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Title: Allied health professionals using translational research in action to develop a stroke audit tool.

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Conflict of interest:

There were no conflicts of interest during this study.

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Title: Allied health professionals using translational research in action to develop a reliable stroke audit tool.

1 **Abstract:**

2 **Objective**

3 To design a local stroke audit tool by engaging allied health clinicians within a
4 privately fund hospital.

5 **Methods**

6 Design: Two-stage study involving a modified Delphi process to inform stroke audit
7 tool development and inter-tester reliability study. Participants: Allied health
8 clinicians. Interventions: A modified Delphi process to select clinical guidelines for
9 inclusion in the audit tool. Reliability study, one allied health representative from
10 each discipline, audited ten clinical records with sequential admissions to acute and
11 rehabilitation services. Main Outcome Measures: Clinical guidelines were admitted to
12 the audit tool when 70% agreement reached, with 50% the reserve agreement. Inter-
13 tester reliability was determined using intra-class correlation coefficients (ICCs).

14 **Results**

15 Twenty-two participants (92% female, 50% physiotherapists, 17% occupational
16 therapists) completed the modified Delphi process. Across six voting rounds, eight
17 clinical guidelines reached 70% agreement, two reached 50% agreement. Two
18 guidelines (nutrition/hydration; goal setting) were added to ensure representation for
19 all disciplines. Substantial consistency across raters was established for the audit
20 tool applied in acute stroke (ICC .71; range .48 to .90) and rehabilitation (ICC.78;
21 range .60 to .93) services.

22

1 **Conclusions**

2 Allied health clinicians agreed on clinical guidelines to inform an audit tool. The tool
3 demonstrated substantial consistency supporting future use for service development.

4 **Key questions**

5 1. **What is known about the topic?** Limited number of privately funded
6 hospitals participate with national stroke foundation audits. Involving clinicians
7 in the audit process may increase likelihood of clinical change following audit
8 results. The majority of audit tools did not involve local clinicians in the
9 development process.

10 2. **What does this paper add?** Allied health clinicians within a privately funded
11 hospital engaged in an audit process to develop a reliable stroke audit tool.

12 3. **What are the implication for practitioners?** This process which engages
13 local clinicians could be adopted by others to design reliable audit tools to
14 identify local service gaps.

15 **Key Words.**

16 Stroke; allied health; stroke clinical guidelines; knowledge translation

17

1 **Introduction:**

2 In Australia, the National Stroke Foundation's (NSF) stroke clinical guidelines,
3 (www.strokefoundation.org.au),¹ recommend best practice for management of
4 stroke survivors.¹ Adherence is monitored biannually through national stroke audits,
5 alternating acute² and rehabilitation care.³ Despite providing 47% of hospital care in
6 Australia,⁴ private hospitals have shown long standing low participation in these
7 national audits. Recently, despite written invitation, only 14% of private rehabilitation
8 services participated,³ with a mere 5% of private acute services participating.²
9 Reasons for this low participation are unknown^{2,3} but could potentially affect the
10 quality of stroke care. Alternative strategies are required to identify knowledge gaps
11 at the local level for stroke services in the private sector.

12 One framework to identify local knowledge gaps is the knowledge to action cycle
13 which comprises of two phases, knowledge creation and the action cycle.⁵ Clinical
14 record audits are the most common method to assess quality of healthcare by
15 identifying potential knowledge gaps⁶ and can inform the problem identification
16 stage of the 'action cycle'.⁵ Clinical record audits use pre-recorded patient medical
17 documentation as the primary source of information⁷ and are commonly used to
18 measure adherence to stroke clinical guidelines.^{2,3,8}

19 Little is known about allied health clinicians' adherence with implementing clinical
20 guidelines. A systematic review identified only one study investigating allied health
21 clinicians' implementation of clinical guidelines.⁹ It has been suggested that actively
22 involving clinicians within an audit process may support clinical change.¹⁰ Therefore,
23 it is possible that involving local allied health clinicians in the selection of NSF clinical

1 guidelines to include in a stroke audit tool may potentially enhance allied health
2 clinicians' engagement with implementing clinical guidelines.

3 Three studies have developed local stroke audit tools to assess stroke services;
4 focussing on physiotherapy,¹¹ allied health,¹² and the multidisciplinary team.¹³ Two of
5 these studies used a similar method for audit tool development where authors
6 identified appropriate guidelines related to physiotherapy¹¹ or allied health¹² for
7 inclusion. Guidelines deemed not relevant were excluded from these stroke audit
8 tools. In the third study the multidisciplinary team (medical, nursing, therapists and
9 social work) selected guidelines for inclusion¹³ but the selection process was not
10 outlined. Additionally, none of these studies¹¹⁻¹³ investigated the reliability of the
11 audit tools. Reliability is important to consider to determine the amount of error
12 among auditors,⁷ that may in turn affect the quality of the results impacting their
13 ability to assess knowledge gap of their service.⁶

14 This study sought to design a stroke audit tool for assessment of allied health
15 clinicians' adherence to NSF clinical guidelines within a private hospital using the
16 knowledge to action cycle. As the stroke audit tool was intended for use in a multi-
17 allied health setting, the tool's reliability was explored using multiple allied health
18 raters.¹⁴

19 Our study tested these premises with the following questions:

- 20 1. Can allied health clinicians from a stroke service of a private hospital
21 agree on NSF clinical guidelines to inform a stroke audit tool?
- 22 2. How reliable is the stroke audit tool when implemented by allied health
23 teams?

