SCAP: Stroke Clinical Audit Process
Assessing and addressing unwarranted clinical variation

Thursday 28th April 2016. Reducing Unwarranted Clinical Variation in Stroke

Conjoint Associate Professor John Worthington | Liverpool Health Service and Ingham Institute UNSW

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
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.

Ischaemic stroke care in NSW

- NSW hospitals look after 11,000 strokes of all types per year
- A minority of hospitals provide organised stroke care.
- 23 Acute Thrombolysis Centres (ATCs) are now nested in 36 acute stroke units across NSW. Nine other hospitals have stroke services. New stroke units, a further stroke service and three new ATCs are coming on line as result of local efforts and SCAP.
- There are 186 sites in NSW with some ED role delineation, 79 with level 3-6 role delineation. Forty nine hospitals see more than 50 strokes of all types a year, 33 hospitals see more than 100 strokes a year and 7 see more than 400 pa.
- The 30 and 365 day ischaemic stroke mortality in NSW is 17 and 27%, respectively (Gattellari et al, Cerebrovascular Diseases, 2011).
- Where stroke units are implemented in NSW there has been a 30% improvement in mortality and in discharge destination (Gattellari et al, Stroke 2009.)
- NSW outcomes for stroke compare favourably with OECD countries and other states (BHI 2012 and 2013), however, they report unwarranted clinical variation between sites.
Causes of death after stroke

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

A hectic three weeks

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.
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.


*Includes aspiration pneumonia and other chest infection

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.
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.
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 in July.

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\(^1\)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

<table>
<thead>
<tr>
<th>DISCHARGE DESTINATION</th>
<th>Before ASU</th>
<th>After ASU</th>
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<tbody>
<tr>
<td>Home</td>
<td>20.3%</td>
<td>28.7%</td>
</tr>
<tr>
<td>Nursing home</td>
<td>12.9%</td>
<td>10.3%</td>
</tr>
<tr>
<td>Death</td>
<td>26.8%</td>
<td>19.7%</td>
</tr>
<tr>
<td>Other*</td>
<td>40.0%</td>
<td>41.4%</td>
</tr>
</tbody>
</table>

10 NON-PRINCIPAL REFERRAL HOSPITALS (METRO) Age > 85 years

Before ASU: 38.7% Home, 6.3% Nursing home, 13.8% Death, 41.2% Other.
After ASU: 44.5% Home, 4.9% Nursing home, 10.5% Death, 40.2% Other.

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

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

Enhancement and clinical process adherence

Not every improvement was maintained or reached acceptable levels.

Adherence to nominated clinical process of care indicators for the six hospitals that participated in the Rural Stroke Project and Stroke Clinical Audit Process.
Stroke care and complications in NSW*

<table>
<thead>
<tr>
<th>Patient Characteristics</th>
<th>Severe complication N = 448</th>
<th>No severe complication N = 4,965</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>209 (47%)</td>
<td>2,503 (51%)</td>
<td>0.1</td>
</tr>
<tr>
<td>Age median (Q1, Q3)</td>
<td>81 (74, 86)</td>
<td>77 (67, 84)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Independent prior^</td>
<td>256 (61%)</td>
<td>3,438 (72%)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stroke type/severity at presentation</th>
<th>Severe complication</th>
<th>No severe complication</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Haemorrhagic stroke</td>
<td>372 (85%)</td>
<td>4,466 (94%)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Impaired speech</td>
<td>338 (82%)</td>
<td>3,074 (65%)</td>
<td>&lt;0.001</td>
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<tr>
<td>Arm deficit</td>
<td>370 (86%)</td>
<td>3,368 (70%)</td>
<td>&lt;0.001</td>
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<tr>
<td>Unable to walk</td>
<td>321 (80%)</td>
<td>2,536 (58%)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Incontinence at 72 hours</td>
<td>341 (79%)</td>
<td>1,835 (40%)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hospital factors</th>
<th>Severe complication</th>
<th>No severe complication</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural location</td>
<td>259 (58%)</td>
<td>2,884 (58%)</td>
<td>0.9</td>
</tr>
<tr>
<td>Neurologist</td>
<td>101 (23%)</td>
<td>1,296 (26%)</td>
<td>0.1</td>
</tr>
</tbody>
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<thead>
<tr>
<th>Bedside factors</th>
<th>Severe complication</th>
<th>No severe complication</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stroke unit care</td>
<td>136 (30%)</td>
<td>1,770 (36%)</td>
<td>0.03</td>
</tr>
<tr>
<td>Brain scan</td>
<td>384 (86%)</td>
<td>4,288 (88%)</td>
<td>0.5</td>
</tr>
<tr>
<td>Physiotherapy</td>
<td>92 (21%)</td>
<td>1,271 (26%)</td>
<td>0.02</td>
</tr>
<tr>
<td>Regular neurological observations</td>
<td>303 (69%)</td>
<td>3,185 (65%)</td>
<td>0.1</td>
</tr>
<tr>
<td>Team meeting</td>
<td>97 (22%)</td>
<td>833 (17%)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Stroke pathway</td>
<td>115 (26%)</td>
<td>1,694 (35%)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Aspirin within 24 hrs*</td>
<td>150 (42%)</td>
<td>2,627 (60%)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Factors associated with severe complications**

