Adherence of allied health clinicians to the Stroke Foundation clinical guidelines for management of stroke (2010): a retrospective clinical record audit of both acute and rehabilitation services.

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Adherence of allied health clinicians to the Stroke Foundation clinical guidelines for management of stroke (2010): a retrospective clinical record audit of both acute and rehabilitation services.

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A thesis submitted in total fulfilment of the requirements of the degree

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Statement of Authorship

This thesis contains no material published elsewhere or extracted in whole or in part from a thesis by which I have qualified for or been awarded another degree or diploma.

No parts of this thesis have been submitted towards the award of any other degree or diploma in any other tertiary institution.

No other person’s work has been used without due acknowledgment in the main text of the thesis. I have taken advise, along the way, from my supervisory panel in the writing of this thesis. Also received advise from Honorary Professor Jenny Peat regarding statistical analysis of data.

All research procedures reported in the thesis received the approval of the relevant Ethics/Safety Committees (where required).

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Date: 23rd February 2018
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Abstract

In 2012, stroke affected over 420 000 people within Australia and the number of stroke survivors is anticipated to increase. Many stroke survivors live with a disability which affects their ability to carry out activities of daily living. In Australia stroke survivors are cared for by both publicly and privately funded hospitals. Available to both systems are the Stroke Foundation Clinical Guidelines for the Management of Stroke Survivors (SF 2010a). The Stroke Foundation carries out biannual national audits in Australia, one focusing on acute services and the other on rehabilitation services, to determine hospitals’ quality of care in accordance with the recommendations of the Stroke Foundation clinical guidelines. Participation of privately funded hospitals in both these national audits has been consistently low. Therefore, there is less understanding of how privately funded hospitals manage stroke survivors compared with publicly funded hospitals.

Stroke survivors admitted to hospitals often journey through both acute and rehabilitation services. A stroke audit that follows the journey of stroke survivors by auditing both acute and rehabilitation services concurrently is required to gain a better understanding of how the clinical guidelines are applied across each service individually and across the combined services.

When developing a stroke audit tool for either local or national use, clinicians tend to have limited input into the selection of audit criteria and tool development. As the overarching framework underpinning this research program, knowledge translation involves clinicians and researchers partnering to develop ready to use research. Therefore, in this research program allied health clinicians (physiotherapists, occupational therapists, social workers, speech pathologists, and dietitians) were invited to assist in the development of a stroke audit tool in a single privately funded hospital and to test its reliability. Establishing the reliability of the stroke audit tool adds to its robustness. The stroke audit tool was used to assess the adherence of allied health clinicians from a privately funded hospital to the selective Stroke Foundation clinical guidelines. The audit included stroke survivors with consecutive admissions to both acute and rehabilitation services.
This research comprised two studies. Study 1 developed a stroke audit tool with allied health clinicians selecting the most relevant clinical guidelines from the Stroke Foundation Clinical Guidelines for Stroke Management (SF 2010a). Both inter and intra-rater reliability of the tool were tested with allied health clinicians who were able to agree on eight Stroke Foundation clinical guidelines with 70% agreement. An additional two Stroke Foundation clinical guidelines with 50% agreement and a further two Stroke Foundation clinical guidelines were added to ensure the stroke audit tool was relevant to all disciplines. Inter-rater reliability for the stroke audit tool was tested across ten clinical records by five (one from each discipline) allied health clinicians or raters. Inter-rater reliability was high with substantial consistency demonstrated across both services. Intra-rater reliability demonstrated substantial to moderate consistency.

Study 2 comprised a 12-month retrospective clinical record audit of stroke survivors with consecutive admission to both acute and rehabilitation services. The stroke audit tool assessed the percentage adherence of allied health clinicians against the selected Stroke Foundation’s clinical guidelines included in the audit tool. Adherence was defined as stroke survivor care delivered in accordance with the Stroke Foundation clinical guidelines 2010. A minimal adherence level was set at 60% with an aspirational level set at 80%. Secondary analysis compared adherence across acute and rehabilitation services. Also, a subgroup analysis was undertaken investigating the influence of age, gender and length of stay to allied health clinician’s adherence of Stroke Foundation clinical guidelines. Allied health clinicians met the 60% adherence rate, for nine (out of 12) Stroke Foundation clinical guidelines, including three that were above 80% adherence rate (aspirational level). There was a significant difference across acute and rehabilitation services for eight of the 12 Stroke Foundation clinical guidelines. Age, gender and length of stay did not influence adherence rates of the allied health clinicians across acute and rehabilitation stroke services.

Allied health clinicians from a privately funded hospital developed a reliable stroke audit tool. The stroke audit tool highlighted areas of adherence as well as service gaps across acute, rehabilitation and the combined service. Investigating adherence across both acute and rehabilitation services could lead to a co-ordinated approach to improving adherence towards Stroke Foundation clinical guidelines.
## Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>ACHS</td>
<td>Australian Council on Healthcare Standards</td>
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<tr>
<td>AIHW</td>
<td>Australian Institute of Health and Welfare</td>
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<td>ASC</td>
<td>Australian Stroke Coalition</td>
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<td>FIM</td>
<td>Functional Independence Measure</td>
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<td>ICC</td>
<td>Intraclass Correlation Coefficient</td>
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<td>IT</td>
<td>information technology</td>
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<td>KTA</td>
<td>Knowledge to Action cycle</td>
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<td>n</td>
<td>number</td>
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<tr>
<td>NHMRC</td>
<td>National Health and Medical Research Council</td>
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<td>NHS</td>
<td>National Health Service</td>
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<tr>
<td>NICE</td>
<td>National Institute for Health and Clinical Excellence</td>
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<tr>
<td>Rehab</td>
<td>Rehabilitation</td>
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<td>SD</td>
<td>Standard Deviation</td>
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<td>SF</td>
<td>Stroke Foundation</td>
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<td>UK</td>
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<td>USA</td>
<td>United States of America</td>
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Chapter 1. Introduction

Stroke is the second leading cause of death globally with 6.24 million people dying from stroke in 2015 (http://www.who.int/mediacentre/factsheets/fs310/en/). In Australia, there were 8304 deaths as a result of stroke in 2010 (AIHW, 2013). But many more Australians survive a stroke, in fact, it is the leading cause of disability (defined as affecting their ability to carry out activities of daily living unassisted) (Deloitte, 2013). Over 420 000 Australians were living with a stroke in 2012 (Deloitte, 2013), affecting 25% more males than females (Deloitte, 2013). The number of stroke survivors in Australia is expected to grow to over 700 000 by 2032 (Deloitte, 2013).

Stroke also contributes a significant burden to health care costs. The financial cost for Australia was estimated at $5 billion in 2012 with carer costs contributing as much as $222 million to the cost of stroke care (AIHW, 2013; Deloitte, 2013). In Australia stroke survivors are cared for by either publicly funded or privately funded hospitals (AIHW, 2016). This program of research focuses on privately funded hospitals which make up 47% of all hospitals and comprise approximately 32 000 hospital beds available in Australia (AIHW, 2016).

Regardless of hospital funding, clinical guidelines developed by the Stroke Foundation (SF) are available to inform quality management of stroke survivors. Clinical guidelines are recommendations for clinical practice developed with the explicit purpose of assisting clinicians to transfer knowledge from research into practice (Hammond, Lennon, Walker, Hoffman, Irwin & Lowe, 2005). Recommendations are based on summarising published research (or good practice) and are formatted in a single document, ready to be applied by clinicians (Johnston, Mudge, Kersten, & Jones, 2013). This program of research utilised the SF clinical guidelines published in 2010 (SF, 2010a), that were approved by the chief executive officer of the National Health and Medical Research Council. SF guidelines were first published in 2003 (Sluggett, Caughey, Ward, & Gilbert, 2014), and have been updated regularly, with new guidelines released in July 2017 (SF, 2017). This program of research was based on the most current guidelines available at the time – Clinical Guidelines for Stroke Management 2010 (SF, 2010a). There is strong evidence that adhering to stroke clinical guidelines results in improved functional outcomes for stroke survivors (Duncan, Horner, Reker, Samsa, Hoenig, Hamilton, & Dudley, 2002; Hubbard et al., 2012) as well as improved stroke service outcomes (Quaglini, Cavallini, Gerzeli, & Micieli, 2004; Reker, Duncan, Hornher, Hoenig, Samsa, & Dudley, 2002).
The transfer of stroke clinical guidelines or any research evidence into health care is not straightforward and is complex (Bowen & Graham, 2013). The process of transferring evidence to health care has been described as slow and hazardous (Graham, Logan, Harrison, Straus, Tetroe, Caswell, & Robinson, 2006). Not following clinical guidelines potentially denies health care users access to proven beneficial treatments (Bowen & Graham, 2013) and is a poor use of health care resources (Graham et al., 2006).

Evidence-based health care has been evolving over the last two decades to improve the use of research within the health care system (Oborn, Barrett, & Racko, 2013). Clinicians drive evidence-based health care by integrating their clinical expertise with the best available evidence (Sackett, Rosenberg, Gray, Haynes, & Richardson, 1996). Therefore, the flow of information from research to clinical practice is in only one direction. Evidence-based health care is based on a linear model to facilitate research into health care (Oborn et al., 2013) involving a process where an answer is sought for a single specific clinical question by critically appraising the evidence available (Chunharas, 2006; Tilson, Settle, & Sullivan, 2008). Unfortunately, the rate of transfer of research into health care remains slow (Graham et al., 2006; Oborn et al., 2013).

More recently the term ‘knowledge translation’ has been used to describe the integration of research into health care (Graham et al., 2006). Knowledge translation considers issues clinicians are facing and incorporates collaboration between clinicians and researchers regarding what is working or not. As a result, a two-way flow of information between researchers and clinicians can be established (Oborn et al., 2013), producing ready to use research for health care (Bowen & Graham, 2013). One model of this two-way flow is the knowledge to action (KTA) cycle (Graham et al., 2006). This cycle contains two phases; knowledge creation and the action cycle. Knowledge creation refers to research that is made for health care (Graham et al., 2006). The second phase, the action cycle, comprises several steps to support the integration into health care of the research created during the first phase (Graham et al., 2006). The KTA cycle aims to integrate research into patients’ care plans, hospital policies and clinical guidelines (Bowen & Graham, 2013).

The KTA cycle was identified as a suitable framework for this study. The SF stroke clinical guidelines (SF, 2010a) are a product of the ‘knowledge creation’ phase; while reviewing how the SF clinical guidelines are being adhered to in practice forms part of the ‘action cycle’ (Graham et
al., 2006). A clinical record audit is a widely-used tool to measure clinicians’ clinical practice against stroke clinical guidelines (Hadely, Power, & O'Halloran, 2013; LaClair, Reker, Duncan, Horner, & Hoenig, 2001; Quaglini et al., 2004) and therefore became the tool used in this research. Additionally, this research sought to develop a partnership between researchers and clinicians by facilitating engagement with the 2010 SF clinical guidelines, an important part of knowledge translation (Graham et al., 2006).

In the current body of literature investigating adherence to stroke clinical guidelines, audit criteria have largely been determined using an expert panel (Hammond et al., 2005; Hill, Middleton, O'Brien, & Lalor, 2009; Hool, Grol, & Limburg, 2004; Rudd, Lowe, Irwin, Rutledge, & Pearson, 2001). This process does not engage clinicians and has resulted in local clinicians having limited input into which guidelines are reviewed. Knowledge translation prompts researchers and clinicians to work closer together to reduce the knowledge gap (Lomas, 2007; Oborn et al., 2013). For this reason, local clinicians working in acute or rehabilitation stroke services were integral to the selection of SF clinical guidelines included in the development of the stroke audit tool used in this research.

Previous audits investigating adherence to stroke clinical guidelines have been undertaken in either acute stroke services (Hammond et al., 2005; Hill, 2008; Luker & Grimmer-Somers, 2009a; Luker & Grimmer-Somers, 2009b) or rehabilitation services (Duncan et al., 2002; Grube, Dohle, Djouchadar, Rech, Bienek, Dietz-Fricke, … & Heuschmann 2012; Hubbard et al., 2012; Johnston, Wood, Stason, & Beatty, 2000) – not both. Only one study was found where both the acute service and the rehabilitation stroke service were audited concurrently, but this was done only in relation to physiotherapy alignment with the guidelines and did not include all allied health disciplines (Johnston et al., 2013). Understanding how all allied health clinicians (physiotherapists, occupational therapists, social workers, speech pathologists, and dietitians) manage stroke survivors across both services is important as the combined care of all allied health disciplines from these two services contributes to a stroke survivor’s recovery (SF, 2010a). Thus, an audit of both acute and rehabilitation services against the SF stroke clinical guidelines for all allied health disciplines was required.

In Australia, the SF co-ordinates regular national audits to assess the delivery of recommendations from SF clinical guidelines. However there has been a long-standing lack of
engagement from privately funded hospitals (SF, 2010b, 2013, 2014, 2015, 2016). Having limited information for privately funded hospitals to benchmark their service could potentially affect the quality of stroke care. This study proposed to assess adherence to SF stroke clinical guidelines within a privately funded hospital. For this research, adherence to SF clinical guidelines was defined as care by stroke services being delivered in accordance with recommendations of SF clinical guidelines 2010 (Hubbard et al., 2012; SF, 2015, 2016).

Overall, the aim of this program of research was to assess the adherence to SF clinical guidelines during the journey of care for stroke survivors from admission to an acute service to discharge via a rehabilitation service of a privately funded hospital. This was achieved by completing a 12-month retrospective clinical record audit. Two studies informed this research program. In Study 1 local allied health clinicians (physiotherapists, occupational therapists, social workers, speech pathologists, and dietitians) determined the SF clinical guidelines to be included in the stroke audit tool. Reliability of the stroke audit tool was investigated across multiple allied health clinicians (one from each discipline). Study 2 presents the results from the 12-month retrospective clinical record audit conducted using the stroke audit tool. Results from this investigation determined how current clinical practice within a private hospital across both units meets the selected SF guidelines. This enabled areas of strength as well as for improvement to be identified.
1.1 Overview of the thesis

This thesis comprises six chapters. Chapter 1 introduces the research program. Chapter 2 presents the background and a review of the relevant literature (see appendix 1). The first section (Section 2.1) outlines knowledge translation and how knowledge from research becomes a part of health care, developing the framework for the research. Section 2.2 explains clinical guidelines and introduces the SF clinical guidelines as well as considering the benefits of stroke clinical guidelines and potential barriers and facilitators towards implementing stroke clinical guidelines into clinical practice. Section 2.3 explores the knowledge gap, when knowledge from research is not being used in health care. Additionally, this section identifies the research gaps for this program of research, including the different methods of audit tool development and design. The last three sections of Chapter 2 are “Summary” (Section 2.4) and “Research aims and hypothesis” (Section 2.5).

Chapter 3, “General Methodology”, reviews the methodological approach taken for both studies. Chapters 4 and 5 detail the two studies incorporated into the research: allied health professionals using translational research in action to develop a stroke audit tool (Study 1), and allied health clinicians’ adherence to stroke guidelines and the implications of a local audit within a privately funded hospital (Study 2). Chapter 6, “General Discussion and Conclusion”, summarises the findings of the research program, and outlines the clinical implications as well as exploring areas for future research.
Chapter 2. Background

This chapter outlines knowledge translation and explores various models for transferring research into clinical practice and approaches for implementing research into clinical practice. This is followed by a discussion of clinical guidelines and the potential issues regarding use of clinical guidelines within clinical practice. The 2010 SF clinical guidelines are introduced in this context. Identified benefits of adherence to stroke clinical guidelines for stroke survivors, as well as potential barriers to and facilitators for stroke clinical guideline uptake within clinical practice are considered. The literature sourced for this chapter was identified using the following combinations of key words (knowledge translation, clinical guidelines and stroke) across Embase, Medline, CINAHL and Pubmed databases (see Appendix 1 for full search strategy). The knowledge gap, or gap between research knowledge and clinical practice, is discussed along with how an audit can be used to measure the knowledge gap between research knowledge and clinical practice. A review of the different ways to design and develop an audit tool to assess a stroke service is then presented. Following the summary of the research literature, the research aims and hypotheses of the two studies incorporated in this research program are presented. The background chapter will inform the methodology chapter and the two studies to examine the level of adherence against SF clinical guidelines of stroke survivors admitted to a privately funded hospital.

2.1 Knowledge Translation

In Australia, it is widely accepted that health care is based on evidence from reliable research (Bosch, Tavender, Bragge, Gruen, & Green, 2013). Unfortunately, findings from research do not enter mainstream health care practice quickly, but occur as part of a slow and disorganised process (Bosch et al., 2013; Graham et al., 2006). This potentially denies patients treatments with proven benefits, resulting in inefficiency and poor use of hospital resources (Graham et al., 2006). Knowledge translation facilitates new research into health care by assisting clinicians to use current research in clinical decisions for their patients (Jones, Roop, Pohar, Albrecht, & Scott, 2015).

The Canadian Institute of Health Research defines knowledge translation as,
“…the exchange, synthesis and ethically-sound application of knowledge – within a complex system of interactions among researchers and clinicians – to accelerate the capture of the benefits of research for Canadians through improving health, more effective services and products, and a strength in health care system” (http://www.cihr-irsc.gc.ca/e/29418.html, 2006).

Knowledge translation is also concerned with the speed of research advancements and uptake by health care (Booth, 2011; Menear, Grindrod, Clouston, Norton, & Légaré, 2012; Oborn et al., 2013). If valid research recommendations are not adopted then a gap between health care and research develops and this is referred to as the ‘knowledge gap’ (Booth, 2011).

Models from knowledge translation attempt to implement the integration of research into health care by producing research ready for use. Knowledge translation produces ready for use research by encouraging researchers and health practitioners to build relationships and address issues facing health care (Jones et al., 2015). A partnership in knowledge translation is different from a linear model of transferring research in health care (Bowen & Graham, 2013). Linear and circular models of knowledge translation will now be explored.

### 2.1.1 Linear model of knowledge translation

An early model of research evidence transfer into health care was linear or unidirectional in nature (Oborn et al., 2013). A linear model assumed that research would eventually develop into new technology which would find new applications in health care, and which flowed passively from research to practice (Oborn et al., 2013). Researchers assumed results from their research were ready for use and easy to implement in health care (Bowen & Graham, 2013; van Twillert, Postema, Geertzen, & Lettinga, 2015). There are many examples of the passive and slow movement of results from research into clinical practice within this linear model – notably it took 200 years between when a cure for scurvy was found and its adoption by the British Navy (Oborn et al., 2013). Additionally, Dr Ignaz Semmelweis identified that hand hygiene could prevent the spread of infections in 1847 but it was not until the 1980s that the first national hand hygiene guidelines were published (Pittet, Hugonnet, Harbarth, Mourouga, Sauvan, Touvenau, & Perneger, 2000). It took a further 20 years for Pittet and colleagues to publish research that changed health care workers’ attitudes towards hand hygiene and resulted in a change in practice (Pittet et al., 2000).
An example of a linear model is evidence-based health care. Evidence-based health care is defined as:

…the conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients. The practice of evidence-based medicine relies on integrating individual clinical expertise with the best available external clinical evidence from systematic research (Sackett et al., 1996 page 71).

Evidence-based health care emerged in the 1990s (Oborn et al., 2013) and prompted users to think of a clinical problem, formulate key questions, search for the best evidence, critically appraise the research and then apply research to the clinical problem in health (Dowla & Chan, 2010; Langhorne, Legg, Pollock, & Sellars, 2002). Users were expected to initiate searches for best evidence based on their professional motivations to provide better health care (Dowla & Chan, 2010; Langhorne, Legg, Pollock, & Sellars, 2002; Oborn et al., 2013). Unfortunately, gaps remained in health care despite the development of evidence-based health care (Bowen & Graham, 2013). Additionally, researchers were failing to address current issues being faced in health care further adding to the knowledge gap in health care (Bowen & Graham, 2013). An alternative method for developing ‘ready to use’ research and establishing a partnership between research and health care was needed.

2.1.2 Circular model of knowledge translation

An alternative model emerged that highlighted the important interaction between health care (the practice) and research (Bowen & Graham, 2013; Oborn et al., 2013). This is known as a circular model because of the two-way flow of information between research and health care. It has been suggested that this circular model results in engagement between research and health care leading to more research in health care (Oborn et al., 2013). The engagement between research and health care may seem straightforward. However this process takes place within complex systems of interactions (Bowen & Graham, 2013) such as, operational systems (hospital policies, funding) (Jones et al., 2015; Scott, Albrecht, O’Leary, Ball, Dryden, Hartling, … & Klassen, 2012), behaviour changes (local clinical practice and/or individual clinicians) (Jones et al., 2015; Scott et
al., 2012), including new research being relevant to health care (Bowen & Graham, 2013). The two-way flow between research and health care practice has been used previously in areas other than health care. The term knowledge translation, for example, has been used extensively in adult education research since the 1950s (LaRocca, Yost, Dobbins, Ciliska, & Butt, 2012). Knowledge translation within health care was an important step towards recognising links between research and health care, and the important interaction between the two (Graham et al., 2006). Other terms describing the two-way flow between research and the user include **knowledge transfer** which involves the transfer of research results or skills between research organisations and the wider community or **knowledge exchange** which requires collective problem solving between researchers and decision makers (Graham et al., 2006). However, knowledge translation includes both the partnership between research and health care, and a process of integrating knowledge with the development of the knowledge to action cycle. Knowledge translation was used as the framework for this program of research.

### 2.1.3 Knowledge to action cycle

The knowledge to action (KTA) cycle is a knowledge translation model developed to integrate research into health care and is shown in Figure 2.1. The KTA cycle has been adopted by the Canadian Institute of Health Research as the accepted model for knowledge translation activities (Straus, Graham, Taylor, & Lockyer, 2008). Graham et al (2006) developed the KTA cycle by systematically reviewing the many planned action theories (links between individuals’ beliefs and behaviour) looking for commonalities across these theories (Graham et al., 2006; Straus et al., 2008). Several theories of knowledge translation, knowledge transfer, knowledge exchange, research utilisation, implementation, dissemination, diffusion, continuing education and continuing professional development were used in the development of the KTA cycle (Graham et al., 2006).
The KTA cycle (Graham et al., 2006) consists of two phases: ‘knowledge creation’ and ‘action cycle’ (Figure 2.1). In the knowledge creation phase, knowledge needs to be synthesised, refined and tailored into a tool to be used in clinical practice (Graham et al., 2006). The knowledge creation phase is represented as a ‘funnel’. As knowledge moves through the ‘funnel’ it becomes more useful to clinicians.

The ‘funnel’ functions of knowledge creation are similar to the ‘4S’ hierarchical structure for finding current evidence (Haynes, 2001). Interestingly, when comparing the knowledge creation ‘funnel’ (Figure 2.1) to ‘4S’ diagrammatic representation (Figure 2.2) the diagram appears as an inversion of the other. In ‘4S’ a clinician starts at the top and works down searching for the best current evidence for practice. At the ‘systems’ level, evidence is integrated informing hospitals’ policies and procedures or care pathways. If a clinician is unable to find current evidence, they move down to ‘synopses’ (summary of studies such as a review article), then ‘synthesis’
(systematic reviews) and finally to ‘studies’ (randomised controlled trial research) at the base and the last place to search (Figure 2.2) (Haynes, 2001).

![Figure 2.2: ‘4S’ level of organisation of evidence from research.](Haynes, 2001)

With knowledge creation, as research passes through the ‘funnel’ from top to bottom, only the most valid and useful knowledge remains. At the top of the knowledge creation ‘funnel’, in the centre, knowledge inquiry or first-generation knowledge is largely unrefined and the primary studies may or may not be easily useable in health practice (Graham et al., 2006). Knowledge synthesis or second-generation knowledge represents the analysis of existing knowledge and making sense of all the relevant knowledge. This often takes the form of systematic reviews and meta-analysis (Graham et al., 2006). Knowledge tools or products, which are third-generation knowledge, are presented in a clear and user-friendly format increasing and facilitating uptake and application of research in health practice (Graham et al., 2006). Examples of knowledge tools for use in health practice include clinical guidelines, decision making aids and clinical care pathways (Figure 2.1) (Graham et al., 2006; Straus et al., 2008; Straus, Tetroe, & Graham, 2009).

Around the outside of the KTA process is the action cycle phase; its main objective is to implement relevant research from the knowledge creation phase within the health care system (Graham et al., 2006; Jones et al., 2015; Scott et al., 2012). The action cycle has eight different elements or steps; each step is needed for successful implementation of research into health care (Graham et al., 2006; Straus et al., 2009).
The eight steps of the action cycle as shown in Figure 2.1 (Graham et al., 2006) are:

1. Identify a problem that needs addressing;
2. Identify, review, and select the knowledge or research relevant to the problem (practice guidelines);
3. Adapt the identified knowledge or research to local context;
4. Assess barriers to using the knowledge;
5. Select, tailor and implement intervention to promote the use of knowledge (i.e. implement the change);
6. Monitor knowledge use;
7. Evaluate the outcomes of using the knowledge; and
8. Sustain ongoing knowledge use.

KTA provides steps to implement research into practice, via both the knowledge creation and action cycle phases. Clinical guidelines are a refined format of current research developed by the final stage in the knowledge creation phase, ‘knowledge tools or products’ (Hutchinson, Sales, Brotto, & Bucknall, 2015). Defining ‘best practice’ is the first step in any knowledge translation research (Bosch et al., 2013) and in this investigation, the SF clinical guidelines (SF, 2010a) represent ‘best practice’.

Without a sound understanding of current practice it’s not possible to measure the gaps between ‘best practice’ (SF clinical guidelines) and actual care provided (clinician behaviour) (Bosch et al., 2013). Using KTA as a starting point for knowledge translation, this program of research is positioned within the first two steps of the action cycle phase (identify problem and review selected knowledge) by completing a stroke audit to understand clinicians’ behaviour against the SF clinical guidelines (best practice) with results to measure the gap between the two.
2.2 Clinical guidelines

Clinical guidelines are considered ‘best practice’ combining the best available research (at the time) with clinical experience to form clinical recommendations (Bosch et al., 2013). Implementing clinical guidelines in health care is a recognised method of attempting to reduce the knowledge gap (Bowen & Graham, 2013) by promoting optimal health care. Strategies to implement clinical guidelines into health care include publications, interactive websites, paper and electronic distribution and education (Bowen & Graham, 2013). Feedback and auditing are required to measure the knowledge gap between research evidence (clinical guideline implementation) and clinical practice. This program of research used auditing as a strategy to identify the knowledge gap.

Clinical guidelines have been defined as,

“…statements that include recommendations intended to optimise patient care that are informed by a systematic review of evidence and an assessment of the benefits and harms of alternative care options” (Graham, Mancher, Wolman, Greenfield, & Steinberg, 2011 page 4).

Therefore, critically appraised clinical guidelines can help individual clinicians implement research findings into their clinical practice (Hadely et al., 2013; Rohde, Worrall, & Le Dorze, 2013). If clinicians adopt recommendations from stroke clinical guidelines, it is likely there will be a positive effect for stroke survivors (Rudd et al., 2001). It is for these reasons that medical bodies such as, the National Health and Medical Research Council (NHMRC) in Australia, and the National Institute for Health and Clinical Excellence (NICE) in the United Kingdom (UK), promote a rigorous methodology for the development of stroke clinical guidelines. Both bodies promote the use of clinical guidelines to increase uptake of research and to prevent unnecessary, ineffective or harmful interventions. Many countries including Australia, United States of America (USA), UK, New Zealand, Italy, Canada, France, and Singapore recognise the value of clinical guidelines (Hill & Lalor, 2008).

In Australia, the SF has developed clinical guidelines for stroke management, originally published in 2003 for acute stroke management (Sluggett, et al., 2014) and in 2005 for stroke rehabilitation. These have been reviewed and updated regularly with the most recent version at the time of this research program published in 2010 (SF, 2010a). However new SF clinical
guidelines were published more recently in July 2017 (SF, 2017). SF clinical guidelines cover all aspects of stroke care, including organisation of service, early intervention, acute management, secondary prevention, rehabilitation, management of complications, community participation and long-term recovery, and cost and social and economic implications. Each recommendation has been given an overall grading based on the evidence available ranging from grade A – body of evidence can be trusted to guide practice; through to, D – body of evidence is weak and recommendation must be applied with caution. Additionally, a grade of “Good practice point” was used where the recommended best practice was based on clinical experience and expert opinion (SF, 2010a).

2.2.1 Limitations of clinical guidelines

Several limitations need to be considered regarding the implementation of clinical guidelines. Clinical guidelines can become outdated for example if changes occur to the evidence supporting the guidelines. Additionally, relying on clinical guidelines only may impact clinicians’ clinical reasoning and a lack of specificity to the recommendations contained within the guidelines may make it difficult for clinicians to implement.