1 It was hypothesised that

2 i) Allied health clinicians would reach 70% agreement for a minimum of 10
3 NSF clinical guidelines.

4 ii) The audit tool could be reliably administered by allied health professionals
5 with substantial consistency (Intraclass Correlation Coefficient (ICC) >0.7).

6

7 **Methodology:**

8 Design: A two-stage prospective study was conducted to develop a stroke audit tool
9 using allied health clinicians and to test the reliability of the tool when administered in
10 the acute stroke and rehabilitation services of a private hospital. In the first stage, a
11 modified Delphi process informed the development of the stroke audit tool. The
12 second stage, an inter-tester reliability study, tested the level of consistency between
13 five allied health raters.

14 Participants: Allied health clinicians including physiotherapists, occupational
15 therapists, speech pathologists, dieticians and social workers working on either the
16 acute stroke or rehabilitation services of a private hospital in Australia, were invited
17 to participate. For the reliability study, one senior allied health member from each
18 discipline participated.

19 Eligible allied health clinicians were those who had at least six months' experience
20 working in the acute stroke and/or rehabilitation services. Knowledge and awareness
21 of the NSF clinical guidelines ¹ were preferable but not essential. Exclusion criteria
22 included non-allied health staff members, allied health staff who did not work on the
23 acute stroke or rehabilitation units, allied health assistants and students on

1 placement, casual allied health staff and allied health staff on extended leave such
2 as maternity leave. Demographics of the allied health participants were collected.
3 Eligible allied health clinicians were invited to an information session regarding the
4 study where the modified Delphi process was explained and the reliability study
5 outlined. Allied health clinicians provided written informed consent to participate in
6 the modified Delphi process. All participants involved in the reliability study
7 consented to this additional component and signed the hospital's privacy policy. The
8 study had ethical approval from relevant institutional Human Research Ethics
9 Committees.

10 Procedures: A modified Delphi process informed the content of the stroke audit tool.
11 A Delphi process has been used across a broad spectrum of topics including health
12 ¹⁵ and social sciences.¹⁶ The Delphi process was modified, in the current study, due
13 to the large number (71) of NSF clinical guidelines for stroke management to be
14 considered.¹ Guidelines that received no votes in each voting round were removed
15 from subsequent voting rounds. While four voting rounds are commonly used,¹⁷ two
16 additional voting rounds were included to maximise the opportunity for inclusion of at
17 least one guideline relevant to each allied health discipline.

18 The modified Delphi process was completed online using *Qualtrics* Survey
19 Software.¹⁸ Participants were emailed a website link and through this portal cast their
20 vote for each guideline (Yes / No). Guidelines were listed in the order they appeared
21 in the NSF Clinical Guidelines for Stroke Management 2010.¹ Participants were
22 provided with a copy of the NSF Stroke Guidelines during each voting round.

23 Participants completed six voting rounds, voting for ten NSF clinical guidelines at
24 each round.¹ Following each voting round, percentage agreement was calculated for

1 each guideline receiving votes. The level of agreement (consensus) typically
2 achieved during a Delphi process is between 50 and 70%.^{19,20} In the current study,
3 the target level of agreement was set at 70% with 50% agreement established as the
4 reserve level of agreement for guideline inclusion. As two disciplines (dietitians and
5 social workers), had limited representation in the participant group due to staff
6 numbers employed at the hospital, a reduced level of agreement (50%), for
7 guidelines relevant to these disciplines was accepted if agreement was not achieved
8 by round six.

