APPENDIX

Title: Improving discharge care: the potential of an organisational intervention to improve discharge planning following hospitalisation for acute stroke.

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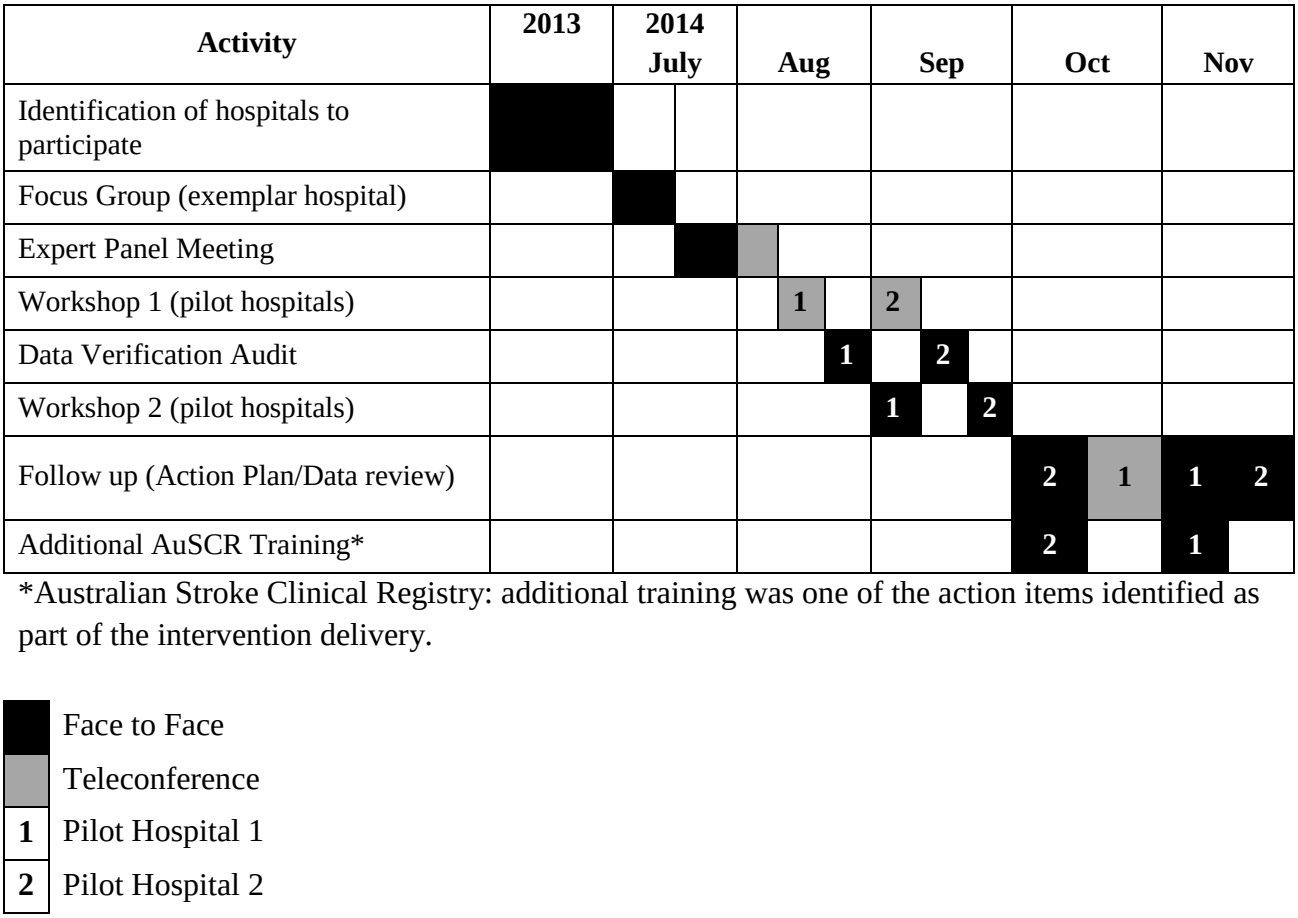
SUPPLEMENTAL METHODS

