An Exploration of the Nursing Role in a Telehealth Based Stroke Secondary Prevention Program.

Submitted in total fulfilment of the requirements of the degree of Master of Philosophy.

April 2015

David A. G. Jackson.

Department of Medicine and Health Sciences. School of Nursing. The University of Melbourne.

Correspondence concerning this work should be addressed to David Jackson,
Department of Neurology,
The Royal Melbourne Hospital,
Grattan St
Parkville, Victoria 3050.

Produced on archival quality paper
Abstract

This research study set out to explore a specialist nursing role in the field of Telehealth for chronic disease management. This study aimed to explore the role of the nurse through measurement of nursing activity during the one-year period of participant follow-up. The study aimed to effect long-term secondary prevention of stroke through an evidence based approach to the management of modifiable cardiovascular risk factors and post stroke depression in the community setting.

Research suggests that up to 80% reduction of risk of successive stroke can be achieved if recommendations from evidence-based guidelines are implemented. Notwithstanding these findings a gap exists in the implementation of preventative strategies for stroke survivors in the community.

Results from previous research indicate that Telehealth is cost effective and potentially may significantly reduce socioeconomic burden and the probability of successive stroke. A small number of studies have highlighted potential mechanisms through which Telehealth can benefit the stroke survivor, carers, families and health professionals. Researchers have recommended more research into Telehealth in order to develop and to define effective interventions. A pilot randomised controlled trial (RCT) conducted at two metropolitan hospitals showed positive results in risk factor and depression outcomes. Integral to this model of care was the role of the nurse.

In the current nurse-led, nested multicentre RCT, study nurses gained increased telephone access, to follow-up and support stroke survivors and their General Practitioners. There were 93 participants (43 intervention) recruited from four metropolitan hospitals over a period of two years. Nursing staff were integrated with the multidisciplinary team in designated stroke centres and General Practitioners in the community. Specialists were available to
participate in shared care. Telephone follow-up was initially attenuated by risk for second stroke, with high-risk individuals receiving a greater frequency of follow-up.

The results indicated that nurses engaged in both fundamental nursing process and advanced activities to assist stroke survivors through transitions across the health landscape after stroke. Case management, assessment and care planning were frequent fundamental activities and occupied a relatively large percentage of the nurse’s time.

The mean difference in outcome systolic blood pressure was significantly improved in the intervention group. The mean difference in post stroke depression screening score was significantly better for the intervention group. Lifestyle modification in particular physical activity was better in the intervention group. The results add support to the place of nursing in the ongoing care of stroke survivors in the community setting.
Declaration

This thesis comprises only my original work towards the Master of Philosophy except where indicated in the text. Due acknowledgement has been made in the text to all of the other material used. The thesis is less than 40,000 words in length, exclusive of tables, figures, bibliographies and appendices.

Signed:

Date:
Acknowledgements

There were many kind people to whom I would thank for their efforts in providing support during the course of this thesis. I am especially grateful to Associate Professor Stephen Elsom for his generosity with time, counsel, clarity of thought, unflinching courage and unwavering support.

Excellent support was provided from the School of Nursing, Melbourne School of Graduate Research, the Office for Research Ethics and Integrity and the Melbourne Health Research Directorate. In this respect I am grateful to Associate Professor Marie Gerdtz, Associate Professor Bridget Hamilton, Professor Elizabeth Patterson, Professor Ian Van Driel, Dr Angela Watt, and Professor Ingrid Winship. Ms Debra O’Connor, Professor David Ames and Mr Dallas Ware provided critical support during pivotal moments.

I was fortunate to commence in research under the directorship and guidance of Professor Stephen Davis. Professor Davis has supported my role within the Department of Neurology and provided all necessary resources to complete this project and make this nursing-led study a reality. I am similarly grateful to the group of renowned investigators for their acceptance of this nursing study and access to their respective stroke units. In another scheme, this research would not have been at all possible if not for the support from the Health Care Fund (HCF) Research Foundation.

My phenomenal colleagues; Melissa Ugalde, Louise Weir, Anne Claxton, Andrea Moore, Karen Bartholomeusz and Adrianna Cartwright provided volumes of expert knowledge and counsel and all worked with particular enthusiasm and focus to integrate this novel role. This group of dedicated senior nurses were of ultimate importance in the completion of this work. In the background, Associate Professor Peter Hand, doctors’ Hans Tu, and Bruce Campbell, maintained an ongoing interest in this study and provided unrestricted access to stroke unit patients in this highly competitive research arena.
I thank Roshani Prematunga, Zewdu Wobalem and importantly Lucy Busija for the expert assistance provided in developing an understanding of the beauty of, and challenges within, statistical analysis, including an appreciation of the sometimes-serendipitous nature of the discovery process.

My family Bronwyn, Levi and Ari, have been most patient and tremendously understanding throughout the development and implementation of this research project and further along the long - sometimes unbelievably steep, twisted, rutted - road of the thesis. Together we hurtled along and my dear family made many sacrifices. I offer them always my deeply heartfelt thanks.

I have my loving parents Kathleen and Samuel to thank for the spirit of enquiry they quietly encouraged, their grounding in the principles of honesty and integrity and for the excellent opportunity in education that they worked so very hard to grant.
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**Introduction**

This chapter aims to describe the background to the current study and provide an introduction and rationale that includes the process of literature review and identifies the key factors that shaped the study’s development and implementation. Additionally, the chapter provides a summary of the aims of the successive chapters.

**Background to this Study**

The study evolved during the period 1998 – 2008, through ongoing review of the literature and through consistent interaction and experience with dedicated health professionals at the Royal Melbourne Hospital, the Melbourne Brain Centre and the University of Melbourne. As a Stroke Research Coordinator in the Department of Neurology in a Designated Stroke Centre of Excellence, the author gained exposure to the vast expanse of stroke related research, treatment, care, and prevention based strategies. The ability to follow a patient’s transition through the health care landscape in both the private and public hospital sectors was invaluable in writing this manuscript. A privileged vision extends from the hyper-acute phase of ambulance pre-call, to the time dependent domain of emergency room care, the Intensive Care Unit, High Dependency Unit, Stroke Care Unit, and rehabilitation, to home and reintegration into the community. This interaction with survivors, carers and the group of health professionals and researchers focussed upon stroke and stroke prevention guided this research from the beginning.

**The Primary Care, Evidence-Practice Gap. Nursing, Social Work and Medicine**

**Integrated with Telehealth**

Identification and management of modifiable risk factors has become an important component of medical management of chronic disease. The Framingham study, an epidemiological, longitudinal community-based cohort study, has studied health and the occurrence of cardiovascular disease and stroke since 1948. From this landmark study, and
others, evidence has amounted to support the importance of designing effective evidence based strategies to manage and treat modifiable cardiovascular risk factors in an effort to reduce stroke incidence. A number of clinical trials have shown that effective treatment and management of cardiovascular risk factors has directly improved stroke outcomes and contributed to a decrease in the lifetime risk of stroke (Hachinski, 2002; Seshadri & Wolf, 2007; Yusuf, 2002).

Prevention of Chronic Disease has featured prominently on the international health agenda and remains topical in the current clinical research arena. The ideal of preventing disease is embodied in definitive statements from all peak bodies in health care. The World Medical Association (WMA) Declaration of Helsinki (2008) provides a foundation upon which to build research initiatives to prevent disease (64th WMA General Assembly, 2008). The American Heart Association (AHA), American Stroke Association Guidelines for the Prevention of Cardiovascular Disease (Sacco et al., 2006) and similar guideline documents from The National Stroke Foundation (NSF) ("National Stroke Foundation. Clinical Guidelines for Stroke Management," 2010) in Australia substantiate the global concerns that prevention of disease is fast becoming of utmost importance in reducing the burden on our existing hospital systems, health budgets and ultimately upon society. Combined, the documents provide guidelines, evidence, recommendations and goals for clinicians and health researchers to achieve results locally, nationally and ultimately globally.

