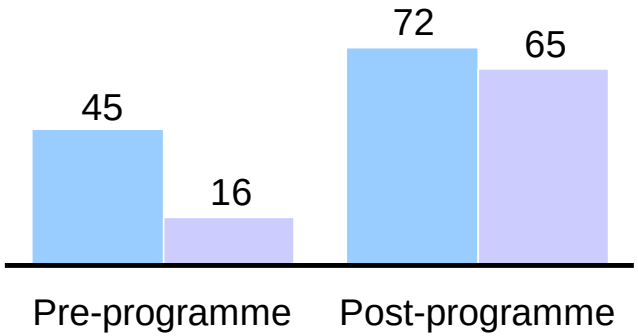
Patient undergoes clinical processes within 24 hours of admission[13]
% of patients



Brain imaging (CT & MRI)

Swallow-tested

Clinical care plan and clinical pathway developed during admission[13]
% of patients



Clinical care plan*

Clinical pathway**

High standards for patient care led to improvements in clinical care processes

- Within 24 hrs of admission
  - 7% more patients received brain imaging
  - 19% more patients were swallow-tested
- Clinical care plans were written for an additional 27% of patients
- Clinical pathways were recorded for an additional 49% of patients

- Clinical care plan is defined as evidence of a written plan by health professionals to avoid complications.
- **Clinical pathway is defined as a structured tool detailing the activities of care during hospital admission.

13. Cadilhac DA et al. *Qual Saf Health Care*. 2008.

Stroke and thrombolysis pathways save lives and reduce disability.

Patient's name: ..... MRN: .....

CATEGORY	DAY 1 Date:	SIGNATURE
ASSESSMENT	2/24 Vital Obs 2/24 Neuro Obs	
	BSL _____	
	Diabetes: ☐	
	Agitation/Confusion: ☐	
	Able to communicate basic needs: ☐	
	Neglect present: ☐	
	Swallowing screen: ☐	
	Telemetry: ☐	
	Fluid balance: ☐	
	Falls risk assessed: ☐	
	Braden scale assessed: ☐	
	Pre-hospital medications: ☐	
INTERVENTIONS	O_2 2L via nasal prongs: ☐	
	IV fluids: ☐	
	TEDs: ☐	
	S/C Heparin: ☐	
	Suction: ☐	
	Bladder/Bowel continence status: ☐	
	IDC: ☐	
	2/24 Toileting: ☐	
	Mouth care 2/24: ☐	
	Pressure area care 2/24: ☐	
	Nursed 30° upright: ☐	
	Joint protection required: ☐	
DIAGNOSTICS	CXR: ☐	
	FBC/UEC/Lipids/LFTs: ☐	
	CT: ☐	
	12 Lead ECG: ☐	
	Booked Carotid Duplex: ☐	
	Booked Echo (TOE) Fast from date: _____ Time: _	
	MRI: ☐	
	Young stroke workup: ☐	
	ABG: ☐	

NORTHERN BEACHES STROKE UNIT MANLY AND MONA VALE HOSPITALS

Northern Beaches Stroke Unit
Checklist for administration of rt-PA
in
Ischaemic stroke under 3 hours

Surname: Other names:
MRN: DOB: Sex:
VMO: Ward/Clinic:

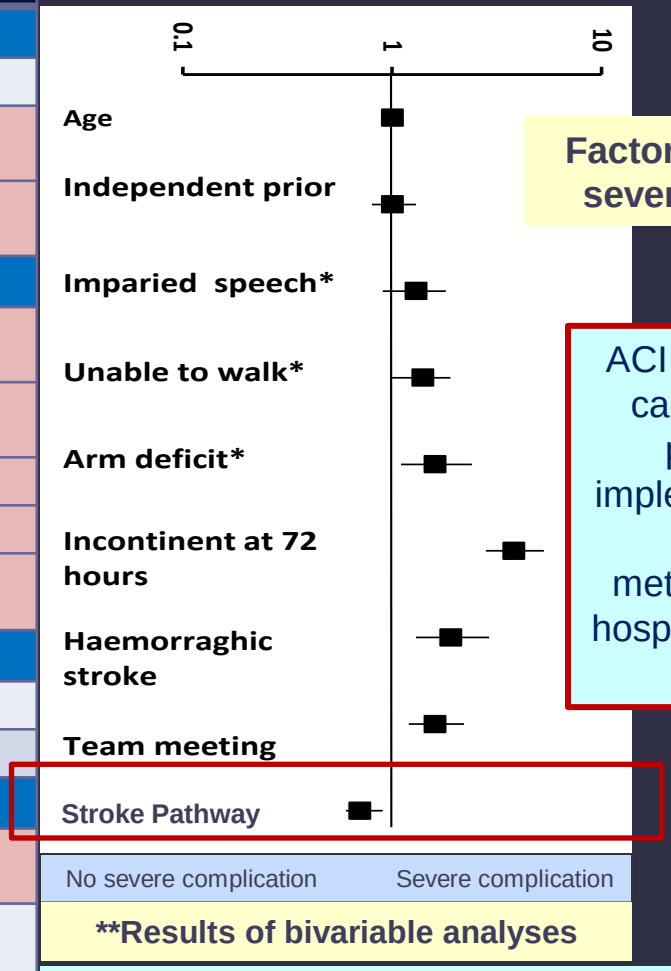
Eligibility for rt-PA	Check
Age 18 or older	
Clinical diagnosis of stroke causing measurable deficit	
Well established onset under 3 hours and time available to start treatment under 3 hours	
Relative contraindication if NIH stroke scale >22 (Scale attached)	
Contra-indications and warnings	**Answer must be No**
Minor or rapidly improving neurological deficit	
Clinical history suggestive of SAH	
Active bleeding	
Haemorrhage on CT scan	
Known bleeding diathesis • Platelets less than 100,000/mm • Current therapeutic use of Warfarin PT>15 seconds • Heparin with APTT beyond upper limit of normal	
Major surgery or trauma in previous 14 days	
Within 3 months neurosurgery, serious head trauma or stroke	
GIT or urinary tract haemorrhage within 14 days	
History of intracranial haemorrhage	
Print name of doctor and sign **Date**	

Stroke and thrombolysis pathways

- Everyone needs a checklist!
- Avoid a plane crash!
- When thrombolysis check-lists are not used the haemorrhage and death rates are unacceptable (Cleveland)

Stroke care and complications in NSW*

	Severe complication N = 448	No severe complication N = 4,965	p value
Patient Characteristics			
Male	209 (47%)	2,503 (51%)	0.1
Age median (Q1, Q3)	81 (74, 86)	77 (67, 84)	<0.001
Independent prior^	256 (61%)	3,438 (72%)	<0.001
Stroke type/severity at presentation			
Haemorrhagic stroke	372 (85%)	4,466 (94%)	<0.001
Impaired speech	338 (82%)	3,074 (65%)	<0.001
Arm deficit	370 (86%)	3,368 (70%)	<0.001
Unable to walk	321 (80%)	2,536 (58%)	<0.001
Incontinence at 72 hours	341 (79%)	1,835 (40%)	<0.001
Hospital factors			
Rural location	259 (58%)	2,884 (58%)	0.9
Neurologist	101 (23%)	1,296 (26%)	0.1
Bedside factors			
Stroke unit care	136 (30%)	1,770 (36%)	0.03
Brain scan within 24 hrs	384 (86%)	4,288 (88%)	0.5
Physiotherapy within 24 hrs	92 (21%)	1,271 (26%)	0.02
Regular neurological observations	303 (69%)	3,185 (65%)	0.1
Team meeting	97 (22%)	833 (17%)	<0.01
Stroke pathway	115 (26%)	1,694 (35%)	<0.001
Aspirin within 24hrs#	150 (42%)	2,627 (60%)	<0.001



Factors associated with severe complications**

****Results of bivariable analyses**

ACI stroke audits were carried out pre- and post-stroke unit implementation and in a wide range of metropolitan and rural hospitals over almost 15 years.

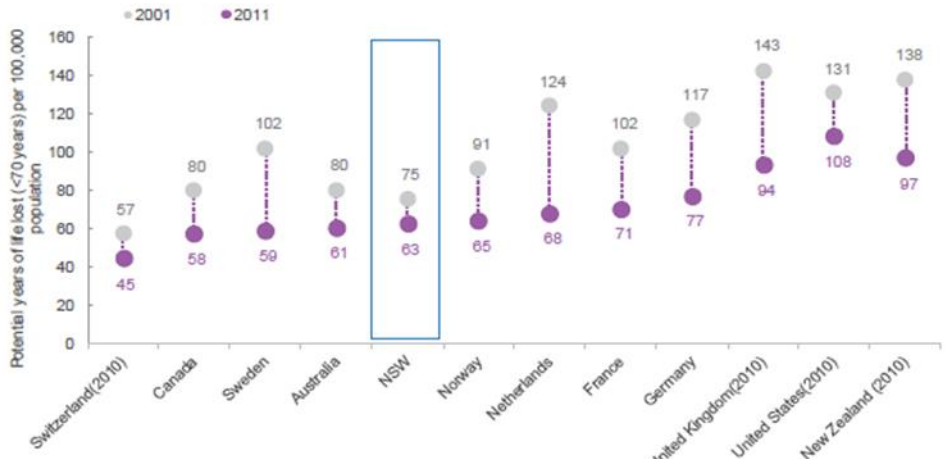
*Retrospective medical record audit of 5,413 stroke patients in acute NSW public hospitals throughout 2000-2014. Median age 78 years (Q1: 68, Q3: 84), 51% male and 93% with ischaemic stroke. Eight percent experienced a severe complication while in acute hospital care.

Purvis T, Longworth M, Kilkenny M, Worthington J, Pollack M, Levi C, Cadilhac D

Improving ischaemic stroke outcomes in NSW

The potential years of life lost due to all stroke types has fallen by 16% over 10 years in NSW which is midrange among other OECD countries

Figure 3.17 Rate of potential years of life lost due to stroke, NSW and comparator countries, 2001 and 2011 or nearest year



In 2011 the age standardised 30 day mortality of ischaemic and haemorrhage stroke in those over age 45 years was 11.5 and 29.6%, having fallen by 19 and 13%, respectively, over the 10 years (2003-2013).