Theoretical basis for the intervention design

A major element of the intervention was to deliver it using staged external facilitation consistent with the Promoting Action on Research Implementation in Health Services (PARIHS) framework (i.e. using evidence, context and facilitation to motivate behaviour change).[1 2] Because hospitals were using the Australian Stroke Clinical Registry (AuSCR)[3] for standardised data collection on all patients admitted consecutively with acute stroke or transient ischaemic attack (TIA), there was the ability to regularly review performance. The design also had a strong basis in concepts from the Plan-Do-Study-Act methods (i.e. promoting the use of audit and feedback cycles and strategy development).[4] Given the recognised importance of barrier assessment, identifying local supports and developing strategy to address practice environment barriers, the Ottawa Model of Research Use was also considered in design of the action planning phase of the intervention.[5 6] The transtheoretical model of behaviour change[7] and work by Michie and colleagues[8] was drawn upon

to support the effective tailoring and sequence of strategies based on stage of readiness to change. Another important component was to attempt to fast track strategy development at the pilot hospitals by describing the successful techniques reported from identified 'exemplar' hospitals. A summary of the project intervention development and delivery stages is provided in Supplemental Figure I. Further details are provided in subsequent sections.

Supplemental Figure I. Intervention delivery, facilitation and support.



*Australian Stroke Clinical Registry: additional training was one of the action items identified as part of the intervention delivery.

Hospital selection: Performance of each hospital was calculated as the number of patients that received the discharge process divided by the number of patients that were eligible for the care process. The composite outcome was calculated as the total number of patients that received the three discharge processes divided by the total number of patients eligible to receive the three care processes. To establish a benchmark for each care process, we used methods based on the Achievable Benchmarks of Care (ABC^{TM}) approach[9] and previously used in stroke by Hall et al, 2013.[10] Our final benchmark was obtained by averaging the results for the hospitals with the highest adjusted adherence that collectively provided at least 15% of the data. This provided equal weighting for hospitals involved in the final benchmark calculation regardless of the number of registrants. For details of the methods used to calculate the benchmark to identify the top-ranked hospitals including the adjusted performance fraction and the composite outcome see Figure II.

APF= (n+1)/(N+2)

APF = Adjusted Performance Fraction
N = number of patients receiving the measure
N = number of patients eligible for the measure

Benchmark score = average APF score of the top n hospitals that provided ≥ 15% of denominator data (N)

$$\text{Composite outcome} = \frac{\text{n received a + n received b + n received c}}{\text{N eligible a + N eligible b + N eligible c}}$$

a = Discharged on antihypertensive medication
b = Discharged on antithrombotics
c = Received a discharge care plan

Composite gap score = composite outcome / composite benchmark score

Supplemental Figure II: Equations used to calculate benchmarks and the composite outcome

Development of the STELAR (Shared Team Efforts Leading to Adherence Results) intervention

The aim of the STELAR intervention was to raise awareness of areas of underperformance and use external facilitation to support mechanisms of change based on having an informed understanding of the context of practice and then optimising enablers and reducing barriers to successful implementation of the discharge care processes (see Supplemental Table II). The intervention was developed iteratively as follows:

Evidence to inform Practice

1(a) Clinical experiences and perceptions - Focus group with exemplar hospital

The two 'exemplar' hospitals were invited to provide information during a focus group interview on what worked effectively at their hospital (Figure I). Information obtained provided evidence relating to clinical experience and identified practices that could realistically be implemented within a similar stroke unit. Unfortunately, one hospital experienced extreme delays in processing local governance clearances and were unable to obtain approvals to participate prior to the project cut-off. The clinical lead from this hospital voluntarily emailed the research team a summary of processes, roles and factors considered to facilitate discharge planning at their site. This information was used to verify that nothing of relevance had been omitted from the participating hospital where the focus group was conducted.

A semi-structured interview schedule was used and was designed to elicit information on how discharge processes of care were being delivered; the aspects considered to be done well, or less well, by the interdisciplinary stroke team and the reasons for this; specific advice to other hospitals including use of tools and methods of communication to facilitate these processes; as well as how education prior to discharge is delivered to patients and their families. Two research staff (DC, ES) took notes during the interview conducted by DC to ensure a full description of the discussion was captured. Data were sent to the participating hospital representative for review to ensure that no information had been omitted or misinterpreted.

