Allied health clinicians using translational research in action to develop a reliable stroke audit tool

Abery, Philip; Kuys, Suzanne; Lynch, Mary; Low Choy, Nancy

Published in:
Journal of Evaluation in Clinical Practice

DOI:
10.1111/jep.12951

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

Authors:

Philip Abery, (MPhil student), Australian Catholic University, Brisbane, Australia.

Professor Suzanne Kuys, PhD, National Head, School of Physiotherapy, Faculty of Health Sciences, Australian Catholic University.

Mary Lynch, Deputy Head, School of Physiotherapy, Faculty of Health Sciences, Australian Catholic University,

Professor Nancy Low Choy, PhD, Professor of Physiotherapy, School of Physiotherapy, Faculty of Health Sciences, Australian Catholic University.

Correspondence:

Philip Abery, Team leader. Allied Health department, 42 Inland Drive, Tugun, QLD 4224, Australia; philipabery@gmail.com

Acknowledgements:

We would like to thank the volunteers from John Flynn Private Hospital who took time out of their schedules to participate in this study. Also would like to acknowledge the advice from Jenny Peat on statistical analysis.

Conflict of interest:

There were no conflicts of interest during this study.

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

Abstract:

Objective

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

Methods

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

Results

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

Conclusions

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

Key questions

1. **What is known about the topic?** Limited number of privately funded hospitals participate with national stroke foundation audits. Involving clinicians in the audit process may increase likelihood of clinical change following audit results. The majority of audit tools did not involve local clinicians in the development process.
2. **What does this paper add?** Allied health clinicians within a privately funded hospital engaged in an audit process to develop a reliable stroke audit tool.
3. **What are the implication for practitioners?** This process which engages local clinicians could be adopted by others to design reliable audit tools to identify local service gaps.

Key Words.

Stroke; allied health; stroke clinical guidelines; knowledge translation

Introduction:

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

One framework to identify local knowledge gaps is the knowledge to action cycle which comprises of two phases, knowledge creation and the action cycle.[5] Clinical record audits are the most common method to assess quality of healthcare by identifying potential knowledge gaps [6] and can inform the problem identification stage of the 'action cycle'.[5] Clinical record audits use pre-recorded patient medical documentation as the primary source of information [7] and are commonly used to measure adherence to stroke clinical guidelines.[2,3,8]

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

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

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

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

Our study tested these premises with the following questions:

1. Can allied health clinicians from a stroke service of a private hospital agree on NSF clinical guidelines to inform a stroke audit tool?

2. How reliable is the stroke audit tool when implemented by allied health teams?

It was hypothesised that

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

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

Methodology:

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

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

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

placement, casual allied health staff and allied health staff on extended leave such as maternity leave. Demographics of the allied health participants were collected.

Eligible allied health clinicians were invited to an information session regarding the study where the modified Delphi process was explained and the reliability study outlined. Allied health clinicians provided written informed consent to participate in the modified Delphi process. All participants involved in the reliability study consented to this additional component and signed the hospital's privacy policy. The study had ethical approval from relevant institutional Human Research Ethics Committees.

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

The modified Delphi process was completed online using *Qualtrics* Survey Software.[18] Participants were emailed a website link and through this portal cast their vote for each guideline (Yes / No). Guidelines were listed in the order they appeared in the NSF Clinical Guidelines for Stroke Management 2010.[1] Participants were provided with a copy of the NSF Stroke Guidelines during each voting round.

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

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

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

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

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

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

Results

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

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

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

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

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

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

Discussion

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

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

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

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

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

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

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

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

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

Conclusion

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

References

1. National Stroke Foundation (NSF). (2010). Clinical Guidelines for Stroke Management. National stroke audit rehabilitation services. Melbourne Australia
2. National Stroke Foundation (NSF). (2015). National stroke Audit - Acute services report. National stroke audit rehabilitation services. Melbourne Australia.
3. National Stroke Foundation (NSF). (2016). National Stroke Audit - Rehabilitation Audit National Stroke Foundation. Melbourne Australia.
4. Australian Institute of Health and Welfare (AIHW). (2016). Hospital resources 2014-2015: Australian hospital statistics. Health services series, no. 71 (176. Canberra: AIHW).
5. Graham, Logan, J., Harrison, M., Straus, S., Tetroe, J., Caswell, W., & Robinson, N. (2006). Lost in knowledge translation: Time for a map? Journal of Continuing Education in the Health Professions, 26(1), 13-24.
6. Wu, L., & Ashton, C. M. (1997). Chart review. A need for reappraisal. Evaluation & the Health Professions, 20(2), 146-163.
7. Matt, V., & Matthew, H. (2013). The retrospective chart review: important methodological considerations. Journal of Educational Evaluation for Health Professions, 10 (12), 1-7.
8. Rudd, A. G., Lowe, D., Irwin, P., Rutledge, Z., & Pearson, M. (2001). National stroke audit: a tool for change? Quality in Health Care, 10(3), 141-151.
9. Thomas, L., Cullum, N., McColl, E., Rousseau, N., Soutter, J., & Steen, N. (2000). Guidelines in professions allied to medicine. Cochrane Database of Systematic Reviews, Issue 1. Art. No.: CD000349.