Figure 3.18 Age-sex standardised 30 day (in-hospital and out-of-hospital) mortality rate for stroke among adults aged 45 years and over, by type of stroke, public and private hospitals, NSW and available comparator countries, 2011 or nearest year

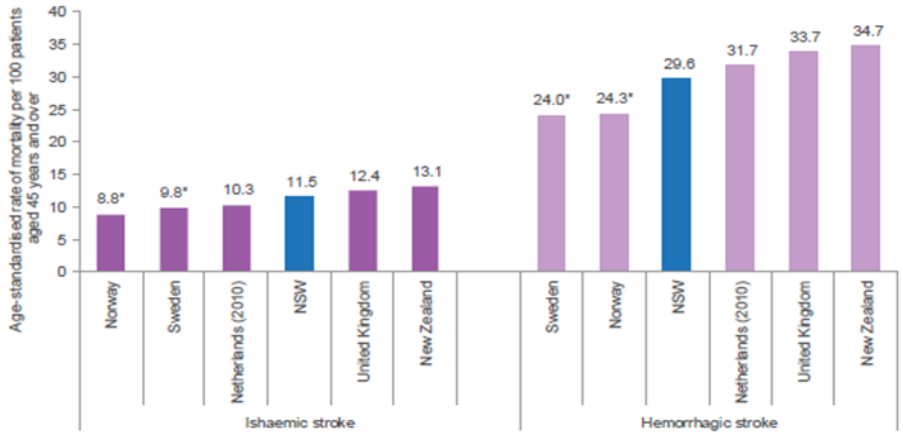
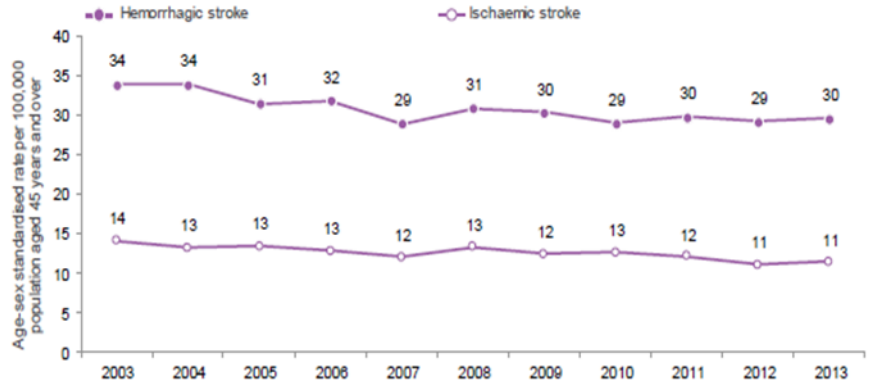


Figure 3.19 Age-sex standardised 30 days (in-hospital and out-of-hospital) mortality rate among adults aged 45 years and over, by type of stroke, public and private hospitals, NSW 2003 to 2013



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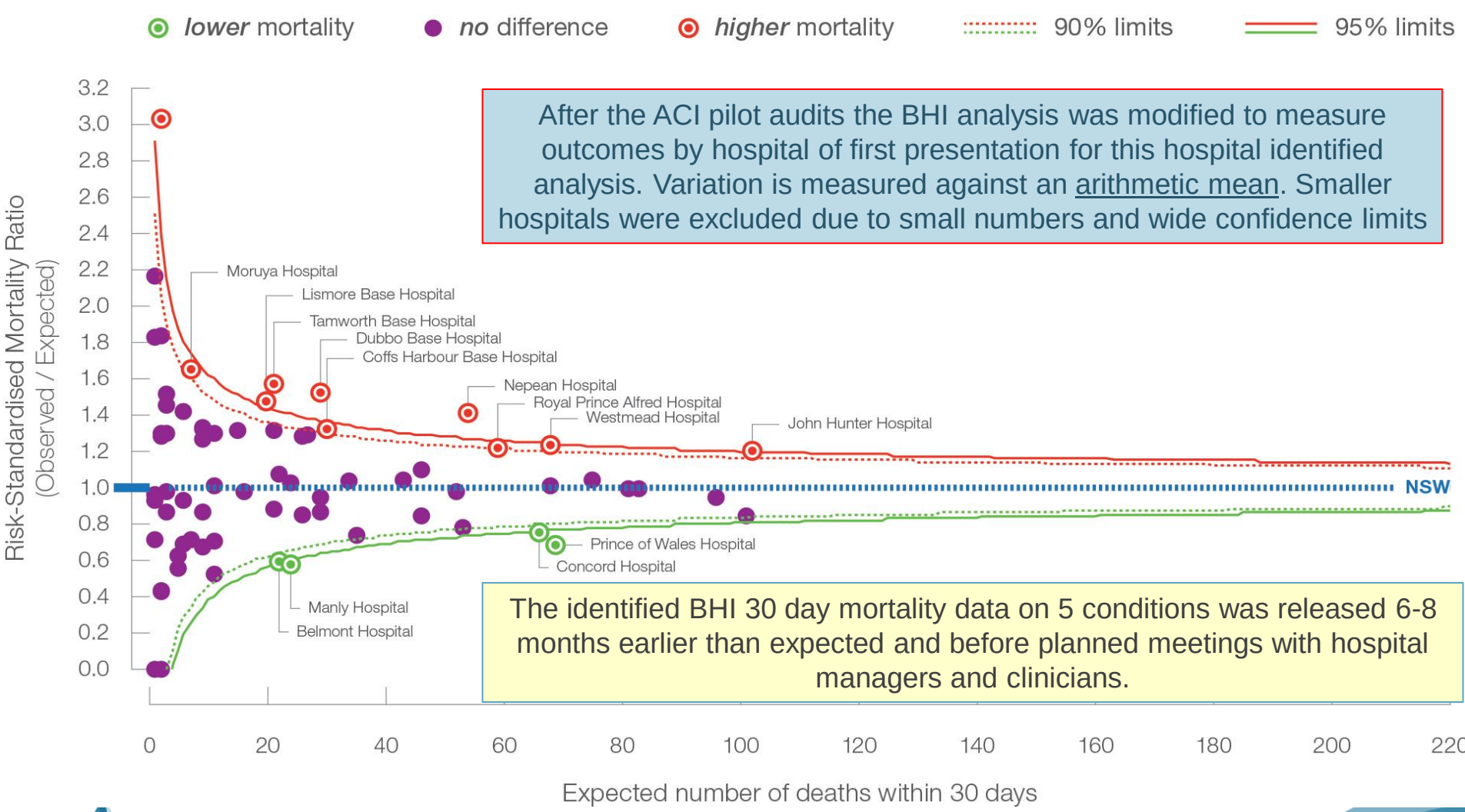
Why? The BHI publication of 30 day ischaemic stroke mortality 2009-2012, with identification of hospitals. Published December 2013.*



After the ACI pilot audits the BHI analysis was modified to measure outcomes by hospital of first presentation for this hospital identified analysis. Variation is measured against an arithmetic mean. Smaller hospitals were excluded due to small numbers and wide confidence limits

The identified BHI 30 day mortality data on 5 conditions was released 6-8 months earlier than expected and before planned meetings with hospital managers and clinicians.

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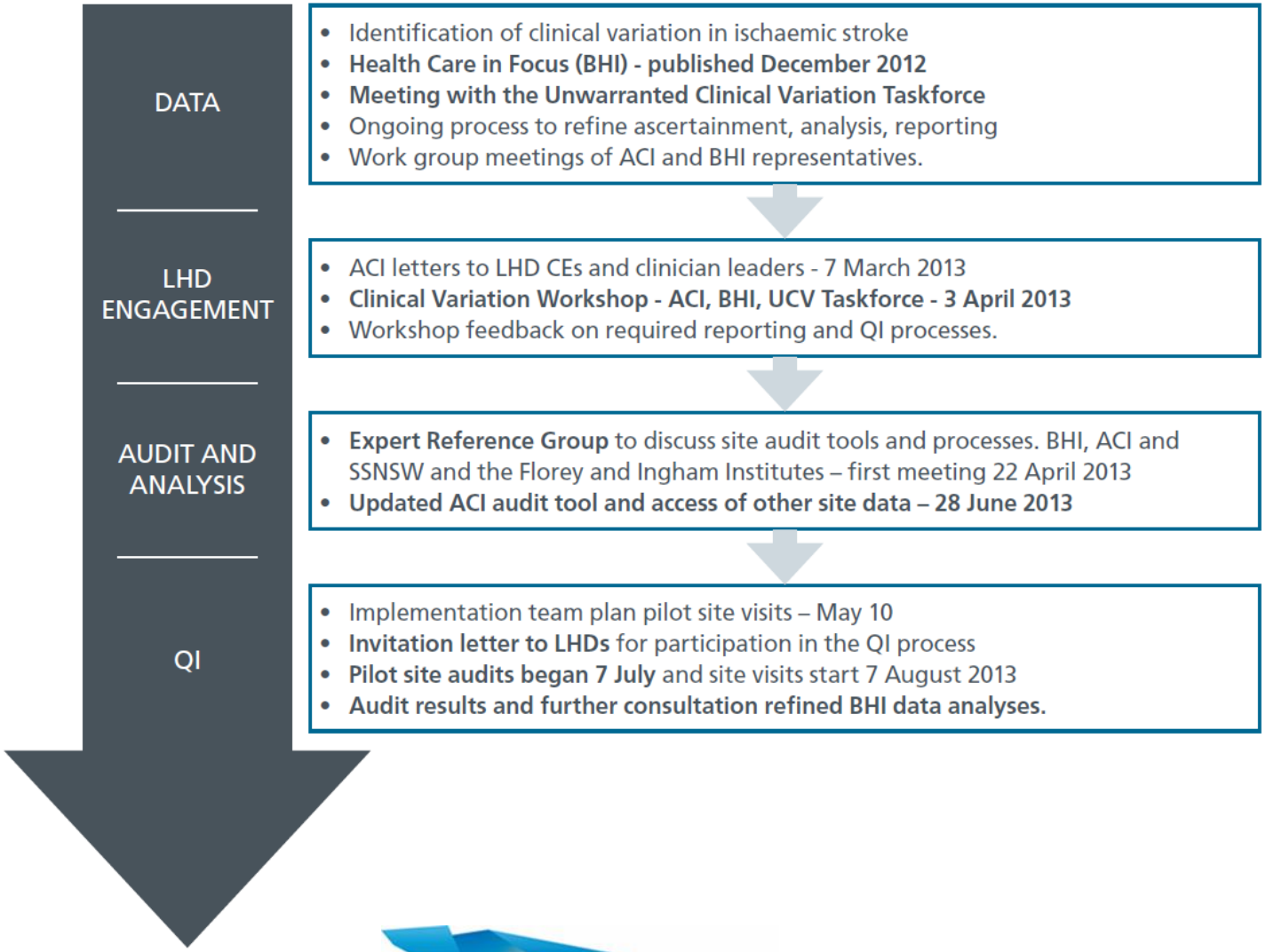
*The Insights Series: 30-day mortality following hospitalisation, five clinical conditions, NSW, July 2009 – 2012. Analysis methods are on the BHI web-site in the 'Spotlight' document.