The data were then subjected to thematic analysis[11] methods in order to identify common patterns from the perceptions elicited and important themes.[12] Themes and sub-themes were identified in relation to: a) the overall experiences of clinicians in providing secondary prevention management and discharge planning; b) possible solutions to overcoming barriers in providing secondary prevention management and discharge planning; and c) what clinicians found useful and not so

useful about the program in the post-implementation phase. An inductive approach to these analyses was used. Inductive analysis is where findings are generated from the data, rather than imposing a pre-determined structure for the analysis.

The factors that were found to influence adherence to the clinical indicators were mapped across the 14 domains of the Theoretical Domains Framework (TDF).[13 14] This provided a conceptual basis for describing the enablers and barriers to implementation. These were further categorised into patient, clinician and system factors as broad areas to target planned mechanisms of action known to influence adherence to evidence-based care.

1(b) Review of evidence– Expert working group

The Expert Working Group consisted of nine experts with experience in stroke or designing and implementing programs to change clinical practice. Two of the members were consumer representatives. At a face-to-face workshop, the Expert Working Group was presented with the summarised qualitative data from the exemplary hospitals and a literature review summarising behaviour change interventions relevant to these discharge processes. Four main sources of evidence were reviewed. These were: (i) findings from the focus group; (ii) AuSCR data showing objective information on adherence to each of the indicators; (iii) current guidelines related to the processes of interest; and (iv) a summary of the literature describing proven methods known to change clinical practice.

The group reviewed the evidence and achieved consensus on what was likely to be the most effective approaches to be used in the target settings given the totality of the information presented. The ***STELAR intervention*** was refined over two subsequent teleconference meetings prior to being implemented at the pilot hospitals. The final detailed description of each intervention stage is outlined below and a summary provided in Supplemental Figure I.

STELAR Intervention

Stage 1: Pre-workshop survey: To gain a better understanding of current discharge processes and practices, staff at the pilot sites were asked to complete an online pre-workshop survey. The questionnaire items were designed so that current systems, practice protocols and team structures, culture and roles relevant to the target indicators could be determined for comparison with 'best practice'. Information was collated and a practice gap analysis performed to identify potential intervention areas for discussion during the first workshop. Specifically the survey included six main questions with sub-questions on the following:

1. How is discharge planning standardised within your stroke unit/service?
   a. Do you use any tools for these processes?
   b. Do you have designated staff that coordinate your discharge processes? If not, who usually performs this role?
   c. Do you have designated staff that coordinate the prescription of discharge (stroke prevention) medication? If not, who usually performs this role?
   d. Do you think that there is anything the team might do to further improve these processes at your hospital?
2. How does the team communicate amongst themselves about discharge planning and secondary prevention for patients with stroke? Please list interdisciplinary processes as well as those involving patients.
3. How do you usually involve patients and their family/caregivers in the discharge process and decision-making?
4. Are there any hospital-wide systems for discharge planning or education for patients with stroke, including those who are not admitted to the acute stroke unit?
5. Are patients referred to external services for ongoing support when discharged to the community?

6. How does your workplace monitor its performance in regards to discharge processes and provision of secondary prevention medications for acute stroke?
    a. How often does the team review these data?
    b. Do you have any concerns about the data quality?

These data were then summarised and mapped into a Process Gap Analysis template developed in Microsoft Excel (2003) informed by the evidence that had been elicited from the exemplar hospitals. In the template six major components were covered: standardised evidence based processes; interdisciplinary care; communication and education; documentation; organisational structures; and external services. For each component, suggested potential action/enablers were listed and opportunities for improvement according to relevance for medication prescription or discharge care planning. The completed template was emailed to participants prior to Workshop 1, as well as a Data Completeness report generated from the AuSCR to inform the hospital about the quality of their locally collected data as a potential source of underperformance.