In the domain of cardiovascular risk factor management for stroke prevention, available evidence suggested that by aggressively managing treatable risk factors, up to 80% reduction in risk of successive stroke was possible (Rothwell, Algra, & Amarenco, 2011). Policy makers, governments and peak health organisations called for improved models of care to combat the growing socio-economic burden of stroke. However, even though the evidence existed to support the benefits of secondary prevention and risk factor control, there was limited uptake
of the evidence at the primary care level (Touze et al., 2008). This lack of translation of evidence into practice prompted government and policy makers to call for and enable the design and development of systems of care aimed at implementing evidence-based guidelines (Schwamm et al., 2009).

Commencing in the year 2000 the author held the position of Research Officer for the General Practice Evaluation Program Grant: GPEP 791. Researchers from the Royal Melbourne Hospital, University of Melbourne, Epworth HealthCare and the Blackburn Specialist Clinic embarked upon pilot research to study the effects of evidence based risk factor control in a shared care initiative with stroke survivors and General Practitioners (GP’s) in the community setting. The pilot study was designed in response to statements provided by the WMA, ASA and the NSF. This secondary prevention model employed a nurse to perform surveillance of stroke survivors’ progress in the community on a quarterly basis, coordinate study specific General Practitioner (GP) appointments and when necessary facilitate shared care between hospital based stroke physicians and participants GP’s (Joubert et al., 2006). The outcomes of the pilot study demonstrated that evidence based, community oriented, systematic, follow-up of stroke survivors', that included coordinated input from nurses, specialists and GP’s, demonstrated improved management of modifiable vascular risk factors and improved depression screening scores at one-year after discharge from an acute facility.

The pilot study was built with the intent of creating a bi-directional flow of information between specialist services and GP’s as coordinated/facilitated by a nurse. The study used a set of standard documents and templates to communicate with and report to participants and GP’s at predetermined intervals. The study relied upon quarterly telephone follow-up of participants and subsequent reporting of the findings to the participants GP via faxed report. The GP recorded their patient’s risk factor measurements on a chart and faxed these results to the nurse for review and to allow potential referral to specialist services, if necessary, in a process of
shared care. Control subjects were exposed to the standard of care available for stroke survivors discharged to the care of their GP in the community and follow-up occurred at 12-months.

From a medical perspective the results echoed the conclusions and recommendations drawn by previous research, that by applying evidence-based guidelines to this population of stroke survivors it was possible to improve risk factor control. The investigators agreed that further testing of the model on a larger population was necessary to understand the mechanisms and to demonstrate results that may translate to program development, to other disease groups and to other geographical locations. The questions arose as to what would enhance the process of care.

In line with key recommendations of the Victorian Stroke Care Strategy, from a nursing perspective, there arose an imperative to understand what aspects of the interaction between the stroke survivor and study nurse lead to improved outcomes in risk factor control, post stroke depression (PSD) management and in enhanced reintegration to the community (Department of Human Services, 2007). In the pilot study the study nurse was in person-to-person contact with the survivor pre-discharge, at discharge, and 2-weeks after discharge during an accompanied visit to the participants GP. Throughout the one-year follow-up, the study nurse was in telephone contact with the participant at 3-monthly intervals through a series of pre-visit and post visit calls. During the pilot study this telephone communication, was not captured in detail in the data collection and not considered in the analysis.

For the investigator, a number of key themes emerged from the pilot research that through experience and review of the literature, combined to excite enquiry into understanding and potentially enhancing the piloted model of care. There was a wealth of research, embodied in both local and international guidelines, aimed at implementing long-term evidence based secondary prevention (Sacco et al., 2006). The implementation and maintenance of effective preventative strategies in the first year following stroke was reinforced as being of utmost
importance in the prevention of further stroke, vascular morbidity and vascular death (Holloway, Benesch, & Rush, 2000). GP’s had an important role in secondary prevention, but a gap existed in the translation of research findings in secondary stroke prevention into practice in the community. This gap in translation was exacerbated by a documented therapeutic inertia at the primary care level (Touze et al., 2008). There was a demonstrated area for improvement in communication flow between specialist services and primary care physicians (Gibbs, Newson, Lawrenson, Greenhalgh, & Davies, 2001). There was a need to improve the continuum of care for stroke survivors and their families and their transition through varying and often difficult to traverse, health care landscapes (Cameron, Tsoi, & Marsella, 2008)

After an initial review of the literature it was apparent that few studies existed that had taken on the challenge of trialling community based strategies aimed at secondary prevention of stroke. Most of the studies were limited either by a focus on a particular component of community-based prevention or by an approach constrained within the discipline from within which the research emanated. From a trans-disciplinary approach, taking into account the input from nursing, medicine and social work, the following questions were considered:

1. Would the level of activity of the nurse interactions with stroke survivors correlate with improved health outcomes?
2. Would the relative time spent in engaging with the stroke survivor have an impact on health outcomes?
3. How would the frequency of contact between nurses and stroke survivors’ impact on health outcomes?
4. Would there potentially be high impact interactions between nurses and stroke survivors that were linked with positive health outcomes?

After a period of reflection and review the group of researchers gained funding from the Health Care Fund (HCF) – Health and Medical Research Foundation to test a revised model
on a larger population of stroke survivors in a range of different settings. During the design phase, the investigators gained a greater understanding of developments in Telehealth and how the model’s relatively simple use of information communications technology (ICT), dovetailed with ongoing developments in this modality of disease management. During the design phase the investigators agreed to add a component of nurse-led telephone follow-up of intervention participants in the community, adding to the quarterly follow-up and reporting in the pilot shared care model. This added component of telephone contact with stroke survivors, their families and GP’s forms the basis of the investigation contained in this thesis.

Chapter Two sets out to describe the current international climate of stroke treatment and care from the formal review of the literature. The chapter includes an epidemiological review, including the economics of stroke in the developed and developing world and a description of population distribution that considers possible future trends in growth. The review documents the major evidence based advances and directions taken in stroke care in the past 20 years including review of relevant medical, pharmacological and surgical therapy. The review documents previously researched and implemented systems and models of care. The review describes the participants, the modalities and measures of the delivery of acute, sub-acute and post stroke care with a major focus on secondary prevention. The aim of the chapter is to suggest how this novel Telehealth based research integrates with health policy, current health system developments and in filling the gap in long-term secondary prevention in the community setting.

The literature published up to 2012 was searched for relevant papers. The search strategy comprised searching five electronic databases (Embase, MEDLINE, CINAHL, PsycINFO and Cochrane Library), scrutinizing of reference lists from empirical studies that met the inclusion criteria, and from relevant review articles, and other databases/search platforms, and thorough searching of indices of journals related to the topic area. In addition
grey literature from the Australian Department of Health and Ageing and the National Stroke Foundation were searched for relevant publications that might further inform the literature review process and search terms.

Key words used in the search were stroke* OR cerebrovascular* OR transient ischemic attack* AND risk* AND prevention* AND caregiver* AND telephone* OR computer* OR internet*. Medical Subject Headings (MeSH) influenced key words, as did suggested key words from the databases. The search was conducted between August 2008 and April 2012. In each database search, the search terms were refined as additional review articles and studies were located.