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.

**Results of bivariable analyses

*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.

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.

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).
ACI actions: Examining clinical variation to improve stroke care.

- ACI has funded the Stroke Clinical Variation Statewide Strategy (SCVSS) & Stroke Clinical Audit Program (SCAP) July 2014-December 2015

- Stroke Clinical Audit Process (SCAP). Unwarranted Clinical Variation Taskforce approved extension to the successful Pilot. **Completion of thirty supervised audits over two years.**

- SCAP. Detailed auditing and feedback of thirty hospitals. Measuring adherence with processes expected to impact on stroke patient outcomes, benchmarked against earlier and other site audits with analyses by Florey/NSRI and the SCAP team

- Validation of routinely collected data used in Bureau of Health Information analyses through a data linkage with SCAP audit data. In scope with BHI.

- Reducing the burden of audit and prospective data entry with development of a Stroke bundles of care for Electronic Medical Record (Build C) with requests to provide data extraction tools.

- Home to Outcome Study (H2O). The OHMR funded and ACI partnered Ingham Home to Outcome (H20) study. A pioneering data-linkage to better describe and measure the whole stroke journey across NSW hospitals. Uses 10 data bases containing ambulance, NSW ED and hospital admission, rehabilitation, death and readmission data.

The NSW Stroke Network and ACI are providing local clinicians and managers with the data and analyses needed to improve stroke care.
SCAP audits: Unwarranted clinical variation
Example of hospital feedback

Ix Hospital 9  2003, 2005, 2007 and 2015

- Median age 74 yrs. 7% intracranial haemorrhages, no IV ‘lysis, 1 palliative care and 2 deaths.
- AF identified 21%, diabetes 25%, high cholesterol 31%, a previous stroke or TIA in 23 and 10%.
- Risk factors on medication at admission AF 75%, Diabetes 84%, high cholesterol 58%, IHD 64% and HT 77%. Only 56% with previous stroke or TIA were on antithrombotics.
- 2 transfers in. None with a t/f protocol. Average time 1.5 hours; 100% presented at transferring hospital by ambulance. No in-patient strokes.
- Direct to Stroke Unit/ICU/HDU/CCU 85%. 67% SU.
- Neuro obs 24hrs 68%, 96% brain imaging <24 hrs, 3% Clinical Care plan, 99% a d/c strategy, 13% Stroke Pathway and none had an MDT Family meeting.
- Echo and Duplex (36 and 76%). MRI 61%. 88% ‘unable to walk’ had heparin/LMW heparin; 100% (4) NBM at 48 hours received IV/NG fluids.
- 64% received aspirin < 24 hours and 72% with IS were on an antithrombotic at discharge. New statin 44%.
- Speech pathologist in 24 hours 67% (86% if speech impaired). 31% documented swallow<4 hrs.
Example: Hospital 6 Pilot Audit Results 2013

• 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)*

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.

*There was local surprise at rates of pathway use and swallow assessment with an immediate QI response
Clinical variation: Measuring and improving care. SCAP and pilot audit, 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
SCAP audits: Unwarranted clinical variation

- No hospital unit performed uniformly well across all processes.
- Brain imaging in the first 24 hours varied between 46% and 100%.
- Cardiac echocardiography 0 to over 90%. Carotid duplex 0-86%.
- Stroke pathway use varied between 0 to over 90%. Two major teaching hospitals do not use a pathway which has been shown to reduce complications.
- Two major hospitals with higher than expected BHI 30 day mortality estimates admitted only 50 and 60% of their ischaemic stroke patients to stroke unit beds.
- Highest rate of VTE prophylaxis in patients with difficulty walking was 88%, only fourteen sites exceeded 50%. Five sites, including two stroke units had rates lower than 15%.
Some hospitals identified as Acute Thrombolysis Centres to which ambulances were being directed only provided ‘clot-busting’ treatment to 1-2% and others exceeded 20% in the audit samples.