9 Selected NSF clinical guidelines meeting the agreement levels were locally adapted
10 ²⁷ and developed into 'yes/no' questions to form the stroke audit tool (appendix 1). To
11 investigate inter-tester reliability of this stroke audit tool, one senior allied health
12 clinician from each of the five allied health disciplines (raters) used the stroke audit
13 tool to audit ten randomly selected **medical charts**. **Charts** of eligible stroke survivors
14 meeting inclusion criteria were identified using hospital account software, *Meditech*
15 and retrieved from hospital records. To be eligible, stroke survivors needed to be
16 admitted during a 12-month period, have a clinical diagnosis for cerebrovascular
17 accident from the clinical diagnosis codes I60.0 to I69.8 from the International
18 Statistical Classification of Diseases and Related Health Problems ²¹ and have
19 services delivered in sequential admissions to both the acute stroke and
20 rehabilitation services. **Charts** were excluded if stroke survivors were admitted
21 outside the timeframe designated and had clinical diagnosis codes not specific to
22 stroke such as transient cerebral ischaemic attacks (G45), traumatic intracranial
23 haemorrhage (S06) and vascular dementia (F01).²¹ From this pool, ten charts were
24 randomly selected using *Windows Program Excel*. Raters were instructed there must

1 be written documentation for the NSF clinical guideline to be met. If there was no
2 written documentation it was deemed that the guideline was not completed.¹²

3 Data analysis: For the modified Delphi process, descriptive analyses were used to
4 present the demographic information of eligible allied health participants. Frequency
5 analyses informed outcomes from the six Delphi rounds with the ten NSF guidelines
6 with the highest level of agreement presented.

7 For inter-tester reliability, each rater recorded (Yes/No) whether charts had written
8 documentation of each guideline. An overall mean (SD) agreement for each rater for
9 each guideline, across ten medical charts was calculated for both the combined
10 service as well as for the acute stroke and rehabilitation services. To determine inter-
11 tester reliability a two-way mixed ICC established the relative consistency between
12 raters (22). Data were analysed using *IBM's SPSS Statistics 23* to calculate the ICC
13 and estimate the 95% confidence intervals.

14 **Results**

15 Participant characteristics: Table 1 presents the demographic characteristics for
16 participants (n = 22) who completed all modified Delhi rounds. Twenty-four (63%) of
17 the allied health clinicians eligible to participate (n = 38), volunteered to be part of the
18 modified Delphi process. Physiotherapy represented the largest group (n = 19),
19 followed by occupational therapy (n = 9); social work (n = 5), speech pathology (n =
20 3), and dietetics (n = 2). One participant withdrew by the fourth round due to ill
21 health, and another commenced extended leave and withdrew by the fifth round.

22 Modified Delphi process: Upon completion of the six voting rounds eight clinical
23 guidelines achieved 70% agreement and were included in the stroke audit tool (table

1 2). Figure 1 displays the specific guidelines after each voting round and the level of
2 agreement among participants. In round one, only one guideline achieved 70%
3 agreement; NSF guideline 6.1, (amount, intensity and timing of rehabilitation).
4 Following rounds two and three, two additional guidelines (one each round) achieved
5 70% agreement, NSF guideline 6.2 (sensorimotor impairment) and NSF guideline
6 6.3 (physical activity). By the sixth and final round, eight guidelines achieved 70%
7 agreement and were included in the stroke audit tool. Two NSF guidelines, 1.3
8 (discharge planning and transfer of care) and 7.15 (falls), were above the reserve
9 50% agreement and were included in the tool. Two additional guidelines were
10 included in the tool, NSF guidelines 7.1 nutrition and hydration and 1.7 goal setting,
11 to ensure the stroke audit tool was relevant to all disciplines.

12 Inter-tester reliability: Seventy-two people were admitted to the hospital following a
13 stroke during the 12-month period. Clinical diagnosis codes identified 55 (76%)
14 stroke survivors sequentially admitted to both the acute stroke and rehabilitation
15 services. Manual inspection of the charts resulted in twelve clinical records being
16 discarded as these had only presented to one service. Thus, 43 (60%) charts were
17 available for inclusion in the reliability study. Ten (14%) randomly selected charts
18 were audited by the five allied health raters.

19 Table 3 shows the mean (SD) percentage agreement of each rater for each
20 guideline (and subsections) across the ten audited charts. For NSF guideline 1.2
21 (hospital care) for example, the physiotherapist rater audited that NSF guideline 1.2
22 had been met in the acute service in all ten charts; 100% (SD 0). Whereas the
23 occupational therapist rater audited that NSF guideline 1.2 was met in nine out of 10
24 charts (98.3%; SD 5.3). Inter-rater relative consistency for the acute stroke service

1 was 0.71 (range 0.48 to 0.90), for the rehabilitation service 0.78 (range 0.60 to 0.93)
2 and across the combined service 0.84 (range .70 to.95)

3 **Discussion**

4 Our study demonstrated that allied health clinicians could effectively participate in a
5 modified Delphi process and agree on NSF clinical guidelines to be included in an
6 allied health stroke audit tool. The tool was applied with substantial consistency in
7 both acute stroke and rehabilitation services of a private hospital. Our results are
8 similar to another study of inter-tester reliability using a stroke practice audit tool
9 developed by an expert panel.²³ This demonstrates that our design of determining
10 audit criteria by local allied health clinicians, in selecting NSF clinical guidelines, was
11 developed into a reliable stroke audit tool to assess a stroke service. Our findings did
12 not fully support our hypothesis that the allied health team could identify and meet
13 70% agreement for 10 NSF clinical guidelines to be included in a stroke audit tool.
14 Only eight guidelines reached this target level of agreement for inclusion in the
15 stroke audit tool after six voting rounds. An additional two guidelines (1.3 Discharge
16 planning and transfer of care; 7.15 Falls) meeting the reserve level of agreement of
17 50% were also included in the tool. Both targets are consistent with the agreement
18 reported in other studies.^{19,20}