Stroke clinical guidelines are a product of the state of knowledge at the time of the guideline development (Lenzer, 2013). Evidence is continually being developed or strengthened and at times, new evidence may even contradict previous evidence. This could lead to a serious issue, if at a later stage, a recommendation was found to lead to ineffective or even harmful practice (Woolf, Grol, Hutchinson, Eccles, & Grimshaw, 1999). For example, the 2010 SF clinical guideline 6.1 (amount and intensity of rehabilitation) promotes early mobilising defined as sitting out of bed, standing and walking within 24 hours of stroke onset (SF, 2010a). The 2017 SF clinical guidelines recommend early mobilisation defined as intensive out-of-bed activities should not start within 24 hours of stroke onset but rather should commence 48 hours after stroke onset (SF, 2017). It is possible that clinicians following the 2010 clinical guidelines may have implemented ineffective or harmful treatment if stroke survivors were mobilised within the first 24 hours post stroke.

The SF is aware of this limitation and attempts to ensure that the guidelines do not become out of date too quickly through regular review and update of the SF clinical guidelines. The SF clinical guidelines have been regularly reviewed since their initial development in 2003 (Sluggett, et al.,
In every review process an expert multidisciplinary working group has been established to systematically review all available research, including what was previously known and any new evidence, to inform required revisions or development of new recommendations. Past reviews also must meet the standard for clinical guidelines set by NHMRC and are required to be reviewed every five years (SF, 2010). The most recent SF clinical guidelines are described as a ‘live’ document with the SF hoping to be able to update the guidelines as new research evidence becomes available more readily (SF, 2017).

Clinical guidelines have been described as potentially having a negative impact on clinical reasoning (Woolf et al., 1999). Not leaving room for clinicians to tailor care to stroke survivors may limit patient-centred care if patient preferences are ignored in the implementation of stroke clinical guidelines. Additionally, clinicians may find recommendations lack specificity, such as how to complete a recommendation safely, which may result in clinicians not agreeing with and therefore not implementing the recommendations. For example, clinicians may have concerns regarding a recommendation around community access and mobilising outdoors for stroke survivors (SF 6.4 Activities of daily living). Clinicians may be concerned for stroke survivor safety so soon after diagnosis and be reluctant to provide community access despite a recommendation in SF clinical guidelines (McCluskey & Middleton, 2010).

In summary, clinical guidelines are developed to be used as a guide for clinicians but have some limitations. Clinicians are required to use their clinical judgement and consider stroke survivors’ preferences in stroke management (SF, 2010a). Clinical guidelines are designed to help clinicians with their decision making. Section 2.2.2 discusses the benefits of adhering to stroke clinical guidelines and the barriers and facilitators to adhering to stroke clinical guidelines in clinical practice.

### 2.2.2 Benefits of adhering to stroke clinical guidelines

Adherence to stroke clinical guidelines, refers to the clinical management for stroke survivors delivered in accordance with stroke clinical guidelines (Hubbard et al., 2012; SF, 2015, 2016). This can lead to improved outcomes for both stroke survivors and health care providers alike. For stroke survivors, improved adherence is associated with improved functional outcomes for stroke survivors, an increased chance of returning home and a shortened hospital length of stay (Duncan et al., 2002; Hubbard et al., 2012; Quaglini et al., 2004). For health care providers, adhering to
stroke clinical guidelines is associated with improved stroke survivor satisfaction with stroke care and reduced health costs due to a shorter length of stay (Quaglini et al., 2004; Reker et al., 2002). These will be discussed in further detail.

Greater adherence to stroke clinical guidelines is associated with stroke survivors having better outcomes and a greater chance of returning home (Hubbard et al., 2012). One commonly used clinical outcome measure in rehabilitation units is the Functional Independent Measure (FIM). The FIM comprises 18 items (13 motor and five cognition items) and assesses functional ability using a seven-point scale, where one indicates total dependence to seven which indicates total independence (Hamilton, Laughlin, Fiedler, & Granger, 1994). FIM scores range from a minimum of 18 up to a maximum score of 126. The difference between FIM scores between admission and discharge scores is referred to as ‘FIM change’ (Hamilton et al., 1994) which is typically associated with functional improvements of stroke survivors during their hospital stay. In an Australian study, it was demonstrated that care provided in accordance with stroke clinical guidelines resulted in higher FIM change scores (Hubbard et al., 2012). In this particular study, a ‘better outcome’ for stroke survivors was defined as a FIM change score equal to or greater than 22 across all 18 motor and cognition items (Hubbard et al., 2012). A FIM change score of 22 has been shown to be the minimum clinical important difference (Beninato, Gill-Body, Salles, Stark, Black-Schaffer & Stein, 2006) suggesting that this improvement is associated with improved functional recovery for stroke survivors. A second benefit of this higher FIM change score was an increased chance of returning home (Hubbard et al., 2012), possibly as a result of the improved functional recovery.

In the USA, rehabilitation units using different models of care, found a similar significant relationship between adherence to stroke guidelines and stroke survivor recovery (Duncan et al., 2002). Higher FIM scores at six months post stroke were again associated with greater adherence with stroke guidelines, even after accounting for age, comorbidities, pre-stroke walking ability and stroke severity (Duncan et al., 2002). However, only motor FIM scores were included in this analysis and the five cognition FIM items were not considered in these findings. A similar result was also found for an acute service in Australia. Care provided with higher adherence to stroke clinical guidelines was positively associated with greater functional improvement based on the stroke survivors’ FIM scores (Luker & Grimmer-Somers, 2009a). Interestingly, in this acute care setting stroke guideline adherence did differ across age and stroke severity (Luker & Grimmer-
Further clarification is needed of the potential influence of factors such as age, gender, and stroke severity on clinician adherence to clinical guidelines.

Delivering stroke care in accordance with stroke clinical guidelines (adherence) also has benefits for health care providers. Reker and colleagues (2002) investigated the relationship between stroke survivor satisfaction with their stroke care and adherence to stroke clinical guidelines. Clinical records of 288 stroke survivors were reviewed to assess the adherence level to stroke clinical guidelines. Stroke survivors were interviewed by telephone to assess their level of satisfaction regarding their hospital care using a stroke specific survey measuring nine items of stroke service ranging from staff attending to problems, treatment provided, information provided on discharge and overall satisfaction with the stroke service provided (Reker et al., 2002). Greater satisfaction with stroke care was associated with greater adherence to stroke clinical guidelines for rehabilitation services though there was no association for acute services (Reker et al., 2002). Additionally, stroke survivors with higher motor recovery were more satisfied with their stroke care (Reker et al., 2002). Regardless of motor recovery, when stroke survivors and their families were involved in their recovery, that is, care provided was patient centred; they were more satisfied with stroke services (Reker et al., 2002).

Higher adherence with stroke clinical guidelines also has economic benefits for health care providers. Health care costs of providing a stroke service were estimated for both direct care costs such as diagnostic and treatment procedures and non-direct costs such as food, laundry and other general costs attributed to length of stay (Quaglini et al., 2004). Clinical records of more than 350 stroke patients were examined and assessed for adherence to stroke guidelines (Quaglini et al., 2004). Lower hospital costs ostensibly due to a shorter length of stay (2 days) in hospital for both acute and rehabilitation services was found with increased adherence to stroke clinical guidelines (Quaglini et al., 2004). There were also indirect benefits associated with a shorter length of stay such as increased bed turnover and bed availability within the stroke services (Quaglini et al., 2004).

Despite the potential benefits of adhering to stroke clinical guidelines, a clearly defined appropriate level of adherence was not found. Defining an appropriate or reasonable level of adherence may assist clinicians to work towards delivering stroke care in accordance with stroke clinical guideline. Adherence levels have been defined as low if less than 60% (McCluskey,
Vratsistas-Curto, & Schurr, 2013), whereas another study suggests that low adherence was less than 50% (Johnston et al., 2013). Defining adherence as a range has also been suggested, 75% or greater was defined as good to high adherence while less than 65% was defined as poor (Duncan et al., 2002). Establishing or defining upper and lower adherence levels may be useful in stroke audits.

In summary, adherence to stroke clinical guidelines appears to be beneficial to stroke survivor functional recovery potentially contributing to an increased chance of being discharged home. Stroke survivors are more satisfied when their stroke care adheres to clinical guidelines, their motor recovery improves and if they and their families are involved in their care. Higher adherence to stroke clinical guidelines is associated with a shorter length of stay leading to reduced health care costs and increased bed availability for health care providers. However a minimum or required adherence level to achieve these benefits was not clear within the literature.

2.2.3 Barriers and facilitators to adherence to stroke clinical guidelines

Despite these benefits of adhering to stroke clinical guidelines there are difficulties or barriers associated with implementing stroke care in accordance with stroke clinical guidelines. Barriers could be viewed from a clinician prospective or from a hospital and service prospective (McCluskey et al., 2013). Facilitators are factors that help improve adherence to stroke clinical guidelines such as having a dedicated stroke team, time for training or funding for equipment (Donnellan, Sweetman, & Shelley, 2013b). Understanding the reasons for adhering or not adhering to stroke clinical guidelines may ultimately help clinicians or services manage their stroke service. Barriers and facilitators to implementing stroke guidelines in both acute and rehabilitation care will be discussed.

2.2.3.1 Barriers to implementing stroke clinical guidelines

A number of barriers have been reported regarding implementing stroke guidelines in both acute and rehabilitation care (McCluskey et al., 2013). One reason why barriers might exist could stem from how research results are frequently produced. Research studies tend to have highly selective patients, and incorporate extra resources and specialised training for individuals (Connell, McMahon, Tyson, Watkins, & Eng, 2016). This is in contrast to a typical hospital environment where non-selective patients, fixed funding and fluctuating staffing levels are common factors.
These differences between how the research is generated and the pragmatic implementation can present as barriers for implementing research into clinical practice (Connell et al., 2016).

Implementing stroke clinical guidelines may require individual clinicians to change their behaviour which can be difficult (Scott et al., 2012). One barrier that might influence an individual clinician changing their practice might include not receiving adequate training or education around stroke clinical guidelines. This lack of education might affect the clinician’s capacity to implement the stroke clinical guidelines (Bayley, Hurdowar, Richards, Korner-Bitensky, Wood-Dauphinee, Eng, … & Graham, 2012; Donnellan, Sweetman, & Shelley, 2013a; McCluskey et al., 2013). The education or training needs might vary from hospital to hospital. Training may be needed if clinicians have a general lack of awareness of stroke clinical guidelines and therefore require education regarding the stroke clinical guidelines such as dissemination training about the purpose of stroke clinical guidelines (Donnellan 2013a). Additional training may be needed to help clinicians understand the technical language used with the stroke clinical guidelines (Bayley, et al., 2012). Training could be provided by one discipline to another discipline to improve the use of stroke clinical guidelines specific technical areas (Bayley, et al., 2012). Or clinicians’ may have specific requests for education and training on a particular areas of stroke clinical guidelines, such as improving confidence in implementing outdoor journeys with stroke survivors or discussing information regarding sexuality following stroke in a sensitive manner (McCuskey et al., 2013). Regardless training should be targeted to the need and gap/s identified.

Another barrier that might affect clinician behaviour could be a belief that a stroke clinical guideline might have an adverse outcome for a stroke survivor. Therefore, the clinician may select and prioritise another treatment over that recommended in a stroke clinical guideline (Bayley et al., 2012; McCluskey & Middleton, 2010). For example, SF clinical guideline 6.4 (activities of daily living) includes accessing the community and undertaking outdoor journeys; however, only 17% of stroke survivors were found to receive community practice at the correct intensity (McCuskey & Middleton, 2008). If the clinician believed undertaking an outdoor visit might have an adverse outcome, they may choose to simulate this or complete a different treatment. A clinician may also forget to implement a stroke clinical guideline (McCuskey & Middleton, 2010). The Stroke Foundation Clinical Guidelines for Stroke Management (2010a) comprise 71 guidelines, many with multiple sub-components of care. Such a number make it
possible that clinicians may forget to implement specific guidelines, particularly, if only
applicable to some stroke survivors. For example, physiotherapists might forget to provide sitting
balance training to stroke survivors who have difficulty standing up (McCluskey et al., 2013),
despite evidence that sitting balance training can carry over into improving sit to stand
performance (Dean & Channon, 2007). The use of an external prompt such as a care pathway
might aid clinicians to implement all stroke clinical guidelines (McCluskey et al., 2013).

Barriers to implementing stroke clinical guidelines including resourcing can also occur from a
hospital or service prospective (McCluskey & Middleton, 2010). Such barriers include staffing
numbers, clinical time and equipment (Bayley et al., 2012; Donnellan et al., 2013a; McCluskey &
Middleton, 2010). Fluctuating or insufficient staffing numbers might impact meeting stroke
clinical guidelines (McCluskey et al., 2013). For example, SF clinical guideline 6.1 (amount and
intensity of rehabilitation) recommends a minimum of one hour of therapy practice five days a
week. If staffing levels are not adequate to deliver this intensity of therapy to stroke survivors,
this will potentially affect the amount of clinical time available to meet to this recommendation.
Similarly, if a hospital or service does not have equipment specified in a stroke clinical guideline,
this may become a barrier to adhering to that particular stroke clinical guideline. For example, SF
clinical guideline 6.3 (physical activity) suggests using a treadmill as an additional intervention
for walking training. If a hospital or service does not have access to a treadmill then offering this
additional walking intervention may not be possible. Identifying barriers provides an opportunity
for clinicians and management to address these barriers (McCluskey et al., 2013).

Despite these barriers clinicians appear to be or are becoming more accepting of stroke clinical
guidelines. A survey completed in 2007 found that Australian physiotherapists were more
accepting of adhering to stroke clinical guidelines than were UK physiotherapists in 2001
(Grimmer-Somers, Lekkas, Nyland, Young, & Kumar, 2007). Likewise, neurologists from the
Netherlands on average agreed with working or reported to work in accordance with stroke
clinical guidelines (Hool et al., 2004).

2.2.3.2 Facilitators to implement stroke clinical guidelines

Identifying potential facilitators can support the implementation of stroke clinical guidelines into
clinical practice (McCluskey et al., 2013). One facilitator to implementing stroke clinical
guidelines is adapting the guidelines to local clinical practice. Examples include, incorporating
stroke clinical guidelines into treatment protocols and making recommendations user friendly and relevant at a local level (Donnellan et al., 2013a; McCluskey et al., 2013) which may facilitate clinicians working within that local facility to integrate the guideline recommendations into their clinical practice.

Another known facilitator to stroke guideline implementation is having a dedicated stroke team. A dedicated stroke team who have a good understanding of the stroke clinical guidelines and are committed to implementing them into clinical practice (Donnellan et al., 2013a) will contribute to better implementation. The stroke team will likely need access to appropriate equipment and technology with managerial support (Donnellan et al., 2013a) to achieve this. Additionally, having access to local experts to provide specific education to enable upskilling and protected time for training are also facilitators shown to improve adherence to stroke clinical guidelines (Donnellan et al., 2013a; McCluskey et al., 2013).

Understanding the barriers and facilitators to implementing clinical guidelines can be helpful at a local level for hospital facilities and units to support clinicians and services to adhere to stroke clinical guidelines. However, first the local knowledge gap needs identification.

### 2.3 Knowledge gap and research gap

The following sections describe the knowledge gap and research gap and where this research program is positioned. The knowledge gap refers to the gap between clinicians’ clinical practice and the available research. The research gap refers to the gaps between the available research and this program of research, providing the rationale for this thesis.

#### 2.3.1 Knowledge gap

When research is applied in clinical practice there is no knowledge gap. But when research is available and not used, a gap is created (MacDermid & Graham, 2009). Gaps exist across health care (MacDermid & Graham, 2009) and can negatively affect quality of life and contribute to inefficient use of health care resources (LaRocca et al., 2012). Defining the knowledge gap is an essential first step when addressing the knowledge gap. Audits provide a useful starting point for local services to identify local knowledge gaps.

National audits of adherence to stroke clinical guidelines in the UK and Australia continue to find knowledge gaps (Hadely et al., 2013). The SF in Australia co-ordinates a national audit.
highlighting knowledge gaps between clinical practice and recommendations for stroke management (SF, 2010b, 2013, 2014, 2015, 2016). Minimal change has been noted over time (Hadely et al., 2013; SF, 2010b, 2014, 2015, 2016). Similar results were identified in the National Health Service (NHS) National Sentinel Audit in the UK with little improvement noted in adherence to the standards between 2004 and 2010 (National, 2011). The minimal change observed between national audits might be due to unforeseen barriers preventing implementation of and adherence to stroke clinical guidelines to the local level.

Implementation of stroke clinical guidelines across both acute and rehabilitation services and engagement of clinicians with identifying and ultimately addressing the knowledge gap remain a challenge. Further understanding of the knowledge gap at a national and local level is required.

2.3.2 Auditing to measure the knowledge gap

Knowing what to do and doing it are two different things. Therefore, without a sound understanding of what exactly happens in practice, it is impossible to measure the knowledge gap (Bosch et al., 2013). Clinical record audits are one tool able to identify whether a gap exists by examining the pattern of behaviour in clinical practice compared to clinical guidelines (MacDermid & Graham, 2009). A clinical record audit can identify problems that need addressing, which is the first step in the ‘action phase’ of the KTA cycle (Brehaut & Eva, 2012; Graham et al., 2006).

Identifying knowledge gaps by audit has been used widely when examining stroke guideline adherence. Several studies have used clinical record audits to examine the knowledge gap between clinical practice and stroke clinical guidelines in stroke care (Duncan et al., 2002; Hubbard et al., 2012; Johnston et al., 2013; Luker & Grimmer-Somers, 2009a).

Various stroke audits assessing adherence of clinical performance to stroke clinical guidelines have identified some common knowledge gaps in the areas of communication with stroke survivors and families (patient-centred care), goal setting, peer support and discharge planning (Duncan et al., 2002; Hubbard et al., 2012; Johnston et al., 2013; Luker & Grimmer-Somers, 2009a; Luker & Grimmer-Somers, 2009b). Some differences in knowledge gaps have also been identified between the studies. Hubbard et al (2012) for example, found low level of adherence to recommendations related to memory, mood, attention and concentration in hospitals in Australia. Whereas, Luker et al (2009a) identified a different gap in a hospital within Australia, concerning
recommendations for swallowing screening. In a hospital in New Zealand, Johnston et al (2013) found additional gaps regarding recommendations referring to managing altered sensation, contracture and falls risk. For hospitals in the USA, Duncan et al (2002) identified a gap regarding recommendations for treatment planning. These varied results suggest that hospitals may be unique regarding their adherence level to specific stroke clinical guidelines. Therefore, it is reasonable to suggest that privately funded hospitals in Australia should not be solely reliant on SF national audit outcomes as these findings are primarily based on data retrieved from publicly funded hospitals and may not be directly relevant to privately funded hospitals.

In summary, previous audits have investigated the knowledge gap (Duncan et al., 2002; Hubbard et al., 2012; Johnston et al., 2013; Luker & Grimmer-Somers, 2009a; Luker & Grimmer-Somers, 2009b), including the most recent SF national audits (SF, 2015, 2016). Addressing the knowledge gap is a multi-factorial issue and exploration of a new approach is warranted, particularly for privately funded hospitals in Australia which historically have not participated in SF national audits. Developing an audit tool to measure the knowledge gap within a privately funded hospital is necessary.

2.3.3 Research gap–development of audit tools

Previous stroke audit tools developed to assess adherence to stroke clinical guidelines in health care vary depending on whether the audit is national or local. The following section explores the different methods used to develop stroke audit tools to provide insight for the methodology in this program of research.

2.3.3.1 National audits

National audits in different countries assessing adherence to stroke clinical guidelines in health care services have largely used expert panels to develop their audit tools (Duncan et al., 2002; Hammond et al., 2005; Hool et al., 2004; LaClair et al., 2001; Rudd et al., 2001). The disciplines forming these expert panels vary. Hool et al (2004) in the Netherlands and Rudd et al (2001) in the UK, for example, both used medical experts to inform the audit tools. In the USA, Duncan et al (2002) and LaClair et al (2001) both used a multidisciplinary (medical, nursing and allied health) expert panel to inform the development of their tools.
Regardless of how expert panels are formed, consensus or agreement between panel members must be reached to determine which guidelines are included in the audit tool. A common technique for gaining agreement among expert panel members is by using a Delphi process (Gompertz, Irwin, Morris, Cstat, Rutledge, Rudd, & Pearson, 2001; Hammond et al., 2005; LaClair et al., 2001). A Delphi process is a forecasting technique to gain agreement between individuals whom have different opinions (Hasson, Keeney, & McKenna, 2000; McKenna, 1994).

The Australian national stroke audit was modelled on the UK national audit (Hubbard et al., 2012). In the UK in 1997, the NHS Executive for England and Wales commissioned the development of a stroke audit tool to assess adherence to their national stroke clinical guidelines. The stroke audit tool was required to work and be used across disciplines and services (acute and rehabilitation) (Gompertz et al., 2001). From this process, the National Sentinel Audit on stroke care was developed. A working party was established consisting of representatives from health colleges and professional associations of all clinical disciplines forming the intercollegiate working party. The UK stroke audit tool was first developed by the members of the intercollegiate working party (Hammond et al., 2005) and then reviewed by an expert panel. The expert panel used a modified Delphi process to determine agreement among the experts to finalise the audit tool (Gompertz et al., 2001). The stroke audit tool was then customised into targeted audits for each specific discipline including physicians (Rudd et al., 2001), physiotherapists and occupational therapists (Hammond et al., 2005). This process ensured that comparisons could be made to highlight common problem areas and issues for both clinicians and researchers to address (Gompertz et al., 2001). Additionally, it was suggested that having audit results relating to specific disciplines might also add value and meaning to the results for those disciplines (Hammond et al., 2005).

Despite being based on the UK model, in Australia, the Stroke Foundation took a different approach to develop the Australian stroke data audit tool used in the two most recent audits (SF, 2015, 2016). The SF used two Australian peak organisations to guide the development of their audit tools – the Australian Stroke Coalition (ASC) and a government agency, the Australian Council on Healthcare Standards (ACHS). The ASC was established in 2008 to bring together experts from academia and clinical networks and relevant professional associations (including allied health) throughout Australia with interest and expertise in improving stroke care
(http://australianstrokecoalition.com.au/). The ACHS is an authorised accreditation agency with the Australian Commission on Safety and Quality in Health Care, who develop clinical care standards across all areas of health care. More specifically ACHS developed the clinical care standard regarding stroke care, ensuring all stroke survivors receive optimal care and treatment (found at https://www.safetyandquality.gov.au/wp-content/uploads/2015/07/Acute-Stroke-IndicatorSpecification.pdf). The two SF audit tools (one for acute services and one for rehabilitation services) developed from ASC agreed framework (no detail publicly available at http://www.strokesociety.com.au) were based on the ACHS stroke clinical care standards. In contrast to the UK national audit, no national discipline specific audits were developed.

Regardless of whether national audits have used an expert panel, such as in the UK, or peak organisations, as was done in Australia, to develop their audit tools, one potential negative aspect is the exclusion of local clinicians’ opinions and their lack of engagement with the stroke audit tool development process (Jamtvedt, Young, Kristoffersen, O’Brien, & Oxman, 2006). This is particularly true if expert panellists’ opinions vary from local clinicians resulting in a stroke audit tool that has possibly little or no meaning for local clinicians.

An alternative approach to developing a stroke audit tool could be to encourage collaboration between clinicians and researchers (Lomas, 2007; Oborn et al., 2013). Targeting clinicians to rate stroke clinical guidelines by their importance/relevance to local practice within their setting is considered to give direction and meaningful value to the audit process and results (Hammond et al., 2005; Jamtvedt et al., 2006).

### 2.3.3.2 Local audits

Different approaches have been used to develop local stroke audit tools (auditing of one hospital). One approach involved using local clinicians directly (Gommans, Sye, & MacDonald, 2005). Treating clinicians or at least stroke service representatives from medical, nursing and allied health developed a stroke audit tool to audit an acute service (Gommans et al., 2005). However, limited information was provided about the tool’s development process, content and how agreement was reached by the group (Gommans et al., 2005). Regardless, local clinicians developed a stroke audit tool allowing them the opportunity to provide their opinions for the development of a stroke audit tool.
The second approach of developing a local stroke audit tool described in the literature was to identify stroke clinical guidelines related to a specific ‘discipline’. This approach did not involve local clinicians themselves. Luker and Grimmer-Somers (2009a) identified 38 SF clinical guidelines relevant for allied health disciplines working within an acute stroke service. The process underpinning the identification of the 38 allied health SF clinical guidelines was not outlined. These 38 guidelines were subsequently developed into a stroke audit tool used to audit allied health care in the acute stroke service (Luker & Grimmer-Somers, 2009a). Johnston and colleagues (2013) developed a stroke audit tool for a specific discipline. Only stroke clinical guidelines related to physiotherapy assessment and treatment of stroke survivors, across both acute and rehabilitation services were included. Guidelines and recommendations that were not solely the physiotherapist’s responsibility were excluded (Johnston et al., 2013). The use of specific ‘disciplines’ to inform development of a stroke audit tool can be seen as limiting clinician involvement in the process. However, stroke care involves more than physiotherapists and so allied health specific audits should be comprehensive of all allied health disciplines.

The literature provides examples of different approaches of developing both national and local stroke audit tools including using expert panels, local clinicians and disciplines from different health backgrounds. There are some likely benefits of developing local tools such as improved engagement and understanding of stroke clinical guidelines if involving local clinicians. Using disciplines to assist with stroke audit tool development has been demonstrated within the literature, however specific details and clarity regarding using local allied health disciplines as an integral part of the stroke audit tool development requires further investigation to develop a rigorous process. This has been lacking in much of the literature to date.

This research program proposes that all allied health disciplines working with stroke survivors have local knowledge and information to help guide the development of a stroke audit tool to assess adherence to SF clinical guidelines. The stroke audit tool developed by allied health disciplines should be relevant to all disciplines involved in this process.
2.3.4 Research gap–acute and rehabilitation service audits

The most recent Australian SF national audits were conducted in the acute service (SF, 2015) and the rehabilitation service (SF, 2016). In hospitals with separate acute and rehabilitation services it is likely that the combined care across units contributes to stroke survivor recovery. In Australia, the majority (89%) of stroke survivors are managed acutely within publicly funded hospitals (AIHW, 2013). For stroke survivors needing rehabilitation approximately half (48%) are transferred to privately funded rehabilitation services (AIHW, 2013). A common journey of care for many stroke survivors is from an acute service via a rehabilitation service to discharge from hospital.

Previous studies investigating stroke clinical guideline adherence have typically audited only one service – either acute (Hammond et al., 2005; Hill, 2008; Luker & Grimmer-Somers, 2009a; Luker & Grimmer-Somers, 2009b), or rehabilitation (Duncan et al., 2002; Grube et al., 2012; Hubbard et al., 2012; Johnston et al., 2000). Little is known about adherence to stroke clinical guidelines during the stroke survivor’s journey through both acute and rehabilitation services within the same hospital. Only one study (Johnston et al., 2013) that investigated guideline adherence across both acute and rehabilitation services within one hospital was found. However, only physiotherapists’ adherence to clinical guidelines for management of stroke survivors was investigated (Johnston et al., 2013). Stroke survivors, particularly those with poor function and requiring rehabilitation, are more likely to receive treatment across multiple allied health disciplines (Luker & Grimmer-Somers, 2009a). Stroke survivors have improved recovery resulting from the combined care of both acute and rehabilitation services (AIHW, 2013). Therefore, a review of SF clinical guidelines relevant across both acute stroke and rehabilitation services that is inclusive of all allied health disciplines is warranted.

2.3.5 Research gap–participation of private hospitals in SF national audits

The SF stroke clinical guidelines (SF, 2010a) are applicable to both publicly (53% of all Australian hospitals) and privately (47% of all Australian hospitals) funded hospitals in Australia (AIHW, 2016). Consistently in Australian national stroke audits, co-ordinated by SF, the private sector has shown low participation (SF, 2013, 2014, 2015, 2016), as shown in Table 2.1. The number of privately funded hospitals is growing in Australia, increasing from 557 hospitals in 2006/7 to 624 hospitals (number of beds increased by 5096) in 2014/15 (AIHW, 2016). In contrast, the number of public hospitals over the same period has decreased by 60 hospitals.
(although the number of beds increased by 4436) (AIHW, 2016). Strategies for engaging privately funded hospitals in national stroke audits in Australia are required.