Chapter Three provides the methodology, detailing the design, measures, and data collection and clarifies how this study fits within a larger multidisciplinary, multi-centre randomised controlled trial. Chapter Four reports the findings of this nursing research. Chapter Five discusses the findings in the context of the current and projected future health care climate and considers the relevance to the development of future strategies in stroke prevention. Chapter Six draws conclusions about the research and comments on how the findings may be used to promote further nursing and trans-disciplinary research into improving outcomes for stroke survivors.
Literature Review

Stroke Epidemiology in the Developed World

Incidence. Based upon ageing populations in select countries of the European Union, the World Health Organisation (WHO) predicted a 27% increase in stroke by 2025 (Goldstein & Rothwell, 2007). In 2008 it was reported that 780,000 Americans had experienced a new or recurrent stroke (Gibbons et al., 2008). Two-years later an American report indicated an incidence of 795,000 new or recurrent strokes (Reeves et al., 2010). Australian statistics estimated an annual incidence of 60,000 strokes ("National Stroke Foundation. Clinical Guidelines for Stroke Management," 2010). The Australian Institute of Health and Welfare (AIHW) report on Australian stroke management detailed that modelling, factoring in an ageing population, projected the annual incidence would increase to 108,000 by 2030 (AIHW: Senes, 2006). Importantly the report made the point that only by reducing stroke incidence rates by 2-3% would it be possible to maintain annual rates of incidence similar to the current rates. Persons born in 1946-1964 aged 55 and older would be the fastest growing proportion of the population in developed countries, presenting policy makers with the greatest challenges in terms of health care needs (Mason, 2009). In the U.S. in the period 2010 – 2030, researchers predicted that the number of residents in this category would nearly double; over 65 year olds would rise from 12.4% (2000) to 19.6% (2030), with many exhibiting a high risk for cardiovascular events.

Mortality. At the time of writing, review of the literature by Bonita and Beaglehole (2007) indicated that globally one in ten deaths were stroke related. Worldwide there were 5.7 million stroke related deaths each year with most occurring in low to middle income countries. Modelling demonstrated that by 2015 and 2030 mortality would increase to approximately 6.3 and 7.8 million deaths per year respectively. Over 65 year olds would contribute to 88% of stroke related deaths (Mason, 2009). In the U.S. deaths attributed to ischemic stroke would
potentially double in the period 2000 – 2032 (Gibbons et al., 2008). The report by Reeves et al. (2010) stated that 137,000 stroke related deaths had occurred annually in the U.S.

A review on a small number of prospective community based studies for long term prognosis after stroke or Transient Ischemic Attack (TIA) reported that mortality from recurrent stroke (approx. 9 -14 %) was highest in the first 30 days to 12 months after an index stroke or TIA (Hardie, Hankey, Jamrozik, Broadhurst, & Anderson, 2003). After 30 days of experiencing a first ever stroke, survivors continued to die at a rate of 10% per year for the next 5 years, this being two-fold greater than the rate of mortality experienced by the general population (Hankey, 2005). Hardie et al. (2003) made the point that the most likely predictors of mortality in the first year were age, presence of atherosclerosis (especially >50% stenosis of large cerebral arteries) and to a lesser extent ischemic heart disease and diabetes. The primary cause of death was recurrent stroke or as time progressed beyond the first year, vascular death. The independent predictors of increased mortality were atherosclerotic plaque accumulation (TIA or intermittent claudication of limbs), pre-existing disability (Barthel Index less than 20) and urinary incontinence. After the first year post stroke and extending to 5 and 10 years, the risk of mortality related to recurrent cerebrovascular event decreased. However, the risk of mortality related to other cardiovascular causes i.e., related to atherothrombosis, atrial fibrillation and cardiac failure, significantly increased. More recently studies indicated that at 5 years approximately 60% or stroke survivors were deceased and at 10 years 86% of stroke survivors were deceased related to a vascular cause (Cadilhac, Carter, Thrift, & Dewey, 2009; Weibers, Feigin, & Brown, 2006).

On the subject of stroke related mortality, Gibbons et al., (2008) indicated that it was important to note that in the U.S. for example, the original 15-year goal for a 25% reduction of mortality related to stroke was met ahead of target. More patients survived an initial stroke and
it was made it clear that such results opened new challenges for clinicians, researchers and policy makers related to the ageing population.

**Survival.** Research suggests that at 5 years after first stroke, survival is about 40% and about half of the survivors are disabled and dependent (Hardie et al., 2003; Weibers et al., 2006). Figures reported in 2010 indicated that 6.5 million Americans were stroke survivors. Factors that influenced the growing prevalence of stroke in the community were the expanding older population and a greater survival rate related to medical advances (Kelly-Hayes, 2010). According to Miller et al., (2010) approximately 50 million stroke survivors existed worldwide.

**Recurrence.** Importantly for this study, previous research indicated that one in six survivors of a first stroke may experience a second stroke within six months and furthermore that approximately 14% of survivors would experience a second stroke in the first year following the first event (Miller et al., 2010). Australian statistics indicated that approximately 12% of stroke survivors would have a recurrent stroke within 12-months of an index event (Hardie et al., 2003). Within 5 years, 25 - 30% of survivors suffered a second stroke. Research indicated that at 10 years, 43% of stroke survivors’ experienced recurrent stroke. Major predictors of recurrent stroke were atherosclerosis of greater than 50%, age and diabetes (Cadilhac et al., 2009).

**Stroke in Developing Countries**

Stroke was the second most frequent cause of death in developing countries with growing and ageing populations compounding the incidence of stroke (Lyons & Rudd, 2007). China held 20% of the world’s population with approximately 40% of strokes in developing countries occurring in China (Wei et al., 2010). Incidence was further exacerbated by the increase in modifiable risk factors especially in urban populations (Bonita & Beaglehole, 2007). The impact of the advent of greater wealth, especially in urban areas, and the growing prevalence of risk factors was increasingly similar to those of developed nations. There was
strong emerging evidence that stroke was not only a disease of wealthy nations, but that more and more middle aged (30-69 year olds) were affected in less wealthy countries e.g., India, Pakistan, Brazil, China and Russia. Poverty and socio-cultural factors; including limited infrastructure (transport, buildings, medical personnel) and limited finance, made it difficult to create and maintain public sector, population based, prevention strategies which were cited as major causes of increasing stroke rates in the developing countries (Pandian, Srikanth, Read, & Thrift, 2007). There was potentially a growing need for new models of prevention and care.

**Rural and Remote Areas**

In 2004, 57% of the world population lived in rural conditions (Strong, Mathers, & Bonita, 2007). With a worldwide incidence of 5.7 million strokes in the year 2005, approximately 87% of these strokes occurred in middle to low-income countries where approximately 80% of the population resided in rural conditions. Statistics indicated that in the U.S. stroke was 1.45 times more likely to occur in a rural area than in an urban area (Adams, Hendershot, & Marano 2005).

In developed countries, disadvantaged groups, e.g., indigenous citizens and migrants living in rural conditions, were more likely to experience disability after stroke primarily related to a lack of access to services (Casey, Call, & Klingner, 2001). Disability was high, with approximately 66% of stroke survivors experiencing at least one significant disability (Walker et al., 2000). In rural settings there was a high case fatality for stroke patients in emergency departments (Yiannakoulas et al., 2004). In rural areas of high, medium and low development countries fatality and prolonged disability correlated with general unavailability of computed tomography (CT), thrombolytic therapy, neuro-interventionist services, stroke teams and limited access to specialist Stroke Care Units (Brainin, Teuschl, & Karla, 2007; Gebhardt & Norris, 2006; Read & Levy, 2005). Hospitals in rural areas were less likely to follow evidence-based guidelines and accepted strategies for reducing case morbidity and
mortality. In rural New South Wales only 50% of hospitals used accepted national best practice guidelines for the treatment and prevention of stroke. In rural NSW there were no specialist stroke nursing positions compared with 21 in urban settings (Read & Levy, 2005).