19 A collaborative approach between clinicians and researchers working together to
20 identify services gaps facilitates application of the knowledge translation model.²⁴
21 Knowledge of service gaps related to current practice enables service
22 enhancements.²⁵ Involving local treating clinicians appears to be beneficial as
23 previous studies ^{26,27} found making stroke guidelines relevant at the local service
24 level resulted in increased uptake in the recommendations and subsequently

1 improved stroke survivor function. Making clinical guidelines relevant to local
2 services is particularly important, as changing current practices can be difficult. Allied
3 health disciplines work in complex organisational structures²⁸ and therefore,
4 behavioural change needs to occur at multiple levels (operationally and
5 behaviourally) as an individual discipline cannot do it alone.²⁸ This private hospital
6 could plan to use this stroke audit tool to identify service gaps by regularly
7 conducting clinical record audits. Such information could inform both the operational
8 and behaviour change processes necessary to optimise stroke care. It is also
9 feasible that the stroke audit tool developed in our context, or at least the process
10 used, could be applied in other settings within the broader organisation, or by other
11 facilities.

12 All health disciplines (including allied health) are encouraged to be holistic in their
13 approach.²⁸ Such inter-professional collaboration is important in the delivery of
14 effective health care,²⁸ with stroke care and management no exception. Hill and
15 colleagues (2009) identified that while specific disciplines had primary responsibility
16 for implementing key NSF clinical guidelines, the multi-disciplinary team was
17 responsible for implementing more NSF clinical guidelines compared to individual
18 disciplines. Thus, our use of multiple allied health disciplines to inform the audit tool
19 was sound.²⁹ Despite the importance of including multiple disciplines, we found that
20 by round six, five NSF clinical guidelines selected were more relevant to
21 physiotherapy and occupational therapy. This was likely due to having higher
22 numbers of these disciplines included in the pool of clinicians involved in the voting
23 rounds. It would have been interesting to gauge whether clinicians regarded their
24 voting preferences to be reflective of a holistic approach to guideline selection; but
25 unfortunately, this information was not sought at the time. With the evidence of this

1 effect at the close of the sixth round, the researchers applied the reserved
2 agreement level of 50% and admitted the next two guidelines to the stroke audit tool.
3 In addition, to ensure that the tool was relevant to all disciplines, the researchers
4 added the guidelines for nutrition and hydration (NSF guideline 7.1) and for goal
5 setting (NSF guideline 1.7).

6 Private hospitals in Australia have consistently demonstrated a lack of engagement
7 with the NSF acute and rehabilitation audits.^{2,3} Additional strategies to increase this
8 engagement require consideration by both the NSF and the Australian Private
9 Hospital Association to optimise stroke care and ultimately outcomes. One example
10 of a successful strategy, is the partnership between the National Audit on Stroke
11 Care and professional bodies in the United Kingdom.³⁰ Following the United
12 Kingdom national audit in 2001,³⁰ the Royal College of Physicians, in partnership
13 with the College of Occupational Therapy and Chartered Society of Physiotherapy,
14 published profession-specific audit packages³⁰ for clinicians to benchmark their own
15 practice and help raise the standard of therapy for stroke patients for their specific
16 field.³⁰ If the NSF and the Australian Private Hospital Association developed a similar
17 partnership, participation of private hospitals may increase, and ultimately improve
18 quality and understanding of stroke care within the private system.

19

20 Study limitation: Several limitations need to be considered. Differing numbers of
21 participants representing the allied health disciplines, appeared to bias the selection
22 of guidelines during the Delphi process. Due to the larger numbers of
23 physiotherapists, there was increased likelihood of gaining agreement for guidelines
24 related to their discipline. An alternative could be to cap the number of participants
25 from each discipline to reduce the impact of one discipline dominating the voting at

1 each round. Another limitation for the reliability study was that data were
2 retrospectively retrieved from within clinical record documentation. It is also possible
3 that guidelines may have been implemented but not clearly documented within the
4 chart.¹² Documentation issues need to be addressed with clinicians who may require
5 education about the importance of chart entries as evidence of practice. There was
6 also potential for selection bias, with raters in the reliability phase also potentially
7 involved in patient care during the audit period. Limitation of a single site study may
8 impact the replicability of this study.