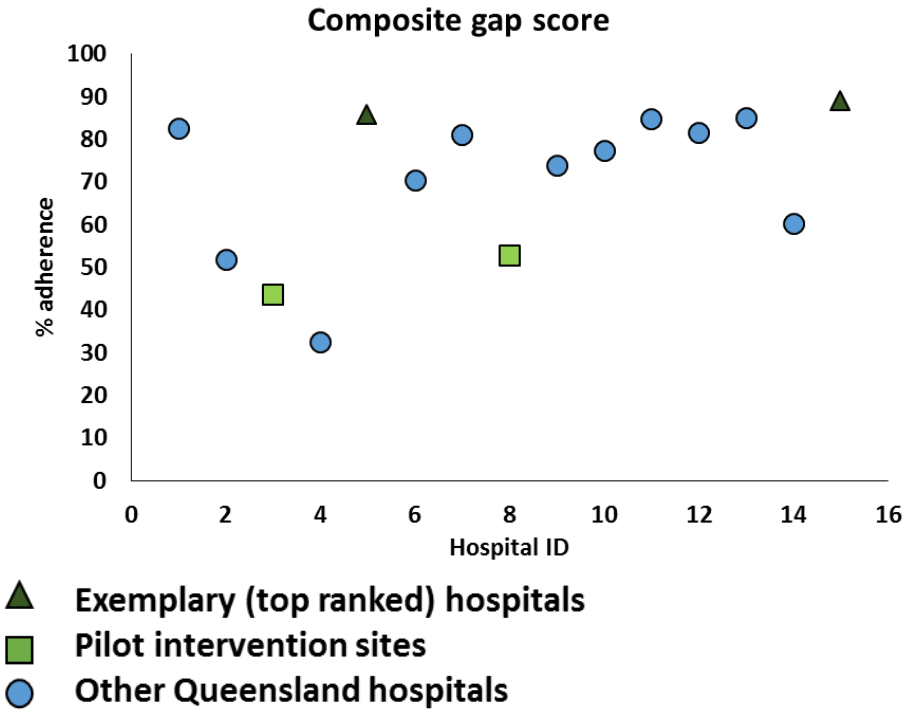
Stage 2: Workshop 1 was delivered as a teleconference with the facilitator dialling into the hospital meeting room to reduce the costs of the intervention and promote scalability. The objective was to leverage effective aspects of existing practices at the pilot sites and gather consensus on the potential barriers that could be modified. During this workshop the facilitator sought to explore changes to practice or behaviours that could be easily implemented based on existing workplace culture and practices as compiled from the pre-workshop surveys. Discussion of barriers was directed toward modifiable and mission critical barriers, and thence to enablers to maintain a focus on positive action planning. The participants were given information on potential enablers identified from the literature, the qualitative findings from the Exemplar hospitals, and other insights from the Expert Working Group. The participants were then asked to discuss and describe their current processes of care in relation to these data. Potential opportunities for interventions, that were deemed feasible by the participants, were then considered and categorised into low, medium and high priority. In addition, recent AuSCR data were analysed to provide an updated indication of performance for each of the three care processes for the hospital. The information from this workshop was then used to tailor the 'educational and evidence-informed action planning' workshop (Workshop 2). Potential 'local opinion' leaders within the participant group were identified by the workshop participants and asked to attend Workshop 2 to both engage them and provide an educational component.

Stage 3: Educational and evidence-informed action planning Workshop: The second workshop (Workshop 2) was a face-to-face meeting. It involved an education component by a 'local opinion leader'; followed by a review of local performance data by the external facilitator (DAC) using the AuSCR data. The facilitator then worked with the participants to draft a local action plan to be implemented by the clinicians responsible for these activities drawing on the information and prioritisation of potential intervention opportunities from Workshop 1. An action plan was developed to address identified modifiable and 'mission critical' barriers related to the behaviours, identify potential adopters and review features of the practice environment that could be addressed.[15-17] A 'change champion' was appointed from the participants who would be best placed to facilitate implementation of the agreed strategies. The actions plans were to be implemented with a view to maximising use of existing resources, processes and activities to improve efficiencies within hospitals, rather than increasing staff workloads.

Stage 4: Ongoing support was provided to hospital staff by the AuSCR Queensland project officer (ES) via monthly telephone contact. Staff responsible for leading work on the action plan were, in this way, required to report on progress in meeting the agreed timelines and goals. Since additional training for using AuSCR was one of the action items identified at both hospitals as part of the

action plan, a face-to-face visit was also conducted. This was determined to be an important part of the intervention since regular reviews of performance should form part of monitoring cycles.[18]

Supplemental Figure III. Composite outcome scores for Queensland hospitals based on Australian Stroke Clinical Registry (AuSCR) data from January 2012 to June 2013 used to identify sites for project participation.