Other reasons described as impacting on access to effective treatment and rehabilitation services in rural and remote areas included that populations were less likely to understand signs of stroke and have knowledge of cardiovascular risk factors (Harwell et al., 2005).

**Economic Considerations: Cost and Burden of Disease.**

The estimated annual cost to society for first ever stroke in Australia was approximately AUD $2 billion per annum with approximately 2% of Australian Health Care expenditure (approx. AUD $1 billion in direct government contribution) devoted to Stroke (Cadilhac, Dewey, Vos, Carter, & Thrift, 2010). In developed countries, stroke accounted for more than 4% of direct health-care expenditure. In Australia, the average lifetime cost for ischemic stroke (IS) was AUD$ 64,733 and AUD$ 54,721 for intracerebral hemorrhage (ICH) (Cadilhac et al., 2009). Long-term cost estimates were higher for IS related to greater use of aged care, rehabilitation and community services. In the first year, cost of ICH was reported proportionately higher related to cost of hospitalization, rehabilitation, aged care, use of community services and out of pocket expenses. In the long term the estimated cost for IS was reported as greater related to re-hospitalizations related to complications and recurrent events, caregiver costs, medications, investigations, respite care, and GP care.

In the U.S., the lifetime cost of IS was estimated at $140,000 (including inpatient, rehabilitation and follow-up costs) (Miller et al., 2010). Approximately 30% of this was available for rehabilitation, follow-up and recovery, with the bulk (70%) being spent on acute inpatient care. The total direct and indirect cost for cardiovascular disease and stroke in the US in 2008 was approximately $448 billion (Gibbons et al., 2008). One quarter of the aggregate cost of hospital care in the US was for stroke and cardiovascular disease. In terms of direct
health expenditure; in the US the absolute cost of stroke was approximately US $40 billion compared with approximately £9 billion in the United Kingdom (Rothwell et al., 2011).

Stroke-related disability was listed as the sixth most common cause of reduced disability-adjusted life-years (DALYS) in 2002 (Rothwell et al., 2011). By 2030, stroke was predicted to rise to the fourth most common cause, related in part to the ageing population base. However, in 2009 stroke was documented as the fourth leading cause of DALYS related to the increased prevalence of lifestyle factors (physical activity, tobacco, alcohol and diet) and raised BP and Cholesterol (Gorelick, 2009).

A group of Australian researchers used the Assessment of Quality of Life (AQoL) to describe Quality-adjusted life years (QALYS) for the Australian stroke population from data describing the population up to 5 years following a first ever stroke (Cadilhac et al., 2010). The study reported the important differences between genders and between the major stroke subtypes. QALYS lost for ischemic stroke in males were 4.69 (SD 0.38), females 5.51 (SD 0.46) and in intracerebral haemorrhage QALYS for males were 5.82 (SD 0.67) and females 6.50 (SD 0.40).

**Acute Stroke Management**

To understand the need for improved community based secondary prevention, it is important to grasp how acute stroke therapies and management have contributed to survival. Studies indicated that the crucial features of acute stroke care were: Improved door to needle time for thrombolysis, provision of education to the community, hospitals and paramedics, the development of designated Stroke Centres, selective stroke triage including timely assessment and evaluation and providing improved quality of care and access to Stroke Care Units (SCU) (Goldstein & Rothwell, 2007). Much importance was placed on the availability of the multidisciplinary stroke team in both hospital and community settings and the adherence to and
implementation of care according to guidelines and standardized care pathways in the hospital setting.

**Thrombolysis.** Based upon the results of the NINDS and ECASS series of trials, performing thrombolysis for stroke patients with tissue plasminogen activator (tPA) within 0 – 4.5 hours of onset of an ischemic stroke was the most effective aggressive form of pharmaceutical therapy approved for acute IS treatment (Robinson, Zaheer, & Mistri, 2011). A large amount of research funding had been proportioned into numerous ongoing research efforts that continued to attempt to extend the window of treatment opportunity beyond 4.5 hours by selecting patients most likely to benefit from thrombolysis, either by using novel agents, enhanced diagnostic imaging techniques coupled with specialised software and/or a combination of both (Davis et al., 2008; Donnan, Howells, Markus, Toni, & Davis, 2003; Hacke et al., 2005; Hacke et al., 2008). Other acute strategies described involved the use of targeted intra-arterial (IA) thrombolysis and clot retrieval using a mechanical device coupled with IA tPA (Khatri et al., 2008).

**Door to needle time.** Studies indicated that a most important contributor to successful tPA outcomes was reduced door-to-needle time. Systems that contributed to effective delivery of tPA for acute stroke were categorised as pre-hospital, intra-hospital and inter-hospital systems (Switzer & Hess, 2008).

**Pre-hospital.** Strategies tested to improve time to hospital included enhanced paramedic diagnosis in the field, improved systems for directing stroke patients to emergency departments at Designated Stroke Care Centres and improved community awareness of stroke, its symptoms and the importance of time in seeking treatment (Department of Human Services, 2007; "National Stroke Foundation. Clinical Guidelines for Stroke Management," 2010).
Intra-hospital. Intra-hospital systems consisted of ideas to improve the pre-notification of ED teams, timely notification of specialist stroke teams (code stroke) and reducing the time from arrival at hospital to CT scan (Schwamm et al., 2009).

Inter hospital systems. Inter hospital Systems included strategies used when it was impossible to transport a stroke patient to a recognized stroke centre i.e., in rural and regional scenarios (Frey, Jahnke, Goslar, Partovi, & Flaster, 2005; Hess et al., 2006). Three separate thrombolysis support scenarios were documented as possibilities for improving outcomes. Ship and Drip patients were evaluated in the regional centre and then if time permitted transported to a stroke centre. Trip and Treat, whereby a stroke specialist was dispatched to the regional centre. Drip and Ship was the most effective of these strategies, where a stroke neurologist and regional physician confer by telephone then if indicated commence administration of tPA at the regional centre, subsequently initiating transport to the urban centre while the tPA is being infused.

Telemedicine. Telemedicine or Telesstroke was a logical extension of the Drip and Ship strategy, allowing stroke physician’s web based video access to rural or remote patients, to observe, assess and evaluate diagnostic criteria, including digitalised diagnostic scan results (Hess et al., 2006). (Table 1. outlines a number of important telemedicine systems tested and currently available for use in acute stroke.)

Stroke Care Units.

Alongside tPA and aspirin, the SCU was the only other evidence-based intervention that improved stroke outcomes (Weir & Cadilhac, 2007). Hospital based organised stroke care in SCU’s was beneficial in reducing mortality at 3, 7, 30 days and 1 year for all stroke subtypes (Brainin, Tatschl, & Teuschl, 2009; Saposnik et al., 2011). Studies emphasised the importance of SCU multidisciplinary specialist stroke teams, and advocated that the calibre of individuals in these care settings was of high importance.
### Table 1
**Examples of acute telemedicine strategies**

<table>
<thead>
<tr>
<th>Intervention Name or acronym</th>
<th>Components</th>
<th>Author/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Palm/PC Interface</td>
<td>GP used Palm/PC interface to record stroke data and transfer to stroke unit relational database. Included transfer of progress data back to the GP</td>
<td>(Meyer et al., 2008)</td>
</tr>
<tr>
<td>STRoke DOC</td>
<td>Hub and spoke broadband internet system to facilitate remote assessment for thrombolysis. Remote camera. Transfer of DICOM files (teleradiology)</td>
<td>(Quaglini et al., 2003)</td>
</tr>
<tr>
<td>REACH</td>
<td>Remote evaluation of acute ischemic stroke.</td>
<td>(Gross et al., 2006)</td>
</tr>
<tr>
<td>TEMPiS</td>
<td>System with greater flexibility and ability to connect in local rooms for the treating hub physician. Facilitated provision of education to remote physicians</td>
<td>(Audebert, Schenkel, Heuschmann, Bogdahn, &amp; Haberl, 2007)</td>
</tr>
<tr>
<td>TESS</td>
<td>As above</td>
<td>(Wiborg &amp; Widder, 2003)</td>
</tr>
<tr>
<td>TeleBAT</td>
<td>As above</td>
<td>(LaMonte et al., 2008)</td>
</tr>
</tbody>
</table>