Enhancement from state-wide programmes or local initiatives are seen to improve overall adherence with desirable processes.

Adherence did not always reach appropriate levels even where services were enhanced eg VTE prophylaxis.

Discharge on antithrombotic in IS varied widely from 46 to 93%

Nursing and allied health determined processes and timely access to allied health usually improved or were maintained over time

Several processes dependent on medical decisions eg: prescribing were not maintained or did not reach acceptable levels.
Unwarranted clinical variation and clinical process adherence

Targeted efforts to enhance sites results in better adherence with processes which are expected to improve outcomes.

There is a relationship between adherence with processes expected to improve outcomes and BHI estimates of 30 d mortality.

Hospitals are ranked from left to right by increasing mortality estimate.
SCAP audits: Average rates of investigation across Unenhanced and Rural and Metro 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

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

ACI NSW Agency for Clinical Innovation

THE FLOREY INSTITUTE OF NEUROSCIENCE & MENTAL HEALTH
SCAP: Process measures at 8 Unenhanced Rural sites N=495

Hospitals ranked from left to right with increasing mortality estimates

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

- Process measures: 9 Enhanced Rural sites

- Hospitals ranked from right to left by increasing estimated mortality
SCAP: Process measures at 12 Metropolitan hospital sites
N=784

Process measures: SCAP audits of 12 metropolitan hospitals

Hospitals ranked from left to right by increasing estimated mortality
| 1. NPR SU N=68  
N=159  
12/11-2/2013  
Awaiting re-audit data | BHI 30d Ischaemic Mortality and RSMR* 2009-12. (Crude SCAP audit mortality all strokes) | SU/HDU/ICU Bed (%) | 24 hr Neuro Ob's (%) | Stroke Clinical P'way (%) | Swallow test< 4 hrs (%) | %D'charged on A'thrombotic | Aspirin at 24 hours (% IS) | Pall' Care (N) | % D/C on Statin | %VTE P'laxis (Not mobile) |
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<td></td>
<td>9% and 0.57 (0%)</td>
<td>91</td>
<td>96</td>
<td>97</td>
<td>45</td>
<td>78</td>
<td>63</td>
<td>0</td>
<td>75</td>
<td>50</td>
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</table>
| 4. PR N=20  
N=240  
8/11-11/11 | 11% and 0.78 | 100 | 95 | 45 | 70 | 84 | 58 | 3 | 63 | 0 |
| 5. PR N=80  
N=503  
3/12-7/12 | 12% and 0.84 | 89 | 94 | 0 | 10 | 93 | 56 | 3 | 53 | 58 |
| 7. NPR N=40  
(76yrs)  
N=81  
2005 and 3/13-3/14/15 | 10% and 0.89 (10%) | 85 | 3 | 65 | 55 | 75 | 59 | 2 | 44 | 35 |
| 8. NPR N=80  
(70yrs)  
N=296  
2003, 05, 07 and '15 | 12% and 0.98 (1.5%) | 77 | 91 | 79 | 20 | 74 | 70 | 0 | 42 | 25 |
| 9. PR N=79  
(75 yrs)  
N=457  
2001,2007+1/14-4/2015 | 13% and 0.99 (13%) | 86 | 89 | 63 | 20 | 77 | 70 | 3 | 75 | 37 |
| 10. PR N=79  
(71 yrs)  
N=477  
2003, 05, 07+9/13-4/14 | 13% and 1.06 | 90 | 95 | 70 | 37 | 78 | 58 | 1 | 51 | 71 |
| 11. NPR N=79  
(74 yrs)  
N=266  
2003, 2005,2007, Jan 13-Dec14 | 14% and 1.1 (3%) | 85 | 68 | 13 | 31 | 74 | 64 | 1 | 44 | 88 |

Less **RED** numbers and more **GREEN** squares are better.
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<tbody>
<tr>
<td>Hospital 1</td>
<td>100%</td>
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<td>100%</td>
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<tr>
<td>Hospital 2</td>
<td>NA</td>
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<td>Hospital 3</td>
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**Risk Standardised Mortality Ratio. BHI Insight series.**

**Note:** A calculated audit sample mortality of 0% reflects a lack of access to the files of deceased patients at time of audit.