SUPPLEMENTAL RESULTS

Focus Group with Exemplar Hospital

There were 12 clinicians (3 doctors, 7 allied health staff and 2 nurses) that contributed to the focus group. The specific factors that were identified as impacting both positively and negatively on the discharge care processes of interest were described within the following three broad categories known to influence adherence to clinical guidelines:

Patient factors: These were mainly described within the context of communication and education and availability of staff to perform these tasks and meet with patients and families at appropriate times. To address this, a multidisciplinary approach to education and communication was used and additional opportunities for doctors to undertake education with patients and families were available at the patient's first outpatient visit following discharge.

Clinician factors: These were often influenced by clinicians' understanding of what roles and responsibilities their individual discipline had within the multidisciplinary team for the discharge aspects of stroke care. Although particular disciplines had certain responsibilities, other disciplines provided backup if something was potentially missed. Regular formal and informal communication was facilitated by the co-location of staff. Social work was important in discharge planning, as was the role of the Discharge Coordinator (administrative nursing position for medical wards) and the Stroke Nurse Specialist. Blanket referrals were provided for most allied health staff and pharmacy staff had an important and active role in facilitating prescription of discharge medication.

System factors: The exemplar hospital had a specific focus on discharge planning from the time of admission. The hospital had dedicated Discharge Officers and a discharge room to streamline discharge of patients with stroke. The Enterprise Discharge Summary (EDS) electronic program had been implemented at this hospital. This was used routinely and was considered an important tool to support high quality discharge care. Automatic downloading of medications (as drawn directly from the pharmacy system) and other information was used as much as possible to provide a template to which other aspects of the discharge planning discussed with the patient could be added.

Table I provides a summary of our findings when we mapped our results from the focus group to the Theoretical Domains Framework (TDF).[13] Overall, we found that the most important aspects highlighted for effective discharge planning and prescription of discharge prevention medication were related to addressing clinician factors followed by system factors.

Overall, the main factors highlighted during the focus group discussion with the potential for translation into pilot settings were:

(1) standardised evidence based processes;
(2) interdisciplinary care;
(3) communication and education; and
(4) improved systems of documentation.

Supplemental Table I: Focus Group response distribution

Domains*	Patient Factors		Clinician Factors		System Factors	
	Enablers	Barriers	Enablers	Barriers	Enablers	Barriers
Knowledge			●●	●	●●●●●	
Skills	●●		●	●	●●●	
Social / Professional Role and Identity			●	●	●●●●	●
Beliefs about capabilities					●●●	●
Optimism				●		
Beliefs about consequences		●	●	●●		●
Reinforcement			●●			
Intentions	●		●		●	
Goals			●●		●●●	
Memory, attention and decision processes				●	●	●
Environmental Context and Resources	●●	●	●●●●●●	●●	●●●●●	●●●
Social Influences				●		●●
Emotion				●		
Behavioural Regulation	●				●	●

*based on Theoretical Domains Framework by Cane, O'Connor and Michie, 2012[13]

1. Expert working group meeting

The Expert Working Group recommended that the following components be included as part of the intervention.

a) ***Education:*** A lead clinician identified as a knowledgeable and expert "local opinion leader" was recommended to provide part of the education for the implementation workshop (Workshop 2) by reinforcing evidence from the national guidelines and the published literature. This provided the dual role of establishing a leader within the group and providing the necessary background evidence.

b) ***Background scoping of the quality of performance data at pilot hospital to be included as feedback:*** An analysis of how accurately the data were being entered into AuSCR was recommended to isolate specific areas of underperformance, knowledge gaps and potential data quality issues. A verification audit of the medical records for cases where AuSCR data indicated that eligible patients did not receive the discharge care process was also performed to identify why the process was not received. Resolution and discussion of data quality issues was considered important so that this could not be used as the 'excuse' for why these hospitals had performed poorly relative to their peers. It was also considered important to increase the confidence of sites in using their data so that a continuous cycle of audit and feedback could be imbedded into practice to monitor progress during the implementation phase.