**Stroke Nurse Specialist.** Within the multidisciplinary team the Stroke Nurse Specialist performed a pivotal role in managing patients throughout the continuum of acute and sub-acute stay while readying the patient and family for rehabilitation, discharge and reintegration to the community (Weir & Cadilhac, 2007). Major components of the role of the Stroke Nurse Specialist were ensuring: (a) assessment and comprehensive care planning, (b) management of communication between team members and problem-solving, (c) Patient and family education regarding secondary prevention, lifestyle and/or behavior change and in (d) Identifying and commencing management of patients’ modifiable cardiovascular risk factors. Other essential components of the role were, advocating on behalf of the patient, assisting with resource acquisition and providing social and emotional support.
Secondary Prevention of Stroke

Made evident in the preceding literature, the past 15 years saw an undivided focus, (including numerous advances) in the acute in-hospital care and sub-acute care of stroke patients, though less resources were expended in advancing rehabilitation and inpatient and community based secondary prevention (Miller et al., 2010). In stroke, secondary prevention was defined as therapy to prevent recurrent cerebrovascular and cardiovascular morbidity and mortality that would improve quality of life in stroke survivors at high risk of further cerebrovascular and cardiovascular events (Sacco et al., 2006).

Acute secondary prevention. Studies showed that patients presenting with stroke and TIA were at high risk for successive events in the initial hours and days (Sacco et al., 2006). Published guidelines emphasised the commencement of appropriate secondary prevention measures (antiplatelet agents or anticoagulation, antihypertensives, statins, and carotid endarterectomy), as appropriate, as soon as the origin of the stroke was confirmed.

Long-term secondary prevention. Numerous studies supported the benefits of controlling more than one risk factor for incrementally reducing the risk of successive stroke in the longer term. After analysis of the effect sizes in the EXPRESS, SOS-TIA and SPARCL trials, consensus indicated that up to an 80% reduction in risk of further stroke was possible, if up to four major modifiable risk factors were managed aggressively in the long term (Hachinski, 2002; Rothwell et al., 2011; Yusuf, 2002).

Modifiable Risk Factors

The concept of risk factors evolved from epidemiological evidence linking various predisposing health related factors to the subsequent development of a disease state (Kelly-Hayes, 2010). According to Kelly-Hayes (2010) risk factors were most relevant when they had a strong relationship to the disease and demonstrated change in the disease state when treated. Furthermore, Kelly-Hayes (2010) indicated that risk factors should be predictive of the disease,
some of the most powerful, but imminently modifiable risk factors for stroke were: high blood pressure, daily physical activity, smoking, and maintenance of a healthy weight.

the american heart association / american stroke association published guidelines define cardiovascular risk factors for stroke and provide practitioners with evidence based goals and aims for treatment (sacco et al., 2006) table 2. provides a summary of set parameters / thresholds for treating patients with out-of-range risk factor profiles.

**table 2. evidence based risk factor thresholds for secondary prevention**

<table>
<thead>
<tr>
<th>risk factor</th>
<th>goals of treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>blood pressure (hypertension)</td>
<td>consider appropriate therapy (ace inhibitor or combination acei and diuretic) aim for sbp &lt; 140, dbp &lt; 90 mmhg normal bp defined as 120/80 mmhg</td>
</tr>
<tr>
<td>physical activity</td>
<td>encourage physical activity (eg. walking) 30 minutes daily, on most days of the week. encourage walking to a comfortable limit unaided or with support. if significant disability present: recommend supervised exercise program.</td>
</tr>
<tr>
<td>weight (obesity)</td>
<td>aim for bmi = 20 kg/m² for males recommended waist circumference = 101.6 cm for females recommended waist circumference = 88.9 cm</td>
</tr>
<tr>
<td>diabetes</td>
<td>serum glucose maintained near normal glycemic levels (5.6 mmol/l fasting) hba1c should be ≤7%</td>
</tr>
<tr>
<td>hyperlipidemia</td>
<td>aim for: hdl: &gt; 0.91 mmol/l ldl: &lt; 2.59 mmol/l trig: &lt; 2.26 mmol/l</td>
</tr>
<tr>
<td>cardiac source for embolism</td>
<td>(i) atrial fibrillation: maintain inr (2-3) with target 2.5 (ii) definite cardiac source for embolus (e.g., valvular lesion, significant wall dyskinesis): maintain inr (2-3) target 2.5 (iii) prothetic valve: maintain inr (2.5-3.5) with target 3.0 for bioprosthetic valves: inr (2.0-3.0) (iv) recent mi with left ventricular thrombus: maintain inr (2-3) with target 2.5 for 3 months to 1 year.</td>
</tr>
<tr>
<td>atherosclerosis</td>
<td>(i) 70-99% stenosis: consider carotid endarterectomy (ii) 50-69% stenosis: endarterectomy to be considered potentially beneficial taking into account age, gender, comorbidities and severity of initial symptoms (iii) &lt;50% stenosis: no indication for carotid endarterectomy</td>
</tr>
<tr>
<td>smoking</td>
<td>cease smoking</td>
</tr>
<tr>
<td>alcohol</td>
<td>consumption of alcohol not in excess of 2 standard drinks per day for males and 1 for females.</td>
</tr>
</tbody>
</table>

(sacco et al., 2006)
**Blood pressure.** Hypertension remained the most prevalent, most important and readily modifiable risk factor for stroke (Rothwell et al., 2011; Sacco et al., 2006). Systolic blood pressure (SBP) more so than diastolic blood pressure (DBP) was more closely associated with stroke risk and especially in the elderly. There was good clinical trial evidence that blood pressure (BP) lowering was effective in secondary prevention of stroke. However, as numerous studies demonstrated, up to 50% of stroke or TIA patients did not have their blood pressure treated and 30-60% of patients that were treated exhibited a blood pressure above recommended limits (Touze et al., 2008).

Hypertension was associated with a continuous risk of fatal and non-fatal stroke and the likelihood of experiencing hypertension increased with advancing age (Kelly-Hayes, 2010; Rothwell et al., 2011; Sacco et al., 2006). Meta-analyses indicated that by reducing blood pressure within recommended limits, up to 30-40% risk reduction might be achieved, \( OR 0.74, 0.67-0.83 \). The AHA recommended pharmacotherapy with an angiotensin-converting-enzyme inhibitor (ACEI) or diuretics, or the combination of and ACEI and diuretics. Furthermore, the AHA recommended lifestyle change in order to address several lifestyle factors that have a cumulative effect on hypertension (smoking, alcohol consumption, diet, weight, and physical activity).

**Physical activity.** Physical activity was strongly related to the risk of first and successive strokes (Kelly-Hayes, 2010). Sedentary behaviors contributed to increased stroke risk, recurrent stroke risk and to recovery potential. Kelly-Hayes (2010) found numerous studies indicated that persons engaged in active lifestyles had a lower risk of stroke. Moderately active individuals had a 20% lower risk and highly active individuals a 27% lower risk. Even mild exercise such as walking was associated with a lower risk. Physical activity promoted cardiovascular health, lowered BP, reduced levels of plasma fibrinogen and the aggregability of platelets, improved vasodilation and glucose tolerance and lowered weight (Sacco et al.,
2006). Physical Activity although challenging for the stroke survivor was potentially achievable through behavioral change strategies and through participation in organised therapeutic activity regimes.