10. Jamtvedt, G., Young, J. M., Kristoffersen, D. T., O'Brien, M. A., & Oxman, A. D. (2006). Does telling people what they have been doing change what they do? A systematic review of the effects of audit and feedback. Quality and Safety in Health Care, 15(6), 433-436.
11. Johnston, Mudge, S., Kersten, P., & Jones, A. (2013). Physiotherapy alignment with guidelines for the management of stroke in the inpatient setting. New Zealand Journal of Physiotherapy, 41(3), 102-111.
12. Luker, J., & Grimmer-Somers, K. (2009). Factors influencing acute stroke guideline compliance: a peek inside the 'black box' for allied health staff. Journal of Evaluation Clinical Practice 15(2), 383-389.
13. Gommans, J., Sye, D., & MacDonald, A. (2005). Guideline recommendations for management of patients admitted with acute stroke: Implications of a local audit. New Zealand Medical Journal, 118 (1214) 1-11.
14. Gompertz PH, Irwin P, Morris R, Cstat DLM, Rutledge Z, Rudd AG, et al. Reliability and validity of the Intercollegiate Stroke Audit Package. Journal of Evaluation in Clinical Practice. 2001;7(1):1-11.
15. Hasson, F., Keeney, S., & McKenna, H. (2000). Research guidelines for the Delphi survey technique. Journal of Advanced Nursing, 32(4), 1008-1015.
16. Landeta, J. (2006). Current validity of the Delphi method in social sciences. Technological Forecasting and Social Change, 73(5), 467-482.
17. Hsu, C.C., & Sandford, B. (2007). The Delphi Technique: Making Sense of Consensus. Practical Assessment, Research & Evaluation, 12(10), 1-8.
18. Smith, S. M., Smith, R., Smith, J., & Orgill, S. (2002). Qualtrics. Retrieved from https://www.qualtrics.com

19. Williams, P. L., & Webb, C. (1994b). Clinical supervision skills: a Delphi and critical incident technique study. Medical Teacher, 16(2-3), 139-157.
20. Sumsion, T. (1998). The Delphi Technique: An Adaptive Research Tool. The British Journal of Occupational Therapy, 61(4), 153-156.
21. The National Casemix and Classification Centre (NCCC). (2013). International Statistical Classification of Diseases and Related Health Problems. Version 8th edition.
22. Landis, J. R., & Koch, G. G. (1977). The Measurement of Observer Agreement for Categorical Data. Biometrics, 33(1), 159-174.
23. LaClair, B. J., Reker, D. M., Duncan, P. W., Horner, R. D., & Hoenig, H. (2001). Stroke care: a method for measuring compliance with AHCPR Guidelines. American Journal of Physical Medicine & Rehabilitation, 80(3), 235-242.
24. Oborn, E., Barrett, M., & Racko, G. (2013). Knowledge translation in healthcare: Incorporating theories of learning and knowledge from the management literature. Journal of Health Organization & Management, 27(4), 412-431.
25. Bosch, M., Tavender, E., Bragge, P., Gruen, R., & Green, S. (2013). How to define 'best practice' for use in Knowledge Translation research: a practical, stepped and interactive process. J of Evaluation in Clinical Practice, 19(5), 763-768.
26. Donnellan, C., Sweetman, S., & Shelley, E. (2013). Implementing clinical guidelines in stroke: A qualitative study of perceived facilitators and barriers. Health Policy, 111(3), 234-244.

27. McCluskey, A., Vratsistas-Curto, A., & Schurr, K. (2013). Barriers and enablers to implementing multiple stroke guideline recommendations: a qualitative study. BioMed Centrail health services research, 13(323) 1-13, 323-323.
28. McCluskey, A., Vratsistas-Curto, A., & Schurr, K. (2013). Barriers and enablers to implementing multiple stroke guideline recommendations: a qualitative study. BioMed Centrail health services research, 13(323) 1-13, 323-323.
29. Hill, K., Middleton, S., O'Brien, E., & Lalor, E. (2009). Implementing clinical guidelines for acute stroke management: do nurses have a lead role? Australian Journal of Advanced Nursing, 26(3), 53-58.
30. Hammond, R., Lennon, S., Walker, M. F., Hoffman, A., Irwin, P., & Lowe, D. (2005). Changing occupational therapy and physiotherapy practice through guidelines and audit in the United Kingdom. Clinical Rehabilitation, 19(4), 365-371.
31. Jamtvedt, G., Young, J.M., Kristoffersen, D.T., O'Brien, M.A., & Oxman, A.D. (2007). Audit and feedback: effects on professional practice and health care outcomes. Cochrane Database of Systematic Reviews 2007, Issue 2. Art. No.: CD000259.