9 Our study describes a process of designing a stroke audit tool by using local
10 clinicians and testing its reliability. The stroke audit tool, once designed, could
11 subsequently inform the stroke service development within a privately funded health
12 care system. Additionally, audit results could help increase adherence with NSF
13 clinical guidelines by identifying areas for improvement. By having greater
14 engagement of local clinicians, it is likely the results would have value³¹ which could
15 assist clinicians to overcoming barriers and ultimately increase the chance of
16 changing clinical practice.^{28,31}

17 **Conclusion**

18 To conclude, allied health clinicians of a privately funded hospital could agree on
19 eight guidelines for inclusion in a stroke audit tool using 70% as the agreement level.
20 The stroke audit tool demonstrated substantial consistency across both acute and
21 rehabilitation services when applied by multiple disciplines. The tool could be used to
22 undertake an audit over a 12-month period and subsequently inform service
23 development within a privately funded health care system.

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20

Table 1 Characteristics of participants who completed all Modified Delphi Rounds.

Characteristics	
Number of participants completed six voting rounds, n (%)	22 (92)
Discipline representation (n = 22): n (%)	
Physiotherapist	11 (50)
Occupational Therapist	6 (27)
Speech pathologist	2 (9)
Social Worker	2 (9)
Dietician	1 (5)
Gender: n (%) females	20 (91)
Part time staff: n (%)	7 (32)
Years since graduation: Mean (SD)	8.8 (5.7)
Level of appointment: n (%)	
Base Grade	9 (41)
Senior Grade	13 (59)

Table 2 Number of guidelines voted on, and number of guidelines reaching 70% achievement level, per voting round.

	Round 1	Round 2	Round 3	Round 4	Round 5	Round 6
Number of participants each round, n (%)	24 (100)	24 (100)	24 (100)	23 (96)	22 (92)	22 (92)
Guidelines per voting round, n (%)	71 (100)	51 (72)	40 (56)	38 (54)	36 (51)	31 (44)
Guidelines reaching 70% agreement n (%)*	1 (1)	2 (4)	3 (8)	7 (18)	7 (19)	8 (26)

*Percentage calculated out of available guidelines

Table 3. Mean (SD) percentage agreement for each rater for each NSF Guideline*, including all subsections, for the acute stroke, rehabilitation services and combined services.

National Stroke Foundation (NSF)* Guidelines	Services	Disciplines				
		Physiotherapist	Occupational Therapist	Social Worker	Speech Pathologist	Dietician
1.2 Hospital care	Acute mean % (SD)	100 (0)	98.3 (5.3)	100 (0)	100 (0)	100(0)
	Rehab mean % (SD)	100 (0)	100 (0)	100 (0)	100 (0)	98 (6.3)
	Combined mean % (SD)	100 (0)	99.2 (3.6)	100 (0)	100 (0)	99 (4.4)
1.3 Discharge planning and transfer of care	Acute mean % (SD)	44 (24.6)	40 (16.3)	44 (18.4)	34 (16.5)	48 (14)
	Rehab mean % (SD)	66 (21.2)	68 (14)	64 (18.4)	60 (21.1)	66 (13.5)
	Combined mean % (SD)	55 (24.4)	54 (20.1)	54 (20.1)	47 (22.2)	57 (15.8)
1.4 Care after hospital	Acute mean % (SD)	50 (0)	50 (0)	50 (0)	50 (0)	50 (0)
	Rehab mean % (SD)	30 (25.8)	25 (26.4)	40 (21.1)	25 (26.4)	15 (24.2)
	Combined mean % (SD)	40 (20)	37.5 (21.7)	45 (15)	37.5(21.7)	32.5 (23.8)
1.7 Goal setting	Acute mean % (SD)	30 (19.7)	15 (17.5)	37.5 (17.7)	20 (19.7)	50 (11.8)
	Rehab mean % (SD)	52.5 (14.2)	50 (0)	50 (0)	50 (0)	50 (0)
	Combined mean % (SD)	41.3 (19.8)	32.5 (21.1)	43.8 (13.4)	35 (20)	50 (7.9)
6.1 Amount, intensity and timing of rehabilitation	Acute mean % (SD)	58.3 (18.0)	63.3 (13.1)	66.7 (11.1)	51.7 (14.6)	58.3 (11.8)
	Rehab mean % (SD)	66 (16.5)	74 (13.5)	72 (23.5)	54 (23.2)	68 (25.3)
	Combined mean % (SD)	62.2 (16.8)	68.7 (13.7)	69.3 (17.6)	52.8 (18.4)	63.2 (19.3)
6.2 Sensorimotor impairment	Acute mean % (SD)	58.3 (11.1)	55 (9)	52.5 (4)	47.5 (11.8)	51.7 (15.1)
	Rehab mean % (SD)	49.2 (10.7)	45.8 (9)	47.5 (14.7)	39.2 (17.6)	43.3 (22.2)
	Combined mean % (SD)	53.8 (11.3)	50.4 (9.7)	50 (10.5)	43.3 (14.8)	47.5 (18.5)