### Table 2.1 Number of Australian privately funded hospitals participating in SF national audits.

<table>
<thead>
<tr>
<th>Years</th>
<th>2009</th>
<th>2011</th>
<th>2013</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Acute stroke service audits (total number of hospitals)</td>
<td>No data collected</td>
<td>4 (184)</td>
<td>3 (124)</td>
</tr>
<tr>
<td></td>
<td>Rehabilitation service audits (total number of hospitals)</td>
<td>15 (96)</td>
<td>12 (101)</td>
<td>12 (103)</td>
</tr>
</tbody>
</table>

The most recent Australian SF acute stroke services audit was conducted in 2015 in which only 5% of privately funded hospitals participated (Table 2.1). There were no privately funded hospitals represented from the Northern Territory, South Australia, Tasmania or Western Australia (SF, 2015). Queensland had the highest Australian state representation with three private hospitals participating (SF, 2015). In 2014/15, in Queensland, there were 109 privately funded hospitals who potentially could have participated in the acute stroke audit (AIHW, 2016) while in the state of New South Wales (the most populous Australian state) there were more than 200 privately funded hospitals available (AIHW, 2016). This low level of participation in national audits has shown no change compared with the previous 2013 national audit when only five privately funded hospitals took part (SF, 2013). Similarly, in the acute stroke service audit, there was no representation from the Northern Territory, South Australia, Tasmania or Western Australia (SF, 2013).

In the most recent rehabilitation audit 15 (14%) privately funded hospitals participated compared with 93 (86%) public hospital rehabilitation services (SF, 2016). All Australian states were represented, with New South Wales having the highest number (four) of private hospitals participating, compared with 30 publicly funded hospitals. Previous audits had similarly low participation of private hospital rehabilitation services (Table 2.1).

A high participation rate is important for audit results to be considered valid and meaningful (Hammond et al., 2005). One consequence of this lack of participation by private hospitals is that
limited data are available to benchmark the services of privately funded hospitals (SF, 2013, 2014, 2015, 2016), which could potentially impact the quality of stroke care. Alternative strategies are required to identify knowledge gaps at the local level for stroke services in the private sector. Adherence to SF clinical guidelines within the privately funded hospitals sector is relatively unknown and warrants further investigation (SF, 2010b).

2.4 Summary

The number of stroke survivors is set to continue to rise resulting in increased health care costs required for stroke care (Deloitte, 2013). Adhering to stroke clinical guidelines can improve stroke survivors’ motor recovery and independence, reduce length of stay and therefore reduce health care costs, improve stroke survivors’ satisfaction and improve their chance of being discharged home (Duncan et al., 2002; Hubbard et al., 2012; Luker & Grimmer-Somers, 2009a; Luker & Grimmer-Somers, 2009b; Quaglini et al., 2004; Reker et al., 2002). Within Australia little is known about privately funded hospital adherence to SF clinical guidelines due to low participation rates in national audits (SF, 2010b, 2014, 2015, 2016), warranting further investigation. Based on reports in the literature, it is known that one-third of stroke survivors will require admission to a rehabilitation service (Hubbard et al., 2012). A common journey of care for many stroke survivors is from the acute service via the rehabilitation service before discharge from hospital. For this reason, an audit investigating adherence to SF clinical guidelines across both the acute stroke care setting and the rehabilitation setting is proposed.

In stroke audit tool development, previous studies have used expert panels to develop tools for national audits (Duncan et al., 2002; Hammond et al., 2005; Hool et al., 2004; LaClair et al., 2001; Rudd et al., 2001). However, using an expert panel removes local clinicians from the development process. A local audit tool is favoured, using all relevant disciplines to develop the stroke audit tool.

The framework of knowledge translation forms a partnership between researchers and clinicians to reduce a defined knowledge gap (Bowen & Graham, 2013). In this research program, a consensus approach (between researchers and clinicians) was adopted to select SF clinical guidelines to inform the development of the local stroke audit tool. The stroke audit tool was then used to conduct a clinical record audit.
This research comprised two studies including the design of a stroke audit tool with local clinicians, testing the stroke audit tool’s reliability, and finally a 12-month retrospective clinical record audit against the SF clinical guidelines of both acute and rehabilitation services to examine adherence.

2.5 Research questions, aims and hypotheses

Two studies were conducted. Study 1 developed and designed the stroke audit tool and investigated its reliability. Using a modified Delphi process clinicians from five allied health disciplines (physiotherapy, occupational therapy, social work, speech pathology, and dietetics) selected the SF clinical guidelines to be included in the stroke audit tool. Inter-rater reliability of the stroke audit tool was investigated by determining the level of agreement between raters from five allied health disciplines across ten clinical records. Also, intra-rater reliability was determined using the same rater across five clinical records. Study 2 comprised a 12-month retrospective clinical record audit using the stroke audit tool to examine adherence against the SF clinical guidelines for stroke survivors based on consecutive admissions to acute stroke and rehabilitation services.

2.5.1 Research questions and hypothesis

The premises of these studies were tested by addressing the following questions:

1. Can allied health clinicians from a stroke service of a privately funded hospital identify and agree on ten SF clinical guidelines to inform a stroke audit tool?
2. How reliable was the stroke audit tool when implemented by multiple raters ans the same rater?
3. What was the adherence of allied health clinicians against SF clinical guidelines across both the acute and rehabilitation services? Does the adherence of allied health clinicians to the SF clinical guidelines differ between the acute and rehabilitation services?

It was hypothesised that:

i) Allied health clinicians, using a modified Delphi process, would identify and agree a minimum of ten SF clinical guidelines.
ii) The audit tool could be reliably administered by multiple allied health clinicians with substantial consistency (Intraclass Correlation Coefficient, >0.7).

iii) The audit tool will demonstrate substantial intra-rater consistency (Intraclass Correlation Coefficient, >0.7).

iv) Allied health clinicians will meet the minimum adherence level of 60% across the majority of selected SF clinical guidelines. Additionally, allied health clinicians’ adherence would reach an aspirational level of 80% on some of the selected SF clinical guidelines.

v) There would be no significant difference in adherence to SF clinical guidelines across acute and rehabilitation services, or when age, gender or length of stay were considered.
Chapter 3. Methodology and Design

This chapter outlines the methodology of the two studies comprising this research program and why this methodological approach was chosen. Different methods to evaluate clinical performance from simulated patients, to peer assessment, direct observation, and a clinical record audit are explored. The methodology underpinning each study is presented. With respect to Study 1, the Delphi process used and justification for the modifications to assist with the stroke audit tool design (phase 1), followed by testing the reliability of the stroke audit tool (phase 2) are explained. For Study 2, a 12-month retrospective clinical record audit, the advantages and disadvantage of audits, and why an audit methodology was used and how this relates to this program of research is discussed. The sampling process along with the data analysis, is described for both studies.

3.1 Methodological approach

Chapter 2 has presented the current evidence and developed the research questions and hypotheses. The methodological approach involves the process of how to acquire the information (or data) to answer the research questions and prove or disprove the hypotheses (Blaikie, 2003; Grix, 2002). For the methodological approach, there are two contrasting positions on how to collect data – positivism and interpretivism. Positivism refers broadly to applying methods using a quantitative approach (Hay, 2002); whereas interpretivism refers broadly to methods assessing differences between people’s opinions therefore applying methods with a qualitative approach (Grix, 2002).

For this research program, that seeks to understand how a privately funded hospital adheres to SF clinical guidelines, a quantitative methodological approach was required. Further, clinicians’ opinions on how a privately funded hospital applies SF clinical guidelines were not being investigated so a qualitative approach was not appropriate. This supports the quantitative approach taken. However, if a qualitative approach were used, a different answer may result to the same question. A semi-structured interview is an example of qualitative data collection but only one study assessing clinicians’ relationships with adherence to SF clinical guidelines was found (Luker & Grimmer-Somers, 2009b). Others investigating this topic have mostly used a quantitative approach (Duncan et al., 2002; Hammond et al., 2005; Johnston et al., 2013; Luker &
Grimmer-Somers, 2009a; Quaglini et al., 2004). Therefore, a similar approach was adopted in this research program.

Method refers to the precise procedure used to acquire data (Blaikie, 2003). A method or precise procedure of collecting data to measure clinician performance against the SF clinical guidelines was needed. In a systematic review assessing doctors’ performance in daily practice (Overeem et al., 2007) six methods to evaluate clinical performance were identified. These included:

- Simulated patients, where a mock patient rated the performance;
- Video observation; where a session is taped and then two observers rated the performance;
- Peer assessment; the completion of questionnaires regarding knowledge, skill and professionalism;
- Appraisal; the completion of an appraisal to promote self-reflection;
- Direct observation; during a session, where an observer assessed their performance; and
- Audit of clinical records, where the records is examined to measure their clinical performance.

From the literature reviewed in Chapter 2 an audit of clinical records was a commonly used method to assess adherence to stroke clinical guidelines (Duncan et al., 2002; Gommans et al., 2005; Hammond et al., 2005; Harris, Cadilhac, Hankey, Hillier, Kilkenny, & Lalor, 2010; Hubbard et al., 2012; Johnston et al., 2013; Luker & Grimmer-Somers, 2009a; Luker & Grimmer-Somers, 2009b; Quaglini et al., 2004; Reker et al., 2002; Salter, McClure, Mahon, Foley, & Teasell, 2012) and was used in this research program. The use of a clinical audit is well accepted in Australia with the SF conducting biannual audits to assess adherence to stroke management guidelines in both acute and rehabilitation services (SF, 2015, 2016). Using a clinical record audit for this research program allowed for comparison between the results from this research program, the literature, and the SF national audits.

The alternative methods identified to evaluate clinical performance (Overeem et al., 2007) were not considered viable methods for this program of research. Simulated patients, or the use of video or direct observation would be difficult to compare with current literature and neither would have been feasible to implement across a year of stroke service delivery. Peer assessment and appraisal would provide insight into clinicians knowledge of how they intended to implement stroke
clinical guidelines but would not necessarily reflect actual clinical performance in implementing the guidelines.

3.2 Study 1

The following sections lay out the procedures used in Study 1. Study 1 comprised two phases; development of the audit tool using a Delphi process (phase 1) and the reliability testing of the audit tool (phase 2). Phase 1 provides a review of the Delphi process including the number of voting rounds, agreement level, scoring and number of votes per round as well as the sampling procedure, and data analysis. Phase 2 provides an outline of the reliability testing, as well as the design, participants and procedure. Ethical considerations are discussed for Study 1 with specific details about the methods used in Study 1 presented in Chapter 4.

3.2.1 Phase 1–Stroke audit tool development

The stroke audit tool was designed using a modified Delphi process. A selection process was required to inform how the allied health clinicians would choose SF clinical guidelines to include in the audit tool. On reviewing the literature for the Background chapter (Chapter 2), researchers (Hammond et al., 2005; LaClair et al., 2001; Rudd et al., 2001) used either a Delphi or a modified Delphi process to inform their investigations of adherence to stroke clinical guidelines. Thus the Delphi process was considered to inform the process of selecting SF clinical guidelines for this research.

3.2.1.1 Delphi process

The Delphi process was developed by Rand Corporation for technological forecasting in the late 1950s and was first published in 1964 (Hasson et al., 2000; McKenna, 1994). The Delphi process was originally used in the armed forces (Hasson et al., 2000; McKenna, 1994) and is now used across a broad spectrum of topics including education, health and social sciences (Hasson et al., 2000; McKenna, 1994; Rowe & Wright, 1999). The Delphi process is an effective way of gaining consensus (agreement) among individuals who have differing opinions (Hasson et al., 2000; McKenna, 1994). The Delphi process fulfils four research objectives (Hasson et al., 2000) that apply equally to this study:
1. To explore or expose underlying assumptions or information leading to differing judgement (assuming allied health clinicians want to assist in the development of a stroke audit tool);

2. To seek out information which may generate a consensus on the part of the response group (allied health clinicians can form agreement on which SF clinical guidelines to select);

3. To correlate informed judgement on a topic spanning a wide range of disciplines (SF clinical guidelines cover a wide range of topics); and

4. To educate the response group as to the diverse interrelated aspects of the topic (for allied health clinicians to increase their understanding around SF clinical guidelines).

A common procedure for conducting the Delphi process consists of a series of voting rounds by a panel of “informed individuals” seeking their opinions on a specific topic (Hsu & Sandford, 2007; McKenna, 1994). After an initial response from round one, data are summarised and provided to the group. In round two the informed individuals are asked to revisit their opinions in response to round one. This process is repeated until either agreement is reached, or once a predetermined number of rounds have been completed (Hsu & Sandford, 2007; McKenna, 1994). The following sections outline components of the Delphi process - number of voting rounds, the voting process and agreement levels.

3.2.1.2 Delphi process–number of voting rounds

Typically four voting rounds are used in a Delphi process (Hsu & Sandford, 2007), though varying numbers of voting rounds have previously been used. LaClair and colleagues (2001), for example, used two rounds of a modified Delphi process to inform their weighted audit tool (LaClair et al., 2001) with scores from the two rounds used to calculate an average score. Hammond and colleagues (2005) also used a modified Delphi process (Hammond et al., 2005) but no details of the number of rounds or how the Delphi was modified was reported. Rudd and colleagues (2001) also developed a national audit tool for assessing a change of clinical practice in stroke care (Rudd et al., 2001) but did not provided details of the number of rounds required to achieve consensus. The literature on using a Delphi process to develop a stroke audit tool provided little information on the number of voting rounds needed to reach consensus.
Although four voting rounds are commonly used in the traditional Delphi process approach, in this research program there were 71 SF clinical guidelines to consider. Additional voting rounds were anticipated to be required to narrow the focus of the stroke audit tool. Another factor that was considered was ensuring that all allied health disciplines had at least one SF clinical guideline relevant to their discipline. Therefore, a maximum of six voting rounds were planned to gain agreement between the allied health participants and have at least one guideline relevant to all participating allied health disciplines.

**3.2.1.3 Delphi process–voting**

A panel of “informed individuals” are required to vote to establish agreement (Hsu & Sandford, 2007). How a panel of informed individuals vote in each round of a Delphi process varies in the literature and there are no universal guidelines (Gerrish & Lacey, 2010 page 227-235). Typically, a Delphi process asks open-ended question(s) and allows a panel of informed individuals complete freedom in their response (Hasson et al., 2000). Initial responses are collected and provided to the panel of informed individuals: in a quantitative form which starts the second round of voting (Hasson et al., 2000).

In the development of one stroke audit tool, the Delphi process assigned points to the voting (LaClair et al., 2001). A panel of informed individuals voted by points (five minimum points, 10, or 15 maximum points) to identify stroke clinical guidelines most pertinent to stroke survivors’ outcomes (LaClair et al., 2001). Voting occurred across two rounds and the average points were assigned to each stroke clinical guideline. This voting system allowed each panel of informed individuals only three votes. This process was not considered relevant for this program of research as this might limit the inclusion of at least one SF clinical guideline per allied health discipline.

An alternative voting method used was to have a panel of informed individuals state whether they ‘agree or disagree’ with each clinical guideline (Green, Jones, Hughes, & Williams, 1999). A panel of informed general practitioners (GPs) took part in a three round Delphi process. In the first round GPs gave their responses to open-ended questions. In the subsequent two rounds GPs indicated whether they ‘agreed or disagreed’ with the statements developed from the first round (Green et al., 1999). For this research program voting by ‘agree or disagree’ was considered to
have some merit but such a process may also have resulted in too broad a selection of SF clinical guidelines being available in each voting round.

Another voting approach involves the panel being able to vote freely on available guidelines with a maximum number of votes. One example is where a panel of informed individuals used the Delphi process to identify the top areas for future research within stroke rehabilitation (Bayley, Hurdowar, Teasell, Wood-Dauphinee, Korner-RBittenksy, Richards, … & Jutai, 2007). The panel of informed individuals, consisting of researchers, clinicians, stakeholders and a stroke survivor, were given ten votes to assign to their priority research areas. The research areas scoring the highest were identified for further discussion (Bayley et al., 2007). For this investigation, it was considered that voting with a maximum of ten votes would allow diversity in the audit tool across all allied health disciplines whilst still maintaining a degree of focus on preferred allied health SF clinical guidelines.

3.2.1.4 Delphi process–agreement level

No clear indication on an appropriate agreement level was identified within the literature on the Delphi process to inform this research program. It has been established though that a numerical level of agreement should be assigned at the onset of the Delphi process (Williams & Webb, 1994).

In the Delphi process, agreement is reached by individuals’ opinions changing over the voting rounds. Typically, after the first voting round in the Delphi process there will be a wide range of individuals’ opinions. After several more rounds individuals’ opinions tend to converge towards agreement (McKenna, 1994). Setting a predetermined end point (such as six rounds) improves the chance of reaching agreement among the panel of informed individuals (Sumsion, 1998).

There are no set guidelines or consensus regarding a minimum or desired agreement level; although the desired agreement level may be defined by researchers (Beretta, 1996). Agreement level should be defined with a numerical level prior to starting a Delphi process such as 50% or 70% agreement (Williams & Webb, 1994). Different researchers have proposed different and varying levels of agreement including 51% (McKenna, 1994), 55% (Payne, Fineman, & Wall, 1976) and 70% (Hasson et al., 2000). Minimum and maximum levels of agreement previously used within the literature have informed this research program.
This research involved multiple allied health disciplines with potentially different opinions on which SF clinical guidelines should be included in a stroke audit tool. For example, early mobilisation of stroke survivors is likely to be more relevant to the physiotherapists and guidelines around communication more relevant to speech pathologists. A Delphi process can assist in establishing agreement between allied health clinicians to develop a stroke audit tool.

Participants who formed the panel of “informed individuals” in the Delphi process were local allied health clinicians who worked on either the acute or rehabilitation services of a privately funded hospital. The inclusion criteria were allied health clinicians (physiotherapists, occupational therapists, speech pathologists, dieticians and social workers). The exclusion criteria were non-allied health staff members, allied health staff who did not work on the acute or rehabilitation services, allied health assistants, the research student coordinating the Delphi process and students on placement, casual allied health staff and allied health staff on extended leave such as maternity leave.

The panel of “informed individuals” took part in six rounds of voting; two additional rounds compared to a typical Delphi process were included due to the large number of SF clinical guidelines. The panel of “informed individuals” had ten votes each in each round to assign to the SF clinical guidelines for inclusion in a stroke audit tool.

The Delphi process was modified to accommodate the large number of SF clinical guidelines; in this case there were 71 clinical guidelines to be considered. In a typical Delphi process all 71 guidelines would be available for each round until the final round (Hsu & Sandford, 2007). However, in this research SF clinical guidelines that received no vote in each voting round were not available in the subsequent voting rounds. Once a SF clinical guideline was removed, it was unavailable for further consideration, precluding panellists from the opportunity to revise their judgement. By reducing the number of SF clinical guidelines available at each voting round this modification would increase the likelihood of meeting the minimum agreement level.

Desired agreement level was set prior to the first voting round. A desirable agreement level was set at 70% with a minimum agreement level set at 50%. Additionally, at least one SF clinical
guideline related to each allied health discipline was desired to ensure relevance to all disciplines and that each allied health discipline was represented in the stroke audit tool.

3.2.1.6 Sampling procedure

The target population for Study 1 were allied health clinicians from a privately funded hospital who worked within an acute service or a rehabilitation service within the same facility. This sample was selected for three reasons: there is limited understanding of how allied health clinicians implement clinical guidelines (Thomas, Cullum, McColl, Rousseau, Soutter, & Steen. 2000); privately funded hospitals have had low participation rates in national stroke audits in Australia (SF, 2015, 2016); and the stroke audit was assessing adherence to SF clinical guidelines across both acute and rehabilitation services. Therefore, allied health clinicians were invited to participate in the modified Delphi process to select the SF clinical guidelines for inclusion in the stroke audit tool to be developed.

3.2.1.7 Data analysis

Descriptive data were collected and used to present the demographic information including years since graduation, age, gender, professional discipline, full or part-time employment status, and years of experience of allied health participants. A frequency analysis was used following each round of the modified Delphi to determine the number of votes each of the included SF clinical guidelines received from the participating allied health clinicians. Data were collected in an online survey tool Qualtrics (Smith, Smith, Smith, & Orgill, 2002); see appendix 2 for the voting form from the first round. Following each voting round, votes were downloaded from Qualtrics software into the Microsoft Office program Excel (Microsoft, 2016) where votes were aggregated into totals for each SF clinical guideline. These totals were calculated (in Excel) into a percentage to confirm the agreement level among the participants. The ten SF clinical guidelines with the highest level of agreement were presented to the participants prior to the next voting round. The totals for each SF clinical guideline were provided to the participants following each round and before the commencement of the next round.

3.2.2 Phase 2–Reliability phase

The quality of data produced by a clinical record audit is dependent on the reliability of the audit tool (the reliability should be stated) (Gilbert, Lowenstein, Koziol-McLain, Barta, & Steiner,
Calculating the reliability of the audit establishes that the audit results were consistent (Matt & Matthew, 2013). Inter-rater reliability measures the ability of two or more auditors to reproduce identical results, which can be considered as the measure of the amount of error among the auditors (Matt & Matthew, 2013). Intra-rater reliability evaluates the difference between the same set of data extracted by the one auditor on two separate occasions (Matt & Matthew, 2013). In this investigation both inter and intra-rater reliability were established.

Following the modified Delphi rounds the selected SF clinical guidelines were developed into a stroke audit tool. Each of the selected SF clinical guidelines was adapted from the generic SF clinical guideline format to a local service format (McCluskey et al., 2013) for this particular privately funded hospital. These were developed into ‘yes/no’ questions (Luker & Grimmer-Somers, 2009a) to form the stroke audit tool (appendix 3).

### 3.2.2.1 Design

Both inter and intra-rater reliability of the stroke audit tool were investigated. For inter-rater reliability, ten clinical records of stroke survivors with consecutive admissions to both services were selected and reviewed by five allied health raters to establish the level of consistency between the five raters. For intra-rater reliability, five clinical records of stroke survivors with consecutive admission to the acute service then the rehabilitation service, were selected and reviewed by the same allied health rater (the research candidate).

### 3.2.2.2 Participants

For inter-rater reliability, five senior allied health participants (one from each discipline) from phase one of Study 1 consented to participate in the inter-rater reliability study. The research candidate completed the intra-rater reliability assessment of the stroke audit tool.

### 3.2.2.3 Procedure

To select the clinical records for inclusion in both inter and intra-rater reliability study eligibility criteria needed to be met. Clinical records were eligible if stroke survivors were admitted during a 12-month period, had a clinical diagnosis of cerebrovascular accident from the clinical diagnosis codes I60.0 to I69.8 (Gompertz et al., 2001) from the International Statistical Classification of Diseases and Related Health Problems 21 (NCCC, 2013), and had consecutive
admissions to both the acute stroke and rehabilitation services. Clinical records were excluded if stroke survivors were admitted outside the timeframe or did not meet the diagnosis codes. Eligible clinical records were identified using hospital account-keeping software, Meditech. Names, medical records numbers and audit numbers were compiled into a password protected spreadsheet (more detail in the ethical considerations section of this chapter, 3.2.3).

Data for both inter and intra-rater reliability were manually extracted from the clinical records using the stroke audit tool. Raters were instructed there must be written documentation within the clinical records for the SF clinical guideline to be met. If there was no written documentation then it was deemed that the guideline was not completed (Luker & Grimmer-Somers, 2009a).

Data for the inter-rater reliability were investigated by five senior allied health participants who reviewed the same ten randomly selected clinical records using the stroke audit tool. For intra-rater reliability, the five randomly selected clinical records were reviewed nine months apart using the stroke audit tool by the research candidate.

3.2.2.4 Data analysis

There are different ways to measure reliability. Cohen’s Kappa statistic can be used to measure observed agreement between two raters comparing one SF clinical guideline at a time (Worster & Haines, 2004) giving a reliability score for every SF clinical guideline. This investigation wanted to define overall reliability for the stroke audit tool, therefore Cohen’s Kappa was not appropriate.

To determine reliability with multiple raters and multiple SF clinical guidelines it is preferable to use Intraclass Correlation Coefficient (ICC) analysis which measures the proportion of variation of the rater scores (Landis & Koch, 1977). This provides a reliability score for the performance of the stroke audit tool; the higher the score the less the variation between auditors (Ludbrook, 2010; Worster & Haines, 2004). To assess inter-rater reliability five allied health raters auditing the same ten clinical records, therefore a two-way mixed ICC analysis was required. Intra-reliability was also assessed using a two-way mixed ICC as there were multiple components of care per SF clinical guideline.
3.2.3 Ethical considerations for Study 1

Ethical clearance for this research program was obtained from Greenslopes Research and Ethics Committee (14/65) and the Australian Catholic University Human Research Ethics Committee (2001500025R) (see appendix 4). For allied health participants who met the inclusion criteria in Study 1, written informed consent to participate was obtained for Phase 1, developing the stroke audit tool (see appendix 5). The senior allied health clinicians involved in Phase 2, testing the stroke audit tool’s reliability gave additional consent (see appendix 5).

For phase 2, testing the stroke audit tool’s reliability, de-identified copies of clinical records were used. Both Human Research and Ethics Committees approved that written consent from stroke survivors were not required as this investigation was deemed low risk. However, protecting individual privacy was an important aspect; hence all files were de-identified prior to reliability testing being undertaken.

Meditech, the hospital’s account keeping software, was used to identify eligible clinical records. Stroke survivors’ names, medical record numbers and audit numbers were compiled into a password protected spreadsheet. Only the research candidate had access to the audit list which was kept in a locked office. Each stroke survivor’s clinical records were copied and de-identified.

Participants from the privately funded hospital may have been involved in the stroke survivors’ care. Therefore an additional step was included for each participant to read and sign the hospital’s privacy policy to act as a reminder to participants that they were viewing confidential information during this phase of the study.
3.3 Study 2

The following sections define a clinical record audit, describe the different types of clinical record audits, and detail the advantages and disadvantages of using a clinical record audit. The following outlines strategies to optimise the audit process. These strategies were applied to this research.

3.3.1 A retrospective clinical record audit

A retrospective clinical record audit is the most common method of data collection to assess quality of health care and has been used as early as 1928 (Wu & Ashton, 1997). Clinical record audits use pre-recorded patient medical documentation as the primary source of information to answer research questions (Matt & Matthew, 2013; Worster & Haines, 2004).

When designing a clinical record audit, the following considerations should be taken into account (Matt & Matthew, 2013):

- Create well-defined, clearly articulated research questions.
- Consider sample size.
- Understand variables affecting a clinical record.
- Train and monitor data auditors.
- Develop and use standardised data abstraction forms.
- Create a data abstraction procedure manual.
- Develop explicit inclusion and exclusion criteria.
- Address reliability.
- Conduct a pilot test.
- Address confidentiality and ethical considerations.

The main advantage of using a chart audit, as a method of data collection, is that data are already documented and only require extraction for analysis (Worster & Haines, 2004).

3.3.2 Types of clinical record audits

There are two different types of clinical record audits: explicit criteria and implicit criteria (Weingart, Davis, Palmer, Beth Hamel, Mukamel, Phillips, … & Iezzoni, 2002; Wu & Ashton,
1997). Explicit criteria clinical record audits use a formal set of standards, such as clinical guidelines, against which an auditor assesses the standard of care documented in the clinical record (Weingart et al., 2002; Wu & Ashton, 1997). For example, using explicit audit criteria an auditor would rate each item as present or not present when auditing a chart (Wu & Ashton, 1997). Implicit criteria audits utilise internalised standards that are not written down for the auditor at the time of an audit (Weingart et al., 2002; Wu & Ashton, 1997). An auditor would be asked for a global judgement on the adequacy of the performance if conducting an implicit criteria audit. It is recognised that clinical record audits conducted using explicit criteria have higher inter-rater reliability than those conducted using implicit criteria (Wu & Ashton, 1997).

### 3.3.3 Advantages of clinical record audits

There are several advantages to using clinical record audits as a method of data collection. The greatest advantage of a clinical records audit is the data is already collected (Worster & Haines, 2004) saving time during data collection phase. Therefore, the clinical data are plentiful and readily available (Worster & Haines, 2004; Wu & Ashton, 1997). Additionally, chart audits do not involve a significant cost, beyond the auditor’s cost of time (Wu & Ashton, 1997).

Clinical records are felt to be reasonably accurate (Ramsdell, 1986). Clinical record audits are considered an efficient data collection method because they can be customised to meet specific research questions and have the scope to deal with large quantities of data (Wu & Ashton, 1997). Also clinical record audits have the benefit of collecting data in either an ongoing process or completed in retrospect, allowing for versatility if required (Wu & Ashton 1997).

### 3.3.4 Disadvantages of clinical record audits

Clinical record audits are not without their disadvantages, such as being labour-intensive for extracting the data (Worster & Haines, 2004; Wu & Ashton, 1997), and there can be limitations associated with clinicians’ recording keeping (Dworkin, 1987; Winickoff, Restuccia, & Fincke, 1991). Two main limitations have been identified when using clinical record audits as a form of data collection: the quality of clinical records and limitations around the auditor extracting the data (Wu & Ashton, 1997).
3.3.4.1 Limitations of clinical records

The quality of audit data is dependent on the completeness and quality of the clinical records under review (Gilbert et al., 1996; St Clair, Oddone, Waugh, Corey, & Feussner, 1992; Wu & Ashton, 1997). Common problems with clinical records include the following:

- **Missing clinical records:** Clinical records departments need to source and find the required clinical records making them available for audits. Clinical record departments need to have a reliable tracking system so clinical records can be tracked and obtained when required.