**Obesity.** The AHA Guidelines defined obesity as a Body Mass Index (BMI) >30Kg/m² (Sacco et al., 2006). In developed countries there was a marked increase in the prevalence of obesity with 63% of men and 55% of women considered overweight and 30% of both sexes being considered obese. Obesity was strongly related with other risk factors e.g., hypertension, dislipidemia and diabetes. A number of studies suggested that abdominal obesity, measured by abdominal girth, was a more important predictor of stroke risk.

Losing weight was directly related to improvements in BP, fasting glucose, serum lipids and in physical endurance (Kelly-Hayes, 2010; Sacco et al., 2006). Promoting behavior change through counseling and recommending a healthy diet e.g., the Mediterranean Diet, was recommended to reduce the risk of stroke.

**Glycemic control.** Diabetes was recognised as a common comorbidity of ischemic stroke and was further associated with poorer short and long-term cardiovascular outcomes (Paciaroni & Bogousslavsky, 2010; Reeves et al., 2010). Diabetes was linked with a range of chronic illnesses and strongly correlated with cardiovascular and cerebrovascular vessel damage. Stroke victims with diabetes were less likely to return home, were more likely to die and exhibited greater hospital lengths of stay. The AHA and the American Diabetes Association noted the importance of aggressive management and recommend rigorous control of BP and blood sugar levels (BSL) to prevent microvascular complications with emphasis on strict control in patients with type 2 diabetes.

**Lipid Profile.** The relationship between hyperlipidemia and hypercholesterolemia and stroke was weaker than for other risk factors (Rothwell et al., 2011). However, decreasing low-density lipoprotein (LDL) cholesterol and triglycerides and raising concentrations of high-
density lipoprotein (HDL) showed clear benefits in risk reduction. Meta-analysis of numerous heterogenous clinical trial samples showed that using statin therapy reduced stroke risk by 18% and the risk of mortality by 13%. Lifestyle modification i.e., through diet control and adequate physical activity, facilitated by counseling and physician advice was recommended (Greenlund, Giles, Keenan, & Mensah, 2002).

**Cardiac source for embolism.** Approximately 20% of ischemic strokes and TIA arose from a cardiogenic source (Sacco et al., 2006). Half were caused by atrial fibrillation, one quarter through valvular disease and one third associated with left ventricular thrombus. Stroke survivors with a cardiac source had a high risk of recurrent stroke. Clinicians were often faced with a difficult task of choosing the correct treatment of either anticoagulant or of platelet inhibitors, based upon the sometimes difficult to interpret mechanism. Often patients would benefit from commencing anticoagulation within 2-weeks of an event with concerted efforts made to maintain the international normalised ratio (INR) within the recommended ranges. Additionally, novel oral anticoagulants e.g., Xa antagonists or direct thrombin (IIa) inhibitors such as Dabigatran, required careful selection of patients and longer-term monitoring of side-effects e.g., hepato-toxicity (Schwartz & Albers, 2010).

**Atherosclerosis.** Patients with moderate to severe (70%-90% stenosis, as per NASCET criteria, were likely to benefit from carotid endarterectomy (CEA) (Sacco et al., 2006). Those with moderate (50-69%) stenosis were less likely to benefit from surgery but with careful analysis of comorbidities and other health related factors surgery was worth consideration. Surgery was not indicated in mild (<50%) stenosis. Carotid stenting surgery was not recommended unless open surgery was difficult and the stenting surgery was to be performed by a surgeon with low morbidity and mortality rates (4-6%). The AHA recommended significant lifestyle modification including: smoking cessation, reduced alcohol consumption, healthy diet and physical activity. Medication therapy with one of or combination of aspirin,
clopidogrel, ticlopidine or dipyridamole and aspirin was recommended for patients with a high risk for ischemic stroke.

**Smoking.** Smoking was listed as one of the most potent risk factors for stroke, doubling of the risk of stroke when compared with non-smokers (Kelly-Hayes, 2010; Sacco et al., 2006). Clinically, smoking increased heart rate and blood pressure and promoted the development of atherosclerotic vessel disease. The risk of stroke decreased significantly after 1 year of quitting and the elevated risk was negated after 5 years. Smoking was treatable through both behavioral change strategies and pharmacotherapy.

**Alcohol.** According to Paciaroni & Bogousslavsky (2010) a dose dependent relationship existed between alcohol intake and stroke, with research indicating a reduced incidence when excessive drinking was stopped. Up to 2 standard drinks for males and one for females were documented as having potential benefits in reduction of risk.

**Post Stroke Depression**

A systematic review of 51 international PSD studies conducted between 1977 and 2002 concluded that up to one-third of stroke survivors experienced PSD (Hackett, Yapa, Parag, & Anderson, 2005). However, within one year, in a majority of cases, depression spontaneously resolved without pharmaceutical and/or psychosocial therapy. Importantly the review highlighted that the greatest risk of PSD was in the first few months following an index stroke. The risk of PSD continued in the first 3 years after stroke with studies indicating that 20% of stroke survivors remained depressed after 5 years (Carod-Artal, 2010).

PSD was associated with (a) impaired progress toward recovery, (b) reduced quality of life (QoL) and (c) increased mortality (J. Joubert et al., 2008). The etiology of PSD was difficult to define but research suggested that stroke severity, level of physical disability and cognitive impairment were regular predictors. The presence of increased carer strain was also associated with higher levels of PSD. Recommended treatment was by pharmacological intervention with
either Selective Serotonin Re-uptake Inhibitors (SSRI), or Tricyclic or Monoamine Oxidase Inhibitors (MAOI), with evidence to augment pharmaceutical therapy with psychosocial support.

**Current Secondary Prevention Strategies**

Hardie et al., (2003) concluded that the most effective strategies to prevent recurrent stroke after an initial event would be removal of the symptomatic disease, control of the prominent causal risk factors and commencement and maintenance of optimal therapy. Optimal secondary prevention would begin in the SCU with collective input from the multidisciplinary team (Fjærtoft, Indredavik, & Lydersen, 2003; Weir & Cadilhac, 2007). Optimal in hospital secondary prevention would be guided by State, National and International guidelines for evidence based best practice. Upon discharge from hospital, long-term secondary prevention was passed on to the GP or Primary Care Physician (Joubert et al., 2006). However studies indicated there was less investment in community based secondary prevention and there remained many questions as to what would be optimal long-term secondary prevention in the community setting (Fjærtoft et al., 2003; Gibbons et al., 2008).

**Evidence based guidelines.** There are numerous international guidelines available regarding stroke and cardiovascular disease. The American Heart Association/American Stroke Association Guidelines for the Prevention of Stroke in Patients with Ischemic Stroke or Transient Ischemic Attack is a frequently cited evidence based document provided to physicians and health care providers to assist in the treatment of identified risk factors for stroke and transient ischemic attack in the hope of preventing further vascular events after stroke (Sacco et al., 2006).

The guidelines are based upon a comprehensive review of current available literature - in this case - from 2004 onwards. The writing group (membership from neurology, cardiology, radiology, surgery, nursing and allied health) undertook to update the guidelines every three
years. Level of evidence criteria provided for each treatment modality conforms to the American College of Cardiology (ACC) and AHA standards for classifying certainty of the treatment effect and class of evidence.