6.3 Physical activity	Acute mean % (SD)	62.5 (13.2)	66.3 (8.4)	62.5 (8.3)	53.8 (10.3)	57.5 (6.5)
	Rehab mean % (SD)	52.5 (21.1)	73.8 (7.1)	65 (9.9)	37.5 (15.6)	70 (14.7)
	Combined mean % (SD)	57.5 (17.4)	70. (8.3)	63.8 (8.8)	45.6 (14.9)	63.8(12.4)
6.4 Activities of daily living	Acute mean % (SD)	43.8 (16.9)	28.8 (8.4)	46.3 (11.9)	30 (6.5)	38.8 (9.2)
	Rehab mean % (SD)	51.7 (16.6)	30 (7)	51.7 (5.3)	25 (11.8)	35 (16.6)
	Combined mean % (SD)	47.7 (16.4)	29.4 (7.4)	49 (9.1)	27.5 (9.4)	36.9 (12.9)
6.5 Communication	Acute mean % (SD)	31.1 (21.5)	32.2 (19.9)	44.4 (18.1)	26.7 (19)	42.2 (18)
	Rehab mean % (SD)	42.2 (27.6)	34.4 (16.1)	44.4 (24.6)	31.1 (18)	38.9 (20.5)
	Combined mean % (SD)	36.7 (24.1)	33.3 (17.2)	44.4 (20.5)	28.9 (17.7)	40.6 (18.4)
6.6 Cognition	Acute mean % (SD)	19 (16)	23 (14.9)	16 (13.5)	29 (12.9)	30 (15.6)
	Rehab mean % (SD)	18 (14.8)	12 (4.2)	19 (11)	29 (14.5)	39 (12.9)
	Combined mean % (SD)	18.5 (14.6)	17.5 (11.8)	17.5 (11.8)	29 (13)	34.5 (14.3)
7.1 Nutrition and hydrations	Acute mean % (SD)	51.4 (23.5)	51.4 (12)	67.1 (17.9)	50 (21.1)	54.3 (18.8)
	Rehab mean % (SD)	21.4 (36.4)	21.4 (26.3)	38.6 (30.9)	8.6 (19.3)	15.7 (33.3)
	Combined mean % (SD)	36.4 (32.7)	36.4 (24.5)	52.9 (27.9)	29.3 (25.7)	35 (32.1)
7.15 Falls	Acute mean % (SD)	80 (42.2)	90 (31.6)	80 (42.2)	100 (0)	100 (0)
	Rehab mean % (SD)	100 (0)	100 (0)	100 (0)	100 (0)	100 (0)
	Combined mean % (SD)	90 (30)	95 (21.8)	90 (30)	100 (0)	100 (0)