- **Inability to locate specific information within the clinical record:** The completeness of the clinical record with appropriate documents within the clinical record may be a limitation. Incomplete clinical records may affect data extraction during the audit process. In Australia, clinicians are responsible for maintaining clear and accurate clinical records (www.ahpra.gov.au/News/2014-02-13-revised-guidelines-code-and-policy.aspx).

- **Conflicting information within the clinical record, poor detail or illegible hand writing within clinical record entries:** This impacts the accuracy of the documentation recorded by clinicians. Conflicting information may affect data extraction during the audit process.

Within a clinical record there are different types of data. “Soft” data are defined as information obtained through subjective interviews, physical examinations, observation and interpretation of findings (Dworkin, 1987; Gearing, Mian, Barber, & Ickowicz, 2006; Wu & Ashton, 1997). These are in contrast to “hard” data such as results from a hospital laboratory measuring specific levels, eg, a full blood count. “Soft” data in clinical records are considered less reliable because of the variation between clinicians obtaining the information (Gilbert et al., 1996; Wu & Ashton, 1997). This might affect data quality during a clinical record audit.

3.3.4.2 Limitations of auditors

Clinical record audits are limited by auditors’ abilities to be accurate, impartial and consistently attentive in extracting data from clinical records (Beard, Yunginger, Reed, O'Connell, & Silverstein, 1992). Auditors must make a decision on whether an event occurred or not, so data collected may be subject to auditor interpretation (Beard et al., 1992; Goldman, 1994; Matt & Matthew, 2013; Wu & Ashton, 1997). Significant attention must be paid to the reliability of those obtaining the data from clinical record audits (Matt & Matthew, 2013; Wu & Ashton, 1997).
Auditors assessing the data may be swayed in their opinions during data extraction by having knowledge of situations and events or simply being too harsh or lenient (Goldman, 1994; Wu & Ashton, 1997). Having an independent observer does not ensure accuracy but does increase the consistency at which data are collected (Wu & Ashton, 1997).

In summary a clinical record audit is a common method of data collection to assess quality in health care. Clinical record audits are efficient and cost-effective method for data collection. However the extraction of data is labour-intensive and dependent on both the completeness and quality of the clinical records and auditors ability to extract the data.

3.3.5 Application of retrospective clinical record audit

The knowledge gained from the preceding sections has informed this program of research. The follow section outlines the considerations of conducting a retrospective clinical record audit (Matt & Matthew, 2013) as listed in Section 3.3.1, the majority of which were met. Specific details about the methods used in Study 2 can be found in Chapter 5.

3.3.5.1 Research question

Having well-defined research questions was the first step in the retrospective chart audit included in this research program. The research questions and hypotheses were stated to give clear direction to and boundaries for this program of research.

3.3.5.2 Sample size

To determine the required sample size of a clinical audit generally depends on the number of available clinical records. The sample size must be considered whilst defining the research question; too specific a question may produce a lower yield of clinical records, while too broad a question may produce a high yield of clinical records (Matt & Matthew, 2013).

In this private hospital both acute and rehabilitation services have a blanket referral system to all allied health clinicians. Therefore, all stroke survivors admitted to this privately funded hospital are likely to be reviewed by all allied health disciplines. This suggests that the available sample size for data extraction from allied health clinicians’ clinical record entries would be sufficient to meet the study aims.
Sample size for this research program was also dependent on the number of stroke survivors admitted to the privately funded hospital. For this study, a potential limitation on the sample size was the requirement that stroke survivors had consecutive admissions to both acute and rehabilitation services. SF audits allow a six month timeframe and require at least 40 clinical records to be reviewed (SF, 2015, 2016). For this program of research, stroke survivors with consecutive admission to both services over a 12-month timeframe were considered to maximise the available sample size. A sample of at least 40 clinical records, similar to both national SF audits (SF, 2015, 2016) was desired. Previous studies had sample sizes ranging from 50 to 94 clinical records. Luker & Grimmer-Somers (2009a) collected data across 50 clinical records over a seven-month period, Johnston and colleagues (2013) reviewed 94 clinical records from a three-month period, and Gommons and colleagues (2005) assessed 50 clinical records from a six month period. For this research program, a sample size of a minimum of 40 clinical records was anticipated.

### Variable affecting a clinical record audit

Potential variables affecting auditing data extraction from the clinical record by the auditors onto the data extraction form need to be considered and minimised. Other literature was reviewed to understand what and how these potential variables were managed (Matt & Matthew, 2013). One potential variable identified was defining adherence; that is defining when the stroke services had been delivered in accordance with the recommendations from the SF clinical guidelines. Previous studies have defined that documentation must be clearly stated and from a specific discipline for a stroke clinical guideline to be adhered to (Luker & Grimmer-Somers, 2009a; Johnston et al., 2013). In the most recent SF rehabilitation service national audit if there was no documentation the response was assumed to be negative (i.e. not adhere) (SF 2016).

For this program of research adherence to SF clinical guidelines was recorded if there was documentation pertaining to the included SF clinical guideline from any allied health clinicians. For the acute service audit, documentation must be within the acute service admission and for the rehabilitation service the documentation must be within the rehabilitation admission. Each clinical record was audited twice, once for acute service and again for the rehabilitation service to ensure that only the relevant service was considered in the audit. If there was no documentation from any allied health clinician for a clinical guideline then no adherence was recorded.
3.3.5.4 Data extraction form

The stroke audit tool formed the data extraction form for this research and was standardised throughout the audit. Clinical records were audited against the selected SF clinical guidelines to assess adherence. The data extraction form (stroke audit tool) was prepared based on the selected clinical guidelines. The selected SF clinical guidelines were adapted to the local service (McCluskey et al., 2013) of a privately funded hospital. Adapting guidelines to the local service ensures that the guidelines are tailored to that service and including consideration of available resources such as staffing levels, staffing expertise and equipment. Once adapted, the SF clinical guidelines were then developed into ‘yes/no’ questions (Luker & Grimmer-Somers, 2009a) forming the stroke audit tool (appendix 3). This was uploaded into the Qualtrics online survey tool (Smith et al., 2002).

3.3.5.5 Inclusion and exclusion criteria

Clear inclusion and exclusion criteria for clinical records to be audited were established prior to commencement of the audit. There are a number of different types of stroke, therefore the type of strokes eligible to be included in the clinical record audit were defined by the International Statistical Classification of Diseases and Related Health Problems (NCCC, 2013). These were a clinical diagnosis of cerebrovascular accident from the clinical diagnosis codes I60.0 to I69.8:

- 160 – subarachnoid haemorrhage;
- 161 – intracerebral haemorrhage;
- 162 – other non-traumatic intracranial haemorrhage;
- 163 – cerebral infarction;
- 164 – stroke, not specified as haemorrhage or infarction;
- 165 – occlusion and stenosis of pre-cerebral arteries, not resulting in cerebral infarction;
- 166 – occlusion and stenosis of cerebral arteries not resulting in cerebral infarction;
- 167 – other cerebrovascular diseases;
- 168 – cerebrovascular disorders in diseases classified elsewhere; and
- 169 – sequelae of cerebrovascular disease.
Additionally, stroke survivors would need to have had consecutive admissions to both acute and rehabilitation services to be eligible for inclusion.

Specific exclusion criteria were also defined and included:

- Time period of admission, outside the specified 12-month period;
- Stroke survivors with non-consecutive admissions to either services; and
- All non-stroke diagnoses including any clinical diagnosis codes that were not stroke related and those with transient cerebral ischaemic attacks and related syndromes (G45), traumatic intracranial haemorrhage (S06), and vascular dementia (F01).

Following the establishment of the inclusion/exclusion criteria, clinical records were admitted into the audit for data extraction.

3.3.5.6 Address reliability

Demonstrating inter and intra-rater reliability is important to show the consistent use of the stroke audit tool (Gompertz et al., 2001) by different and the same individuals. Study 1 addresses the inter- and intra-rate reliability testing of the tool (Section 3.2.2).

3.3.5.7 Ethical considerations

Ethical clearance was obtained from the Greenslopes Research and Ethics Committee (14/65) and Australian Catholic University Human Research Ethics Committee (2001500025R) (appendix 4). Both committees approved that written consent was not required from stroke survivors’ as this was a low risk program of research. The selected stroke survivors’ clinical records were identified using Meditech, a hospital account keeping software. The list of stroke survivors’ names and hospital numbers with corresponding audit numbers were compiled on a password protected spreadsheet stored in a locked office. Only the candidate had access to the audit spreadsheet. A formal request to obtain and access selected clinical records from the clinical records department was made. To maintain security and privacy of the selected clinical records throughout the stroke audit, the audit was conducted in the clinical records department.

3.3.5.8 Other considerations

Auditor training and monitoring were not required for this research program. Additionally, conducting a pilot study or developing a procedure manual for the stroke audit tool was also not
required. Only one auditor was used, the candidate, for all data extraction. The auditor for the clinical record audit, conducted as Study 2 within this program of research, was familiar with the stroke audit tool and had been overseeing the development and testing of the stroke audit tool. Furthermore, inter and intra-rater reliability of the auditor was established.

3.3.6 Data analysis

Descriptive data of stroke survivor characteristics were collected for age, gender and length of stay within the acute service and rehabilitation services. The primary data analysis for Study 2 required that an acceptable level of adherence to the SF clinical guidelines needed to be defined. Only one study was found that defined an acceptable level of adherence as 60% (McCluskey et al., 2013). Practice was identified as having low adherence if less than 60%. Setting an upper and lower adherence level was also suggested (Duncan et al., 2002). Owing to the lack of other literature, this research program defined an acceptable adherence level of 60% or above and set an aspirational target for SF clinical guideline adherence at 80% or above.

Secondary data analysis were undertaken with a paired t-test to compare adherence to SF clinical guidelines across acute and rehabilitation services for stroke survivors. Subgroup analysis was undertaken using a one-way analysis of variance (ANOVA) for age and gender. Age was divided into three groups: younger than 75 years old, 75 to 84 years old, and 85 years old or older. These groups were established based on the finding that 81% of stroke death occurs in people aged 75 or over (AIHW, 2013).

3.4 Summary

This research aimed to gain an understanding of the level of adherence to selected SF clinical guidelines of allied health clinicians in a privately funded hospital following the development by allied health clinicians of a stroke audit tool.

The stroke audit tool was developed by engaging local clinicians across both the acute and rehabilitation services. A modified Delphi process guided the selection process to determine which SF clinical guidelines local allied health clinical staff would select for inclusion. Following the selection process the SF clinical guidelines were developed into a stroke audit tool and reliability (both inter and intra reliability) was established. A clinical record audit was conducted of stroke survivors who had consecutive admissions to both acute and rehabilitation services. The
adherence level of allied health clinicians against the SF clinical guidelines was determined by auditing the documentation. An acceptable level of adherence was defined as 60% or above with an aspirational level of adherence set at 80% or above, as an ambitious target.

The next two chapters of this thesis detail the methods and results of the two studies comprising this program of research. Chapter 4 reports results of the first study and Chapter 5 reports results of the second study.
Chapter 4. Study 1: Allied health clinicians using translational research in action to develop a stroke audit tool

This chapter describes the two phases of Study 1 of this program of research; the development of the stroke audit tool and the testing of inter and intra-rater reliability.

4.1 Introduction

In Australia, the Stroke Foundation (SF) stroke clinical guidelines, (www.strokefoundation.org.au) (SF, 2010a), recommend best practice for management of stroke survivors (SF, 2010a). Adherence is monitored biannually through national stroke audits, alternating acute (SF, 2015) and rehabilitation care (SF, 2016). Despite providing 47% of hospital care in Australia (AIHW, 2016), private hospitals have demonstrated long standing low participation in these national audits. Recently, despite written invitation, only 14% of private rehabilitation services participated (SF, 2016), with a mere 5% of private acute services participating in SF national audits (SF, 2015). Reasons for this low participation are unknown (SF, 2015, 2016) but could potentially affect the quality of stroke care within Australia. 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. This framework comprises two phases: knowledge creation, and the action cycle (Graham et al., 2006). Clinical record audits are the most common method to assess quality of health care by identifying potential knowledge gaps (Wu & Ashton, 1997) and can inform the problem identification stage of the ‘action cycle’ (Graham et al., 2006). Clinical record audits use pre-recorded patient medical documentation as the primary source of information (Matt & Matthew, 2013) and are commonly used to measure adherence to stroke clinical guidelines (Rudd et al., 2001; SF, 2015, 2016).

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 (Thomas et al., 2000). It has been suggested that actively involving clinicians in an audit process may support clinical change (Jamtvedt et al., 2006). Therefore, it is possible that involving local allied health clinicians in the selection of SF clinical guidelines to
include in a stroke audit tool may potentially enhance their engagement with implementing clinical guidelines.

Several studies have reported the development of local stroke audit tools to assess stroke services focussing on physiotherapy (Johnston et al., 2013), allied health (Luker & Grimmer-Somers, 2009a), and the multidisciplinary team (Gommans et al., 2005). Two of these studies used a similar method for audit tool development where authors identified appropriate guidelines related to physiotherapy (Johnston et al., 2013) or allied health (Luker & Grimmer-Somers, 2009a) 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 (Gommans et al., 2005) but the selection process was not outlined. Additionally, none of these studies (Gommans et al., 2005; Johnston et al., 2013; Luker & Grimmer-Somers, 2009a) investigated the reliability of the audit tools. Reliability is important to consider to determine the amount of error among auditors (Matt & Matthew, 2013), that may in turn affect the quality of the results impacting their ability to assess knowledge gap of their service (Wu & Ashton, 1997).

This research sought to develop a stroke audit tool for assessment of allied health clinicians’ adherence to SF clinical guidelines within a private hospital using the knowledge to action cycle. As the stroke audit tool was intended for use in a multidisciplinary allied health setting, the tool’s reliability was explored using multiple allied health raters (Gompertz et al., 2001).

The study tested these premises with the following questions:

1. Can allied health clinicians from a stroke service of a private hospital agree on SF clinical guidelines to inform a stroke audit tool?
2. How reliable is the stroke audit tool when implemented by allied health clinicians?

It was hypothesised:

i. That allied health clinicians would identify and agree a minimum of ten SF clinical guidelines.

ii. The stroke audit tool would be able to demonstrate reliability for both inter and intra-rater with substantial consistency (Intraclass Correlation Coefficient (ICC) >0.7).
4.2 Methods

4.2.1 Stroke audit tool development

A two-phase 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 privately funded hospital. In Phase 1, a modified Delphi process informed the development of the stroke audit tool. In Phase 2, an inter and intra-rater reliability study, tested the level of consistency.

4.2.2 Participants

For Phase 1, allied health clinicians including physiotherapists, occupational therapists, speech pathologists, dieticians and social workers from a privately funded hospital in Australia, were invited to participate in the Delphi process. This privately funded hospital comprises 334 beds and services the Gold Coast area of Queensland. Acute services include intensive care, coronary care, surgery, maternity, trauma and elective orthopaedic surgery, medical, oncology and rehabilitation. The acute stroke service is located within the main hospital as part of the medical wards, with 10 beds allocated for stroke survivors. Two rehabilitation wards are located within another building on the hospital grounds and comprise 24 beds. The allied health clinicians worked on either the acute stroke or rehabilitation services. For Phase 2, inter-rater reliability was investigated of one senior allied health member from each discipline as well as intra-rater reliability of the research candidate.

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 SF clinical guidelines (SF, 2010a) 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 (year since graduation, age, gender), professional discipline, full or part-time employment status, and years of experience 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 (see appendix 4).

4.2.3 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 (Hasson et al., 2000) and social sciences (Landeta, 2006). The Delphi process was modified in the current study due to the large number (71) of SF clinical guidelines for stroke management to be considered (SF, 2010a). Guidelines that received no votes in each voting round were removed from subsequent voting rounds. While four voting rounds are commonly used (Hsu & Sandford, 2007), 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 (Smith et al., 2002). 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 SF Clinical Guidelines for Stroke Management 2010 (SF, 2010a). Participants were provided with a copy of the SF Stroke Guidelines during each voting round.

Participants completed six voting rounds, voting for ten SF clinical guidelines at each round (SF, 2010a). Following each voting round, percentage agreement was calculated for each guideline receiving votes. The level of agreement typically achieved during a Delphi process is between 50% and 70% (Sumson, 1998; Williams & Webb, 1994). In this study, the target level of agreement was set at 70% of agreement for guideline inclusion. Additionally, inclusion of at least one stroke clinical guideline relevant to each allied health discipline to ensure relevance to all disciplines was required.

Selected SF clinical guidelines meeting the agreement levels were adapted into ‘yes/no’ questions to form the stroke audit tool (appendix 3). To investigate reliability of this stroke audit tool (phase 2) inter-rater reliability was tested. One senior allied health clinician from each of the five allied health disciplines (raters) used the stroke audit tool to audit ten randomly selected clinical
records. For intra-rater reliability the same rater (the candidate) used the stroke audit tool to audit five randomly selected clinical records with a nine months apart separation.

Clinical records 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 (NCCC, 2013) and have services delivered in consecutive admissions to both the acute stroke and rehabilitation services. Charts were excluded if stroke survivors were admitted outside the designated timeframe and had clinical diagnosis codes not specific to stroke such as transient cerebral ischaemic attacks (G45), traumatic intracranial haemorrhage (S06), and vascular dementia (F01) (NCCC, 2013). From this pool, ten charts were selected using Windows Program Excel’s random function. Raters were instructed that there must be written documentation for the SF clinical guideline to be met. If there was no written documentation it was deemed that the guideline was not completed (Luker & Grimmer-Somers, 2009a).

4.2.4 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 SF guidelines with the highest level of agreement presented.

For 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 clinical records, was calculated for both the combined service as well as for the acute stroke and rehabilitation services. To determine inter and intra-rater reliability a two-way mixed ICC established the relative consistency between and within rater(s) (Landis & Koch, 1977). Data were analysed using SPSS Statistics 24 (IBM) to calculate the ICC and estimate the 95% confidence intervals.
4.3 Results

4.3.1 Participant characteristics

Twenty-four (63%) of the allied health clinicians eligible to participate (n = 38), volunteered to be part of the modified Delphi process. Table 4.1 presents the demographic characteristics of participants (n = 22) who completed all modified Delphi rounds. 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.

Table 4.1 Characteristics of participants who completed all modified Delphi rounds.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>n = 22</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of participants who completed six voting rounds, n (%)</td>
<td>22 (92)</td>
</tr>
<tr>
<td>Discipline representation, n (%)</td>
<td></td>
</tr>
<tr>
<td>Physiotherapist</td>
<td>11 (50)</td>
</tr>
<tr>
<td>Occupational Therapist</td>
<td>6 (27)</td>
</tr>
<tr>
<td>Speech Pathologist</td>
<td>2 (9)</td>
</tr>
<tr>
<td>Social Worker</td>
<td>2 (9)</td>
</tr>
<tr>
<td>Dietician</td>
<td>1 (5)</td>
</tr>
<tr>
<td>Gender, n (%) females</td>
<td>20 (91)</td>
</tr>
<tr>
<td>Part time staff, n (%)</td>
<td>7 (32)</td>
</tr>
<tr>
<td>Years since graduation, mean (SD)</td>
<td>8.8 (5.7)</td>
</tr>
<tr>
<td>Level of appointment, n (%)</td>
<td></td>
</tr>
<tr>
<td>Base Grade</td>
<td>9 (41)</td>
</tr>
<tr>
<td>Senior Grade</td>
<td>13 (59)</td>
</tr>
</tbody>
</table>

Abbreviations: n, number; SD, standard deviation
4.3.2 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 4.2).

Table 4.2: Number of guidelines voted on, and number of guidelines reaching 70% agreement level, per voting round.

<table>
<thead>
<tr>
<th>Round</th>
<th>Round 2</th>
<th>Round 3</th>
<th>Round 4</th>
<th>Round 5</th>
<th>Round 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of participants per round, n (%)</td>
<td>24 (100)</td>
<td>24 (100)</td>
<td>24 (100)</td>
<td>23 (96)</td>
<td>22 (92)</td>
</tr>
<tr>
<td>Guidelines per voting round, n (%)</td>
<td>71 (100)</td>
<td>51 (72)</td>
<td>40 (56)</td>
<td>38 (54)</td>
<td>36 (51)</td>
</tr>
<tr>
<td>Guidelines reaching 70% agreement n (%)*</td>
<td>1 (1)</td>
<td>2 (4)</td>
<td>3 (8)</td>
<td>7 (18)</td>
<td>7 (19)</td>
</tr>
</tbody>
</table>

*Percentage calculated out of available guidelines

Abbreviations: No., number

Figure 4.1 displays results from round one of voting with only one guideline achieving 70% agreement; SF clinical guideline 6.1, (*amount, intensity and timing of rehabilitation*). Following subsequent rounds two and three (Figure 4.2), two additional guidelines (one each round) achieved 70% agreement, SF clinical guideline 6.2 (*sensorimotor impairment*) and SF clinical guideline 6.3 (*physical activity*). By the sixth and final round (figure 4.3), eight guidelines achieved 70% agreement and were included in the stroke audit tool.

After six rounds all allied health disciplines, apart from dietetics, were represented by at least one SF clinical guideline. Using the minimum agreement level of 50% two additional SF guidelines were included, SF clinical guidelines 1.3 (*discharge planning and transfer of care*) and 7.15 (*falls*). Despite these inclusions there were no SF clinical guidelines included relevant to dietetics. Therefore two further SF clinical guidelines were included in the stroke audit tool, SF guidelines 7.1 (*nutrition and hydration*), to ensure the stroke audit tool was relevant to all disciplines and SF clinical guidelines 1.7 (*goal setting*) was also included as this was a common gap identified within the literature (Duncan et al., 2002; Hubbard et al., 2012; Johnston et al., 2013).
Figure 4.1: Level of agreement for round 1 of the modified Delphi process for 10 SF Guidelines

* Stroke Foundation (SF) Guidelines: 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
Figure 4.2: Level of agreement for rounds 2 to 5 of the modified Delphi process for 10 SF Guidelines

* Stroke Foundation (SF) 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; 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
Figure 4.3: Level of agreement for round 6 of the modified Delphi process for 10 SF Guidelines

* Stroke Foundation (SF) Guidelines: 1.2 Hospital care; 1.3 Discharge planning and transfer of care; 1.4 Care after hospital discharge; 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
4.3.3 Inter and intra-rater reliability

Seventy-two people were admitted to the hospital following a stroke during the 12-month period used in this study. 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 patients had presented to only one service. Thus, 43 (60%) charts were available for inclusion in the reliability study. Ten (14%) randomly selected charts were audited by five allied health raters, one from each discipline.

Table 4.3 shows the mean (SD) percentage agreement of each rater for each guideline (and subsections) across the ten audited charts. For SF guideline 1.2 (hospital care) for example, the physiotherapist rater audited that SF clinical guideline 1.2 had been met in the acute service in all ten charts; 100% (SD 0). Whereas the occupational therapist rater audited that SF clinical guideline 1.2 was met in nine out of 10 charts (98.3%; SD 5.3). ICCs for inter-rater reliability 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 0.70 to 0.95). ICCs for intra-rater reliability for the acute stroke service was 0.81 (range 0.45 to 0.98), for the rehabilitation service 0.54 (range 0.35 to 0.95) and across the combined service 0.74 (range 0.85 to 0.97). These results demonstrated substantial consistency for both the acute and combined services. For the rehabilitation service there was moderate consistency.
Table 4.3 Mean percentage (SD) agreement for each rater for each SF Guideline, including all components of care, for the acute service, rehabilitation service and combined services.

<table>
<thead>
<tr>
<th>Stroke Foundation Guidelines</th>
<th>Services</th>
<th>Disciplines</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Physiotherapy</td>
<td>Occupational Therapy</td>
<td>Social Work</td>
<td>Speech Pathology</td>
</tr>
<tr>
<td>1.2 Hospital care</td>
<td>Acute</td>
<td>100 (0)</td>
<td>98.3 (5.3)</td>
<td>100 (0)</td>
<td>100 (0)</td>
<td>100(0)</td>
</tr>
<tr>
<td></td>
<td>Rehabilitation</td>
<td>100 (0)</td>
<td>100 (0)</td>
<td>100 (0)</td>
<td>100 (0)</td>
<td>98 (6.3)</td>
</tr>
<tr>
<td></td>
<td>Combined</td>
<td>100 (0)</td>
<td>99.2 (3.6)</td>
<td>100 (0)</td>
<td>100 (0)</td>
<td>99 (4.4)</td>
</tr>
<tr>
<td>1.3 Discharge planning and</td>
<td>Acute</td>
<td>44 (24.6)</td>
<td>40 (16.3)</td>
<td>44 (18.4)</td>
<td>34 (16.5)</td>
<td>48 (14)</td>
</tr>
<tr>
<td>transfer of care</td>
<td>Rehabilitation</td>
<td>66 (21.2)</td>
<td>68 (14)</td>
<td>64 (18.4)</td>
<td>60 (21.1)</td>
<td>66 (13.5)</td>
</tr>
<tr>
<td></td>
<td>Combined</td>
<td>55 (24.4)</td>
<td>54 (20.1)</td>
<td>54 (20.1)</td>
<td>47 (22.2)</td>
<td>57 (15.8)</td>
</tr>
<tr>
<td>1.4 Care after hospital</td>
<td>Acute</td>
<td>50 (0)</td>
<td>50 (0)</td>
<td>50 (0)</td>
<td>50 (0)</td>
<td>50 (0)</td>
</tr>
<tr>
<td></td>
<td>Rehabilitation</td>
<td>30 (25.8)</td>
<td>25 (26.4)</td>
<td>40 (21.1)</td>
<td>25 (26.4)</td>
<td>15 (24.2)</td>
</tr>
<tr>
<td></td>
<td>Combined</td>
<td>40 (20)</td>
<td>37.5 (21.7)</td>
<td>45 (15)</td>
<td>37.5(21.7)</td>
<td>32.5 (23.8)</td>
</tr>
<tr>
<td>1.7 Goal setting</td>
<td>Acute</td>
<td>30 (19.7)</td>
<td>15 (17.5)</td>
<td>37.5 (17.7)</td>
<td>20 (19.7)</td>
<td>50 (11.8)</td>
</tr>
<tr>
<td></td>
<td>Rehabilitation</td>
<td>52.5 (14.2)</td>
<td>50 (0)</td>
<td>50 (0)</td>
<td>50 (0)</td>
<td>50 (0)</td>
</tr>
<tr>
<td></td>
<td>Combined</td>
<td>41.3 (19.8)</td>
<td>32.5 (21.1)</td>
<td>43.8 (13.4)</td>
<td>35 (20)</td>
<td>50 (7.9)</td>
</tr>
<tr>
<td>6.1 Amount, intensity, timing</td>
<td>Acute</td>
<td>58.3 (18.0)</td>
<td>63.3 (13.1)</td>
<td>66.7 (11.1)</td>
<td>51.7 (14.6)</td>
<td>58.3 (11.8)</td>
</tr>
<tr>
<td>of rehabilitation</td>
<td>Rehabilitation</td>
<td>66 (16.5)</td>
<td>74 (13.5)</td>
<td>72 (23.5)</td>
<td>54 (23.2)</td>
<td>68 (25.3)</td>
</tr>
<tr>
<td></td>
<td>Combined</td>
<td>62.2 (16.8)</td>
<td>68.7 (13.7)</td>
<td>69.3 (17.6)</td>
<td>52.8 (18.4)</td>
<td>63.2 (19.3)</td>
</tr>
<tr>
<td>Stroke Foundation Guidelines</td>
<td>Services</td>
<td>Disciplines</td>
<td></td>
<td></td>
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<tr>
<td>-----------------------------</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>Physiotherapy</td>
<td>Occupational Therapy</td>
<td>Social Work</td>
<td>Speech Pathology</td>
<td>Dietetics</td>
</tr>
<tr>
<td>6.2 Sensorimotor impairment</td>
<td>Acute</td>
<td>58.3 (11.1)</td>
<td>55 (9)</td>
<td>52.5 (4)</td>
<td>47.5 (11.8)</td>
<td>51.7 (15.1)</td>
</tr>
<tr>
<td></td>
<td>Rehabilitation</td>
<td>49.2 (10.7)</td>
<td>45.8 (9)</td>
<td>47.5 (14.7)</td>
<td>39.2 (17.6)</td>
<td>43.3 (22.2)</td>
</tr>
<tr>
<td></td>
<td>Combined</td>
<td>53.8 (11.3)</td>
<td>50.4 (9.7)</td>
<td>50 (10.5)</td>
<td>43.3 (14.8)</td>
<td>47.5 (18.5)</td>
</tr>
<tr>
<td></td>
<td>Acute</td>
<td>62.5 (13.2)</td>
<td>66.3 (8.4)</td>
<td>62.5 (8.3)</td>
<td>53.8 (10.3)</td>
<td>57.5 (6.5)</td>
</tr>
<tr>
<td>6.3 Physical activity</td>
<td>Rehabilitation</td>
<td>52.5 (21.1)</td>
<td>73.8 (7.1)</td>
<td>65 (9.9)</td>
<td>37.5 (15.6)</td>
<td>70 (14.7)</td>
</tr>
<tr>
<td></td>
<td>Combined</td>
<td>57.5 (17.4)</td>
<td>70.8 (3.8)</td>
<td>63.8 (8.8)</td>
<td>45.6 (14.9)</td>
<td>63.8 (12.4)</td>
</tr>
<tr>
<td></td>
<td>Acute</td>
<td>43.8 (16.9)</td>
<td>28.8 (8.4)</td>
<td>46.3 (11.9)</td>
<td>30 (6.5)</td>
<td>38.8 (9.2)</td>
</tr>
<tr>
<td>6.4 Activities of daily living</td>
<td>Rehabilitation</td>
<td>51.7 (16.6)</td>
<td>30 (7)</td>
<td>51.7 (5.3)</td>
<td>25 (11.8)</td>
<td>35 (16.6)</td>
</tr>
<tr>
<td></td>
<td>Combined</td>
<td>47.7 (16.4)</td>
<td>29.4 (7.4)</td>
<td>49 (9.1)</td>
<td>27.5 (9.4)</td>
<td>36.9 (12.9)</td>
</tr>
<tr>
<td></td>
<td>Acute</td>
<td>31.1 (21.5)</td>
<td>32.2 (19.9)</td>
<td>44.4 (18.1)</td>
<td>26.7 (19)</td>
<td>42.2 (18)</td>
</tr>
<tr>
<td>6.5 Communication</td>
<td>Rehabilitation</td>
<td>42.2 (27.6)</td>
<td>34.4 (16.1)</td>
<td>44.4 (24.6)</td>
<td>31.1 (18)</td>
<td>38.9 (20.5)</td>
</tr>
<tr>
<td></td>
<td>Combined</td>
<td>36.7 (24.1)</td>
<td>33.3 (17.2)</td>
<td>44.4 (20.5)</td>
<td>28.9 (17.7)</td>
<td>40.6 (18.4)</td>
</tr>
<tr>
<td></td>
<td>Acute</td>
<td>19 (16)</td>
<td>23 (14.9)</td>
<td>16 (13.5)</td>
<td>29 (12.9)</td>
<td>30 (15.6)</td>
</tr>
<tr>
<td>6.6 Cognition</td>
<td>Rehabilitation</td>
<td>18 (14.8)</td>
<td>12 (4.2)</td>
<td>19 (11)</td>
<td>29 (14.5)</td>
<td>39 (12.9)</td>
</tr>
<tr>
<td></td>
<td>Combined</td>
<td>18.5 (14.6)</td>
<td>17.5 (11.8)</td>
<td>17.5 (11.8)</td>
<td>29 (13)</td>
<td>34.5 (14.3)</td>
</tr>
<tr>
<td></td>
<td>Acute</td>
<td>51.4 (23.5)</td>
<td>51.4 (12)</td>
<td>67.1 (17.9)</td>
<td>50 (21.1)</td>
<td>54.3 (18.8)</td>
</tr>
<tr>
<td>7.1 Nutrition and hydrations</td>
<td>Rehabilitation</td>
<td>21.4 (36.4)</td>
<td>21.4 (26.3)</td>
<td>38.6 (30.9)</td>
<td>8.6 (19.3)</td>
<td>15.7 (33.3)</td>
</tr>
<tr>
<td></td>
<td>Acute</td>
<td>80 (42.2)</td>
<td>90 (31.6)</td>
<td>80 (42.2)</td>
<td>100 (0)</td>
<td>100 (0)</td>
</tr>
<tr>
<td>7.15 Falls</td>
<td>Rehab</td>
<td>100 (0)</td>
<td>100 (0)</td>
<td>100 (0)</td>
<td>100 (0)</td>
<td>100 (0)</td>
</tr>
<tr>
<td></td>
<td>Combined</td>
<td>90 (30)</td>
<td>95 (21.8)</td>
<td>90 (30)</td>
<td>100 (0)</td>
<td>100 (0)</td>
</tr>
</tbody>
</table>
Table 4.4 Inter- and intra-rater reliability for acute, rehabilitation and combined services.