The AHA Scientific Statement: Comprehensive Overview of Nursing and Interdisciplinary Rehabilitation Care of the Stroke Patient, builds upon the International Classification of Functioning (ICF) framework to establish evidence based guidelines for nursing and interdisciplinary approaches to rehabilitation, secondary prevention and follow-up of stroke survivors, caregivers and families in an individualized manner (Miller et al., 2010). The recommendations recognize the importance of sustained approaches to rehabilitation, secondary prevention and follow-up of survivors, carers and families in both the inpatient and community dwelling phases of long-term care to reduce the burden of stroke and improve survival statistics. The guidelines were strongly geared towards assisting the survivor and carer across the health care landscape towards successful reintegration into community life.

Hospital initiated secondary prevention. To standardize stroke care, various programs have been trialed and implemented to improve adherence to evidence based guidelines. There was a positive uptake of guideline based secondary prevention recommendations by hospital based physicians in the Get With the Guidelines (GWTG) program (Schwamm et al., 2009). The PROTECT trial compared the commencement of eight
risk factor modification therapies during hospitalization for an ischemic stroke or TIA, with a usual care cohort (Ovbiagele et al., 2004). The study demonstrated that an aggressive model of implementing evidence based therapies through a coordinated interdisciplinary team approach resulted in improved uptake of key risk factor modification strategies pre-discharge from an acute treatment hospital. A clear limitation was a lack of evidence to suggest patients would be compliant with therapies and lifestyle changes instituted in hospital after discharge.

**Discharge planning.** Discharge planning, included pre-discharge instructions to assist patients in accessing medical necessities and community based supports, including social resources, (Cameron et al., 2008). Discharge planning for hospitals accounted for shorter lengths of stay and provided the potential to improve transitions of patients into community based care environments.

**Primary care level - secondary prevention.** After discharge from hospital most patients were returned to the care of their primary care physician (Touze et al., 2008). In a 2004-2005 observational study of secondary prevention of 383 eligible patients from four hospitals there was focus on control of hypertension (< 140/90 mmHg) and LDL Cholesterol (<2.59mmol/L) at 6 and 12-months. Secondary prevention strategies commenced within hospital demonstrated enhanced risk factor control, but at 6-months modification of therapy was unlikely to occur even when participants exhibited blood pressure and or LDL cholesterol levels that were above those recommended in the current guidelines.

Touze et al., (2008) suggested that the unlikelihood of modifying therapy at 6 and 12-months was due to a therapeutic inertia at the primary care level. This therapeutic inertia may have been caused by (a) primary care physicians overestimation of the care they provided, (b) the use of “soft” reasons to dissuade from further adjunctive therapy e.g., side effects, perception that care is improving, concerns over the validity or legitimacy of large trials in
advising on other treatments. Other reasons cited were a lack of education or training and whether or not the practice organization was focused on achieving therapeutic goals i.e., physicians understood therapeutic goals but, were not adequately versed in the attainment of therapeutic goals e.g., using multi-drug therapies. The report highlighted the importance of developing hospital based strategies aimed at reducing therapeutic inertia especially immediately after the index event. One research group considered that shared care and tailoring guidelines and recommendations to target GP’s would improve uptake of evidence-based therapy and extend specialist support into the community (Joubert et al., 2006).

**Community based initiatives.** There were numerous initiatives trialed and implemented to combat both immediate and longer-term stroke secondary prevention (Redfern, Mc Kevitt, & Wolfe, 2006). Many initiatives were set within the broader framework of Chronic Disease Management but were often not focused on the particular needs of stroke survivors and their carers. Some initiatives only targeted control of a single risk factor e.g. diabetes (Gary et al., 2004). Secondary prevention interventions included: (a) Shared Medical Records, (b) Shared Medical Records plus monitoring, (c) multicomponent interventions involving education, psychosocial intervention, behavior modification, social support, emotional support and counseling (see Table 3) (J. Redfern et al., 2006). Most initiatives attempted to measure the effectiveness of multi-disciplinary health team and GP’s. At the time of writing there were no accepted standardized, evidence based secondary prevention strategies specifically targeting the community setting, for stroke survivors and treating health physicians. Trialing complex interventions in secondary prevention was difficult due to recruitment, randomization, longer-term follow-up and ethical reasons (Redfern et al., 2006). However policy recommendations and currently available guidelines aimed to trigger the development of complex secondary prevention programs and to motivate continued research (Gibbons et al., 2008; Park & Schwamm, 2008).
### Table 3

**Community based secondary prevention strategies**

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Description</th>
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<tbody>
<tr>
<td><strong>Case Management</strong></td>
<td><strong>Modality:</strong> Face-to-face and/or telephone  &lt;br&gt; <strong>Aims:</strong> (a) Enhanced transition across health care landscape. (b) enhanced care planning  &lt;br&gt; <strong>Practitioner:</strong> Nurse  &lt;br&gt; <strong>Outcomes:</strong> (a) Improved physical and cognitive outcomes. (b) cost effective delivery. (c) improved compliance (d) Improved risk factor control (e) reduced re-hospitalisations.</td>
</tr>
<tr>
<td>Cameron et al. (2008), Ma et al. (2009)</td>
<td></td>
</tr>
<tr>
<td><strong>Stroke Coordinators</strong></td>
<td><strong>Modality:</strong> Face-to-face  &lt;br&gt; <strong>Aims:</strong> (a) adjunct to the aims of the National Health Service (NHS) (b) linking the services involved in the immediate treatment, rehabilitation, secondary prevention and long-term care of older survivors of stroke.  &lt;br&gt; <strong>Practitioner:</strong> Nurse  &lt;br&gt; <strong>Outcomes:</strong> 80% service development. 20% patient care</td>
</tr>
<tr>
<td><strong>Early Supported Discharge (ESD)</strong></td>
<td><strong>Modality:</strong> Face-to-face  &lt;br&gt; <strong>Aims:</strong> (a) assessment of needs. (b) A home visit to facilitate: discharge planning, assessment of needs for help, support, and rehabilitation, (c) A pre-discharge meeting with the patient, relatives, (d) Follow-up visits, with the primary health care system including assessment of secondary prevention and rehabilitation. (e) Hospital outpatient clinic 4 weeks after discharge. (f) 3-month after discharge educational meeting.  &lt;br&gt; <strong>Practitioner:</strong> Physician, ESD team member  &lt;br&gt; <strong>Outcomes:</strong> (a) reduced length of acute stay (b) improved functional outcomes (c) improved continuity of services for patients at 12-months after stroke. (d) enhanced rehabilitation</td>
</tr>
<tr>
<td>Fjærtoft et al. (2003), Fisher et al. (2011)</td>
<td></td>
</tr>
<tr>
<td><strong>Self Management</strong></td>
<td><strong>Modality:</strong> Face-to-face  &lt;br&gt; <strong>Aims:</strong> Provide advice, guidance, education and support  &lt;br&gt; <strong>Practitioner:</strong> Nurse  &lt;br&gt; <strong>Outcomes:</strong> Patients accept responsibility for health and engage in learning to manage long-term illness. Use of home monitoring, maintenance of a health diary or dietary record and the use of health aids e.g., a pedometer</td>
</tr>
<tr>
<td>Lorig and Holman (2003), Davies (2010), Cameron et al. (2008) and Greaves and Campbell (2007)</td>
<td></td>
</tr>
<tr>
<td><strong>Individualised Care</strong></td>
<td><strong>Modality:</strong> Face-to-face. Printed material  &lt;br&gt; <strong>Aims:</strong> (a) ensure that patients, carers and professionals conceptualized stroke as a chronic illness, (b) standardize delivery and content of therapy (c) ensure access to all stroke survivors at effective time points, without professional bias and (d) individualised patient care.  &lt;br&gt; <strong>Practitioner:</strong> Physician  &lt;br&gt; <strong>Outcomes:</strong> Patients had difficulty understanding printed material. Enhanced patient satisfaction with performing ADL’s</td>
</tr>
<tr>
<td><strong>Peer Role Models</strong></td>
<td><strong>Modality:</strong> Face-to-face  &lt;br&gt; <strong>Aims:</strong> providing stroke survivors and carers with psycho-social information and support by trained peers to negotiate the transition from hospitalization to reintegration to the community.  &lt;br&gt; <strong>Practitioner:</strong> Peer provided with education by a nurse  &lt;br&gt; <strong>Outcomes:</strong> (a) enhanced knowledge of community resources (b) consolidation of knowledge gained in hospital (c) reassurance that help was available. (d) information provided in take home kits.</td>
</tr>
<tr>
<td><strong>Shared Care</strong></td>
<td><strong>Modality:</strong> Face-to-face and telephone  &lt;br&gt; <strong>Aims:</strong> (a) Secondary Prevention (b) GP support  &lt;br&gt; <strong>Practitioner:</strong> Nurse facilitated, shared care between GP’s and specialist services.  &lt;br&gt; <strong>Outcomes:</strong> (a) Enhanced secondary prevention and management of PSD. (b) Enhanced transfer of information between hospital specialists and GP’s</td>
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</table>
Telehealth