c) ***Pre-workshop 1 survey:*** Participants at the pilot hospitals in which the STELAR intervention would be implemented were asked to complete a survey to identify gaps between practices at their site and "best practice" as determined by the expert working group. This information was used to elicit and summarise barriers and enabling factors relevant to their site prior to the first workshop. This was done to promote clinicians to begin thinking about their service and how it could be improved prior to the workshop. The questions elicited information on how the current clinical practices were being done, if they used any tools to support delivery of the intervention, and if there were any designated staff who usually performed coordinated that aspect of care. Questions about team communication, involvement of the patient and family in decision-making, hospital-wide or external services available to support delivery of the clinical practices and if local performance data were regularly reviewed were also elicited.

d) ***Planning for development of action plans:*** Broad action areas considered important for successful discharge planning, based on the enabling factors noted during the focus group meeting at the exemplar hospital and in the Pre-workshop 1-survey, were identified prior to the workshops. These were used to help guide the discussion and assist the staff at the pilot hospitals in identifying enablers related to their own systems and practices to facilitate developing their own action plan.

2. Workshop 1

Modifiable gaps in practice identified between pilot hospitals and "best practice" are outlined in Table 1. Common themes were observed between the two sites especially with regards to habituation of practice and knowledge and education. More specifically inconsistent use of tools and systems, lack of pharmacy involvement, inconsistent knowledge associated with content, definitions and eligibility for a discharge care plan and sub-optimal recording of processes in AuSCR and medical records were identified as potential areas for improvement by both the pilot sites.

3. Workshop 2

Local ‘change’ champions were identified at each site to lead the implementation of the quality improvement activities as agreed to on the action plan. To improve discharge care planning a number of strategies were agreed: The Stroke Foundation *My Stroke Journey* care plan tool formed the main component of the action plan for improving discharge care planning processes, as well as the need for further education and professional development about what constituted a satisfactory care plan. Common strategies used by the pilot sites for improving this process included: providing an example of a comprehensive discharge care plan for clinicians to refer to; and using reminders, stamps, and reviews at team meetings. The use of reminders was perceived to facilitate uptake, documentation and adherence. Staff also planned to empower patients and their families to use the ‘*My Stroke Journey’* booklet and discharge plan to promote effective discharge care planning. There was recognition that when such interactions with patients and families occurred this needed to be documented.

Developing efficient tools and systems, as well as greater involvement of pharmacy were an important focus of the action plan for improving prescription of secondary prevention prior to discharge. Common strategies were: blanket referrals to pharmacy to review medications and flag inconsistencies; use of internal and external audits to identify sub-groups of patients that may not be receiving medications; use of checklists; coordination/integration of electronic pharmacy and electronic discharge summaries; and developing systems to flag missed cases for follow-up at outpatients.

Additional training on how to accurately enter the AuSCR data and how to use and interpretation the AuSCR ‘live reports’ and data exports was requested by both pilot sites. Plans were put in place to regularly review the AuSCR data at team meetings and to track adherence trends both during the intervention implementation phase and on an ongoing basis to ensure sustainability.

Supplement Table II: AuSCR data dictionary definition for discharge care processes used in Queensland hospitals

Variable name	Detailed definition	Eligibility criteria
On discharge was the patient prescribed antithrombotic agents?*	Evidence that antithrombotic medication was prescribed at discharge if not an intracerebral haemorrhage	Excludes intracerebral haemorrhage
On discharge was the patient prescribed antihypertensive agents?	Evidence that patient was discharged on antihypertensive medication. Antihypertensive agents commonly include angiotensin converting enzyme inhibitors (e.g. Perindopril, Ramipril) with or without diuretic and angiotensin II receptor antagonists (e.g. Telmisartan, Losartin) with or without diuretic. Other agents include alpha blockers (e.g. Prazosin), beta blockers (e.g. Atenolol, Metoprolol), calcium channel blockers (e.g. Amlodipine, Diltiazem hydrochloride) and thiazide diuretics	Includes all patients with stroke
Is there evidence that a care plan outlining post discharge care in the community was developed with the team and the patient (or family if patient has severe aphasia or cognitive impairments)?	Documented evidence that the patient, or the patient's family, have received a plan that outlines care in the community post discharge that has been developed with input from both the multi-disciplinary team and the patient or in situations where the patient is no longer able to make decisions, with the family or significant other. The care plan should include the following information: • risk factor modification • any community services • local stroke support services • further rehabilitation or outpatient appointments • appropriate contact numbers • equipment needed A verbal discharge formulated with a patient is not considered a care plan	Includes those discharged to the community (i.e. home or aged care)

*not routinely collected in Australian hospitals outside of Queensland before 2015

Source:

http://www.auscr.com.au/wp-content/uploads/AuSCR-Data-Dictionary-V4-1_26-September-2016.pdf accessed 05 December 2016.