<table>
<thead>
<tr>
<th></th>
<th>Inter– rater reliability</th>
<th>Intra – rater reliability</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ICC (range)</td>
<td>ICC (range)</td>
</tr>
<tr>
<td>Acute service</td>
<td>0.78 (0.60 to 0.93)</td>
<td>0.81 (0.44 to 0.98)</td>
</tr>
<tr>
<td>Rehab service</td>
<td>0.84 (0.70 to 0.95)</td>
<td>0.54 (0.35 to 0.95)</td>
</tr>
<tr>
<td>Combined services</td>
<td>0.71 (0.48 to 0.90)</td>
<td>0.74 (0.85 to 0.97)</td>
</tr>
</tbody>
</table>

ICC, Intraclass correlation coefficient

4.4 Discussion

This study demonstrated that allied health clinicians could effectively participate in a modified Delphi process and agree on SF clinical guidelines to be included in an allied health stroke audit tool. The tool was applied with substantial consistency across acute stroke, rehabilitation and combined services with good inter-rater reliability demonstrated. These results are similar to another study of inter-rater reliability using a stroke practice audit tool developed by an expert panel (LaClair et al., 2001). Good to moderate intra-rater reliability of the audit tool was also demonstrated when applied across acute, rehabilitation and combined services areas. Determining audit criteria by local allied health clinicians selecting SF clinical guidelines developed a reliable stroke audit tool to assess a stroke service. These findings did not fully support the hypothesis that the allied health team could identify and meet 70% agreement for 10 SF 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 and 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 (Sumsion, 1998; Williams & Webb, 1994).

A collaborative approach between clinicians and researchers working together to identify services gaps facilitates application of the knowledge translation model (Oborn et al., 2013). Knowledge of service gaps related to current practice enables service enhancements (Bosch et al., 2013). Involving local treating clinicians appears to be beneficial as previous studies (Donnellan et al., 2013a; McCluskey et al., 2013) 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 (Scott et al., 2012) and therefore, behavioural change needs to occur at multiple levels (operationally and behaviourally) as an individual discipline cannot do it alone (Scott et al., 2012). This privately funded hospital could plan to use the 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 (Scott et al., 2012). Inter-professional collaboration is important in the delivery of effective health care (Scott et al., 2012), with stroke care and management no exception. Hill and colleagues (Hill et al., 2009) identified that while specific disciplines had primary responsibility for implementing key SF clinical guidelines, the multi-disciplinary team was responsible for implementing more SF clinical guidelines compared to individual disciplines. Thus, our use of multiple allied health disciplines to inform the audit tool was sound. Despite the importance of including multiple disciplines, we found that by round six, five SF clinical guidelines selected were more relevant to physiotherapy and occupational therapy. This was likely due to 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 researcher 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, additional guidelines for SF clinical guideline 7.1 (nutrition and hydration) and for SF clinical guideline 1.7 (goal setting) were included in the stroke audit tool.

Privately funded hospitals in Australia have consistently demonstrated a lack of engagement with the SF acute and rehabilitation audits (SF, 2015, 2016). Additional strategies to increase this engagement require consideration by both the SF 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 UK (Hammond et al., 2005). Following the UK national audit in 2001, the Royal College of
Physicians, in partnership with the College of Occupational Therapy and Chartered Society of Physiotherapy, published profession-specific audit packages (Hammond et al., 2005) for clinicians to benchmark their own practice and help raise the standard of therapy for stroke patients for their specific field (Hammond et al., 2005). If the SF 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.

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 retrieved retrospectively from within clinical record documentation. It is also possible that guidelines may have been implemented but not clearly documented within the chart (Luker & Grimmer-Somers, 2009a). 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. It is not clear why 14 (37%) allied health clinicians did not volunteer for participation in this study. It is possible that some reasons may include they may not have been overly interested in stroke care, were too busy or were away during the recruitment period. A further limitation of a single site study may impact the replicability of this study.

This 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 SF clinical guidelines by identifying areas for improvement. By having greater engagement of local clinicians, it is likely the results would have value (Jamtvedt, Young, Kristoffersen, O’Brien, & Oxman, 2007) which could assist clinicians to overcome barriers and ultimately increase the chance of changing clinical practice (Jamtvedt et al., 2007; Scott et al., 2012).
4.5 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.
Chapter 5. Study 2: Allied health clinicians’ adherence to national stroke guidelines: implications of a local audit within a privately funded hospital

This chapter describes Study 2 of this program of research. The stroke audit tool developed from Study 1 was used to complete a 12-month audit on stroke survivors with consecutive admission to both acute and rehabilitation services.

5.1 Introduction

In 2010, in Australia, there were over 420,000 people living with a stroke with many living with a disability which affects their ability to carry out activities of daily living (Deloitte, 2013). Australian stroke survivors are cared for by either publicly or privately funded hospitals (AIHW, 2016) with both types of services accountable for the care provided.

The Stroke Foundation (SF) has developed clinical guidelines (www.strokefoundation.org.au) to guide the management of stroke care for both publicly and privately funded hospitals (SF, 2010a). Clinical guidelines have been defined as,

“...statements that include recommendations intended to optimise patient care that are informed by a systematic review of evidence and an assessment of the benefits and harms of alternative care options” (Graham, Mancher, Wolman, Greenfield, & Steinberg, 2011 page 4).

The adoption of recommendations from stroke clinical guidelines into practice by clinicians has been shown to reduce mortality and morbidity of stroke survivors (Rudd et al., 2001).

SF clinical guidelines cover all aspects of health across the continuum of care (SF, 2010a). The SF complete two biannual national audits in Australia; one focusing on acute care (SF, 2015) and the other on rehabilitation service (SF, 2016). While the majority of publicly funded hospitals participate in these audits, the participation rate of privately funded hospitals has been low, 14% for rehabilitation services (SF, 2016) and 5% for acute (SF, 2015). This is in contrast to the growth of privately funded hospitals in Australia; there has been an increase of almost three percent over the last five years with these hospitals currently making up approximately 47% of all hospitals in Australia (AIHW, 2016). The ongoing low participation rate of the private sector in
SF audits (SF, 2010b, 2013, 2014, 2015, 2016), suggests that different strategies are needed to identify knowledge gaps for stroke services within this sector.

In Australia hospital care following stroke is commonly delivered by separate acute and rehabilitation services (AIHW, 2016). The majority of all stroke hospitalisations are managed by the publicly funded hospitals (89%) (AIHW, 2013). However, for those stroke survivors requiring ongoing treatment, 48% are transferred to privately funded hospitals (AIHW, 2013). Little is known about how stroke survivors are managed in privately funded hospitals and not enough is understood about how allied health clinicians implement clinical guidelines. A systematic review identified only one study investigating how allied health clinicians implement clinical guidelines (Thomas et al, 2000). Further understanding of how allied health clinicians apply clinical guidelines within privately funded hospitals is needed.

Audit outcomes reporting adherence to stroke clinical guidelines have invariably been undertaken in either acute (Hammond et al., 2005; Hill, 2008; Luker & Grimmer-Somers, 2009a; Luker & Grimmer-Somers, 2009b) or rehabilitation service (Duncan et al., 2002; Grube et al., 2012; Hubbard et al., 2012; Johnston et al., 2000). It is rare for stroke survivors to be audited across both services to gauge adherence to optimal care throughout the entire care journey. One study was found (Johnston et al., 2013) that reported an audit of stroke care across both acute and rehabilitation services, but only physiotherapy alignment with the guidelines was reviewed. An audit of the adherence of all allied health clinicians could help to inform any required practice changes. Another study did assess allied health adherence to SF clinical guidelines but only within the acute services of publicly funded hospital (Luker & Grimmer-Somers, 2009a). Stroke survivor recovery can be attributed to the combined care provided by all allied health clinicians of both acute and rehabilitation services (SF, 2010a).

Audits that are used to inform changes to clinical practice have rarely involved clinicians, who have specific responsibilities in the application of stroke guidelines in practice (Jamtvedt et al., 2007), to inform their audit criteria. If audit findings are to drive and optimise clinical practice change then clinicians need to participate in the selection of guidelines (Jamtvedt et al., 2007). Three studies have developed stroke audit tools for use at a local service level (Gommans et al., 2005; Johnston et al., 2013; Luker & Grimmer-Somers, 2009a) with only one audit tool developed with input from the treating team (Gommans et al., 2005).
A stroke audit tool was developed by allied health clinicians within a privately funded hospital to identify priority gaps in allied health stroke care delivery across separate acute and rehabilitation services (see Chapter 4). Allied health clinicians (physiotherapists, occupational therapists, social workers, speech pathologists and dietitians) who worked on either the acute stroke service or rehabilitation service used a modified Delphi process to select 12 (out of 71) SF clinical guidelines, considered important for inclusion in a stroke audit tool. Selected SF clinical guidelines were locally adapted and developed into ‘yes/no’ questions to form the stroke audit tool (appendix 3). The stroke audit tool demonstrated substantial inter-rater relative consistency when applied by five different allied health disciplines. Additionally, the tool demonstrated substantial to moderate consistency when applied by the research candidate (see Chapter 4).

This study applied the stroke audit tool to determine adherence of allied health clinicians to the selected SF clinical guidelines. Adherence was defined as services providing care in accordance with SF clinical guidelines (Hubbard et al., 2012). Optimal adherence rates have not been identified in the literature although one study has been sourced that indicated 60% adherence to a guideline was an acceptable outcome (McCluskey & Middleton, 2010). Thus, this level of agreement was set as the minimum level of adherence for this study.

The aim of this study was to test the utility of an audit tool developed by allied health clinicians for use within the acute stroke and rehabilitation services in a private hospital by:

1. Determining the adherence (%) level of allied health clinicians to SF clinical guidelines within and across the acute and rehabilitation services.
2. Identifying if the adherence of allied health clinicians to SF clinical guidelines differed between acute and rehabilitation services, and if age, gender or length of stay (above or below the service mean stay) influenced adherence to the SF clinical guidelines.

The hypotheses were that:

i. Allied health clinicians would meet the minimum adherence level of 60% across the majority of the selected SF clinical guidelines. Additionally, allied health clinician adherence would reach an aspirational level of 80% on some of the selected SF clinical guidelines.
ii. There would be no significant difference in adherence to SF clinical guidelines across acute and rehabilitation services, or when age, gender or length of stay were considered.

5.2 Methods

5.2.1 Design

Clinical records from eligible stroke survivors who had consecutive admissions to both the acute and rehabilitation services across a defined 12-month audit period were retrieved. Data were manually extracted from clinical records using the stroke audit tool, then analysed for adherence to SF Clinical guidelines.

5.2.2 Participants

Stroke survivors’ clinical records were eligible for inclusion if they had a clinical diagnosis of cerebrovascular accident from the clinical diagnosis codes I60.0 to I69.8 from the International Statistical Classification of Diseases and Related Health Problems (NCCC, 2013) and had services delivered in consecutive admissions to both the acute stroke and rehabilitation services. Clinical records were excluded if stroke survivors were admitted outside the designated timeframe and had clinical diagnostic codes that were not formally associated with a stroke such as transient cerebral ischaemic attacks and related syndromes (G45), traumatic intracranial haemorrhage (S06) and vascular dementia (F01). Clinical records of stroke survivors that met these inclusion criteria were identified and included in the audit. The study had ethical approval from relevant institutional Human Research Ethics Committees (appendix 4).

5.2.3 Procedures

SF clinical guidelines were selected by allied health clinicians and developed into a stroke audit tool. Audit data were extracted manually from clinical records and recorded in Qualtrics (Smith et al., 2002), an online survey tool. Included clinical records were coded with an audit number for confidentiality, and stored on a password protected spreadsheet accessible only to the research candidate.

Each clinical record was examined by the research candidate to determine adherence (Luker & Grimmer-Somers, 2009a) with the SF clinical guidelines included in the stroke audit tool (appendix 3). Admissions to both services were concurrent, however each service was audited separately. To be classified as met by acute service and rehabilitation service, relevant
information pertaining to each guideline or guideline subsection needed to be clearly documented within the clinical record by any allied health clinician (Luker & Grimmer-Somers, 2009a; Luker & Grimmer-Somers, 2009b; Salter et al., 2012). Guidelines could be met by one or all of allied health disciplines. Clinical records were audited first in relation to the acute stroke service and then for the rehabilitation service.

5.2.4 Data analysis

Descriptive analyses of the stroke survivors’ characteristics for those admitted to the audit were conducted (age, gender, and acute and rehabilitation length of stay). Windows Excel program was used to calculate adherence for each guideline, as a percentage for acute, rehabilitation and combined services by totalling the sub-sections of each guideline for acute and rehabilitation services separately as well as the overall percentage adherence. Guideline adherence was considered low if adherence was less than 60% (McCluskey et al., 2013) and acceptable if 60% or above. An aspirational target for guidelines adherence was set at 80%.

Paired t-test analysis was undertaken to compare differences in guideline adherence between acute and rehabilitation services. Subgroup analysis was undertaken using a one-way analysis of variance (ANOVA) for age and gender and independent t-test for length of stay regarding guideline adherence. Age was grouped into three groups; less than 74 years old, 75 to 84 years old, and 85 years old and older. These groups were established based on the finding that 81% of stroke deaths occur in people aged 75 or over (AIHW, 2013). Length of stay was divided into two groups defined by the average length of stay from the combined services. Analyses were calculated using SPSS statistics version 24 (IBM), with statistical significance set at $p < 0.05$ for comparison.

5.3 Results

5.3.1 Participant characteristics

Seventy-two people were admitted to a privately funded hospital following a stroke over a 12-month period. Clinical diagnosis codes identified fifty-five clinical records (76%) meeting the inclusion criteria of consecutive admission to both acute and rehabilitation services. Twelve clinical records revealed that patients had presented to only one service and were discarded. Forty-three clinical records (60%) were available for the audit.
Table 5.1 shows the audited stroke survivor characteristics. Eighty-one percent were over 75 years of age and 63% were female. Stroke survivors stayed over twice as long in the rehabilitation service as in the acute service (mean difference nine days 95% confidence interval 7 to 12).

Table 5.1 Characteristics of stroke survivors included in audit.

<table>
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<th>Acute/Rehabilitation services</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age group, n (%)</td>
<td></td>
</tr>
<tr>
<td>&lt;65–74 years</td>
<td>8 (18)</td>
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<tr>
<td>75–84 years</td>
<td>14 (33)</td>
</tr>
<tr>
<td>&gt;85 years</td>
<td>21 (49)</td>
</tr>
<tr>
<td>Age, Mean SD years (range)</td>
<td>82±8.0 (63–95)</td>
</tr>
<tr>
<td>Gender, n (%)</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>16 (37)</td>
</tr>
<tr>
<td>Female</td>
<td>27 (63)</td>
</tr>
<tr>
<td>Length of stay, Mean (SD) days</td>
<td></td>
</tr>
<tr>
<td>Combined service</td>
<td>32.1 (13.0)</td>
</tr>
<tr>
<td>Acute stroke service (SD)</td>
<td>9.7 (6.1)</td>
</tr>
<tr>
<td>Rehab Service (SD)</td>
<td>22.5 (10.6)</td>
</tr>
</tbody>
</table>

Abbreviations: n, number; % percentage; <, less than; >greater than; SD standard diversion; rehab, rehabilitation

5.3.2 Main findings

5.3.2.1 Adherence of allied health clinicians

Allied health clinician adherence to individual components of care for each SF clinical guideline included in the audit tool is presented in Table 5.2. Nine SF clinical guidelines (out of 12) met the accepted 60% adherence rate across the combined services including three SF clinical guidelines, (1.2, 6.3 and 7.15) that were above 80% adherence rate (Table 5.3). Sixty percent adherence rate was met for seven SF clinical guidelines for acute service and nine SF clinical guidelines for rehabilitation services.
Table 5.2 Number (%) of audited charts demonstrating adherence with each SF clinical guideline for acute and rehabilitation stroke services.

<table>
<thead>
<tr>
<th>Summary of SF clinical guidelines, components of care (n)</th>
<th>Acute service n = 43 (%)</th>
<th>Rehab service n = 43 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1.2 Hospital Care n = 6</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Admitted direct to a stroke unit with a multidisciplinary team</td>
<td>41 (95)</td>
<td>43 (100)</td>
</tr>
<tr>
<td>A dedicated stroke team was in place</td>
<td>40 (93)</td>
<td>43 (100)</td>
</tr>
<tr>
<td>Transferred to rehabilitation with staff with stroke specific expertise</td>
<td>42 (98)</td>
<td>43 (100)</td>
</tr>
<tr>
<td>Patients were assessed by a specialist rehabilitation team for rehabilitation transfer</td>
<td>42 (98)</td>
<td>43 (100)</td>
</tr>
<tr>
<td>A stroke care co-ordinator was involved</td>
<td>37 (87)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>An acute stroke pathway was used</td>
<td>37 (87)</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>1.3 Discharge planning and transfer of care n = 5</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A home or access visit was completed</td>
<td>13 (30)</td>
<td>36 (84)</td>
</tr>
<tr>
<td>Safe discharge with follow up outpatient appointments made and discharge plan/summary</td>
<td>42 (98)</td>
<td>43 (100)</td>
</tr>
<tr>
<td>Discharge was co-ordinated by discharge planner or social worker</td>
<td>29 (67)</td>
<td>43 (100)</td>
</tr>
<tr>
<td>A discharge plan check list was used</td>
<td>24 (56)</td>
<td>42 (98)</td>
</tr>
<tr>
<td>The family received training from the multidisciplinary team</td>
<td>12 (28)</td>
<td>22 (51)</td>
</tr>
<tr>
<td><strong>1.4 Care after hospital discharge n = 2</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Follow up referral was made</td>
<td>42 (98)</td>
<td>43 (100)</td>
</tr>
<tr>
<td>Follow up with consultant or stroke team was organised</td>
<td>8 (19)</td>
<td>0 (100)</td>
</tr>
<tr>
<td><strong>1.7 Goal setting n = 4</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The patient family’s wishes and expectations were acknowledged</td>
<td>32 (74)</td>
<td>42 (98)</td>
</tr>
<tr>
<td>The patient and family were involved in goal setting</td>
<td>0 (0)</td>
<td>1 (2)</td>
</tr>
<tr>
<td>The goals were recorded, reviewed and updated regularly</td>
<td>25 (58)</td>
<td>43 (100)</td>
</tr>
<tr>
<td>The patient was offered self-management training</td>
<td>0 (0)</td>
<td>0 (0)</td>
</tr>
<tr>
<td><strong>6.1 Amount, intensity and timing of rehabilitation n = 6</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The patient had a minimum of one hour of therapy 5 days a week</td>
<td>39 (91)</td>
<td>42 (98)</td>
</tr>
<tr>
<td>Task specific group therapy or video self-modelling occurred</td>
<td>6 (14)</td>
<td>28 (65)</td>
</tr>
<tr>
<td>Family/friends received training to continue practising therapy</td>
<td>8 (19)</td>
<td>12 (28)</td>
</tr>
<tr>
<td>The patient sat out of bed or walked within the first 24 hours</td>
<td>42 (98)</td>
<td>N/A</td>
</tr>
<tr>
<td>Speech pathologists started aphasia treatment</td>
<td>39 (91)</td>
<td>42 (98)</td>
</tr>
<tr>
<td>Upper limb treatment was started in the first 2 weeks</td>
<td>39 (91)</td>
<td>42 (98)</td>
</tr>
<tr>
<td><strong>6.2 Sensorimotor n = 12</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A validated tool was used to screen for swallowing deficits</td>
<td>39 (91)</td>
<td>40 (93)</td>
</tr>
<tr>
<td>Screening for swallow deficits occurred within 24 hours of admission</td>
<td>39 (91)</td>
<td>40 (93)</td>
</tr>
<tr>
<td>The gag reflex was NOT used as a valid screen tool</td>
<td>40 (93)</td>
<td>40 (93)</td>
</tr>
<tr>
<td>A speech pathologist assessed patients with poor swallow</td>
<td>39 (91)</td>
<td>40 (93)</td>
</tr>
<tr>
<td>The patient with swallowing problems used strategies to manage</td>
<td>38 (88)</td>
<td>40 (93)</td>
</tr>
<tr>
<td>Swallowing interventions (shaker, electrical stimulation, thermo-tactile stimulation) were used to resolve difficulties</td>
<td>30 (88)</td>
<td>35 (81)</td>
</tr>
<tr>
<td>The patient’s oral intake and weight were monitored</td>
<td>41 (95)</td>
<td>43 (100)</td>
</tr>
</tbody>
</table>
### Summary of SF clinical guidelines, components of care (n)

<table>
<thead>
<tr>
<th>Description</th>
<th>Acute service n = 43 (%)</th>
<th>Rehab service n = 43 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient treatments for reduced strength included progressive resistance exercises, electrical stimulation or electro-myographic biofeedback</td>
<td>42 (98)</td>
<td>43 (100)</td>
</tr>
<tr>
<td>The patient with sensory loss received specific training</td>
<td>35 (81)</td>
<td>39 (91)</td>
</tr>
<tr>
<td>The patient with visual loss was screened with a specific assessment</td>
<td>17 (40)</td>
<td>25 (58)</td>
</tr>
<tr>
<td>Prism glasses were used to manage homonymous hemianopia</td>
<td>0 (0)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Computer-based visual training was used for visual function</td>
<td>0 (0)</td>
<td>0 (0)</td>
</tr>
</tbody>
</table>

#### 6.3 Physical activity n = 8

<table>
<thead>
<tr>
<th>Description</th>
<th>Acute service n = 43 (%)</th>
<th>Rehab service n = 43 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>The patient practised sitting balance</td>
<td>42 (98)</td>
<td>43 (100)</td>
</tr>
<tr>
<td>The patient practised standing balance or sit to standing</td>
<td>42 (98)</td>
<td>43 (100)</td>
</tr>
<tr>
<td>The patient received feedback during task specific standing practice</td>
<td>42 (98)</td>
<td>43 (100)</td>
</tr>
<tr>
<td>The patient practised walking or components of walking</td>
<td>41 (95)</td>
<td>42 (98)</td>
</tr>
<tr>
<td>During walking practice, strategies such as cueing (cadence), treadmill training, joint position biofeedback, or virtual reality training were used</td>
<td>39 (91)</td>
<td>42 (98)</td>
</tr>
<tr>
<td>Patients with persistent foot drop used an ankle-foot orthosis (n= 4)</td>
<td>0 (0)</td>
<td>4 (100)</td>
</tr>
<tr>
<td>Strengthening exercises were used for the upper limb (constraint induced movement therapy, repetitive task-specific and/or mechanical assisted training)</td>
<td>39 (91)</td>
<td>41 (95)</td>
</tr>
<tr>
<td>Upper limb treatment included: mental practice, electromyography biofeedback, electrical stimulation, mirror therapy or bilateral training</td>
<td>27 (63)</td>
<td>33 (78)</td>
</tr>
</tbody>
</table>

#### 6.4 Activities of daily living n = 6

<table>
<thead>
<tr>
<th>Description</th>
<th>Acute service n = 43 (%)</th>
<th>Rehab service n = 43 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>An occupational therapist assessed activities of daily living with the patient</td>
<td>35 (81)</td>
<td>43 (100)</td>
</tr>
<tr>
<td>The patient practised dressing or prepared breakfast</td>
<td>16 (37)</td>
<td>36 (84)</td>
</tr>
<tr>
<td>The family and/or staff were trained in appropriate techniques and equipment to maximise performance of activities of daily living</td>
<td>25 (58)</td>
<td>36 (84)</td>
</tr>
<tr>
<td>The patient received training regarding outdoor journeys including crossing roads, visiting local shops, bus or help to resume driving</td>
<td>3 (7)</td>
<td>8 (19)</td>
</tr>
<tr>
<td>The patient was not given amphetamines to improve activities of daily living</td>
<td>43 (100)</td>
<td>43 (100)</td>
</tr>
<tr>
<td>The patient was not given acupuncture or traditional herbal medicines</td>
<td>43 (100)</td>
<td>43 (100)</td>
</tr>
</tbody>
</table>