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.

	Services	Disciplines				
National Stroke Foundation (NSF)* Guidelines		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

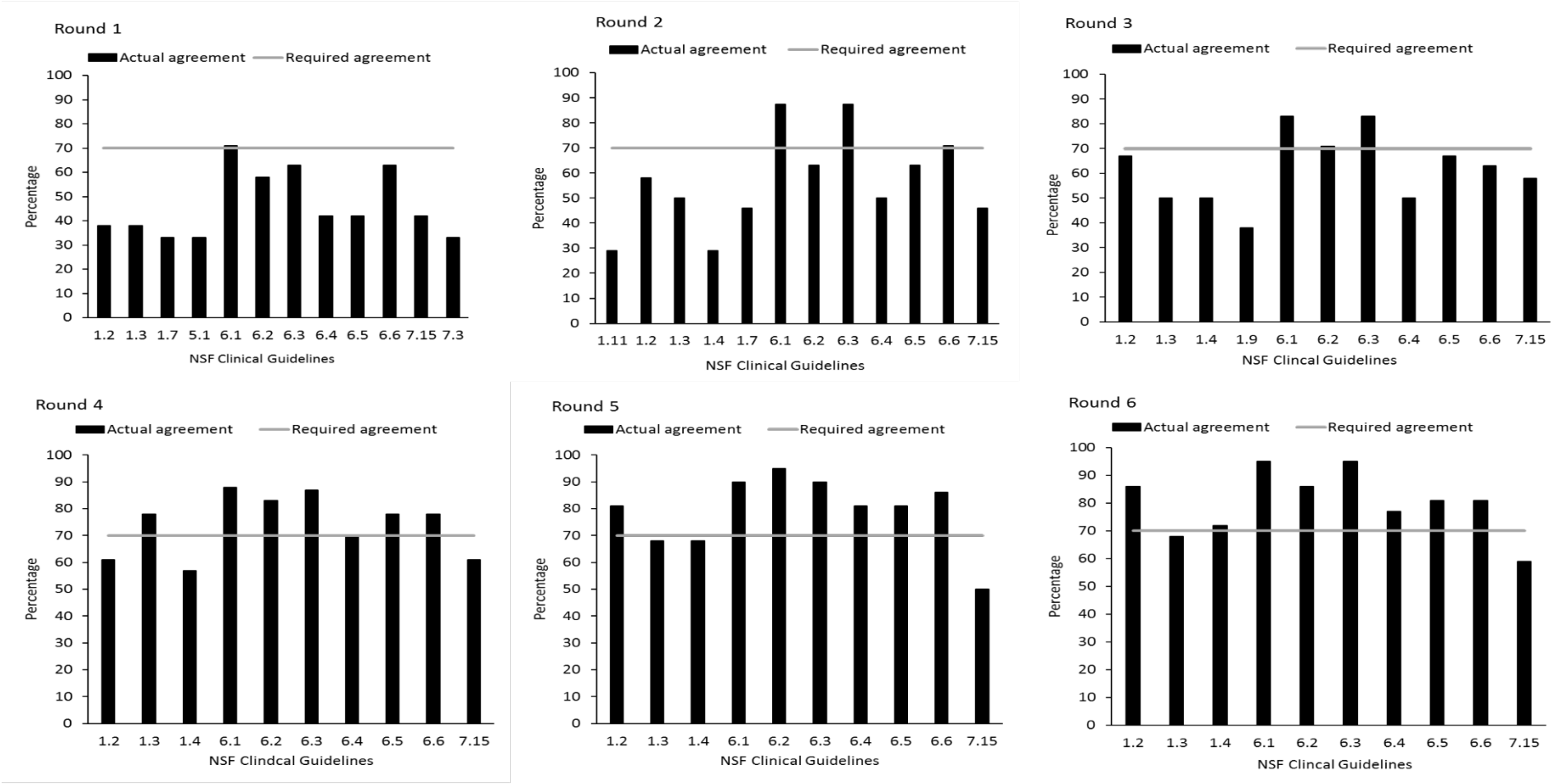

Figure 1 Level of Agreement across Six Rounds of the Modified Delphi Process for 10 NSF Guidelines*.

*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 patent'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 manoeuvers 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, theromo-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?		