The response to unwarranted clinical variation.



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Setting variables

- What are we trying to do and are we measuring what can be changed?
- Effective and valuable for what and for whom? *
- Obvious/intuitive and evidence based variables.
- Variables are hopefully supported by local guidelines and policy or be a defensible or overdue alternative to these.
- Variables should, where possible, be mappable to earlier work and to the measures of others to detect change and benchmark.
- Some variables are needed to pioneer innovation such as early swallow screening

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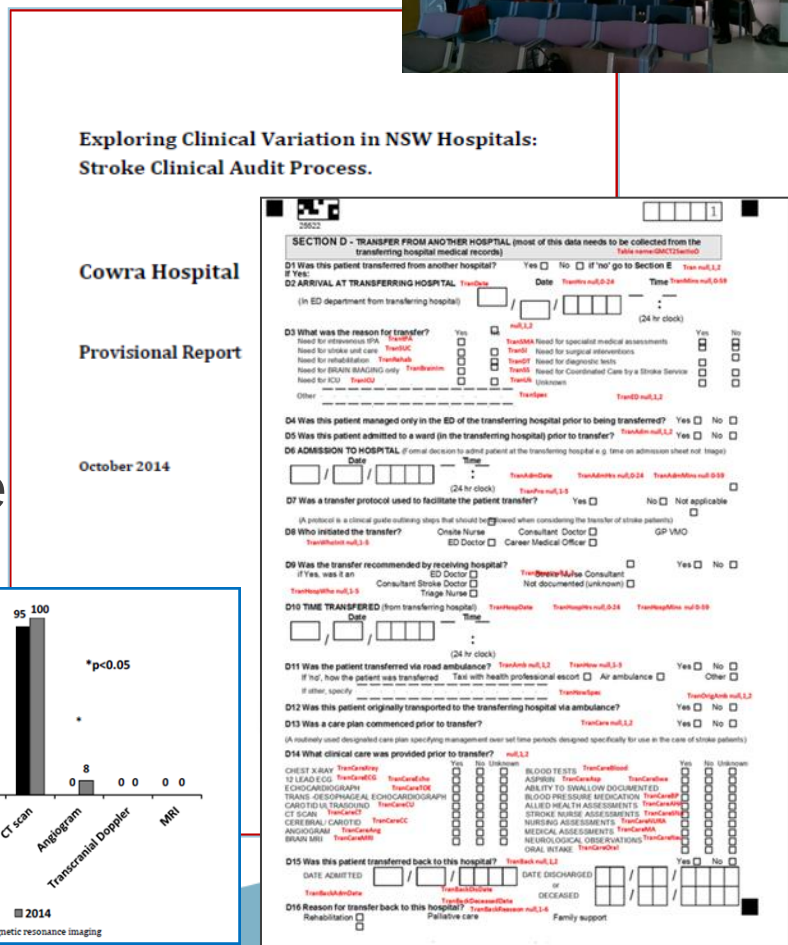
*Including relevance to any volunteer auditor

Clinical variation: Measuring and improving care. SCAP and pilot audits, analysis and feedback

- Adherence with bed-side processes known to improve patient outcomes and experience
- Access to desired investigations
- Use of a stroke clinical pathway
- Access to stroke unit beds
- Access to a multidisciplinary team
- Evidence-based prescribing
- Prevention and timely treatment of stroke complications

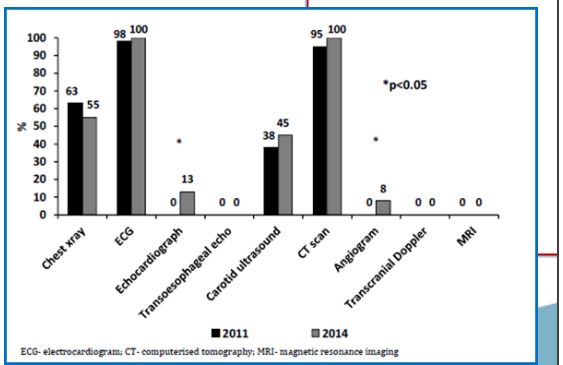

Exploring Clinical Variation in NSW Hospitals:
Stroke Clinical Audit Process.

Cowra Hospital

Provisional Report

October 2014

SECTION D - TRANSFER FROM ANOTHER HOSPITAL (most of this data needs to be collected from the transferring hospital medical records)



ECG- electrocardiogram; CT- computerised tomography; MRI- magnetic resonance imaging

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ACI actions: Examining clinical variation to improve stroke care.

25522

SECTION D - TRANSFER FROM ANOTHER HOSPTIAL (most of this data needs to be collected from the transferring hospital medical records) Table name:GMCT2SectioD

D1 Was this patient transferred from another hospital? Yes ☐ No ☐ if 'no' go to Section E Tran null,1,2

If Yes:

D2 ARRIVAL AT TRANSFERRING HOSPITAL TranDate Date TranHrs null,0-24 Time TranMins null,0-59

(In ED department from transferring hospital) / / : (24 hr clock)

null,1,2

D3 What was the reason for transfer?

	Yes	No		Yes	No
Need for intravenous tPA TrantPA	☐	☐	TranSMA Need for specialist medical assessments	☐	☐
Need for stroke unit care TranSUC	☐	☐	TranSI Need for surgical interventions	☐	☐
Need for rehabilitation TranRehab	☐	☐	TranDT Need for diagnostic tests	☐	☐
Need for BRAIN IMAGING only TranBrainIm	☐	☐	TranSS Need for Coordinated Care by a Stroke Service	☐	☐
Need for ICU TranICU	☐	☐	TranUk Unknown	☐	☐

Other _____ TranSpec

TranED null,1,2

D4 Was this patient managed only in the ED of the transferring hospital prior to being transferred? Yes ☐ No ☐

D5 Was this patient admitted to a ward (in the transferring hospital) prior to transfer? TranAdm null,1,2 Yes ☐ No ☐

D6 ADMISSION TO HOSPITAL (Formal decision to admit patient at the transferring hospital e.g. time on admission sheet not triage)

Date / / Time :

TranAdmDate TranAdmHrs null,0-24 TranAdmMins null,0-59

D7 Was a transfer protocol used t

(A protocol is a clinical guide outlinin

D8 Who initiated the transfer?

TranWhoInit null,1-5

D9 Was the transfer recommende

if Yes, was it an Consultant

TranHospWho null,1-5

D10 TIME TRANSFERED (from trar

Date / /

D11 Was the patient transferred vi

If 'no', how the patient was trans

If other, specify _____ TranHowSpec

TranOrigAmb null,1,2

D12 Was this patient originally transported to the transferring hospital via ambulance? Yes ☐ No ☐

D13 Was a care plan commenced prior to transfer? TranCare null,1,2 Yes ☐ No ☐

(A routinely used designated care plan specifying management over set time periods designed specifically for use in the care of stroke patients)

D14 What clinical care was provided prior to transfer? null,1,2

	Yes	No	Unknown		Yes	No	Unknown
CHEST X-RAY TranCareXray	☐	☐	☐	BLOOD TESTS TranCareBlood	☐	☐	☐
12 LEAD ECG TranCareECG	☐	☐	☐	ASPIRIN TranCareAsp	☐	☐	☐
ECHOCARDIOGRAPH TranCareEcho	☐	☐	☐	ABILITY TO SWALLOW DOCUMENTED TranCareSwa	☐	☐	☐
TRANS -OESOPHAGEAL ECHOCARDIOGRAPH TranCareTOE	☐	☐	☐	BLOOD PRESSURE MEDICATION TranCareBP	☐	☐	☐
CAROTID ULTRASOUND TranCareCU	☐	☐	☐	ALLIED HEALTH ASSESSMENTS TranCareAHA	☐	☐	☐
CT SCAN TranCareCT	☐	☐	☐	STROKE NURSE ASSESSMENTS TranCareSNA	☐	☐	☐
CEREBRAL/ CAROTID TranCareCC	☐	☐	☐	NURSING ASSESSMENTS TranCareNURA	☐	☐	☐
ANGIOGRAM TranCareAng	☐	☐	☐	MEDICAL ASSESSMENTS TranCareMA	☐	☐	☐
BRAIN MRI TranCareMRI	☐	☐	☐	NEUROLOGICAL OBSERVATIONS TranCareNeu	☐	☐	☐
				ORAL INTAKE TranCareOral	☐	☐	☐

D15 Was this patient transferred back to this hospital? TranBack null,1,2 Yes ☐ No ☐

DATE ADMITTED / / TranBackAdmDate

TranBackDisDate

DATE DISCHARGED or DECEASED / / TranBackDeceasedDate

D16 Reason for transfer back to this hospital? TranBackReaseon null,1-6

Rehabilitation ☐ Palliative care ☐ Family support ☐

Figure 1. ACI stroke clinical audit process

SITE AUDIT → FLOREY ANALYSIS → COLLATED REPORT → LOCAL CE COMMS → LOCAL FEEDBACK → IMPROVEMENT PLAN → COLLABORATIVE FEEDBACK (STATE-WIDE)

Supervised audits, written reports and senior peer feedback to local clinicians and managers responsible for the stroke journey including ambulance.

Facilitation of local solutions to UCV

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First six rural and metropolitan pilot site visits 2013.