Rehab = Rehabilitation Services

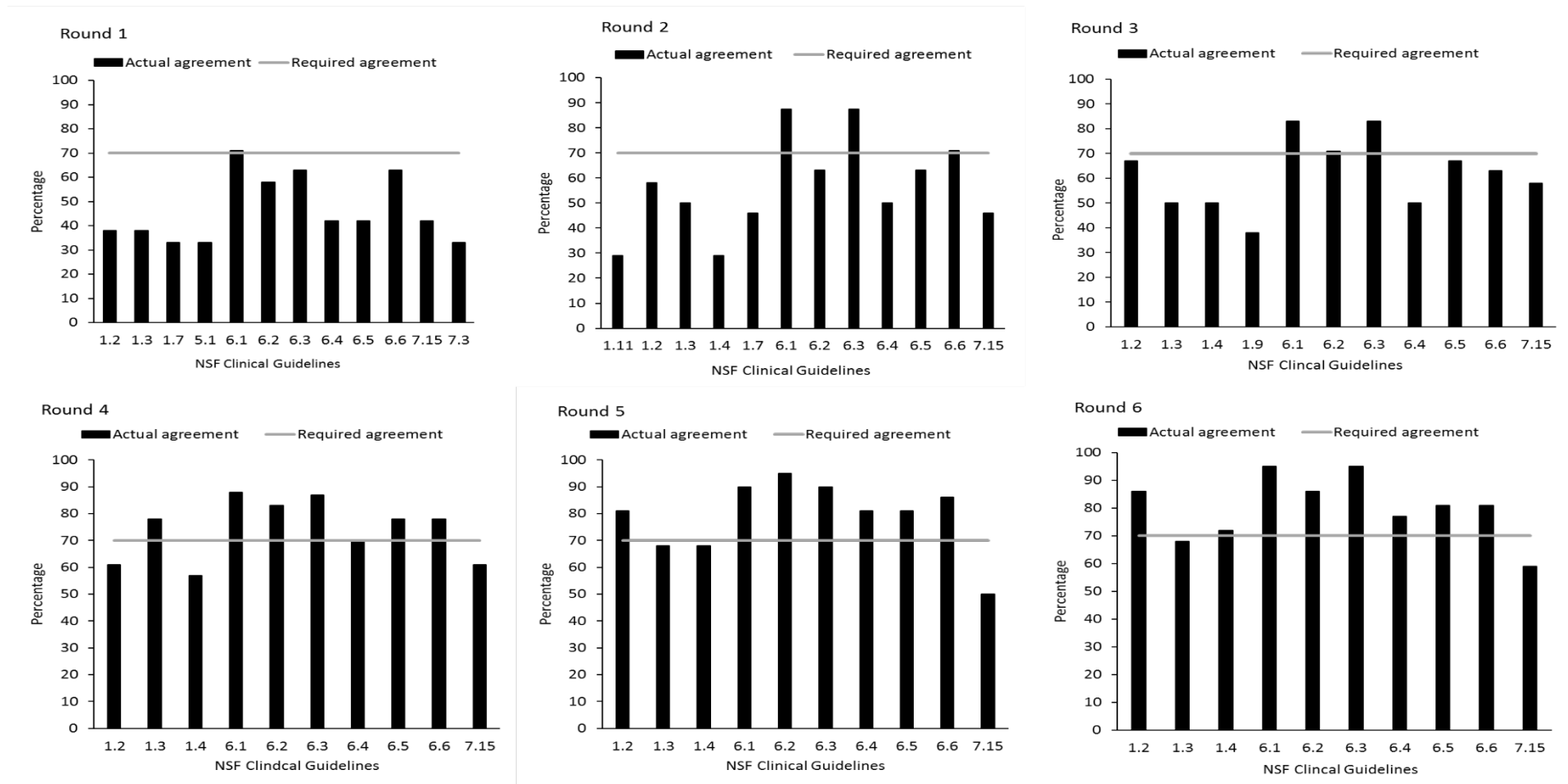


Figure 1 Level of Agreement across Six Rounds of the Modified Delphi Process for 10 NSF Guidelines*.

*National Stroke Foundation (NSF) Guidelines: 1.11 Stroke service improvement; 1.2 Hospital care; 1.3 Discharge planning and transfer of care; 1.4 Care after hospital discharge; 1.7 Goal setting; 1.9 Patient and care/family support; 5.1 Lifestyle modifications; 6.1 Amount, intensity and timing of rehabilitation; 6.2 Sensorimotor impairment; 6.3 Physical activity; 6.4 Activities of daily living; 6.5 Communication; 6.6 Cognition; 7.15 Falls; 7.3 Spasticity

Appendix 1: Stroke Audit Tool

1.2 Hospital Care	Yes	No
Was the stroke patient admitted direct to a stroke unit with a multidisciplinary team?		
Was there a dedicated stroke team?		
Was the patient transferred to rehabilitation with staff who have stroke specific expertise?		
Was the stroke patient assessed by a specialist rehabilitation team regarding the suitability for ongoing rehabilitation?		
Was the stroke care coordinator involved?		
Was the stroke patient's treatment managed using an acute stroke pathway?		
1.3 Discharge planning and transfer of care	Yes	No
Did the patient have a home or access visit prior to discharge?		
To ensure a safe discharge, did the following occur: did the patient and family have the opportunity to identify and discuss their post discharge needs, were the GP and services informed before or at the time of discharge, all medication and equipment and services were organised for discharge, a discharge plan of care needs and any further outpatient appointments?		
Was a discharge planner or social worker involved in discharge coordination?		
Was a discharge plan check list used?		
Did the family receive training from relevant members of the multidisciplinary team such as personal care, communication strategies, handling techniques or safe swallowing and dietary needs?		
1.4 Care after hospital discharge	Yes	No
Was the patient referred to transitional care program, day patient program or to rehabilitation?		
Was a follow up appointment organised to see a Consultant or stroke team at 3 months, 6 months and 12 months?		
1.7 Goal setting	Yes	No
Were the wishes and expectations of the patient and family acknowledged?		
Were the patient and family involved in goal setting?		
Were the goals recorded, reviewed and updated regularly?		
Was self-management training offered to the patient including active problem solving and individual goal setting?		
6.1 Amount, intensity and timing of rehabilitation	Yes	No
Did the patient receive a minimum of one hour of structured therapy per day at least five days a week?		
Did the patient participate in task specific group therapy (breakfast practice, reconditioning groups, physiotherapy group) or video self-modelling?		
Did family/friends receive training to continue practicing therapy outside of structured therapy?		
Was the patient sat out of bed or walked within the first 24 hours of a stroke?		
Did the speech pathologist start aphasia or communication treatment?		
Did the occupational therapy or physiotherapy treat the upper limb within the first two weeks of the stroke?		
6.2 Sensorimotor impairment	Yes	No
Was the patient screened for swallowing deficits using a validated tool?		