#### 6.5 Communication n = 9

<table>
<thead>
<tr>
<th>Description</th>
<th>Acute service n = 43 (%)</th>
<th>Rehab service n = 43 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients with communication problems were screened – tool defined</td>
<td>39 (91)</td>
<td>40 (93)</td>
</tr>
<tr>
<td>Patients with communication problems were formally assessed by speech pathologist</td>
<td>39 (91)</td>
<td>40 (93)</td>
</tr>
<tr>
<td>Strategies for enhancing communication were discussed with patient, family and treating team</td>
<td>35 (81)</td>
<td>36 (84)</td>
</tr>
<tr>
<td>Alternative means of communication were used to aid communication</td>
<td>34 (79)</td>
<td>38 (88)</td>
</tr>
<tr>
<td>Interventions were tailored to the patient's deficits</td>
<td>39 (91)</td>
<td>40 (93)</td>
</tr>
<tr>
<td>Group therapy and conversation groups were used</td>
<td>0 (100)</td>
<td>0 (100)</td>
</tr>
<tr>
<td>Training was provided to the family/friends including barriers addressed and raising awareness</td>
<td>7 (16)</td>
<td>5 (12)</td>
</tr>
<tr>
<td>Treatments for dysarthria were used: biofeedback or a voice amplifier, intensive therapy to increase loudness, strategies to decrease rate, over articulation or gesture and oral musculature exercises</td>
<td>27 (63)</td>
<td>34 (79)</td>
</tr>
</tbody>
</table>
**Summary of SF clinical guidelines**, components of care (n)

<table>
<thead>
<tr>
<th>Patients with cognitive impairment had a comprehensive assessment</th>
<th>Acute service n = 43 (%)</th>
<th>Rehab service n = 43 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3 (7)</td>
<td>12 (28)</td>
</tr>
</tbody>
</table>

### 6.6 Cognition n = 10

Patients were screened for cognition/perceptual deficits using formal screening tools:

<table>
<thead>
<tr>
<th></th>
<th>Acute service n = 43 (%)</th>
<th>Rehab service n = 43 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>The patient with cognitive deficits was referred to neuropsychological</td>
<td>0 (100)</td>
<td>0 (100)</td>
</tr>
<tr>
<td>The patient received cognitive rehabilitation</td>
<td>14 (33)</td>
<td>25 (58)</td>
</tr>
<tr>
<td>The patient had a comprehensive assessment of their memory abilities, with compensatory techniques (notebooks, diaries, audiotapes) used</td>
<td>13 (30)</td>
<td>21 (49)</td>
</tr>
<tr>
<td>The patient received formal assessment of executive function; external cues were used to aid the patient</td>
<td>6 (14)</td>
<td>13 (30)</td>
</tr>
<tr>
<td>The patient was screened for limb apraxia</td>
<td>36 (84)</td>
<td>43 (100)</td>
</tr>
<tr>
<td>The patient was treated for limb apraxia (n=17)</td>
<td>14 (83)</td>
<td>16 (94)</td>
</tr>
<tr>
<td>The patient was assessed for agnosia</td>
<td>34 (79)</td>
<td>39 (91)</td>
</tr>
<tr>
<td>The patient with neglect had a formal assessment</td>
<td>14 (33)</td>
<td>19 (44)</td>
</tr>
<tr>
<td>Patients with neglect were treated using simple cues, visual scanning, prism adaptation, eye patching, mental imagery, structured feedback</td>
<td>13 (30)</td>
<td>14 (33)</td>
</tr>
</tbody>
</table>

### 7.1 Nutrition and hydration n = 7

The patient’s hydration status was assessed, monitored and managed:

<table>
<thead>
<tr>
<th></th>
<th>Acute service n = 43 (%)</th>
<th>Rehab service n = 43 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>The patient was screened for malnutrition</td>
<td>36 (84)</td>
<td>15 (65)</td>
</tr>
<tr>
<td>The patient was referred to the dietitian</td>
<td>36 (84)</td>
<td>13 (30)</td>
</tr>
<tr>
<td>The patient's nutritional status was formally assessed</td>
<td>36 (84)</td>
<td>12 (28)</td>
</tr>
<tr>
<td>The patient with poor nutrition was offered nutritional supplementation</td>
<td>36 (84)</td>
<td>16 (37)</td>
</tr>
<tr>
<td>Patients unable to swallow were fed by nasogastric tube (n=7)</td>
<td>6 (85)</td>
<td>7 (100)</td>
</tr>
<tr>
<td>The patient's food intake was monitored</td>
<td>43 (100)</td>
<td>43 (100)</td>
</tr>
</tbody>
</table>

### 7.15 Falls n = 1

Fall risk assessment tool completed/management plan implemented:

<table>
<thead>
<tr>
<th></th>
<th>Acute service n = 43 (%)</th>
<th>Rehab service n = 43 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>42 (98)</td>
<td>42 (98)</td>
</tr>
</tbody>
</table>

*For full details of clinical guidelines, see appendix 3. Abbreviations: SF, Stroke Foundation; n, number; rehab, rehabilitation

Level of adherence: less than 60% - low, 60% or above - acceptable, 80% or above - aspirational
5.3.2.2 Difference across acute and rehabilitation services

Eight SF clinical guidelines (out of 12) had a significant mean percentage and seven had difference greater than 10% between acute and rehabilitation services (p <0.004) (Table 5.3).

Table 5.3 Adherence rate for selected stroke clinical guidelines for acute, rehabilitation and combined services and mean difference (95% confidence interval (CI)) between acute and rehabilitation services.

<table>
<thead>
<tr>
<th>SF clinical guidelines</th>
<th>Overall adherence (%)</th>
<th>Mean difference (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Combined services</td>
<td>Acute</td>
</tr>
<tr>
<td>1.2 Hospital care</td>
<td>87%</td>
<td>93%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.3 Discharge planning and transfer of care</td>
<td>71%</td>
<td>56%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.4 Care after hospital discharge</td>
<td>54%</td>
<td>58%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.7 Goal setting</td>
<td>42%</td>
<td>33%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.1 Amount, intensity and timing of rehabilitation</td>
<td>72%</td>
<td>67%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.2 Sensorimotor impairment</td>
<td>72%</td>
<td>70%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.3 Physical activity</td>
<td>92%</td>
<td>89%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.4 Activity of daily living</td>
<td>72%</td>
<td>64%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.5 Communication</td>
<td>60%</td>
<td>58%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.6 Cognition</td>
<td>54%</td>
<td>47%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.1 Nutrition and hydration</td>
<td>72%</td>
<td>89%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.15 Falls</td>
<td>99%</td>
<td>98%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Abbreviation: SF, Stroke Foundation; rehab, rehabilitation; CI, confidence interval; %, percentage; p, p value
*p <0.05, **p <0.01

Level of adherence: less than 60% - low, 60% or above - acceptable, 80% or above - aspirational
### 5.3.2.3 Influence of age, gender or length of stay

No significant differences in adherence to SF clinical guidelines were found for age (F < 3.172, p > 0.053). No significant differences in adherence to SF clinical guidelines were found for gender (F < 2.207, p > 0.145) and length of stay for both acute (F < 4.879, p > 0.101) and rehabilitation services (F < 3.474, p > 0.070).

**Table 5.4 Percent adherence for age, gender and length of stay**

<table>
<thead>
<tr>
<th>SF clinical guidelines</th>
<th>Age</th>
<th>Gender</th>
<th>Acute Length of Stay</th>
<th>Rehabilitation Length of Stay</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>≤ 74</td>
<td>75 to 84</td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>1.2 Hospital care</td>
<td>89</td>
<td>88</td>
<td>85</td>
<td>88</td>
</tr>
<tr>
<td>1.3 Discharge planning and transfer of care</td>
<td>74</td>
<td>77</td>
<td>66</td>
<td>72</td>
</tr>
<tr>
<td>1.4 Care after hospital discharge</td>
<td>72</td>
<td>71</td>
<td>68</td>
<td>69</td>
</tr>
<tr>
<td>1.7 Goal setting</td>
<td>44</td>
<td>46</td>
<td>38</td>
<td>43</td>
</tr>
<tr>
<td>6.1 Amount, intensity and timing of rehabilitation</td>
<td>69</td>
<td>74</td>
<td>70</td>
<td>72</td>
</tr>
<tr>
<td>6.2 Sensorimotor impairment</td>
<td>74</td>
<td>73</td>
<td>71</td>
<td>74</td>
</tr>
<tr>
<td>6.3 Physical activity</td>
<td>95</td>
<td>91</td>
<td>92</td>
<td>93</td>
</tr>
<tr>
<td>6.4 Activity of daily living</td>
<td>76</td>
<td>71</td>
<td>65</td>
<td>71</td>
</tr>
<tr>
<td>6.5 Communication</td>
<td>66</td>
<td>61</td>
<td>58</td>
<td>63</td>
</tr>
<tr>
<td>6.6 Cognition</td>
<td>58</td>
<td>60</td>
<td>48</td>
<td>56</td>
</tr>
<tr>
<td>7.1 Nutrition and hydration</td>
<td>76</td>
<td>74</td>
<td>68</td>
<td>69</td>
</tr>
<tr>
<td>7.15 Falls</td>
<td>100</td>
<td>100</td>
<td>98</td>
<td>98</td>
</tr>
</tbody>
</table>
5.4 Discussion

This study demonstrated allied health clinicians were able to meet an adherence level of 60% (McCluskey et al., 2013) for the majority of selected SF clinical guidelines across combined services. Four SF clinical guidelines met the aspirational adherence level (80%) in the acute service and five met this level in the rehabilitation service. This suggests that a high level of adherence can be achieved by allied health clinicians and these findings support setting such an aspirational target. For those SF clinical guidelines with a low level of adherence (<60%), further investigation into one or both services appears to be required to identify practice shortfalls.

There was evidence of a significant difference in adherence rates between acute and rehabilitation services for most SF clinical guidelines (8 out of 12) suggesting that each service applied guidelines differently. However, for the secondary analysis of the sub groups, considering age, gender and length of stay, there were no significant differences between the two services. Both services appeared to apply and document their adherence to the SF clinical guidelines consistently when assessing and treating stroke survivors regardless of stroke survivor age, gender and length of stay.

Stroke survivors included in this audit were admitted to both services, which might have influenced finding of a difference across acute service and rehabilitation service. Adherence rates were explored across both settings and it appears that each service applied the SF clinical guidelines differently. For example, SF clinical guideline 1.3 (discharge planning and transfer of care) shows the acute service was less adherent in completing a ‘home or access visit’. As this audit was of stroke survivors with consecutive admissions across both acute and rehabilitation services, this is perhaps due to staff working in the acute service relying on the rehabilitation service to complete this component of care. Therefore this may be a reasonable finding.

Additionally, acute service staff may have actively chosen not to complete this component of care because of the short length of stay within the acute service. Similarly, for SF clinical guideline 7.1 (nutrition and hydration), stroke survivors referred to dietitians for assessment were then discharged if no intervention was required; this appears to have resulted in a low rate of review during the rehabilitation service phase. If no intervention was required during the acute service, dietitians appear to actively choose not to re-assess once these stroke survivors are transferred to the rehabilitation service. It is likely that adherence rates for documenting clinical guidelines
could be improved by providing feedback to allied health disciplines about these patterns of behaviour.

Documentation regarding the involvement of stroke survivors, families and carers appears to be consistently poor across both acute and rehabilitation allied health services when all relevant guidelines are considered (SF clinical guidelines 1.7, 6.1, 6.4, 6.5). Involving stroke survivors, families and carers could be referred to as patient-centred care (Mead & Bower, 2002). These findings suggest there is a need for more explicit documentation about this aspect of care. A greater understanding about how to best capture patient-centred care is needed within the acute and rehabilitation services. Luker and Grimmer-Somers (2009a) suggested that documenting patient-centred care is difficult, as documenting a conversation with a stroke survivor and/or family is more difficult than the documentation of performance of a physical assessment or treatment. Further prompts are required to assist the staff in capturing patient-centred care in their entries (Luker & Grimmer-Somers, 2009a). Such action would likely result in improved adherence to at least these SF clinical guidelines pertaining to patient-centred care. Patient-centred care was also highlighted as an area for improvement in the two most recent national audits (SF, 2015, 2016).

Similarities and differences were noted in adherence in the current study when compared to recent national audits. For example, low adherence with guideline 1.3 (discharge planning and transfer of care) for the acute service (56% in the current study) was consistent with the recent acute national audit (59%) (SF, 2015). Additionally, adherence with SF clinical guideline 14 (care after hospital discharge) was low across both services in the current study and in both acute and rehabilitation national audits (SF, 2015, 2016) and identified as areas for improvement. One key difference was found for SF clinical guideline 1.7 (goal setting) where in the current audit both acute (33% compared to 66% respectively) (SF, 2015) and rehabilitation services (50% compared to 89% respectively) had lower adherence compared to recent national audits (SF, 2016). Inconsistent adherence rates were also found compared to national audits. Adherence for providing carer training (SF clinical guideline 1.3 and 6.1) was low in the current audit across both services. In the acute national audit adherence was similarly low (48%) (SF, 2015), whereas high adherence (75%) was achieved in the rehabilitation national audit (SF, 2015).
The results from this research are different from those of the SF national audits indicating that privately funded hospitals cannot rely fully on the findings from the SF national audits and assume there is a direct association. Differences between both local and national stroke clinical audits were also identified in the literature (see Chapter 2). These findings suggest that either privately funded hospitals need to increase their participation in national SF audits significantly so results are meaningful, or they need to complete their own local audit.

The results from this audit identified several gaps within components of care that require improvement. For example, there was low adherence to the component of SF clinical guideline 1.4 (*care after hospital discharge*) regarding access to the consultants or stroke teams following discharge. Similarly, access to neuropsychology, a component of SF clinical guideline 6.6 (*cognition*) was also low. The low adherence of this latter guideline was primarily due to this service (neuropsychology) not being available onsite and visitation rights requiring approval. To improve levels of adherence to these guidelines, the service provider could document recommendations, provide information on accessibility and facilitate referrals to consultants and neuropsychologists that would benefit stroke survivors after their inpatient stay.

Another component of care with low adherence identified in the current audit was the use of group therapy in SF clinical guidelines 6.1 (*amount, intensity and timing of rehabilitation*) and 6.5 (*communication*) particularly by the acute service and for speech pathology. Identifying ways to use group therapy could be beneficial for both stroke survivors and the service provider as group sessions enable increased intensity of practice (Zanker, English, Prideaux, & Luker, 2007). Additionally, group therapy has been shown to be cost effective (Bakker, Hidding, van der Linden, & van Doorslaer, 1994; Elman & Bernstein-Ellis, 1999), allows for peer support (Morris & Morris, 2012) and can have better outcomes (Rose, Paris, Crews, Wu, Sun, Behrman, & Duncan, 2011), at least in an inpatient rehabilitation setting. Despite the potential benefits of group therapy, understanding the restrictions or barriers preventing the implementation of such therapies that may contribute to the observed low adherence rates is important and needs to be explored within a service. As a private service providing stroke care, changes have started to be implemented to address these gaps in our service. Continuous monitoring of our stroke services will allow for ongoing improvements.
Identifying barriers that impact on adherence rates provides an opportunity for allied health clinicians to address those identified (McCluskey et al., 2013). For example, SF clinical guideline 6.6 (*cognition*) had a low rate of adherence for the acute service. This may be because six out of the ten components of care are assessment based tasks and this amount of assessment could be challenging to achieve in an acute setting due to a short length of stay, length of time required to complete each assessment, caseload demand on staff who also service additional wards and the impact of fatigue on stroke survivors (Zedlitz, Rietveld, Geurts, & Fasotti, 2012). Potential barriers, such as lack of time (Bayley et al., 2012; Hammond et al., 2005; Luker & Grimmer-Somers, 2009a) or staffing issues (Bayley et al., 2012; Otterman, van der Wees, Bernhardt, & Kwakkel, 2012) and financial factors (Heinemann, Roth, Rychlik, Pe, King, & Clumpner, 2003; Otterman et al., 2012) also may impact adherence rates. Alternatively, allied health disciplines may identify facilitators to improve adherence rates such as incorporating stroke guidelines into treatment protocols, and making recommendations user friendly and relevant at a local level (Donnellan et al., 2013a; McCluskey et al., 2013). Either way, participation in the audit is the key, as service gaps must first be identified (MacDermid & Graham, 2009) and then service development can occur.

Participation of private hospitals in national stroke audits must be increased given the high level of involvement of this sector in service delivery (AIHW, 2016). A greater understanding of the performance privately funded hospitals regarding stroke management ideally should be developed to optimise stroke management in Australia. Results from audits have the potential to identify opportunities for stroke service development (Hubbard et al., 2012) within privately funded hospitals similar to national SF audits and publicly funded hospitals (SF, 2015, 2016). Improving adherence with SF clinical guidelines by allied health clinicians has been associated with greater functional improvements for stroke survivors (Luker & Grimmer-Somers, 2009a). How to engage privately funded hospitals to participate in national audits falls outside the scope of this study but is an important topic to be raised in particular as the number of privately funded hospitals in Australia has increased over recent years and they are an integral part of Australia’s health care system. National SF audits provide a plan for the development of stroke care throughout Australia and assist with future planning (SF, 2015, 2016).

Several limitations to this study need to be acknowledged. Only allied health clinical record entries were reviewed during the audit which restricts the implications of the findings to allied
health disciplines. As allied health disciplines are only one component of the clinical care for stroke survivors, this audit does not reflect the contributions made by medical and nursing teams to a stroke survivor’s recovery (Hill et al., 2009; Luker & Grimmer-Somers, 2009a) or the adherence of these disciplines to relevant SF guidelines. The auditing of these disciplines was outside the scope of the study. However, SF clinical guidelines were selected by allied health clinicians choosing guidelines relating to their disciplines. Also, the results from this study add to the understanding of how to improve allied health adherence to stroke guidelines (Luker & Grimmer-Somers, 2009a).

Audits are also limited by their dependence on accuracy (information being documented at the time) (Wu & Ashton, 1997) and completeness (clinicians failing to document events into clinical records) of the clinical records (Dworkin, 1987). If allied health clinicians from this privately funded hospital did not document this audit assumed that the care did not occur. This may have impacted the reported adherence level for the selected SF clinical guidelines. Audits are also dependent on the auditor collecting data from clinical records accurately, impartially and consistently (Beard et al., 1992). It is possible the auditor’s opinions could be swayed by knowledge of the situation, which may result in the auditor being too harsh or lenient (Goldman, 1994; Wu & Ashton, 1997). For this program of research multiple auditors demonstrated substantial inter-rater reliability when utilising the stroke audit tool. Further, intra-rater reliability of the auditor was established. By establishing the stroke audit tool’s reliability, it is likely that the tool was used consistently in this audit (Gompertz et al., 2001).

5.5 Conclusion

This study provides insight into allied health clinicians’ adherence to SF clinical guidelines across both the acute and rehabilitation services of a privately funded hospital. The audit was led by allied health clinicians who participated in the development of the stroke audit tool which thus comprised SF clinical guidelines they identified as important. Further research is needed to identify how clinicians can document patient-centred care and the need for clinicians to better engage stroke survivors in goal setting. Strategies to encourage privately funded hospitals in Australia to participate in national SF audits need to be considered and implemented.
Chapter 6. General Discussion and Conclusion

The overarching aim of this research was to investigate adherence to SF clinical guidelines by allied health clinicians from a privately funded hospital across both acute and rehabilitation services, a common journey of recovery for many stroke survivors. The research consisted of two studies (reported in Chapters 4 and 5). Study 1 developed and tested the reliability of a stroke audit tool, while Study 2 assessed allied health clinicians’ adherence to SF stroke clinical guidelines using this stroke audit tool.

In this chapter, the main findings of the studies are summarised and discussed in the context of developing and assessing the reliability of a stroke audit tool and determining allied health clinicians’ adherence to stroke clinical guidelines. Following this the potential clinical implications, future research directions, study limitations and general conclusions from this research program will be discussed.

6.1 Overview of significant research findings

The two studies comprising this research sought to develop a stroke audit tool from the SF clinical guidelines (SF, 2010a) selected by allied health clinicians as important to their care, to test the audit tool’s reliability, and to determine the adherence of allied health clinicians to the selected SF clinical guidelines. The following section outlines the main findings from both studies relating to the hypotheses set for the research.

6.1.1 Study 1–Development of a stroke audit tool

The main aim of Study 1 was to determine whether allied health clinicians from a privately funded hospital could agree on the SF clinical guidelines to include in a stroke audit tool. A secondary aim was to assess the inter and intra-rater reliability of the stroke audit tool.

6.1.1.1 SF clinical guideline selection

In Study 1, allied health clinicians developed a stroke audit tool using a modified Delphi process. This study identified the stroke clinical guidelines allied health clinicians considered relevant to include in a stroke audit tool. This approach applied a key component of the framework of knowledge translation (Oborn et al., 2013) by having researchers and clinicians work together to produce meaningful research.
Using the modified Delphi process, 22 allied health clinicians reached agreement on eight SF clinical guidelines to include in a stroke audit tool. It was hypothesised that allied health clinicians would reach the target agreement of 70% on ten SF clinical guidelines. Following six rounds of voting, allied health clinicians agreed on eight SF clinical guidelines with a minimum 70% target agreement. Additionally, not all disciplines were represented, therefore a further two guidelines meeting 50% agreement were included. However, a guideline relevant to dietitians was still not included. This prompted the inclusion of a further two SF clinical guidelines; one regarding dietetic management of stroke survivors and another around goal setting, a common knowledge gap. This ensured that each allied health discipline had at least one guideline relevant to their discipline included in the audit tool to increase the diversity of the stroke audit tool and potentially improving its relevance to all allied health disciplines. A total of 12 SF clinical guidelines were included in the stroke audit tool.

Therefore, the first hypothesis of this research, that the allied health clinicians, using a modified Delphi process, would identify a minimum of ten SF clinical guidelines was partially supported.

6.1.1.2 Establishing reliability of the audit tool

The stroke audit tool demonstrated good inter-rater reliability and was applied with substantial consistency across acute, rehabilitation and combined services. Additionally, the stroke audit tool demonstrated good to moderate intra-rater reliability applied with substantial consistency across the acute service and for the combined service. Therefore, the hypotheses for the secondary aims, that (ii) the audit tool could be reliably administered by multiple allied health clinicians with substantial consistency (Intraclass Correlation Coefficient, >0.7) and (iii) the audit tool could be reliably administered by an auditor with substantial consistency (Intraclass Correlation Coefficient, >0.7) were mostly supported.

These findings from Study 1 demonstrate that the methodological approach of using local clinicians to determine audit criteria produced a reliable stroke audit tool. This stroke audit tool was then used as the outcome measure in Study 2.
6.1.2 Study 2–Adherence of allied health clinicians to selected SF clinical guidelines

The aim of Study 2 was to assess the adherence to the selected SF clinical guidelines using the stroke audit tool designed in Study 1. Stroke survivors’ clinical records with consecutive admissions to both the acute and rehabilitation services were reviewed to establish adherence to the selected SF clinical guidelines. Secondary aims were to investigate whether adherence differed across the two services, or if stroke survivor characteristics such as age, gender or length of stay, influenced adherence.

6.1.2.1 Adherence level of allied health clinicians

Study 2 investigated the adherence of allied health clinicians across both acute and rehabilitation services in a privately funded hospital with the selected SF stroke clinical guidelines included in the audit tool. A minimum adherence level of 60% was set in line with previous research with an aspirational adherence level of 80% also included.

The acute service demonstrated aspirational adherence level of 80% was achieved across four SF clinical guidelines. Seven SF clinical guidelines met the minimum 60% adherence level. Five SF clinical guidelines did not reach the minimum adherence level.

The rehabilitation service met an aspirational adherence level of 80% for five SF clinical guidelines. Nine SF clinical guidelines met the minimum 60% adherence level with three SF clinical guidelines not reaching the minimum adherence level.

6.1.2.2 Adherence across acute and rehabilitation services

When the services are considered together as a continuum of care for stroke survivors, nine (out of 12) SF clinical guidelines met the minimum 60% adherence level across the combined services. From those nine SF clinical guidelines, three achieved an aspirational adherence level of 80%. These findings support hypothesis (iv) that allied health clinicians met the minimum adherence level of 60% across majority of the selected SF clinical guidelines. Additionally, allied health clinicians’ adherence would reach an aspirational level of 80% on some of the selected SF clinical guidelines.
For the combined service, three SF clinical guidelines fell below the minimal adherence level (60%). SF clinical guidelines 1.4 (care after hospital discharge), 1.7 (goal setting), 6.6 (cognition), require specific attention in both services to address these shortcomings in practice.

6.1.2.3 Difference across acute and rehabilitation services

There was a significant difference between acute and rehabilitation stroke services in how allied health clinicians applied eight out of 12 SF clinical guidelines – 1.2 (hospital care), 1.3 (discharge planning and transfer of care), 1.4 (care after hospital discharge), 1.7 (goal setting), 6.1 (amount, intensity and timing of rehabilitation), 6.4 (activity of daily living), 6.6 (cognition) and 7.1 (nutrition and hydration). This suggests that each service implemented these eight SF clinical guidelines differently. There was no significant difference across acute and rehabilitation for four SF clinical guidelines – 6.2 (sensorimotor impairment), 6.3 (physical activity), 6.5 (communication) and 7.15 (falls).

6.1.2.4 Influence of age, gender or length of stay

There were no significant differences in the application of the selected SF clinical guidelines between the two services when considered in terms of patient age, gender or length of stay. This suggests that allied health clinicians were not influenced by these factors when assessing and treating stroke survivors. Therefore, results mostly supported hypothesis (v) there will be no significant difference in adherence to SF clinical guidelines across acute and rehabilitation services, or when age, gender or length of stay are considered.

6.2 Clinical implications

The following section reviews the clinical implications derived from this program of research. These include the importance of involving clinicians in the audit process to promote change to clinical practice, setting a minimum and an aspirational adherence level for the audit, the importance and the difficulty of documenting patient-centred care, the use of the KTA cycle to implement change to clinical practice and the advantages of auditing both acute and rehabilitation stroke services with the same audit criteria. This section ends with a discussion of the implications of conducting an audit specific to allied health clinicians.
6.2.1 Involving clinicians in an audit process

Allied health clinicians from this privately funded hospital demonstrated willingness to be involved in the audit process, with 24 (out of 38) clinicians volunteering to be part of the modified Delphi process and develop a stroke audit tool. Unfortunately, two participants who volunteered withdrew, one for illness and another started extended leave. Other potential participants did not volunteer as they were working in a difference service such as the day patient program (community program) or were away during the recruitment phase.

Allied health clinicians were keen to be involved in the development of a stroke audit tool to assess their adherence to SF clinical guidelines. Over 60% of allied health clinicians volunteered with a minimal dropout rate (8%). Clinicians (at this privately funded hospital) wanted to be involved in the audit process and be a part of service improvement. This is in contrast to the traditionally low participation rates of privately funded hospitals in SF national audits (SF, 2015, 2016). If this desire of clinicians to be involved in an audit process could be explored to include participation in SF national audits, it is then more likely that there would be improved understanding of the stroke service provided in Australia.

Involving local allied health clinicians was fundamentally a beneficial concept when developing this stroke audit tool. Allied health clinicians have significant roles in managing stroke survivor recovery; in 2013, 77% of all stroke survivors hospitalised in Australia had at least one allied health intervention (AIHW, 2013). However, the role of allied health clinicians in implementing stroke clinical guidelines is less understood compared to nursing and medical clinicians, despite their substantial involvement with stroke survivors. Only one study was identified in a Cochrane review regarding allied health clinicians’ role in implementing guidelines (Thomas et al., 2000).

Involving allied health clinicians in the audit process may drive change in clinical practice and improve implementation of stroke clinical guidelines. Giving clinicians specific responsibility, such as stroke audit tool development, has been suggested to improve the amount of change to clinical practice able to be achieved (Jamtvedt et al., 2007). An individual discipline cannot simply change their clinical practice and have a desired outcome of changing the practice of all disciplines (Scott et al., 2012). Therefore allied health clinicians are required to work collectively to change clinical practice within their own teams and across all teams comprising allied health disciplines (Scott et al., 2012).
In summary, although this has been a single site research program, allied health clinicians at the local level were keen to be involved. Allied health clinicians were interested in the audit process and developing an understanding of their clinical practice both as individual disciplines and as an allied health team. This could lead to allied health clinicians changing their clinical practice to improve adherence to SF clinical guidelines and increase the potential benefits for the stroke survivor recovery.