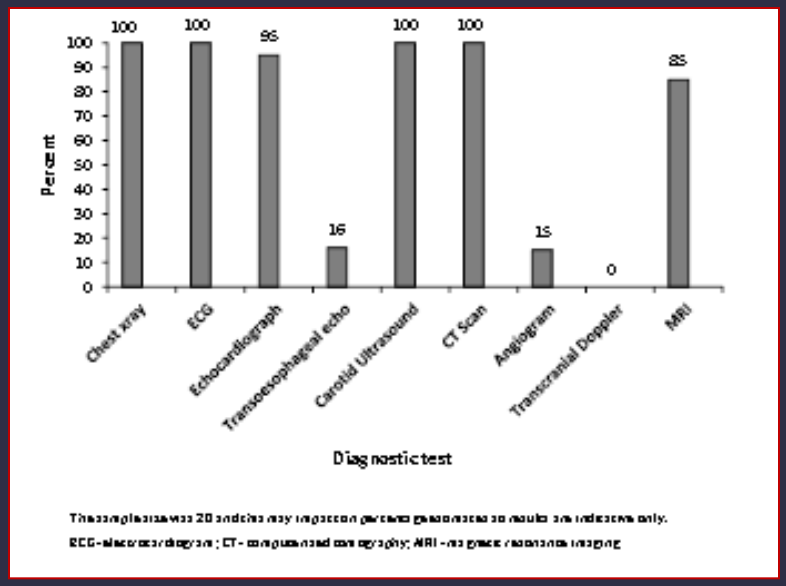
Site and date	Type	N	Crude 30 day Mortality%	Standardised (Adjusted) BHI Mortality %	CI 95%
Hospital 1 14th August	Principal referral ATC/SU	353	17.1	20.7	15.3-27.2
Hospital 2 7th August	Principal referral ATC/SU	289	8.0	8.2	5.0-12.6
Hospital 3 14th August	Non-principal, Metro. SU	138	11.6	9.2	5.2-15.1
Hospital 4 15th August	Rural. SS/No SU	197	20.8	19.1	13.6-26.15
Hospital 5 29th August	Rural No SU	83	22.9	30.6	7.6-63.0
Hospital 6 30th August	Rural ATC/SU	213	8.9	9.6	5.6-15.3

The ACI team selected 6 rural and metropolitan sites with above or below average mortality in the 2012 BHI analysis and with different service characteristics

The first BHI analysis was of the final hospital. Subsequent analyses were based on hospital of first presentation.

The NSW Stroke Network accepts that stroke care varies and there is a unwarranted variation in stroke outcomes.

Example: Hospital 6 Pilot Audit Results 2013



No hospital unit performed consistently well across all clinical care processes that are likely to influence patient outcomes. Where outcomes appeared worse the gaps in evidence-based care were generally greater

- Rural SU and ATC. Similar results to 2008/9
- 55% transferred in (one for rehab). Hub and spoke!
- Average age 71 years
- 35% had AF
- 15% a previous stroke
- All were admitted to the stroke unit!
- 75% were on a stroke clinical pathway during the admission.*
- 65% had a CT within 2 hours and 100% in 24 hours.
- Stroke investigation rates shown in figure
- 100% received neurological observations in the first 24 hours
- 72% received aspirin in the first 24 hours.
- Documented swallow assessment in 4 hours of 40% (45% in speech impaired)*

Assume Nothing!

*There was local surprise at rates of pathway use and swallow assessment with an immediate QI response

First three metropolitan site audits in 2013.

Site and date	Type	Adjusted mortality %	Selection of audit characteristics
Hospital 1 14th August	Principal referral ATC N=353	20.7	July-Aug 2011 3 transfers in. Nil reported palliative. Rapid CT brain; rate 100%. 100% reached stroke unit or HDU. 100% Neuro obs in 1st 24 hours. Low rate of cardiac ultrasound 30%. No use of a stroke clinical pathway. Only 78% on antithrombotics at discharge. 44% on aspirin in 24 hours. Documentation of swallowing at 4 hours 25%.
Hospital 2 7th August	Principal referral ATC N=289	8.2	Aug 2011-Nov 2011. 1 transfer in. 1 documented for palliative care and 2 t/f to a Pal care facility. Rapid CT brain; rate 100%. 100% reached stroke unit or HDU. 95% Neuro obs. Cardiac ultrasound TOE + TTE 76%. Clinical pathway 45%. 84% on antithrombotic on discharge. 58% on aspirin in 24 hours. Swallowing documentation at 4 hrs 70%.
Hospital 3 14th August	Non-principal Metro. SU N=138 .	9.2	July 2011-Jan 2012. Note: Recent major service changes. No transfers in. Two documented as palliative care. 63% reached the stroke unit. TOE + TTE 97%. 63% Neuro obs. 85% on a clinical pathway. 93% on antithrombotics at discharge. 60%on aspirin at 24 hours. Swallowing documentation < 4 hrs 20%.

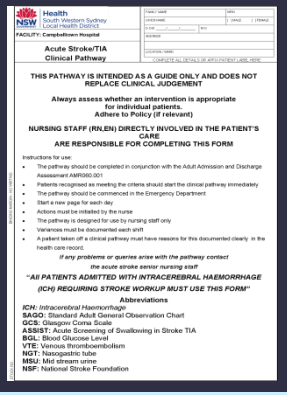
The face-to-face feedback to managers and clinicians was almost universally well met and has impacted on care

First three rural site audits in 2013

Site and date	Type	Adjusted mortality %	Selection of audit characteristics
Hospital 4 15th August	Rural no SU N=197	19.1	April 2012-June 2012. 7 transferred in. Nil documented palliative. CT 95%<24 hours. No stroke unit. Neuro obs 55%. Low rate of cardiac echo. 80% clinical pathway (new stroke co-ordinator). 71% on antithrombotics at discharge. 47% on aspirin in 24 hours. Swallowing documentation < 4 hrs 10%.
Hospital 5 29th August	Rural no SU N=83	30.6	July 2011-May 2012 (N=11). High rate of missing data. 1 transfer. 3 palliative care. No on-site CT. 36% documented CT. No stroke unit. Neuro obs 9%. No cardiac echo. No documented carotid imaging. No clinical pathway. 80% on antithrombotics at discharge. 20% on aspirin at 24 hours. Documentation of swallowing < 4 hours 0.
Hospital 6 30th August	Rural ATC N=213	9.6	Aug-Nov 2012. 55% transferred in. All with protocols. Delays in t/f post-onset. No documented pal care. CT 100% < 24 hours. 100% reached stroke unit. Cardiac echo>95%. 100% neuro obs. 75% clinical pathway. 100% on antithrombotics at dc. 72% on aspirin at 24 hours. Documentation of swallowing < 4 hrs 40%.

6 pilot sites: Comparison of processes expected to influence stroke patient outcomes

Hospital	Adjusted Mortality (%)	SU/HDU Bed (%)	24 hr Neuro Ob's (%)	Clinical P'way (%)	Swallow test< 4 hrs (%)	%Discharged on A'thrombotics	Aspirin at 24 hours (%)	Pall' Care (N)	% D/C on Statin
1	20.7	100	100	0	25	78	44	0	28
2	8.2	100	95	45	70	84	58	3	63
3	9.2	63	63	85	20	93	60	2	60
4	19.1	0	55	80	10	71	47	0	43
5	30.6	0	9	0	0	80	20	3	20
6	9.6	100	100	75	40	100	72	0	67


Health
South Western Sydney
Local Health District

Acute Stroke/TIA
Clinical Pathway

THIS PATHWAY IS INTENDED AS A GUIDE ONLY AND DOES NOT REPLACE CLINICAL JUDGEMENT

Always assess whether an intervention is appropriate for individual patients.
Adhere to Policy (if relevant)

NURSING STAFF (RN,EN) DIRECTLY INVOLVED IN THE PATIENT'S CARE ARE RESPONSIBLE FOR COMPLETING THIS FORM

Instructions for use:

- The pathway should be completed in conjunction with the Adult Admission and Discharge Assessment AMR000.001
- Patients recognised as meeting the criteria should start the clinical pathway immediately
- The pathway should be commenced in the Emergency Department
- Start a new page for each day
- Actions must be initialled by the nurse
- The pathway is designed for use by nursing staff only
- Variances must be documented each shift
- A patient taken off a clinical pathway must have reasons for this documented clearly in the health care record.

If any problems or queries arise with the pathway contact the acute stroke senior nursing staff

"All PATIENTS ADMITTED WITH INTRACEREBRAL HAEMORRHAGE (ICH) REQUIRING STROKE WORKUP MUST USE THIS FORM"

Abbreviations

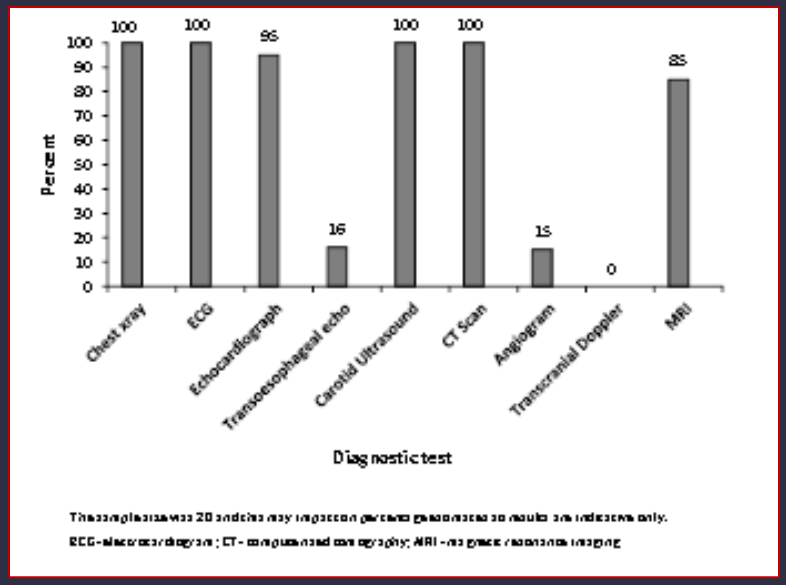
ICH: Intracerebral Haemorrhage
SAGO: Standard Adult General Observation Chart
GCS: Glasgow Coma Scale
ASSIST: Acute Screening of Swallowing in Stroke TIA
BGL: Blood Glucose Level
VTE: Venous thromboembolism
NGT: Nasogastric tube
MSU: Mid stream urine
NSF: National Stroke Foundation

Pilot results (and methods) provided a proof of concept for the SCAP project

Red numbers indicate worse than expected mortality or process adherence

Unwarranted clinical variation in stroke is explicable variation. At present stroke patients do not always receive evidenced-based care. This may be the result of being admitted to a smaller hospital with no organised stroke care and little prospect of providing it, admission to a hospital where stroke unit care could reasonably be provided but no unit has been established, because patients fail to reach stroke unit beds in a hospital with a stroke unit or because of variations in the quality of care delivered in existing stroke units.