NA= Not available

**Red** numbers indicate low measures. **Blue** indicates higher measures.

Tile shades of **Green**, **Yellow** and **White** indicate the ranking of measured processes within columns. Palliative care in **Grey** is not ranked.

More **GREEN** squares and less **RED** numbers are better.
SCAP Audit: Average process adherence by type

Average adherence

- Metropolitan Enhanced
- Rural Enhanced
- Rural Non-enhanced

- SU/HDU/ICU
- Brain Imaging within 24 hours
- Neuro Obs 24 hours
- Aspirin<24 hours
- Physio<24 hours
- Speech Path<24 hours
- OT<24 hours
- Use of Stroke Clinical Pathway
- VTE Prophylaxis
- MDT Family Meeting
- Discharge on antithrombotic
- Discharge on New Statin
SCAP audit: Process measures across 29 sites  N=1788

Clinical process adherence: Pilot and SCAP audited hospitals

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

<table>
<thead>
<tr>
<th>Hospital</th>
<th>BHI 30 day Mortality (%)</th>
<th>SU/HDU Bed (%)</th>
<th>24 hr Neuro Ob's (%)</th>
<th>Clinical P'way (%)</th>
<th>Swallow test&lt; 4 hrs (%)</th>
<th>%Discharged on A'thrombotics</th>
<th>Aspirin at 24 hours (%)</th>
<th>Pall’ Care (N)</th>
<th>% D/C on Statin</th>
</tr>
</thead>
</table>
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.

Results and locally agreed strategies were fed back to LHD CE’s by the ACI Chief Executive in writing.
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 coming on line in those 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 are in the process of establishing hub and spoke flows.
SCAP: Improving stroke unit access

- Two major hospitals with higher than expected BHI 30 day mortality estimates admitted only 50 and 60% of their ischaemic stroke patients to stroke unit beds and access to stroke unit beds at other hospitals was lower than expected.

- Audited sites with stroke units have undertaken to improve Stroke Unit/HDU/ICU access for stroke patients to 90% or more through improved patient-flows.

- A stroke pathway in a HDU has been effective at Hospital 2 where a stroke unit may not be feasible. This approach is being considered by Hospital 21 (67 strokes pa and 189 ks from its nearest ‘hub’), and may be widely applicable.

- All participating unenhanced sites have committed to either on-site upgrades or the use of a hub and spoke model of downstream and return flows. (Upgrades: Hospitals 16, 19, 21, 25, and 28 and hub and spoke Hospitals 22, 27 and 29).

- Ambulance bypass and facilitated transfer is being used or considered for Hospitals 21-3, 22-9, and 29-10, and Spoke A-Hospital 6, Spoke B-Hospital 1 and Spoke C-Hospital 2, and across two participating LHDs as new units are being established.
SCAP: Conclusions and achievements

- We know that many patients do not reach a stroke unit hospital or a stroke unit bed in a stroke unit hospital (SCAP, NSF and ACI audit data). Patients do not always receive evidence based processes of care within stroke units (SCAP audits).
- SCAP has identified explanations for unwarranted clinical variation seen in BHI data.
- ACI has taken data to the bedside. Engaging with hundreds of clinicians and managers across NSW, providing information, expertise and support to identify and locally address unwarranted clinical variation.
- Face-to-face feedback has resulted in locally developed responses to UCV.
- Thirty participating sites are addressing access to desired investigations, and access to stroke unit beds, better prescribing and the use of stroke care pathways to improve adherence with other processes known to improve patient outcomes and experience.
UCV and stroke: What is next?

- Two more SCAP feedback site feedback sessions remain.
- The EMR Build C including stroke bundles of care is going into testing and there is hope that data extraction tools will be put in place to monitor site adherence with important clinical processes.
- The BHI is expected to work with ACI’s SCAP team to complete a data-linkage and analysis between there 30 day mortality data and the audit data to validate and improve the collection and analyses of the routinely collected data used by BHI.
- The new NWAU weighting for accessing a stroke bed in NSW and the new code for thrombolysis are expected to strongly impact on patient access.
- BHI will expect to repeat the analysis of the 30 day mortality analysis which will assess the early impact of the SCAP programme.
- This ACI sponsored Stroke Forum: Reducing Unwarranted Clinical Variation for clinician and managers involved in the stroke journey to discuss the SCAP results, hear presentations from participating hospital sites and consider next steps in improving stroke patient care and outcomes.
Via plane, train, cars and ambulance (car)....
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Special Thanks
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Process measures: A comparison of Rural Unenhanced and Metropolitan and Rural Enahcened Sites