6.2.2 Adherence levels to clinical guidelines

One question that arose during the planning of this research program was what is a reasonable level of adherence for clinicians to work towards? A 100% adherence level across all guidelines seems unrealistic and potentially not achievable (Oborn et al., 2013). ‘Best practice’ documents such as SF clinical guidelines are used to maintain quality rather than to mandate compulsory practice. Therefore achieving 100% adherence across all SF clinical guidelines is unlikely to be realistic. Interestingly 100% adherence has been reported for at least components of care from stroke clinical guidelines within local audits (Gommans et al., 2005; Luker & Grimmer-Somers, 2009a; Johnston et al., 2013). However, 100% adherence has not been reported for any components of care within national audits in Australia (SF2015; 2016). This program of research has illustrated that achieving 100% adherence was also possible (table 5.2). One SF clinical guideline, 7.15 (falls), achieved an overall adherence level of 100%. All audited charts across both acute care and rehabilitation services identified documentation indicating that falls risk assessment had been completed using a formal tool and a management plan had been implemented if a fall occurred. However, this particular SF clinical guideline only had one component of care. This is in contrast to SF clinical guideline 6.2 (sensorimotor) for example, which includes 12 components of care. It is reasonable to expect that greater adherence is likely to clinical guidelines with fewer components of care.

Looking to the literature for guidance, one study defined a reasonable adherence level of 60% (McCluskey et al., 2013) whilst another alluded to an adherence level of less than 50% as low (Johnston et al., 2013). Other studies assessing local adherence to stroke clinical guidelines did not define a minimum level of adherence (Gommans et al., 2005; Luker & Grimmer-Somers, 2009a). SF national audits (both acute and rehabilitation) similarly do not define minimum requirements but focus their discussions around the rate of change from previous biannual audits (SF, 2015, 2016). Another study suggests a lower and upper adherence level (Duncan et al.,
This perhaps allows further interpretation of audit results. In this particular study (Duncan et al., 2002) adherence level greater than the upper level (75%) were described as high, between the lower and upper adherence level (less than 75% to 65%) were moderate and below the lower adherence level (less than 65%) were low.

Setting an adherence level at 60% as per McCluskey and colleagues (McCluskey et al., 2013) seems achievable. An adherence level of 60% equates to fewer than two out of every three clinical records audited demonstrating adherence to the selected SF clinical guideline. On the other hand, this represents probably only moderate adherence so could be considered a little low. Therefore, two adherence levels were set in this program of research: a minimum or lower level of 60%, and an upper level of 80%. This latter was considered an adherence level to aim for, an optimistic or aspirational adherence level. Predominantly clinical record audits focus on service (knowledge) gaps (MacDermid & Graham, 2009) rather than identifying the areas where clinicians are performing well. Having an aspirational level of adherence (80%), as in this research, furnishes an opportunity to provide positive feedback to clinicians and possibly encourage modifications to clinical practice to achieve the aspirational level. Another potential benefit of setting an aspirational adherence level is that this also identifies the care components being delivered well, and which therefore may only need intermittent monitoring.

Having both minimum and aspirational levels of adherence may assist allied health clinicians interpret audit results. Those SF clinical guidelines, if any, that are falling below the minimum adherence level could be identified as service gaps and therefore require attention from the allied health clinicians. Guidelines that met the minimum but not the aspirational level may encourage allied health clinicians to continue to adapt their practice to achieve higher adherence levels. SF clinical guidelines meeting the aspirational level could urge allied health clinicians to continue to maintain their practices and sustain performance.

6.2.3 Documentation of patient-centred care

Clinical record audits are commonly used to assess quality within health care (Wu & Ashton, 1997), and data collection processes for audits are dependent on the documentation within the clinical records (Wu & Ashton, 1997). Poor-quality documentation, particularly documentation of involving stroke survivors and their families in their care (evidence of patient-centred care), was evident within this program of research. Patient-centred care stems from shared decision
making between the health care user and clinicians about preferred treatments (Elwyn, Edwards, Mowle, Wensing, Wilkinson, Kinnersley, & Grol, 2001). However, there is no agreed definition of patient-centred care (Delaney, 2017) except to ensure that individuals are met with respect and responsiveness, and that personal preference and partnership in relation to making clinical decisions are paramount (Delaney, 2017; Epstein, Franks, Fiscella, Shields, Meldrum, Kravitz, & Duberstein, 2005).

Documentation of patient-centred care has been described as difficult because it is less tangible than a more objective physical assessment (Luker & Grimmer-Somers, 2009a). Therefore, it may be difficult for clinicians to produce high quality documentation of this aspect of care, which potentially impacts adherence levels. This is reinforced by other studies also reporting difficulties with demonstrating adherence to patient-centred care; aspects such as communication with stroke survivors and families, goal setting, peer support, and discharge planning (Duncan et al., 2002; Hubbard et al., 2012; Johnston et al., 2013; Luker & Grimmer-Somers, 2009a; Luker & Grimmer-Somers, 2009b).

Improved allied health clinician understanding of integrated patient-centred care into their clinical practice (Luker & Grimmer-Somers, 2009a) or at least the documentation of their clinical practice might improve adherence to SF clinical guidelines that involve patient-centred care. SF clinical guideline 1.7 (goal setting) highlights that stroke survivors should be involved in a goal setting process. This was one example where allied health clinicians did not consistently document about the involvement of stroke survivors in their care, demonstrating low adherence with this SF clinical guideline. If clinicians had documented the stroke survivor’s goals as well as the stroke survivor’s involvement in the goal setting process, improved adherence to SF clinical guideline 1.7 (goal setting) would have been demonstrated.

When patient-centred care occurs stroke survivors are more satisfied with the care provided by stroke services (Reker et al., 2002). Additionally, documentation that goal setting has occurred has been shown to demonstrate that patient-centred care was provided (Levack, Dean, McPherson & Siegert 2006a). Furthermore, the goals set can be used to evaluate outcomes that treatments are working, allowing clinicians to exhibit accountability regarding treatments provided (Delaney, 2017; Levack, Dean, Siegert & McPherson., 2006b). Within the rehabilitation setting, having patients including stroke survivors, actively participate with goal setting can lead
to other benefits including influencing motivation to achieve the set goals and increased participation in therapy treatment sessions (Levack, Taylor, Siegert, Dean, McPherson, & Weatherall, 2006). One strategy to improve documentation and hopefully adherence to SF clinical guideline 1.7 (goal setting) could be for allied health clinicians to use a relevant outcome measure for goal setting. Documenting results of using a goal setting outcome measure would demonstrate involvement of the stroke survivor and therefore patient-centred care. The SF clinical guidelines suggest using the goal-attainment scale (GAS), to assist clinicians and stroke survivors in setting goals (SF, 2010a). Implementing this outcome measure in the future would likely enhance adherence with this SF clinical guideline.

In summary, patient-centred care is important but appears difficult to document. Results from this research show that clinicians from a privately funded hospital have difficulty documenting evidence of patient-centred care. Clinicians need to involve stroke survivors and families in their care and improve documentation of patient-centred care to provide evidence of adherence in future audits. An outcome measure might be useful to capture this evidence. Patient-centred care has benefits for both the stroke survivor and stroke services.

6.2.4 Knowledge to action cycle–the full cycle

The methods laid out in this research program could theoretically be used in other hospitals or departments to assess or review clinical practice. Based on the framework used within this study, the KTA cycle is a model to integrate research into health care (Graham et al., 2006). SF clinical guidelines are produced as the ‘knowledge creation’ phase and a stroke audit is a part of the ‘action cycle’ phase. This program of research only implemented the first step of the action cycle. To implement the full action cycle, the results from this first two step would be used to inform the remaining steps. This section explores the full cycle of KTA using an example.

Including clinicians to identify if a problem exists is the first step in addressing the service gap (Bosch et al., 2013). Such a step is likely to produce meaningful results for hospitals or departments. However, simply identifying a problem does not necessarily lead to meaningful change in a service. This research completed only the first step of the action cycle in the KTA cycle–problem identification (Figure 2.1) (Graham et al., 2006). The complete steps of the action cycle are: identify, review, and select the knowledge or research relevant to the problem (i.e. practice guidelines); adapt the identified knowledge or research to local context; assess barriers
to using the knowledge; select, tailor and implement intervention to promote the use of knowledge (i.e. implement the change); monitor knowledge use; evaluate the outcomes of using the knowledge; and sustain knowledge use (Graham et al., 2006). To achieve meaningful knowledge translation all steps in the cycle need to be undertaken.

Continuing with the previous example, SF clinical guideline 1.7 (goal setting) will be used to illustrate how the observed overall low adherence rate (acute, rehabilitation, and combined services) (below the minimum 60% level) can inform the implementation of the KTA cycle.

The second step of the action cycle is to review and select the relevant literature. In this case a systematic review on goal setting (Hurn, Kneebone, & Cropley, 2006) highlighted that the goal attainment scale (GAS) was a suitable tool to use with strong evidence for its reliability, validity and sensitivity (Hurn et al., 2006). The third step requires the research to be adapted to the local context. This could be done by these allied health clinicians agreeing to include the GAS as part of the team’s clinical practice. The next step of the KTA cycle is addressing potential barriers to implementing the research into the clinical setting. This may involve local education and training about the GAS. One potential barrier to using the GAS previously identified includes the need for a calculation by applying a formula, which may put some clinicians off using the GAS (Turner-Stokes, 2009). Developing an electronic GAS calculation sheet which automatically calculates scores may overcome this barrier (Turner-Stokes, 2009).

The fifth step is the implementation phase, and would refer to incorporating the GAS into practice and using it with stroke survivors and their families. Implementing the GAS might involve decisions within the team regarding whose responsibility it is to complete or document the GAS, or a prompt during regular team meetings, for example. Once implemented it is important to monitor these changes to determine if the tool is being used as planned and if adherence rates have improved. This could be done by repeating the stroke audit in another six or twelve months so a comparison between the two results can be made (Graham et al., 2006). Once the desired change has occurred, outcomes should be evaluated to determine whether the change in clinical practice has made an actual difference to stroke survivor outcomes as well as service outcomes (Graham et al., 2006). This could potentially be done by evaluating stroke survivors’ satisfaction with using the GAS as part of goal setting or other quantifiable outcomes.
such as functional recovery or length of stay. This is an essential part of the KTA cycle and one that is often not done.

The final step of the knowledge action cycle is assessing the sustainability of the change. It is possible that over time clinicians may revert to old habits (Graham et al., 2006) and not document goal setting in the clinical records. Establishing a feedback loop that continues the cycle through the action phase, a follow-up audit or review of clinical practice, completes the KTA cycle (Graham et al., 2006; Straus et al., 2008) and may enhance sustainability.

6.2.5 Auditing a combined service

Allied health clinicians commonly work across both acute and rehabilitation services. In this private hospital, allied health clinicians regularly work across both services, rotating approximately every six months. The journey for many stroke survivors occurs across both services during their recovery (AIHW, 2013). During the course of this study, over a 12-month period, 60% of all stroke survivors were admitted to both services. An audit of the care stroke survivors received throughout the continuum from admission to the acute service to discharge via the rehabilitation service would show a complete picture of the care received. Reflecting the care provided by allied health clinicians who regularly work across both services would likely demonstrate a level of consistency.

This research assessed the adherence level of both acute and rehabilitation services separately as well as of the combined service using the same stroke audit tool. This approach allows for a direct comparison of the care stroke survivors experience from both services. Earlier studies audited either only acute care (Hammond et al., 2005; Hill, 2008; Luker & Grimmer-Somers, 2009a; Luker & Grimmer-Somers, 2009b) or rehabilitation services (Duncan et al., 2002; Grube et al., 2012; Hubbard et al., 2012; Johnston et al., 2000). Assessing both services allows for an improved understanding of the stroke survivor journey.

Adherence across both acute and rehabilitation stroke services has received little previous investigation. Only one study was found that has investigated adherence across both services (Johnston et al., 2013). However, only physiotherapist adherence was investigated. Johnston and colleagues (Johnston et al., 2013) found that New Zealand physiotherapists showed varying levels of adherence across both services; rehabilitation service had greater adherence than the acute service in goal setting for example (Johnston et al., 2013). Additionally, there were
differences between services in treatment strategies implemented for weakness, altered sensation, standing balance, mobility, shoulder subluxation, cardiorespiratory fitness, fatigue and falls risk (Johnston et al., 2013).

Results from this current research identified differences between services for eight out of twelve SF clinical guidelines: 1.2 (hospital care), 1.3 (discharge planning and transfer of care), 1.4 (care after hospital discharge), 1.7 (goal setting), 6.1 (amount, intensity and timing of rehabilitation), 6.4 (activity of daily living), 6.6 (cognition) and 7.1 (nutrition and hydration). This suggests that the services operate differently despite allied health clinicians regularly working across both services. By focusing changes on each service rather than clinicians, performance might improve adherence to SF clinical guidelines as allied health clinicians appear to comply with the service standards.

Changing clinical practice to improve adherence of both acute and rehabilitation services to SF clinical guidelines may need a co-ordinated approach. Establishing how each service adheres to the SF clinical guidelines, including similarities and differences, needs to be considered for strategies to address any identified shortcomings in practice. There is also potential for determining specific SF clinical guidelines to be focused on in either acute or rehabilitation stroke service. SF guideline 7.1 (nutrition and hydration), for example, should perhaps be a focus within the acute service to ensure stroke survivors are well hydrated and nourished in the early stages following their stroke. Only those requiring or requesting follow up in rehabilitation should receive further allied health review ensuring the best use of staffing and resources.

Length of stay might be a contributing factor to a co-ordinated approach for improving both services. Study 2 of this research program identified that allied health clinicians on the acute service did not adhere to some SF clinical guidelines, such as conducting home visits, while rehabilitation clinicians did. It might be a reasonable expectation for allied health clinicians in an acute stroke service to not conduct a home visit, particularly as length of stay was less (by 12.8 days) in the acute care compared to the rehabilitation service. Improving co-ordination or collaboration between services to ensure stroke survivors receive care as indicated by the SF clinical guidelines should facilitate recovery across the combined care of both services.

In summary, allied health clinicians commonly work across both acute and rehabilitation services, at least in this facility. More than half the stroke survivors admitted during the 12-month
audit period were admitted to both services. Using the same audit criteria for both services allowed for direct comparison across the acute and rehabilitation services of adherence to SF clinical guidelines. Identification of differences between services may be reasonable and may provide an opportunity to establish a co-ordinated approach across the stroke continuum of care and prioritise adherence to SF clinical guidelines.

6.2.6 Stroke audit tool focusing on allied health clinicians

In the literature, the focus of stroke audits varies due to the methods used to develop audit selection criteria, as discussed in Chapter 2. The results from this study are different from the SF national audits, which indicates that a private hospital cannot rely fully on the findings from the national audits. Differences between stroke clinical audits were also identified in the literature (see Chapter 2). A comparison between the results from this study and those from the SF national reports was not straightforward, as both national audits have a difference focus (SF, 2015, 2016). Chapter 5 discussed similarities and differences between the results from Study 2 and the most recent SF national audits.

The SF acute service audit includes 18 clinical indicators specific to emergency and acute care medicine (SF, 2015). The SF acute service audit was based on indicators set for stroke by Australian Council on Healthcare Standards (ACHS) collaboration with the framework laid out by the Australian Stroke Coalition (ACS) (SF, 2015). Reviewing these clinical indicators suggests there is less focus on ‘rehabilitation’ and allied health assessments and treatments in the SF acute care audit. Rather the SF acute service audit includes indicators pertaining to rapid assessment in the emergency department such as thrombolysis and care following thrombolysis if indicated along with the medical management of risk factors. This would seem reasonable as in the acute phase stroke survivors require a high level of emergency and acute care upon admission to hospitals to ensure survival and reduce disability (SF, 2015). One potential consequence of this could be that the national SF audit results are less meaningful to allied health clinicians working within the acute service. Only five indicators in the SF acute care audit involve allied health clinicians: referral to physiotherapy, the start of rehabilitation therapy, goal setting, care support, and training (SF, 2015).

The SF rehabilitation service audit includes 14 elements reflecting clinical guidelines regarding timely assessment and treatment, allied health involvement, goal setting, care planning, and
discharge planning, as well as patient management and secondary prevention (SF, 2016). These clinical guidelines appear more related to allied health clinicians, both prevalence and the therapy used, provided more meaningful audit results because the results were allied health focused.

Involving allied health clinicians in the selection of the SF clinical guidelines to be included in the audit allowed them to direct the focus of the audit and possibly the components of care in which they were most involved. Hence five (out of twelve) of the SF clinical guidelines that had a ‘rehabilitation’ focus (SF clinical guideline 6.1 amount, intensity and timing of rehabilitation, 6.2 sensorimotor, 6.3 physical activity of daily living, 6.5 communication and 6.6 cognition) were included in the audit tool. In the UK, the Intercollegiate Stroke Working Party developed a national audit that could be used not only across disciplines (Hammond et al., 2005) but by different health sectors as well (Gompertz et al., 2001). An audit with a range of guidelines for a specific discipline or health sector will highlight specific problem areas and issues relative to that discipline or health sector (Hammond et al., 2005).

In summary, the focus of the national SF audits are different from each other and from this program of research. The clinical implication of involving allied health clinicians to influence the focus of a stroke audit by selecting a specific range of SF clinical guidelines tailored to their interests may assist with future changes to allied health clinical practice, as it is anticipated that these results may be considered more meaningful (Hammond et al., 2005).

6.3 Future research directions

The following section outlines several potential future research opportunities following the results from this research. There is further discussion of the involvement of allied health clinicians in the audit process, the importance of completing the full knowledge to action cycle, how to engage the private sector in national clinical audits, and new strategies which could be used to improve adherence to SF clinical guidelines.

6.3.1 Involving allied health clinicians in the audit process

Involving allied health clinicians in the audit process appears to engage them in this process. Whether engagement leads to improved adherence to SF clinical guidelines needs further investigation.
Trying to change clinical practice (behaviour) is difficult and research evidence alone is not sufficient to change clinical practice (Oxman & Flottorp, 2001). Involving clinicians in an audit process appears to facilitate their engagement (Grimshaw, Thomas, Maclennan, Fraser, Ramsay, Vale, … & Donaldson, 2004; Scott et al., 2012), and may lead to change in clinical practice (Jamtvedt et al., 2007). Additionally, the use of mandatory audits appears to have a reduced effect on changing clinical practice. One reason for this is that clinicians may not have explicit responsibility to implement clinical practice change based on the feedback received from such mandatory audits (Jamtvedt et al., 2007; Scott et al., 2012).

Additional research into how to support clinicians to implement changes in their clinical practice following audit results is required. The effectiveness of audit results to inform changes to clinical practice is also dependent on other factors, such as clinicians agreeing to review their practice (Mugford, Banfield, & Hanlon, 1991), and clinicians actively taking up the results and being willing to make changes to their clinical practice (Kanouse & Jacoby, 1988). Other factors to consider when trying to change clinical practice include operational considerations (finance, organisational constraints such as time) (Oxman & Flottorp, 2001), and prevailing opinions of the team (Oxman & Flottorp, 2001).

### 6.3.2 Engaging the private sector

The low participation of privately funded hospitals in SF National audits is not well understood. There is a need to better understand the reasons why these hospitals are not participating in SF National audits, as privately funded hospitals are an integral part of the Australian health care system (AIHW, 2016). The private sector plays a significant role in the management of stroke survivors within the Australian health care system, including diagnosis, assessment, treatment, and discharge (AIHW, 2013) with the number of privately funded hospitals increasing over the last five years (AIHW, 2016).

Study 1 suggested a partnership between the SF and the Australian Private Hospitals Association as a potential solution. Privately funded hospitals were invited to participate in the two most recent SF national audits (SF, 2014, 2016) but this had minimal impact on private hospital participation, with 12 hospitals participating in 2014 (SF, 2014) increasing to 15 hospitals in 2016 (SF, 2016). Future research to understand why privately funded hospitals have such a limited participation within SF national audits and why the majority of privately funded hospitals
are not participating should be explored. Investigation of potential strategies to encourage privately funded hospitals to engage in national audits, such as offering funding inducements to reduce the burden of cost by allocating specific work hours for audit data collection (Cadilhac, Andrew, Salama, Meade, Kuhle, Dunstan, … & Grimley, 2017), could be undertaken.

Increasing participation of privately funded hospitals in SF national audits will increase the understanding of stroke services provided throughout Australia. Gaining this understanding will ultimately improve stroke care for all stroke survivors whether admitted to publicly or privately funded hospitals.

6.3.3 Is it time for new strategies?

Participation in an audit is only one half of the process; the second half is to bring about a change to clinical practice within the health care system. How to encourage local clinicians to align their practice with recommendations from SF clinical guidelines needs further investigation. A process is required that encourages all hospitals not only to participate in SF national audits but also to implement changes to clinical practice following the publication of the results. Despite participation in the SF national audits being mandatory or publicly funded hospitals, adherence levels to SF clinical guidelines, as well as advances in treatment and care, have had minimal change since national audits were initially undertaken (SF, 2015, 2016). Both the most recent SF national audit reports have gone as far as saying:

*The audit reveals acute stroke care service in this country (Australia) has stagnated. (Acute services report SF 2015, page 4).*

*Report findings demonstrate inpatient stroke rehabilitation quality has stagnated. (Rehabilitation service report SF 2016, page 4).*

A Cochrane review suggested that one reason for minimal change may be that no one necessarily has direct responsibility for instigating changes to clinical practice (Jamtvedt et al., 2007). The same review also stated: that audits should be well designed, with a large enough sample to detect change; that analysis of audit results is complex requiring a robust analysis; and finally, there need to be comparisons of different ways to audit (Jamtvedt et al., 2007). Further research is required into how to improve the audit process, analyse the results, and implement change from the audit results.
To improve adherence, clinical guidelines must be complemented by proven implementation strategies (Grimshaw, Eccles, Lavis, Hill, & Squires, 2012; Grol, 1997). The most recent SF clinical guidelines (SF, 2017) include suggestions to improve implementation of the guidelines. The new 2017 guidelines dedicate a chapter to dissemination and implementation, and outline five implementation strategies; namely education sessions, education outreach visits, education resources, audit and feedback, and team/working group meetings (SF, 2017). The new SF clinical guidelines acknowledge that it is not known if a single strategy or multiple strategies are more effective for implementation of research (Bauer, Damschroder, Hagedorn, Smith, & Kilbourne, 2015). Future research will need to assess the effectiveness of each of the strategies suggested by new SF clinical guidelines to determine if these have improved adherence.

Not only does the SF suggest strategies for implementation, the interaction between clinicians and the SF website (https://informme.org.au/) has changed. The new SF clinical guidelines are described as ‘live’ with some suggestion that it is or will be possible to update the guidelines regularly as new evidence/research becomes available (SF, 2017). Therefore it is likely that these SF clinical guidelines will be updated more frequently than every seven years (as was past practice), removing one of the limitations of using guidelines (SF, 2017). However, the approval process for updating these ‘live’ SF clinical guidelines is yet to determined but if a similar process to that used in the past is maintained how frequently the 2017 SF clinical guidelines will be able to be updated is not known. The layout and style of the 2010 and 2017 SF clinical guidelines are fundamentally the same although the new SF clinical guidelines have included more detail within each guideline (SF, 2010a, 2017). Also, it has been proposed that the new SF clinical guidelines will be summarised into discipline specific content including all allied health disciplines, as well as nursing, general practitioners and emergency departments. This is similar to the UK with their guidelines and audits (Gompertz et al., 2001; Hammond et al., 2005) though this has yet to be undertaken in Australia. The SF website includes resources such as eLearning modules, emerging evidence, and tools to assist clinicians implement the guidelines. Future research into how clinicians interact with these available resources and their own hospital results available from SF website may lead to improved adherence to SF clinical guidelines. As each discipline has their own language (Gompertz et al., 2001) and culture (Davies, Nutley & Mannion 2009), each discipline might learn and develop differently from each other discipline. Future
research could explore optimal methods to present resources and audit results to each discipline to maximise use and uptake and any impact on adherence needs investigation.

Research could be conducted into developing strategies that might help with improving adherence to the SF clinical guidelines. One strategy that could be considered is the use of electronic clinical records that automatically self-audit against the SF clinical guidelines. Hospitals are increasingly adopting electronic clinical records. If information technology systems supporting the electronic records incorporated SF clinical guidelines (or any other guidelines for that matter) preloaded into the system a comparison between the clinical record and SF clinical guidelines could occur. It might also be feasible that the information systems could include potential prompts to highlight key aspects of care not documented.

Allowing clinicians immediate access to SF clinical guidelines whilst documenting or developing internal prompts for clinicians, for instance, a prompt for clinicians to liaise with the stroke survivor and family regarding goal setting, is likely to help in areas of low adherence. Immediate self-auditing of clinical records against SF clinical guidelines would provide direct feedback to individual clinicians as well as to disciplines and departments. This potentially allows for a direct change to clinical practice as the feedback could be almost instantaneous.

To develop this concept of self-auditing clinical records further, imagine if new evidence from stroke research, SF clinical guidelines and clinical records were continuously interacting with each. As new research became available the SF clinical guidelines could be updated. Self-auditing electronic clinical records against the most up-to-date clinical guidelines could provide near immediate feedback on adherence of clinical practice within each setting and possibly more broadly, throughout the country. As new information technology systems develop it might be possible to have a ‘live’ system which links research, SF clinical guidelines and clinical records (documented clinical practice). This could reduce the time period between the publication of new research findings, their critical appraisal and incorporation into guidelines, and implementation into clinical practice, potentially improving stroke survivors’ functional outcomes through improved adherence to SF clinical guidelines.
6.4 Limitations

Several limitations need to be acknowledged when interpreting the findings of this research. The following section describes the limitations associated with stroke clinical guidelines relevant to this research program, modifying the Delphi from a traditional process, the number and size of specific allied health disciplines contributing to the audit tool development, and limitations of the clinical record audit.

6.4.1 Clinical guidelines

General limitations relating to clinical guidelines have been discussed in Chapter 2. This section discusses how adherence levels may have been affected by clinicians using clinical judgement or the grade of research evidence based on NHMRC categories (Grade A – trustworthy to Grade D – weak or apply with caution) (NHMRC, 2010).

SF clinical guidelines state that if there was clear and trusted evidence or consensus of expert opinion the word “should” was used. Whereas when the evidence was less clear or there was significant variation in the expert opinion the word “can” was used (SF, 2010a). SF clinical guidelines are intended to be a guide towards appropriate practice for the management of people with stroke. Guidelines are not intended to be inflexible but rather are aimed at assisting clinicians with the management of stroke survivors by integrating this knowledge along with their clinical judgement (SF, 2010a). Clinicians may have opted to move away from SF clinical guidelines based on their clinical experience or individual factors, which may have contributed to the lower adherence level observed for some guidelines. As this audit only reviewed the clinical record documentation for data collection any reasons that individual clinicians may have had for not implementing the SF clinical guidelines could not be explored.

One reason that clinicians may have not adhered to the SF clinical guidelines may be their perception (true or otherwise) that the guideline was based on weak research evidence. Similarly if the clinical guideline was suggested as a good practice point, clinicians may have not implemented the guideline based on their experience. The stroke audit tool used in this program of research did not consider the grade of research supporting each guideline potentially contributing to low adherence levels. This approach is similar to that used in the SF national audits where the audit tools used do not consider the grade of research in their development.
Interestingly, all identified stroke audits assessing benefits from adhering to stroke clinical guidelines considered all stroke clinical guidelines as ‘equal’ regardless of the grade of research (Duncan et al., 2002; Hubbard et al., 2012; Quaglini et al., 2004; Reker et al., 2002). Regardless, better adherence to stroke guidelines has been shown to be associated with benefits of improved functional recovery and (Duncan et al., 2002; Hubbard et al., 2012) increased chance of returning home for stroke survivors (Hubbard et al., 2012; Reker et al., 2002), along with reduced length of stay and therefore reduced health costs (Quaglini et al., 2004), and improved satisfaction with the stroke service (Reker et al., 2002).

6.4.2 Modified Delphi process

The Delphi process was modified for this study. A Delphi process is subject to numerous modifications (McKenna, 1994). Modifying a Delphi is expected and common, as the focus of a Delphi is on understanding the complexity of the social sciences (McKenna, 1994). However, too many modifications may impact on Delphi rigour and therefore threaten its validity (McKenna, 1994). In the original Delphi process all questions included are available in the first round of voting (Hsu & Sandford, 2007), as was done in this program of research. However, typically, all included questions are also made available in subsequent voting rounds including the final round. In this research, the Delphi process was modified due to the large number of SF clinical guidelines to be considered by the allied health clinicians. SF clinical guidelines that received no votes in each round of voting were removed from the next voting round. This meant that in the first round of voting 71 SF clinical guidelines were available. However, by the sixth and final round only 31 SF clinical guidelines were available for consideration for inclusion in the audit tool. This may have impacted on the selection of the clinical guidelines included in the audit tool, as with each voting round participants had fewer guidelines to select. This modification increased the chance of reaching agreement on selected guidelines but at the same time limited individual participant choice.

Several reasons underpin the need for this modification of removing guidelines that received no votes from subsequent voting rounds including:

- the number of SF clinical guidelines to be considered (71) increasing the time required to complete the Delphi process;
the potential for participants to regard some SF clinical guidelines as more relevant to allied health practice due to the breadth of the guidelines ranging from emergency department admission through to community and long-term recovery, as well as cost and socioeconomic implications, to improve the stroke audit tool’s focus on allied health;

• minimising the variation among the disciplines; and

• increasing the likelihood of agreement among allied health clinicians.