Example: Hospital 6 Pilot Audit Results 2013



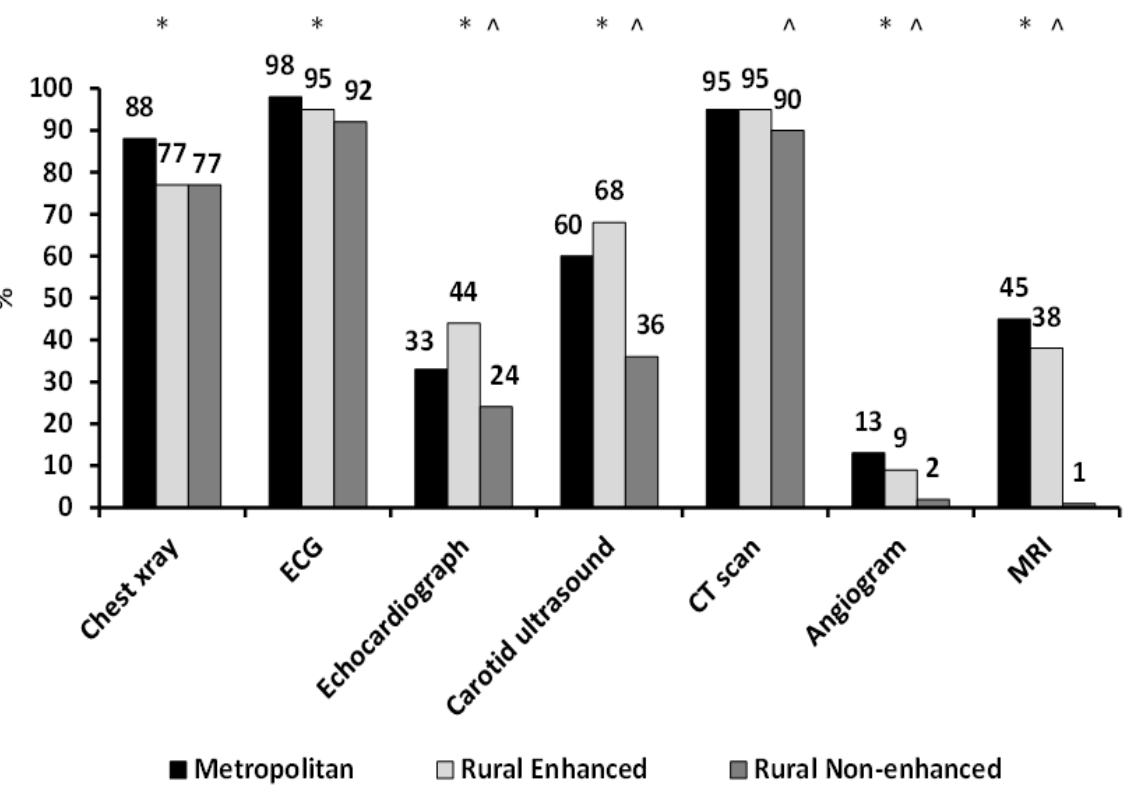
No hospital unit performed consistently well across all clinical care processes that are likely to influence patient outcomes. Where outcomes appeared worse the gaps in evidence-based care were generally greater

- Rural SU and ATC. Similar results to 2008/9
- 55% transferred in (one for rehab). Hub and spoke!
- Average age 71 years
- 35% had AF
- 15% a previous stroke
- All were admitted to the stroke unit!
- 75% were on a stroke clinical pathway during the admission.*
- 65% had a CT within 2 hours and 100% in 24 hours.
- Stroke investigation rates shown in figure
- 100% received neurological observations in the first 24 hours
- 72% received aspirin in the first 24 hours.
- Documented swallow assessment in 4 hours of 40% (45% in speech impaired)*

Assume Nothing!

*There was local surprise at rates of pathway use and swallow assessment with an immediate QI response

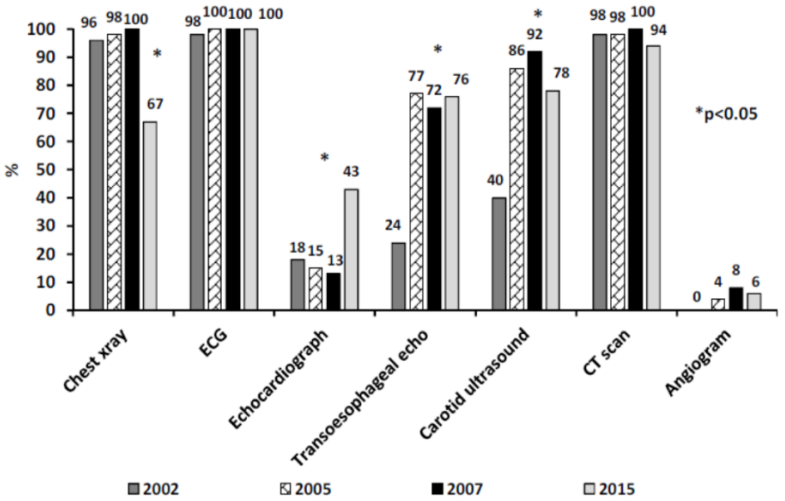
SCAP audits: Average rates of investigation across Unenhanced and Rural and Metro Enhanced sites



* p<0.05 between metropolitan-rural enhanced sites
^ p<0.05 between rural enhanced-rural non-enhanced sites

The rates of investigation were lower at unenhanced hospitals some of which had no onsite CT scanning, with an average of 74% receiving brain imaging within 24 hours. CT rates at two Unenhanced sites were 36 and 43%. Documented carotid imaging and echocardiography rates were zero at some sites

Hospital 1: Investigations over 4 audits



ECG- electrocardiogram; CT- computerised tomography; MRI- magnetic resonance imaging
* significant p<0.05 in linear trend across audit periods

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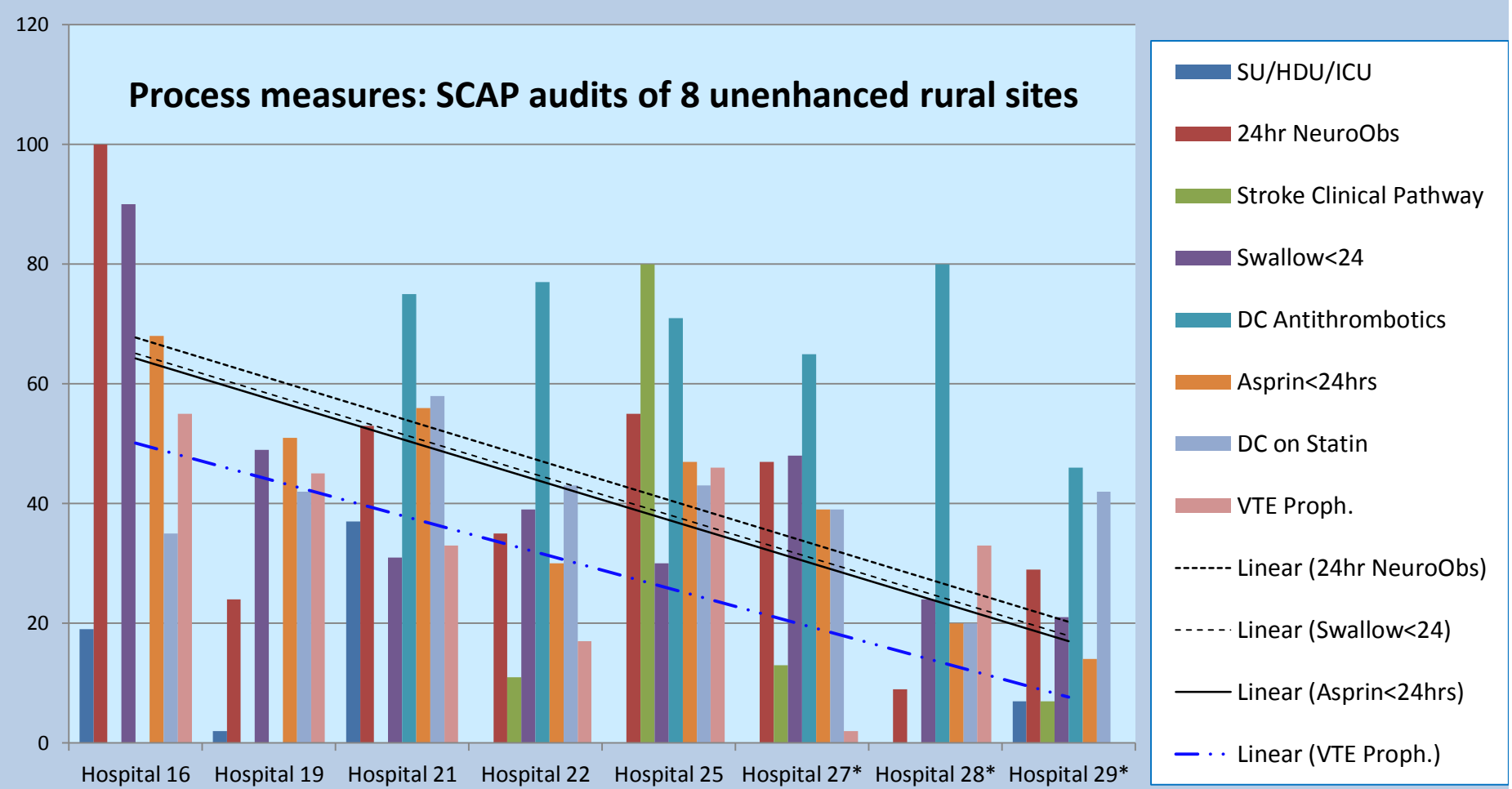
SCAP: Process measures at 8 Unenhanced Rural sites N=495