<table>
<thead>
<tr>
<th>Hospitals ranked from right to left by increasing estimated mortality</th>
</tr>
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Brain Imaging*
Physio*
Speech*
OT*
Documented Swallow*
Documented Swallow**
MDT Family Meeting
Any SU/HDU
Stroke pathway
Clinical care plan
Linear (Any SU/HDU)
Linear (Stroke pathway)
SCAP: Process measures at 8 Unenhanced Rural sites N=495

Hospitals ranked from left to right by increasing estimated mortality
SCAP: Process measures at 9 Enhanced rural sites N=510

Process measures: 9 Enhanced Rural sites

Hospitals ranked from right to left by increasing estimated mortality
Unwarranted clinical variation and unwanted outcomes
Metropolitan hospital sites to November 2015

Ranked by increasing BHI 30 d mortality
### Unwarranted clinical variation and unwanted outcomes

#### Metropolitan hospital excerpt

<table>
<thead>
<tr>
<th>Hospital, Audit No, (Mean age), No. strokes pa 2013-14, ACI audit periods.</th>
<th>BHI 30d Ischaemic Mortality and RSMR* 2009-12. (Crude SCAP audit mortality all strokes)</th>
<th>SU/HDU/ICU Bed (%)</th>
<th>24 hr Neuro Ob’s (%)</th>
<th>Stroke Clinical P’way (%)</th>
<th>Swallow test&lt; 4 hrs (%)</th>
<th>%D’charged on A’thrombotic</th>
<th>Aspirin at 24 hours (%IS)</th>
<th>Pall Care (N)</th>
<th>% D/C on Statin</th>
<th>%VTE P’laxis (Not mobile)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. NPR SU N=68 N=159 12/11-2/2013 Awaiting re-audit data</td>
<td>9% and 0.57 (0%)</td>
<td>91</td>
<td>96</td>
<td>97</td>
<td>45</td>
<td>78</td>
<td>63</td>
<td>0</td>
<td>75</td>
<td>50</td>
</tr>
<tr>
<td>4. PR N=20 N=240 8/11-11/11</td>
<td>11% and 0.78</td>
<td>100</td>
<td>95</td>
<td>45</td>
<td>70</td>
<td>84</td>
<td>58</td>
<td>3</td>
<td>63</td>
<td>0</td>
</tr>
<tr>
<td>5. PR N=80 N=503 3/12-7/12</td>
<td>12% and 0.84</td>
<td>89</td>
<td>94</td>
<td>0</td>
<td>10</td>
<td>93</td>
<td>56</td>
<td>3</td>
<td>53</td>
<td>58</td>
</tr>
<tr>
<td>7. PR N=79 (75 yrs) N=457 2001,2007+1/14-4/2015</td>
<td>13% and 0.99 (13%)</td>
<td>86</td>
<td>89</td>
<td>63</td>
<td>20</td>
<td>77</td>
<td>70</td>
<td>3</td>
<td>75</td>
<td>37</td>
</tr>
<tr>
<td>9. PR N=79 (71 yrs) N=477 2003, 05, 07+9/13-4/14</td>
<td>13% and 1.06</td>
<td>90</td>
<td>95</td>
<td>70</td>
<td>37</td>
<td>78</td>
<td>58</td>
<td>1</td>
<td>51</td>
<td>71</td>
</tr>
<tr>
<td>9. NPRN=79 (74 yrs) N=266 2003, 2005,2007, Jan 13-Dec14</td>
<td>14% and 1.1 (3%)</td>
<td>85</td>
<td>68</td>
<td>13</td>
<td>31</td>
<td>74</td>
<td>64</td>
<td>1</td>
<td>44</td>
<td>88</td>
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<tr>
<td>10. PR N=20 N=276 7/11-8/2011</td>
<td>14% and 1.22 (Actual est. 62%)</td>
<td>100</td>
<td>100</td>
<td>0</td>
<td>25</td>
<td>78</td>
<td>44</td>
<td>0</td>
<td>28</td>
<td>14</td>
</tr>
</tbody>
</table>

*More GREEN squares and less RED numbers are better*