6.4.3 Voting power of the allied health disciplines

Another potential limitation to the modified Delphi process was the different number of allied health clinicians from each discipline participating in the voting rounds. More than three-quarters of the allied health clinicians involved in the selection of the SF clinical guidelines were physiotherapists and occupational therapists (77%). As each participant had 10 votes per round, this potentially resulted in physiotherapists and occupational therapists having a larger voting ‘power’ compared to other disciplines. This may have contributed to the number of SF clinical guidelines related directly to physiotherapy and occupational therapy included in the audit tool. Six of the 12 included guidelines could be regarded as relating directly to physiotherapy and occupational therapy and included SF clinical guidelines 6.1 (amount, intensity and timing of rehabilitation), 6.2 (sensorimotor), 6.3 (physical activity), 6.4 (activities of daily living), 6.6 (cognition), and 7.15 (falls).

As a result, the audit tool may have had more relevance for both these disciplines and may not have provided an equal balance for the other disciplines. The stroke audit tool aimed to assess adherence of all allied health clinicians and ideally needed to represent all allied health disciplines. This contributed to the decision to use the 50% agreement to select the additional SF clinical guidelines 1.3 (discharge planning and transfer of care), as well as individual selected SF clinical guideline 1.7 (goal setting) and 7.1 (nutrition and hydration) to ensure relevance for all allied health clinicians. Potentially, having an equal number of allied health participants during the Delphi process might have resolved this limitation though this also may have limited engagement of the allied health clinicians with the process.
6.4.4 Clinical record audits

Clinical record audits are dependent on the documentation that is being reviewed (Gilbert et al., 1996; Wu & Ashton, 1997). As discussed in Chapter 3, there are several limitations to clinical record audits. These include being able to retrieve the clinical record itself, the completeness of the documentation once the clinical record is retrieved, and the accuracy of the documentation within a clinical record (Dworkin, 1987; Wu & Ashton, 1997). The privately funded hospital involved in this research had a tracking system of all clinical records. All clinical records requested for this study were found and available. The completeness and accuracy of documentation from this privately funded hospital was dependent on internal documentation policy and the commitment of allied health clinicians. All clinicians are registered with the Australian Health Practitioner Regulation Agency, whose code of conduct includes maintaining clear and accurate clinical records (www.ahpra.gov.au/News/2014-02-13-revised-guidelines-code-and-policy.aspx). Additionally, a strength of completing this program of research using a retrospective clinical audit is that this approach helps to minimise clinician bias (Mudge, Hart, Murugan and Kersten 2017). Clinical documentation reflects the clinical care delivered. A prospective review of clinical practice may have resulted in clinicians changing their practice or at least the documentation of their practice as a result of being observed.

Another limitation to a clinical audit is the auditor’s ability to accurately, impartially and consistently extract the data from a clinical record (Beard et al., 1992). This risk was mitigated by ensuring both inter and intra-rater reliability of the tool. The research candidate completed the intra-rater reliability testing with a prolonged period between audits of nine months to minimise the chance of remembering prior audit results. The tool demonstrated substantial consistency for inter-rater and moderate to substantial consistency for intra-rater reliability. Other research has found variation with the audit tool used within the UK national stroke audit and with the auditors applying the tool (Gompertz et al., 2001). Establishing both inter and intra-rater reliability, as undertaken in Study 1, adds rigour to the tool and process (Gompertz et al., 2001).
6.5 Conclusion

The overall aim of this research was to investigate the adherence level to SF clinical guidelines of allied health clinicians from a privately funded hospital. The research identified that allied health clinicians, using a modified Delphi process over six voting rounds, could identify and agree on SF clinical guidelines deemed relevant for inclusion in a stroke audit tool.

The 12-month clinical record audit of stroke survivors highlighted areas of adherence and service gaps across the acute, rehabilitation and combined services. Having both a minimum and aspirational level of adherence to SF clinical guidelines provided an opportunity for the audit results to be interpreted both positively and negatively; that is, to identify areas of clinical practice with high adherence and areas requiring improvement. This research program provides some insight into how allied health clinicians adhere to SF clinical guidelines and where service improvements are required. This research program also identified where the stroke service was performing well and standards that should be maintained.

This research adds to the understanding of allied health clinician adherence to SF clinical guidelines across both acute and rehabilitation services. Additionally, it helps improve the understanding of the role allied health clinicians play in implementing SF clinical guidelines at a local clinical level. The research highlighted the important role privately funded hospitals play in delivering stroke services within Australia and the issue of their low participation within national SF audits.

This research also identified the important role of local clinicians within the audit process. As local clinicians from this privately funded hospital appeared interested in becoming involved with the audit process; their opinions may add meaning to audit results and their potential to participate in the change management required. An understanding of local clinical practice performance may improve adherence to SF clinical guidelines and SF national audits can improve the understanding of local clinical practice.
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Appendices

Appendix 1. Search Strategy

A systematic review of the literature was completed. Relevant databases searched included Embase, Medline, CINAHL (Cumulative Index of Nursing and Allied Health Literature) and Pubmed using broad terms of knowledge translation, clinical guidelines and stroke to capture as much information as possible on these topics. Almost 7000 papers related to knowledge translation, clinical guidelines and stroke were identified. Following an initial cull by title and abstract, review of full text resulted in 231 papers retrieved relevant to this topic. Of the 231 papers, 61 papers were discarded on the basis of being positional papers, editorial, abstracts for conferences and thesis papers. The remaining 170 papers were relevant to the primary interest of this thesis grouped according to three categories of stroke guidelines, stroke knowledge translation and hospital based knowledge translation (acute and rehabilitation). Papers identified were specific for allied health. Literature pertaining to nursing or medicine knowledge translation were excluded.
Appendix 2. Modified Delphi Process

Please choose your 10 guidelines that are to be included in the stroke audit tool

Q1 Where do you work?
- Acute stroke unit (1)
- Rehab unit (2)

Q2 What is your discipline?
- Physiotherapist (1)
- Occupational therapist (2)
- Social worker (3)
- Speech Pathologist (4)
- Dietitian (5)

Q3
1.1 Hyper-acute Care
- Yes (1)
- No (2)

Q4
1.2 Hospital cares including:
1.2.1 Stroke unit care
1.2.2 Ongoing inpatient rehabilitation
1.2.3 Care pathways
1.2.4 Inpatient stroke care coordinator
1.2.5 Telemedicine and networks
- Yes (1)
- No (2)

Q5
1.3 Discharge planning and transfer of care including
1.3.1 Safe transfer of care from hospital to community
1.3.2 Carer training
- Yes (1)
- No (2)

Q6
1.4 Care after hospital discharge including
1.4.1 Community rehabilitation and follow-up services
1.4.2 Long-term rehabilitation
- Yes (1)
- No (2)

Q7
1.5 Transient ischaemic attack
- Yes (1)
- No (2)

Q8
1.6 Standardised assessment
- Yes (1)
- No (2)
Q9
1.7 Goal setting
☐ Yes (1)
☐ No (2)

Q10
1.8 Team meetings
☐ Yes (1)
☐ No (2)

Q11
1.9 Patient and carer/family support including:
1.9.1 Information and education
☐ Yes (1)
☐ No (2)
1.9.2 Family meetings
☐ Yes (1)
☐ No (2)
1.9.3 Counselling
☐ Yes (1)
☐ No (2)
1.9.4 Respite care
☐ Yes (1)
☐ No (2)

Q12
1.10 Palliative care
☐ Yes (1)
☐ No (2)

Q13
1.11 Stroke service improvement
☐ Yes (1)
☐ No (2)

Q14
Stroke recognition and pre-hospital care
☐ Yes (1)
☐ No (2)

Q15
3.1 Transient ischaemic attack
☐ Yes (1)
☐ No (2)

Q16
3.2 Rapid assessment in the emergency department
☐ Yes (1)
☐ No (2)

Q17
3.3 Imaging
☐ Yes (1)
☐ No (2)

Q18
3.4 Investigations
☐ Yes (1)
☐ No (2)

Q19
4.1 Thrombolysis
☐ Yes (1)
☐ No (2)
Q20
4.2 Neurointervention
- Yes (1)
- No (2)

Q21
4.3 Anti-thrombotic therapy
- Yes (1)
- No (2)

Q22
4.4 Acute phase blood pressure lowering therapy
- Yes (1)
- No (2)

Q23
4.5 Surgery for ischaemic stroke and management
- Yes (1)
- No (2)

Q24
4.6 Intracerebral haemorrhage management
- Yes (1)
- No (2)

Q25
4.7 Physiological monitoring
- Yes (1)
- No (2)

Q26
4.8 Oxygen therapy
- Yes (1)
- No (2)

Q27
4.9 Glycaemic control
- Yes (1)
- No (2)

Q28
4.10 Neuroprotection
- Yes (1)
- No (2)

Q29
4.11 Pyrexia management
- Yes (1)
- No (2)

Q30
4.12 Seizure management
- Yes (1)
- No (2)
Q31
4.13 Complementary and alternative therapy
☐ Yes (1)
☐ No (2)

Q32
5.1 Lifestyle modifications including:
5.1.1 Smoking
☐ Yes (1)
☐ No (2)

Q33
5.2 Adherence to pharmacotherapy
☐ Yes (1)
☐ No (2)

Q34
5.3 Blood pressure lowering
☐ Yes (1)
☐ No (2)

Q35
5.4 Anti-platelet therapy
☐ Yes (1)
☐ No (2)

Q36
5.5 Anti-coagulation therapy
☐ Yes (1)
☐ No (2)

Q37
5.6 Cholesterol lowering
☐ Yes (1)
☐ No (2)

Q38
5.7 Carotid surgery
☐ Yes (1)
☐ No (2)

Q39
5.8 Diabetes management
☐ Yes (1)
☐ No (2)

Q40
5.9 Patent foramen ovale management
☐ Yes (1)
☐ No (2)

Q41
5.10 Hormone replacement therapy
☐ Yes (1)
☐ No (2)
Q42
5.11 Oral contraception
☐ Yes (1)
☐ No (2)

Q43
6.1 Amount, intensity and timing of rehabilitation including:
6.1.1 Amount and intensity of rehabilitation
☐ Yes (1)
☐ No (2)

Q44
6.2 Sensorimotor impairment including:
6.2.1 Dysphagia
6.2.2 Weakness
6.2.3 Loss of sensation
6.2.4 Visual field loss
☐ Yes (1)
☐ No (2)

Q45
6.3 Physical activity including:
6.3.1 Sitting
6.3.2 Standing up
6.3.3 Standing
6.3.4 Walking
6.3.5 Upper limb activity
☐ Yes (1)
☐ No (2)

Q46
6.4 Activities of daily living
☐ Yes (1)
☐ No (2)

Q47
6.5 Communication including:
6.5.1 Aphasia
6.5.2 Dyspraxia of speech
6.5.3 Dysarthria
6.5.4 Cognitive communication deficits
☐ Yes (1)
☐ No (2)

Q48
6.6 Cognition including:
6.6.1 Assessment of cognition
6.6.2 Attention and concentration
6.6.3 Memory
6.6.4 Executive functions
6.6.5 Limb apraxia
6.6.6 Agnosia
6.6.7 Neglect
☐ Yes (1)
☐ No (2)

Q49
7.1 Nutrition and hydration
☐ Yes (1)
☐ No (2)
Q50
7.2 Poor oral hygiene
☐ Yes (1)
☐ No (2)

Q51
7.3 Spasticity
☐ Yes (1)
☐ No (2)

Q52
7.4 Contracture
☐ Yes (1)
☐ No (2)

Q53
7.5 Subluxation
☐ Yes (1)
☐ No (2)

Q54
7.6 Pain including:
7.6.1 Shoulder pain
☐ Yes (1)
☐ No (2)

7.6.2 Central post-stroke pain
☐ Yes (1)
☐ No (2)

Q55
7.7 Swelling of the extremities
☐ Yes (1)
☐ No (2)

Q56
7.8 Loss of cardiorespiratory fitness
☐ Yes (1)
☐ No (2)

Q57
7.9 Fatigue
☐ Yes (1)
☐ No (2)

Q58
7.10 Incontinence including;
7.10.1 Urinary incontinence
7.10.2 Faecal incontinence
☐ Yes (1)
☐ No (2)

Q59
7.11 Mood disturbance
☐ Yes (1)
☐ No (2)

Q60
7.12 Behavioural change
☐ Yes (1)
☐ No (2)

Q61
7.13 Deep venous thrombosis or pulmonary embolism
☐ Yes (1)
☐ No (2)
Q62
7.14 Pressure care
☐ Yes (1)
☐ No (2)

Q63
7.16 Sleep apnoea
☐ Yes (1)
☐ No (2)

Q64
7.15 Falls
☐ Yes (1)
☐ No (2)

Q65
8.1 Self-management
☐ Yes (1)
☐ No (2)

Q66
8.2 Driving
☐ Yes (1)
☐ No (2)

Q67
8.3 Leisure
☐ Yes (1)
☐ No (2)

Q68
8.4 Return to work
☐ Yes (1)
☐ No (2)

Q69
8.5 Sexuality
☐ Yes (1)
☐ No (2)

Q70
8.6 Support including:
8.6.1 Peer support
☐ Yes (1)
☐ No (2)

8.6.2 Carer support
☐ Yes (1)
☐ No (2)

Q71
9.1 Organisation of care
☐ Yes (1)
☐ No (2)

Q72
9.2 Specific interventions for the management of stroke
☐ Yes (1)
☐ No (2)
### Appendix 3. Stroke audit tool

<table>
<thead>
<tr>
<th>1.2 Hospital Care</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Was the stroke patient admitted direct to a stroke unit with a multidisciplinary team?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Was there a dedicated stroke team?</td>
<td></td>
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</tr>
<tr>
<td>Was the patient transferred to rehabilitation with staff who have stroke specific expertise?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Was the stroke patient assessed by a specialist rehabilitation team regarding the suitability for ongoing rehabilitation?</td>
<td></td>
<td></td>
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<tr>
<td>Was the stroke care coordinator involved?</td>
<td></td>
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</tr>
<tr>
<td>Was the stroke patient’s treatment managed using an acute stroke pathway?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>1.3 Discharge planning and transfer of care</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Did the patient have a home or access visit prior to discharge?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>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?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Was a discharge planner or social worker involved in discharge coordination?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Was a discharge plan check list used?</td>
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<td></td>
</tr>
<tr>
<td>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?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>1.4 Care after hospital discharge</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Was the patient referred to transitional care program, day patient program or to rehabilitation?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Was a follow up appointment organised to see a Consultant or stroke team at 3 months, 6 months and 12-months?</td>
<td></td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>1.7 Goal setting</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Were the wishes and expectations of the patient and family acknowledged?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Were the patient and family involved in goal setting?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Were the goals recorded, reviewed and updated regularly?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Was self-management training offered to the patient including active problem solving and individual goal setting?</td>
<td></td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>6.1 Amount, intensity and timing of rehabilitation</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Did the patient receive a minimum of one hour of structured therapy per day at least five days a week?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Did the patient participate in task specific group therapy (breakfast practice, reconditioning groups, physiotherapy group) or video self-modelling?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
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</thead>
<tbody>
<tr>
<td></td>
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</table>

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 maneuvers 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

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
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<tbody>
<tr>
<td></td>
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</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
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<tbody>
<tr>
<td></td>
<td></td>
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<tr>
<td><strong>6.5 Communication</strong></td>
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<tr>
<td>----------------------</td>
<td></td>
</tr>
<tr>
<td>Was the patient screened for communication problems using a form of screening tool?</td>
<td></td>
</tr>
<tr>
<td>For patients with communication difficulties (dysarthria, dyspraxia, dysphasia, dysphonia), did they receive formal, comprehensive assessment by a speech pathologist?</td>
<td></td>
</tr>
<tr>
<td>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.</td>
<td></td>
</tr>
<tr>
<td>Were alternative means of communication (such as gesture, drawing, writing or alternative communication devices) used to aid communication?</td>
<td></td>
</tr>
<tr>
<td>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</td>
<td></td>
</tr>
<tr>
<td>Were group therapy and conversation groups used?</td>
<td></td>
</tr>
<tr>
<td>Was training provided to the family/friends? Barriers should be address with training, raising awareness with friends and family</td>
<td></td>
</tr>
<tr>
<td>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?</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>6.6 Cognition</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Was the patient screened for cognition and perceptual deficits using formal screening tools?</td>
</tr>
<tr>
<td>Were patients identified to have cognitive deficits referred for comprehensive clinical neuropsychological investigations?</td>
</tr>
<tr>
<td>Did the patient receive cognitive rehabilitation?</td>
</tr>
<tr>
<td>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?</td>
</tr>
</tbody>
</table>
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?

<table>
<thead>
<tr>
<th>7.1 Nutrition and hydration</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Did the patient have their hydration status assessed, monitored and managed?</td>
<td></td>
<td></td>
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<tr>
<td>Was the patient screened for malnutrition?</td>
<td></td>
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<tr>
<td>Was the patient referred to the dietitian for ongoing management?</td>
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<td></td>
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<tr>
<td>Was the patient's nutritional status assessed by using formal assessment tools?</td>
<td></td>
<td></td>
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<tr>
<td>If the patient was nutritionally poor, was nutritional supplementation offered?</td>
<td></td>
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<tr>
<td>For patients that were unable to swallow were they fed by nasogastric tube feeding?</td>
<td></td>
<td></td>
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<tr>
<td>Was the patient's food intake monitored?</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>7.15 Falls</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Was a falls risk assessment completed using a formal tool and was a management plan implemented if there was a fall?</td>
<td></td>
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</table>
Appendix 4. Ethics Approval and Amendments

9th December 2014

Mr Philip Abery
Allied Health Rehabilitation Team Leader
John Flynn Private Hospital
42 Ireland Drive
TUGUN Q 4224

Dear Mr Abery

Protocol 14/65
Adherence of Allied Health Staff to stroke clinical guidelines in acute stroke and rehabilitation unit settings: a retrospective chart audit.

Thank you for submitting the above research application for ethical review. The following documents were considered by the Greenslopes Research and Ethics Committee at the meeting held on Monday 9th December, 2014.

- Letter of Support from John Flynn Private Hospital
- Appendix B – Application form dated 24th November 2014
- Appendix C – Consent Form
- Appendix D – Patient Information Sheet
- Full project proposal

After reviewing these documents the committee agreed to grant ethical approval to conduct this study at John Flynn Private Hospital.

The Greenslopes Research and Ethics Committee is constituted and functions in accordance with the National Statement on Ethical Conduct in Human Research (2007) - updated March, 2014.

Greenslopes Research and Ethics Committee continuing approval is subject to the following conditions being met:

1. Conditions
   - The Greenslopes Research and Ethics Committee will be notified, giving reasons, if the project is discontinued at a site before the expected date of completion.
   - The Coordinating Investigator will provide an annual report to the Greenslopes Research and Ethics Committee and at completion of the study in the specified format.
   - It is important that you inform the Ethics Committee immediately of any problems which arise during the course of the project which may have implications relating to the ethics of continuing the project in its present form.
   - Approval is conditional upon the commencement of the project within twelve months of the date of approval being granted. If the project does not commence within this time limit then a new protocol will require to be submitted to the Greenslopes Research and Ethics Committee.
2. Reporting
   - An annual report is required to be submitted to the Ethics Secretary in a timely manner. A review questionnaire will be circulated to you annually to keep the Ethics Committee informed of the progress of the project.
   - The Coordinating Investigator will immediately report anything which might warrant review of ethical approval of the project in the specified format, including any unforeseen events that might affect continued ethical acceptability of the project.
   - Serious Adverse Events must be notified to the Committee. In addition, the Coordinating Investigator must provide a summary of the adverse events, in the specified format, including a comment as to suspected causality and whether changes are required to the Participant Information Sheet and Consent Form. In the case of Serious Adverse Events occurring at the local site, a full report is required from the Principal Investigator, including duration of treatment and outcome of event.

3. Amendments
   Amendments to the protocol should be forwarded to the Ethics Secretary for consideration at a committee meeting.

A copy of this letter should be presented when required as official confirmation of the approval of the Greenslopes Private Hospital Research Ethics Committee.

The Greenslopes Research and Ethics Committee wish you every success in your research.

Yours sincerely,

[Signature]

Dr. [Name]
Chair
Greenslopes Research and Ethics Committee
-----Original Message-----

From: Res Ethics
Sent: Friday, 20 February 2015 9:13 AM
To: Nancy Low Choy
Cc: Res Ethics
Subject: 201500025R Registration of External Ethics Approval

Dear Nancy,

Principal Investigator: Prof Nancy Low Choy
Co-Investigators: Ms Mary Lynch, Dr Suzanne Kuyys Student Researcher: Philip Abery, Ethics Register
Number: 201500025R Project Title: The adherence to the stroke clinical guidelines of both the acute
stroke and rehabilitation units: Retrospective chart audit.
Risk Level: Multi Site
Date Approved: 26/02/2015
Ethics Clearance End Date: 31/12/2015

The Australian Catholic University Human Research Ethics Committee has considered your
application for registration of an externally approved ethics protocol and notes that this application
has received ethics approval from Greenslopes Private Hospital [Reference: 14/65].

The ACU HREC accepts the ethics approval with no additional requirements, save that ACU HREC is
informed of any modifications of the research proposal and that copies of all progress reports and
any other documents be forwarded to it. Any complaints involving ACU staff must also be notified to
ACU HREC (National Statement 5.3.3)

We wish you well in this research project.

Regards,

Kylie Fashey
on behalf of ACU HREC Chair, Dr Nadia Crittenden Ethics Officer | Research Services Office of the
Deputy Vice Chancellor (Research) res.ethics@acu.edu.au
Appendix 5. Explanatory statement and consent form

Explanatory Statement

**Project Title:** The adherence to the stroke clinical guidelines of both the acute stroke and rehabilitation units: Retrospective chart audit.

**Researchers**

Supervisors – Nancy Low Choy; Mary Lynch; Suzanne Kuys
Student – Philip Aber (MPhil Program)

**Purpose of the study**

The research study will involve a retrospective chart audit to review the adherence of allied health staff to the stroke clinical guidelines (developed by the National Stroke Foundation in 2010) of both the acute stroke and rehabilitation units at John Flynn Private Hospital. To guide the audit process I am seeking your involvement as allied health professionals to participate in a collaborative planning process to inform a clinical audit tool that will be applied in the main chart audit.

The results from the study will help to identify where allied health staff adhere closely to the stroke clinical guidelines and other areas that may need to be improved.

Three premises will be tested in the research program with the following questions to be addressed:
1. Can the multi-disciplinary teams from the acute stroke and rehabilitation units identify and agree on stroke guidelines to be developed into an audit tool by using the Delphi process?
2. What is the reliability of the audit tool informed by the multi-disciplinary teams of the acute stroke and rehabilitation units identified through the Delphi process?
3. What are the knowledge gaps identified when a retrospective chart audit is completed using ‘weighted clinical guidelines’ identified through the Delphi process and applied in the respective acute stroke unit and the rehabilitation unit within a private hospital?

The study will be completed in two stages. Stage one is the design of the audit tool and the reliability testing of this tool. Stage two is the main retrospective chart audit.

You are asked to participate in stage one of the study and help inform and test the clinical audit tool to be applied during the main retrospective chart audit

**What will I be asked to do?**

You are specifically invited to participate in:

a) A Delphi voting round to inform the clinical audit tool, and  
b) A reliability study to test the reliability of the clinical audit tool when administered by a number of allied health staff

a) The designing of the audit tool is determined by using the Delphi process. The Delphi process is a series of voting rounds in order to bring about a consensus. The voting will occur in a series of rounds, after each round, I will provide feedback regarding how the team voted. In the next round you will be asked to vote again but this time factoring in the feedback from the previous round(s). The consensus is defined when 80% agreement has been reached within the team.

You will be voting online using the survey software, Qualtrics, Australian Catholic University (ACU) survey tool. A web link will be emailed to you for the voting process and feedback on how the team voted will also be emailed. How you voted will remain anonymous to the group, only I will have access to that information. I request that you do not discuss how you voted with other participants as this may affect the results or outcomes.
The 10 stroke clinical guidelines that you agree upon will form the basis of the audit tool to be used in the retrospective chart audit.

b) A reliability study is required to be completed to test the audit tool’s consistency. You are asked to participate in a 10 charts audit of stroke patients randomly selected for this phase of the study. I am seeking up to five allied health staff from different disciplines to complete an audit of the same 10 charts that I will audit – the results will be compared to analyse the reliability of the audit tool.

**Benefits of the Study**

After Stage One has been completed, a larger retrospective chart audit will be undertaken using the audit tool that has been designed and tested for reliability during stage one. The results from stage two will be analysed to assess the areas that the allied health team adhere to clinical guidelines for stroke patients. Where clinical guidelines are not met this will identify areas for future development and/or training to improve adherence to clinical guidelines within current practice. It is anticipated that longer term, improved adherence to the clinical guidelines, should lead to improved quality of care for stroke survivors.

**How much time will the project take?**

It will take you about 15 to 20 mins to complete the voting for each Delphi Round and thus up to an hour could be involved if there are 3-4 voting rounds to reach a consensus. The audit of the 10 charts of stroke survivors is likely to take you about 30 mins to complete each chart – thus up to 5 hours for each staff member could be involved. For this reason you will be backfilled for two days to complete this task should you volunteer to undertake the audit.

**Are there any risks associated with participating in this project?**

There are no risks involved in your participation – all information or data collected will not identify you in any way and will be stored as de-identified data. You can be assured that all information will be held in the strictest confidence and will not be used in any way but to inform the audit process.

**Can I withdraw from the study?**

Participation in this study is completely voluntary and you can withdraw at any time with no adverse effects on your role as a staff member of John Flynn Private Hospital.
**Will anyone else know the results of the project?**

Your confidentiality will be maintained at all times with a coded number used when entering information into the Voting system Qualtrics along with the Survey your test results into an Excel spread sheet. Thus, your personal information will not be revealed to any other parties at any time. Your test results and data may be used in journal publications, conferences or shared with other researches without revealing your personal information. All original data will be kept at Brighton Rehabilitation Unit, and a de-identified copy will be kept at ACU.

**Will I be able to find out the results of the project?**

You will be informed about the outcomes of the survey as I would like to discuss the outcomes with all allied health staff and collaboratively plan any changes and the implementation plan.

**Who do I contact if I have questions about the project?**

If you have any queries about the project, please contact either myself or my supervisors.

1. Mr Philip Abery, MPhil student Phone: +61 7 5598 9727  
   Email: aberyp@ramsayhealth.com.au
2. Principle supervisor: Prof Nancy Low Choy, Phone: +61 7 3623 7685  
   Email: Nancy.LowChoy@acu.edu.au
3. Co-supervisor: Ms Mary Lynch, Phone: +61 7 3623 7664  
   Email: Mary.Lynch@acu.edu.au
4. Co-supervisor: Dr Suzanne Kuys, Phone: +61 7 3861 6049  
   Email: Suzanne.kuys@acu.edu.au
Participant Informed Consent Form

**Project Title:** The adherence to the stroke clinical guidelines of both the acute stroke and rehabilitation units: Retrospective chart audit.

**Researchers/Supervisors**

Nancy Low Choy (PhD, MPhy- Research, BPhty)  
Mary Lynch (MPhil, BPhty Hons)  
Suzanne Kuys (PhD; PG Dip Pub Health; BPHTY Hons; B Ed St; BHM)  
**MPhil Student** – Philip Abery (BPhty Hons)

I __________________________ have agreed to take part in the above project being undertaken at John Flynn Private Hospital. I have read the Explanatory Statement and I am willing to participate in:

1. **A) The Delphi process of voting to identify the 10 stroke clinical guidelines to be audited.**  
   (Please circle) **Yes / No**  
   - I understand that the voting process is anonymous and that only the research student will have access to individual voting results.  
   - I agree not to discuss how I voted with other allied health team members.  
   - I agree to continue with the Delphi process until a consensus of 70% has been reached.

2. **B) The reliability study.**  
   (Please circle) **Yes / No**  
   - I agree to audit 10 charts.  
   - I agree to attend an education session on the audit tool.  
   - I agree to read and adhere to the Privacy Policy of Ramsay Health.
I understand that any information I provide is confidential, and that no information that could lead to the identification of any individual will be disclosed in any reports on this project or to any other party. I also understand that my participation is voluntary and that I can choose not to participate in part or the entire project and that I can withdraw at any stage of the project.

Participant Name: __________________________________ (please print)
Signature: ___________________________________ Date: __________

Independent witness Name: ________________________ (please print)
Signature: ___________________________________ Date: __________

Researcher’s name: _______________________________ (please print)
Signature: ___________________________________ Date: __________