Hospitals ranked from left to right with increasing mortality estimates

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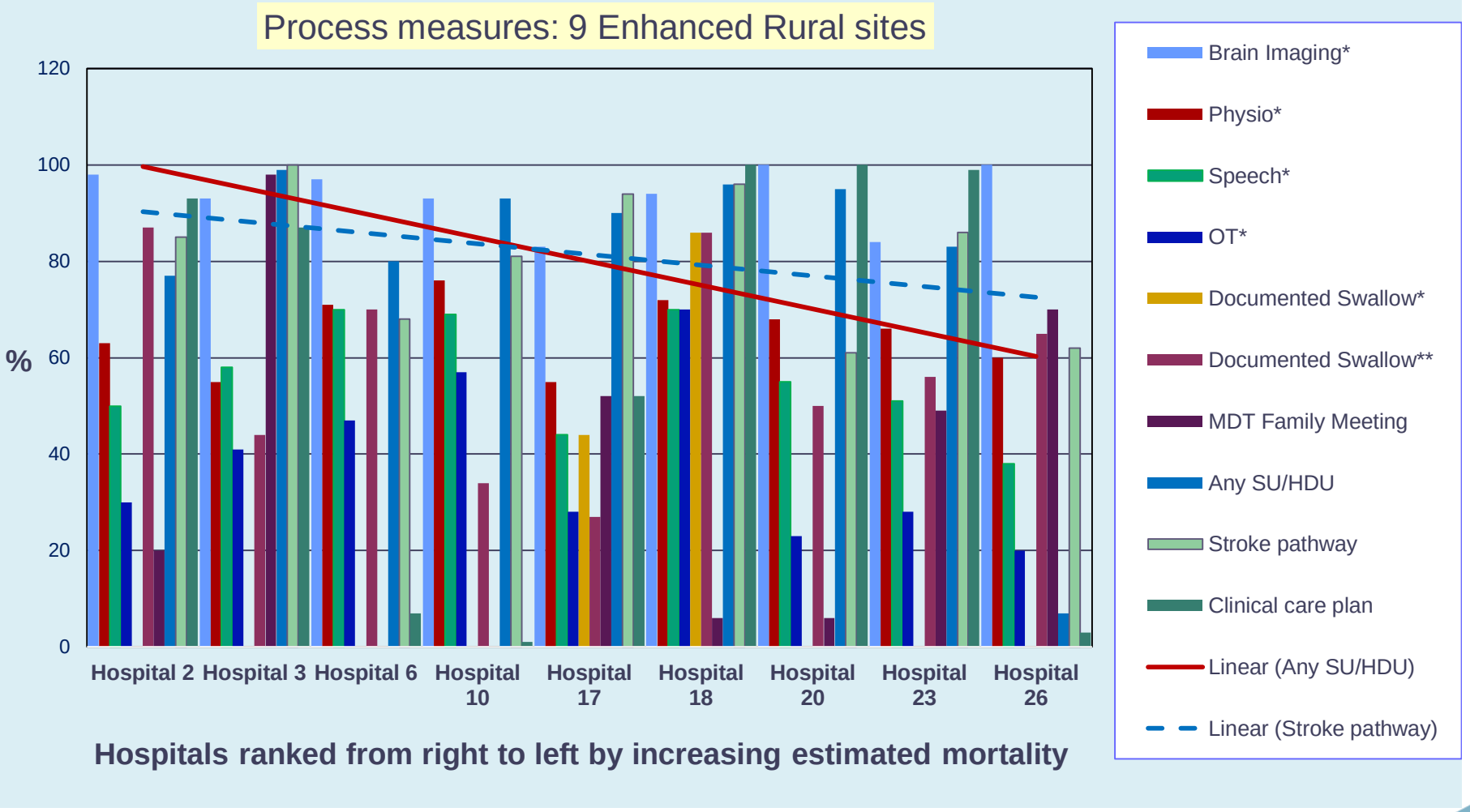
Hospital 16 has an 18% 30 day IS mortality and risk-standardised mortality ratio of 1.27

SCAP: Process measures at 9 Enhanced rural sites N=510



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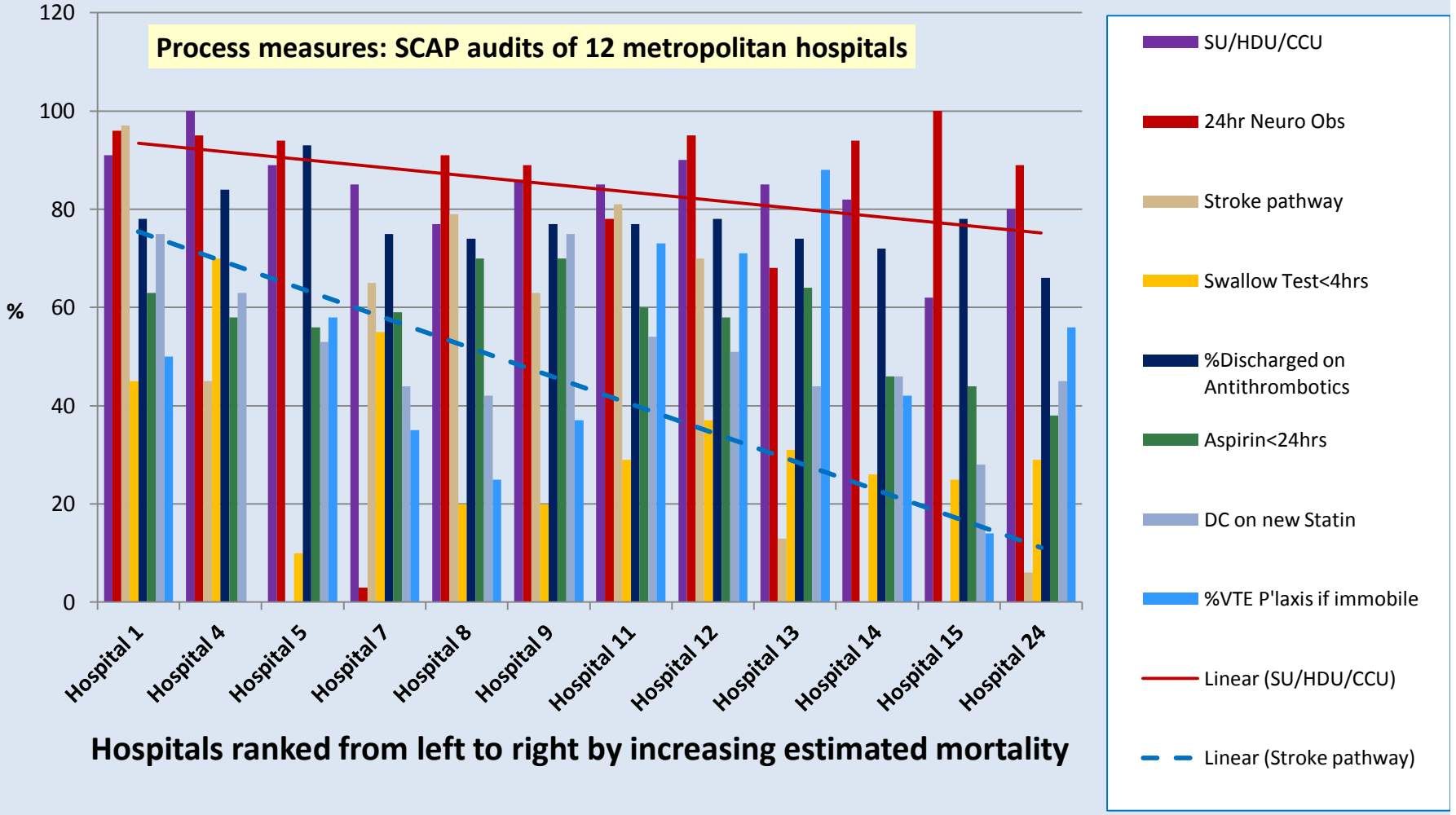
SCAP: Process measures at 12 Metropolitan hospital sites N=784



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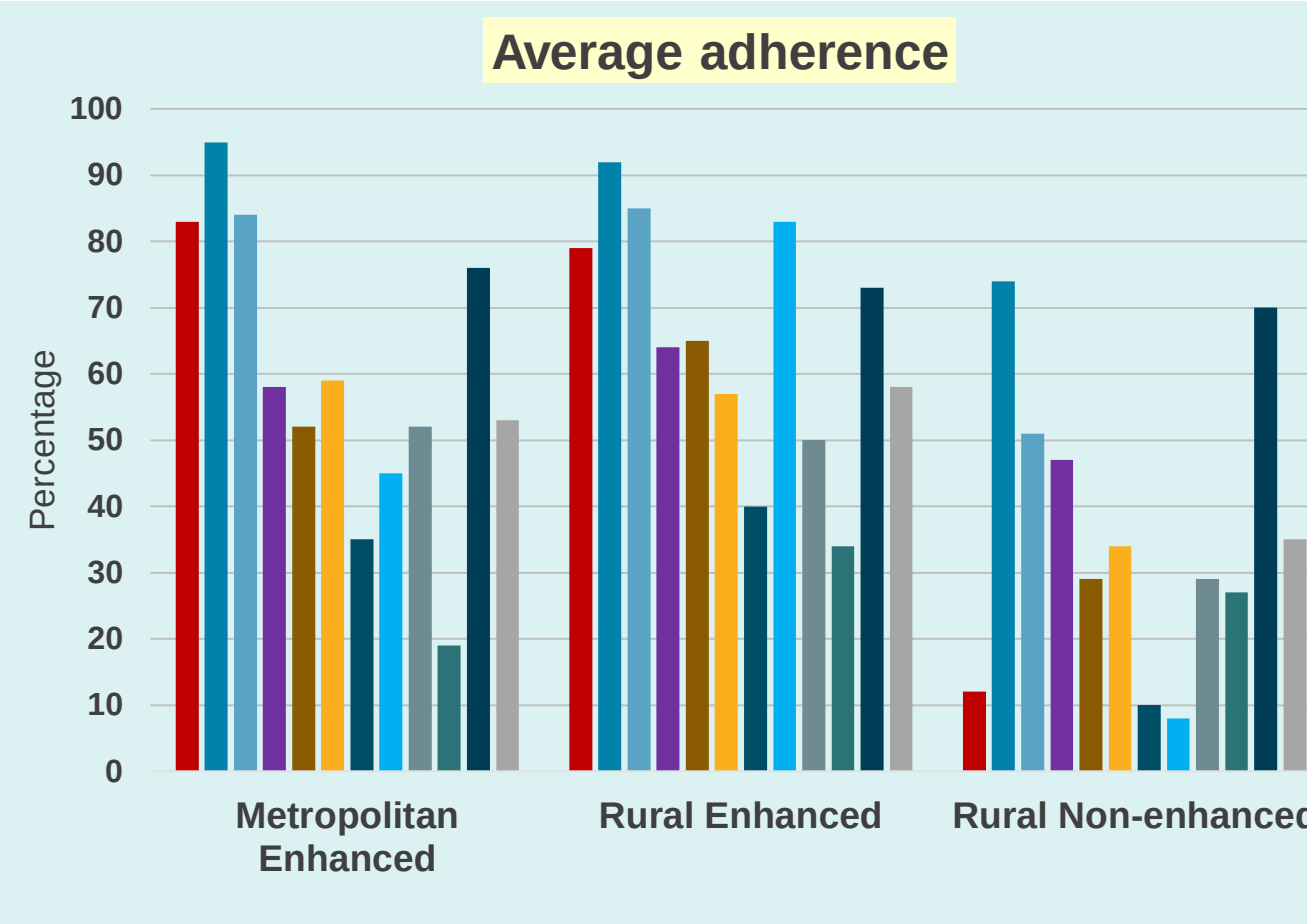
SCAP Audit: Average process adherence by type