Supplemental Table III Demographic characteristics of patients in the pre and post intervention periods for each intervention sites and overall for the non-participating Queensland sites

Patient Characteristics	Pilot Site 1			Pilot Site 2			Other Queensland AuSCR (non-participating) Hospitals (n=13)		
% unless specified	Pre N=119	Post N=113	p-value	Pre N=52	Post N=60	p-value	Pre N=626	Post N=729	p-value
Female	42.9	36.3	0.3	44.2	40.0	0.6	42.8	47.1	0.1
Age (median IQR)	75.7 (66.7, 84.0)	74.1 (65.3, 84.8)	0.7	66.3 (57.7, 76.7)	70.4 (59.6, 82.5)	0.2	73.0 (60.9, 81.3)	71.3 (60.6, 82.0)	0.3
Transfer from another hospital	24.6	26.1	0.8	22.5	33.3	0.2	14.5	13.5	0.6
In hospital	4.2	5.4	0.7	4.2	5.0	0.8	4.0	3.9	0.9
Able to walk on admission	50.0	35.2	0.04	25.0	75.0	<0.001	40.1	42.8	0.4
Prior stroke	19.1	20.7	0.8	12.2	21. 7	0.2	24.3	23.9	0.9
Stroke type									
ICH	9.2	15.0	0.3	15.4	13.3	0.7	9.1	8.8	<0.001
Ischaemic	70.6	67.2		67.3	60.0		67.6	60.0	
TIA	19.3	15.0		15.4	25.0		22.0	23.7	
Undetermined	0.8	2.7		1.9	1.7		1.3	7.5	
Length of Stay, days (median (IQR)	3 (1, 4)	3 (1, 5)	0.6	7 (3, 14)	6 (3, 11)	0.5	5 (2, 8)	4 (2, 8)	0.5
Discharged to residential care	1.7	5.0	0.2	2.2	3.5	0.7	4.2	2.7	0.2
Discharged to rehabilitation*	11.3	6.9	0.3	28.3	33.3	0.6	26.6	22.1	0.07
Discharged to sub-acute care*	27.8	33.7	0.4	0	1.8	0.4	4.2	4.4	0.9
Discharged to home*	53.9	47.5	0.3	65.2	52.6	0.2	52.5	58.2	0.04

*Excludes those who died in hospital; AuSCR: Australian Stroke Clinical Registry, IQR: Inter Quartile Range, ICH: Intracerebral Haemorrhage, TIA: Transient Ischaemic Attack

Supplemental Table IV: Adherence to discharge processes prior to the intervention, following implementation of the intervention, and 12-months after the post-intervention period: gap scores relative to benchmarks calculated for each period