Did the screening occur in the first 24 hours of admission?		
The gag reflex was NOT used as a valid screen tool?		
Patients with a poor swallow were assessed by a speech pathologist?		
Were compensatory strategies such as positioning, therapeutic manoeuvres or modification to food and fluids used for the patient with swallowing problems?		
Were any of the following interventions used to resolve swallowing difficulties? Shaker, Electrical stimulation, thermo-tactile stimulation		
Was the patient's oral intake and weight monitored?		
Was one or more of the following treatments used for patients with reduced strength: progressive resistance exercises, electrical stimulation or electromyographic biofeedback?		
Did the patient receive sensory specific training for loss of sensation?		
Was the patient with visual loss screened with specific assessment tools?		
If the patient had homonymous hemianopia, were prism glasses used?		
Was computer-based visual restitution training used to improve visual function?		
6.3 Physical activity	Yes	No
Did the patient practice sitting balance?		
Did the patient practice standing balance or sit to standing?		
Did the patient receive feedback (visual and/or auditory) during task specific standing practice?		
Did the patient practice walking or components of walking like stepping?		
Were any of the following used for walking practice? Cueing of cadence, treadmill, joint position biofeedback, or virtual reality training		
For patients with persistent foot drop was an ankle-foot orthosis used?		
Did strengthening exercises occur for the upper limb? For example, Contra induce movement therapy, repetitive task-specific and/or mechanical assisted training		
Were 1 or more of the following used for the upper limb: mental practice, Electromyograph biofeedback, electrical stimulation, mirror therapy or bilateral training?		
6.4 Activities of daily living	Yes	No
Was the patient assessed by an occupational therapist regarding activities of daily living such as showering, toileting, dressing, domestic tasks?		
Did the patient receive treatment to address these issues such as dressing practice or breakfast practice?		
Was there training for family and/or staff for the appropriate techniques and equipment to maximise performance of ADLs?		
Was there any training for the patient regarding outdoor journeys including crossing roads, visiting local shops, bus or help to resume driving?		
The patient was not given amphetamines to improve Activities of daily Living?		
The patient not was given acupuncture alone or in combination with traditional herbal medicines as routine in stroke rehabilitation?		
6.5 Communication	Yes	No
Was the patient screened for communication problems using a form of screening tool?		
For patients with communication difficulties (dysarthria, dyspraxia, dysphasia, dysphonia), did they receive formal, comprehensive assessment by a speech pathologist?		
Were impairments and strategies or techniques for enhancing communication discussed with the patient, family and treating team? Goals and plan discussed, plus written information given to patient.		

Were alternative means of communication (such as gesture, drawing, writing or alternative communication devices) used to aid communication?		
Was the intervention tailored to the patient's deficits? Treatment can include aspects of language, constraint induced language therapy, gesture, supported conversation, using computer for treatment		
Were group therapy and conversation groups used?		
Was training provided to the family/friends? Barriers should be address with training, raising awareness with friends and family		
Were any of the following treatments for dysarthria used: biofeedback or a voice amplifier, intensive therapy aiming to increase loudness, using strategies such as decreased rate, over articulation or gesture and oral musculature exercises?		
6.6 Cognition	Yes	No
Was the patient screened for cognition and perceptual deficits using formal screening tools?		
Were patients identified to have cognitive deficits referred for comprehensive clinical neuropsychological investigations?		
Did the patient receive cognitive rehabilitation?		
Did the patient have comprehensive assessment of their memory abilities and were they assessed to see if compensatory techniques such as notebooks, diaries, audiotapes are useful?		
Did the patient receive a formal assessment regarding their executive function using a formal assessment tool? Then external cues were used to aid the patient.		
Was the patient screened for limb apraxia?		
Was the patient treated for limb apraxia?		
Was the patient assessed for agnosia?		
If the patient had neglect were they assessed using formal assessment tools?		
If the patient had neglect, were any of the following treatments used such as simple cues, visual scanning, prism adaptation, eye patching and mental imagery training or structured feedback?		
Did the patient's cognitive involvement have a comprehensive assessment?		
7.15 Falls	Yes	No
Was a falls risk assessment completed using a formal tool and was a management plan implemented if there was a fall?		
7.1 Nutrition and hydration	Yes	No
Did the patient have their hydration status assessed, monitored and managed?		
Was the patient screened for malnutrition?		
Was the patient referred to the dietitian for ongoing management?		
Was the patient's nutritional status assessed by using formal assessment tools?		
If the patient was nutritionally poor, was nutritional supplementation offered?		
For patients that were unable to swallow were they fed by nasogastric tube feeding?		
Was the patient's food intake monitored?		