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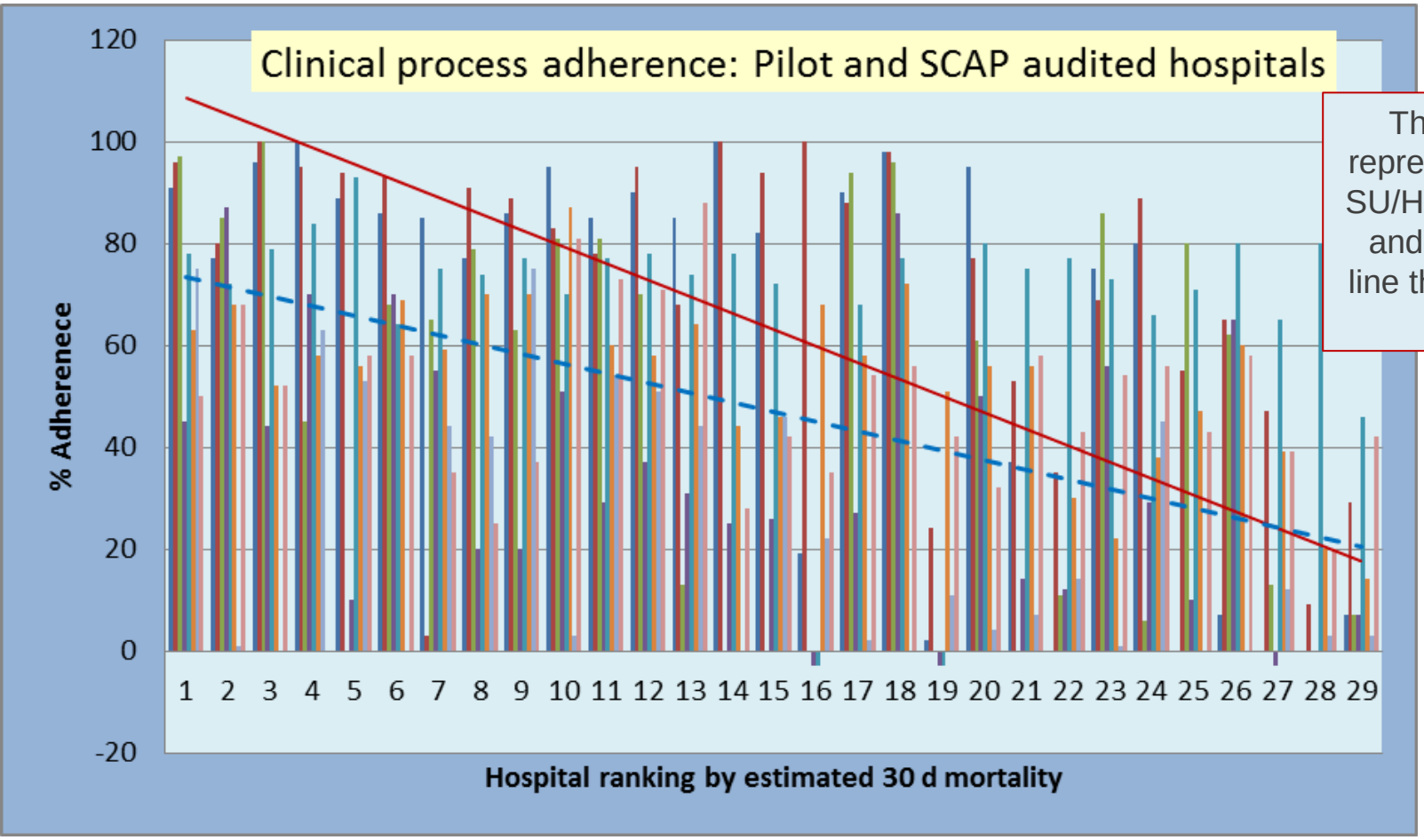
SCAP audit: Process measures across 29 sites N=1788



The solid red line represents access to a SU/HDU/CCU/ICU bed and the broken blue line the use of a stroke pathway

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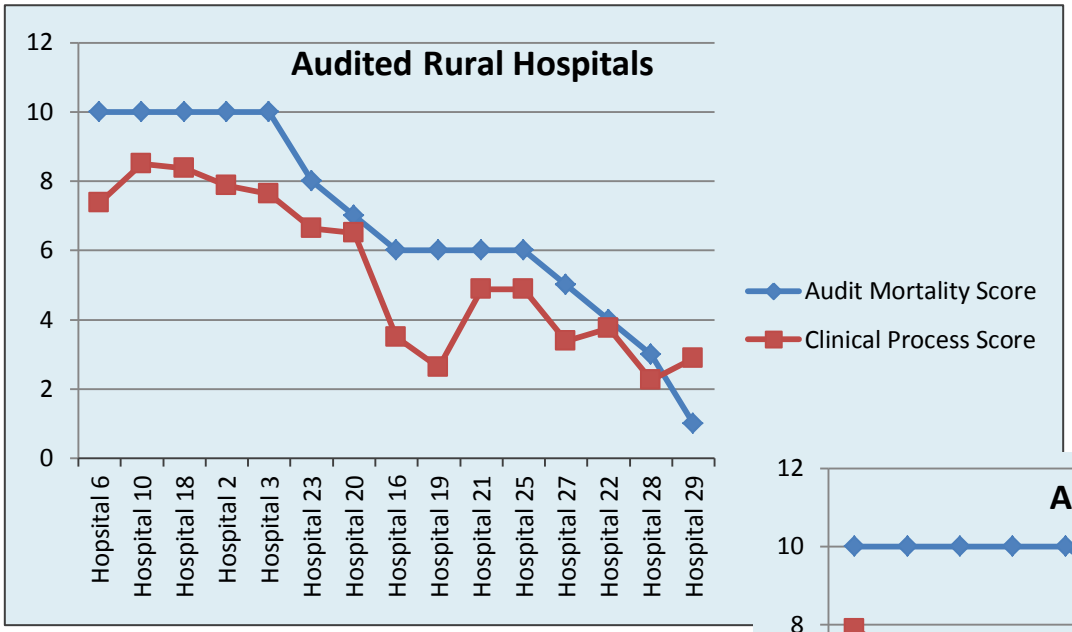
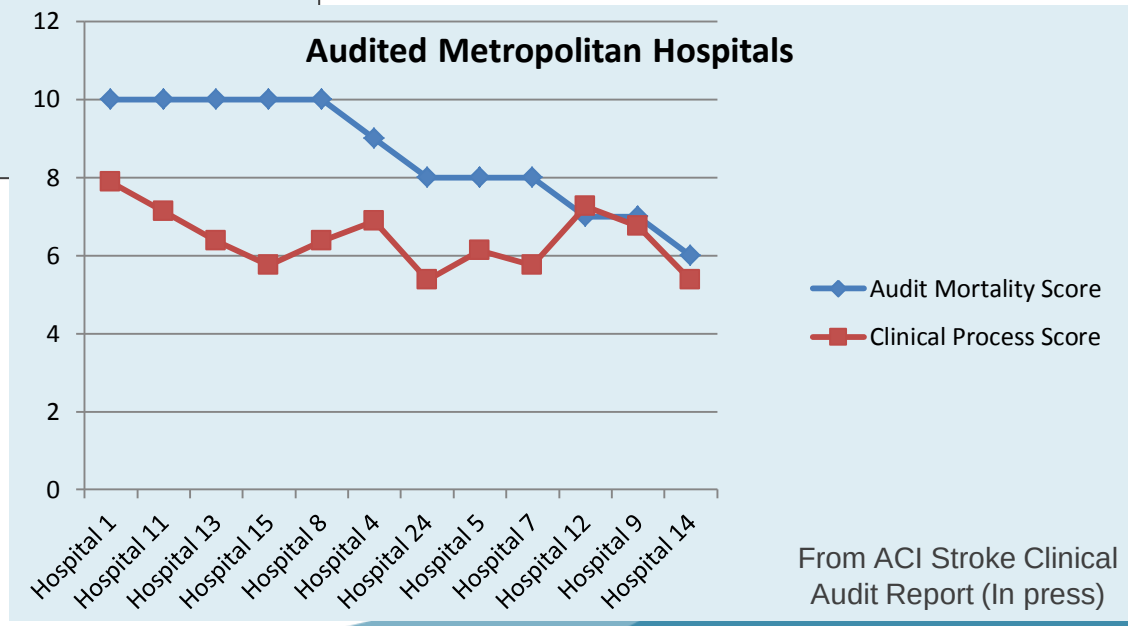
Mortality Vs Clinical Process Adherence



Mortality versus an unweighted score of process adherence by hospital site including access to stroke beds, VTE prophylaxis and use of stroke pathways



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From ACI Stroke Clinical Audit Report (In press)

SCAP: Identifying unwarranted clinical variation

- A minority of hospitals provide specialised stroke care and no hospital performed uniformly well across all key processes.
- Brain imaging in 24 hours varied between 46% and 100%.
- Cardiac echocardiography 0 to over 90%. Carotid duplex 0-86%.
- VTE prophylaxis in immobile patients peaked at 88%, only fourteen sites exceeded 50%. Five sites, including two stroke units had rates lower than 15%.
- Discharge on an antithrombotic in ischaemic stroke varied widely, from 46-93%.
- Stroke clinical pathway were used 0 to over 90% of the time although pathways reduce complications. Access to stroke unit beds was highly variable.
- Acute Thrombolysis Centres to which ambulances are directed had ‘clot-busting’ rates ranging from 1-2% to over 20%.
- Lower use of stroke clinical pathways, lower access to stroke beds and lower adherence with other key bed-side processes were associated with higher mortality, explaining the sources of unwarranted clinical variation.