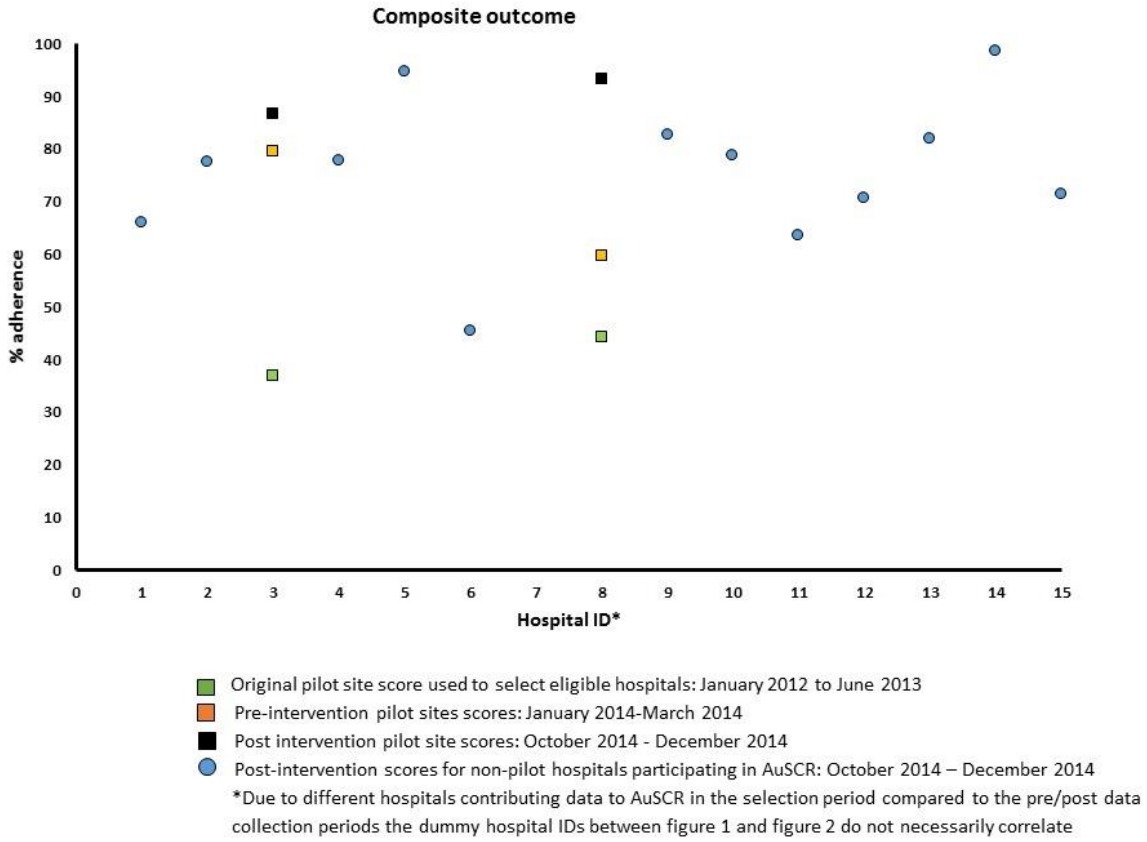
	Gap scores* Pre-intervention (%)	Gap scores* Post intervention (%)	¥Absolute difference	p-value	*Gap scores Sustainability period (%)	§p-value
Composite score†	Site 1 N=292 Site 2 N=127	Site 1 N=274 Site 2 N=164			Site 1 N=294 Site 2 N=138	
Combined	85	94	9	<0.001	94	1.0
Site 1	92	91	-1	0.7	91	1.0
Site 2	69	98	29	<0.001	100	0.1
Individual Processes						
Antihypertensive medication	Site 1=116 Site 2=46	Site 1=102 Site 2=57			Site 1 N=117 Site 2 N=46	
Combined	77	84	7	0.1	89	0. 2
Site 1	79	78	-1	0.9	86	0.1
Site 2	71	95	24	0.001	97	0.6
Antiplatelet therapy	Site 1 N=105 Site 2 N=40	Site 1 N=90 Site 2 N=50			Site 1 N=105 Site 2 N=46	
Combined	91	98	7	0.01	91	0.01
Site 1	92	95	3	0.4	87	0.06
Site 2	89	101	12	0.02	99	0.5
Discharge care plan	Site 1 N=71 Site 2 N=41	Site 1 N=82 Site 2 N=57			Site 1 N=72 Site 2 N=46	
Combined	76	100	24	<0.001	92	<0.001
Site 1	96	101	5	0.07	92	0.01
Site 2	39	96	57	<0.001	90	0.2

*Gap score is the adjusted adherence divided by the benchmark. Benchmarks were calculated separately for each time period to account for state level changes that may have occurred independent of the intervention. A higher score indicates that the site score is closer to the benchmark. Scores above 100% indicate that the site is above the benchmark. N refers to the combined number eligible for the two sites

§Compared to post-intervention scores; †Calculated as the total number that received the care processes divided by the total number eligible across all 3 care processes; ¥Difference between pre- and post-intervention gap scores

Pre-intervention: Jan-Mar 2014, post-intervention: Oct-Dec 2014, sustainability period: Oct-Dec 2015

Supplemental Figure IV. Summary point estimate results for pilot sites over time and non-participating hospital at post intervention time period



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