Common local Quality Improvement activities resulting from the SCVSS & SCAP

Feedback sessions engaged local clinicians and managers together, as well as members of ASNSW and often members of the LHD executive. Local QI responses were facilitated by a local clinician leader and Mr Mark Longworth from ACI/SCAP. Local responses were comprehensive and new strategies shared with other sites

- Establishing a new stroke unit.
- Patient flow review to ensure 90% of all presenting patients are admitted to a stroke unit
- Develop a stroke/neurology pathway
- Ongoing program of ED staff education to implement the Acute Screening of Swallow in Stroke/TIA Training Tool (ASSIST) for all stroke patients at presentation.
- The development, implementation and evaluation of a 24/7 blanket referral to Allied Health, commencing in ED and confirmed when the patient is admitted to a ward bed.
- Pharmacy review of all stroke patients with a particular emphasis on the prescribing of anti-thrombotics and statins
- Use of local HDU beds or ambulance bypass and hub and spoke transfer
- Specific QI for individual processes

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Results and locally agreed strategies were fed back to LHD CE's by the ACI Chief Executive in writing

SCAP: Improving stroke unit access

- A minority of hospitals provide organised/specialised stroke care.
- At the beginning of the pilot and SCAP process there were no stroke units in two of participating LHDs and in eastern NSW and there was no organised stroke thrombolysis south of Campbelltown in Eastern NSW.
- Since the pilot process there are four new stroke units and a new stroke service are coming on line in the areas of focus.
- Three new Acute Thrombolysis Centres have come on line.
- In SCAP all unenhanced sites seeing >100 strokes per year are being enhanced or bypassed using a hub and spoke model.

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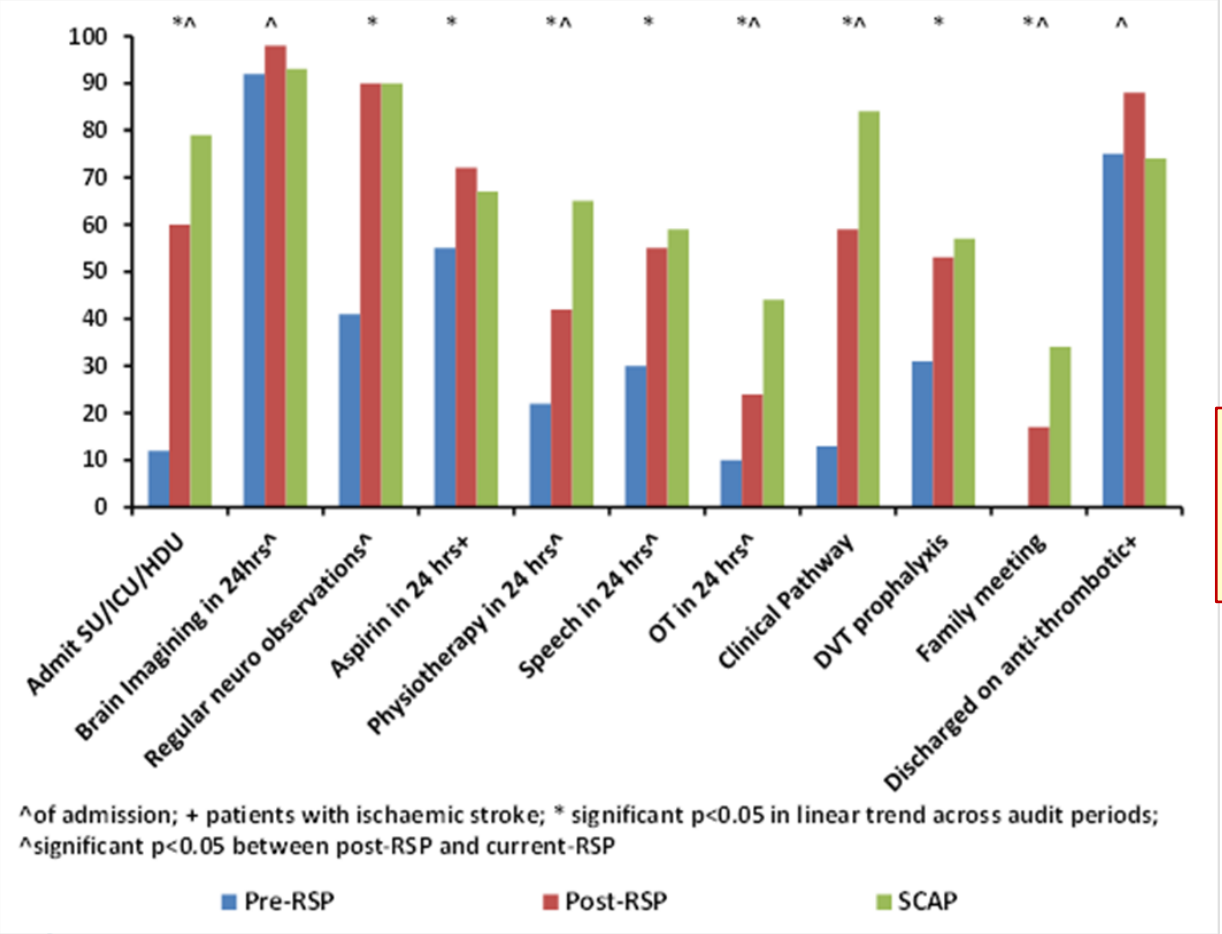
Enhancement and change in clinical process adherence



Not every improvement was maintained or reached acceptable levels

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Adherence to nominated clinical process of care indicators for the six hospitals that participated three audits the Rural Stroke Project and Stroke Clinical Audit Process

SCAP project: Site-by-site process improvement

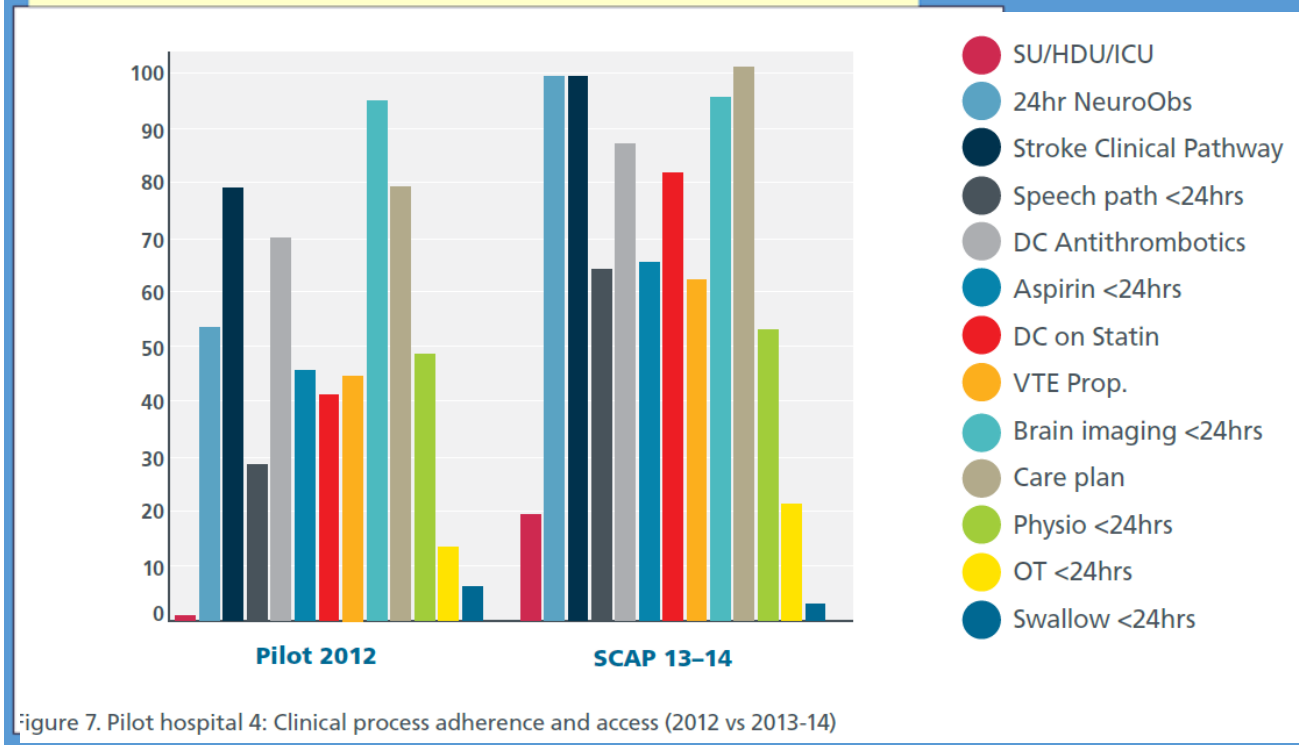

Figure 7. Pilot hospital 4: Clinical process adherence and access (2012 vs 2013-14)

From a Pilot audit with poor adherence, and a high BHI mortality estimate, to a new Stroke unit and now an Acute Thrombolysis Centre. The 2013-14 audit bridges the inception of the new Stroke unit but shows substantial improvement in process adherence

More recent audit shows 95% access to SU/HDU and 100% antithrombotic prescribing on discharge

Hospital	BHI 30 day Mortality (%)	SU/HDU Bed (%)	24 hr Neuro Ob's (%)	Clinical P'way (%)	Swallow test< 4 hrs (%)	%Discharged on A'thrombotics	Aspirin at 24 hours (%)	Pall' Care (N)	% D/C on Statin
4	19.1	0	55	80	10	71	47	0	43

SCAP achievements

- SCAP provides an explanation for reported unwarranted clinical variation.
- Feedback, to hundreds of clinicians and managers, has resulted in local responses to address unwarranted clinical variation.
- Early re-audits have demonstrated improvements.
- Four new stroke units, a new stroke service and three new Acute Thrombolysis Centres have been opened or are coming on line.
- All unenhanced sites seeing >100 strokes per year are being enhanced, or bypassed.
- New NSW funding arrangements are now in place to improve patient access to stroke unit beds.

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Conflicts of interests

No pharma funding since 2004.

SCAP project clinical lead and BHI board member

In memoriam

Dr Tiziana Savio and Dr Ian Black