Telehealth was described as the electronic transmission of medically related data between two or more remote locations for the improvement of patient health and/or education of a health care provider and could encompass the areas of consultative, diagnostic and treatment services (Webb & Williams, 2006). Through review of numerous studies a divide appeared in the use of Telehealth and information and communication technology (ICT) in chronic disease management (Bulik, 2008). A major use of ICT was in assessment of clinical parameters e.g., blood values, BP, respiratory function etc. by means of automated or client activated systems that feed data back to clinicians and health services. The main aim was to keep medically important client information in order and available with the ability to flag out-of-range results.

The other area was in enhancing the relationships between people (patients and health providers / Patients and carers / health providers. Factors such as enhancing quality of life, reducing social isolation, providing education or skills training, adding surveillance and support and in assessing and servicing patients, carers and family’s needs through the continuum of care were key components. The underlying aim of both streams was to produce cost effective and practical solutions to complex health care needs.

Numerous advantages were proposed for Telehealth. However, there was some speculation contained in health care websites, industry sites and in the article by Hjelm (2005) that Telehealth would introduce a range of disadvantages for patients and healthcare providers. Some disadvantages included at the time of writing were: (a) Health service barriers or organisational barriers and or legal barriers to the set-up and provision of Telehealth/telemedicine services that included such items as FDA approvals and item costing for cost retrieval of services provided. (b) Anxieties were suggested related to the potential for poor quality data transmission, a threat to confidentiality and issues related to providing consent to take part in Telehealth services. (c) Another fear was that potentially
relationships between healthcare providers and their patients would breakdown, or that relationships between healthcare providers would breakdown.

**Advantages of Telehealth in community based management.** Within the context of an ageing population and community care of patients with chronic disease, major incentives to use Telehealth in systems of care were convenience, cost effectiveness and time saving (Webb & Williams, 2006). Major indicators for the development of Telehealth interventions for chronic disease management and in particular for stroke prevention were: (a) ensuring medication compliance, (b) addressing social isolation, (c) improving limited access to specialists and community based services, (d) enhancing coordination of home based services and (e) improvement of inadequate communication between community care agencies and acute hospitals, particularly in relation to fostering adequate communication of an accurate patient history and discharge plan (Demeris, Shigaki, & Schopp, 2005).

**Advantages for community health services.** Telehealth produced savings in time and in associated costs for community nurses and GP’s to manage patients e.g., reduced transport costs. Telehealth enabled the convenient sequential scheduling of appointments, negated waiting room time and reduced potential exposure to disease vectors. Telehealth exhibited the potential to reduce health care provider stress, practice running expenses and assisted in decreasing the demands on a depleted GP work force within an expanding community of ageing clients (Noel, Vogel, Erdos, Cornwall, & Levin, 2004; Schneider, 2004; Taylor & Capamagian, 2007).

**Advantages for patients.** Telehealth created the potential for patients to provide their GP with an up to date report of their condition prior to engaging the health care provider for assessment/consultative services and had the potential to save time, reduce duplication of documentation and allow more time to be focused on clients needs (Celler, Lovell, & Basilakis, 2003). Telehealth allowed a rapid transfer of information between patients, hospital based
services and GP’s, providing accuracy of documentation. Patients were likely to become more aware of their own health condition, gain greater reassurance with health care, be more compliant with therapy and visit their GP less frequently.

Further advantages of Telehealth were in providing (a) the potential for improved rapport with patients, (b) improved access to care, (c) improved productivity, (d) enhanced quality of care coordination for chronic illness in the home or community setting, and (e) added greater access to physicians/clinicians with the potential for rapid responses to needs e.g., responses to crisis situations (Hopp, Hogan, Woodbridge, & Lowery, 2007; Kondalsamy-Chennakesavan et al., 2004).

**Appropriate technology.** Potentially the most important consideration in a Telehealth model of health was in providing the participants with the most appropriate technology to effect improved communication (Taylor, 2005). Experts stressed that it was not the technology but how the technology was most effectively used that became the most important concern in allowing health professionals access to patients in their own homes and in so doing allowing effective care in the right place at the right time (Cherry, Dryden, Kobb, Hilsen, & Nedd, 2003; Taylor, 2005). Demeris et al., (2005) suggested that Telehealth programs should enable: (a) adequate provision of continuity of care, (b) increased social support and decreased isolation (for the consumer), (c) positive impact on medical outcomes, (d) positive consumer and practitioner attitudes towards the intervention and (e) health economic advantage. Using the lowest level of technology to carry out a task, there existed the potential for marked cost savings. The study by Winters & Winters (2007) canvassed four main modes of telecommunication: (a) voice only, (b) video/images, (c) data exchange and (d) virtual contact.
Telehealth and community management of stroke survivors.

A number of initiatives have been trialled for the ongoing treatment, management and care of stroke survivors and their carers (See Table 4). There was a high degree of heterogeneity in the models in terms of (a) aims (b) study design, (c) technology and (c) outcomes measures.

There were numerous advantages for Telehealth in comparison to disadvantages. However, the major hurdles to the implementation of large scale Telehealth initiatives were clearly at policy, legal and administrative levels, which in many respects were large hurdles to be overcome by important and powerful groups in healthcare. According to the research, Telehealth using current infrastructure and the most affordable, cost effective modality to suit the need could reduce the costs of service provision. Telehealth in the hands of appropriately credentialed professionals had the potential to be adapted to envelop existing face-to-face health activities and improve communication and transfer of information between providers and between providers and patients and provide access to on time care, improved frequency and duration of care and to extend reach further into the community.

Policy, Strategy and Recommendations for Stroke Secondary Prevention

Historically, in 1992, the AHA published five defining principles to guide policy makers (local, state and federal) on addressing the looming health crisis in cardiovascular disease and stroke (Gibbons et al., 2008). At this same time in a landmark report the Institutes of Medicine (IOM) noted that US residents would only receive care as recommended in guidelines approximately half of the time; that a ‘chasm’ existed between the care that residents could have and the care that existed. Later, the AHA/ASA put forward six principles in the context of an expanding and ageing society exposed to new challenges such as: obesity, sedentary lifestyle, diet and smoking (Jones et al., 2008). The principles called for affordable, meaningful, high quality health care for all residents without gender, race or geographical differences. The principles supported adequate funding of research and the growth and
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<th>Table 4</th>
<th>Telehealth interventions trialed with stroke survivors and their carers</th>
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<td><strong>Outreach Telephone Support</strong></td>
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| (Boter, 2004) | Design: RCT  
Modality: 3 telephone calls and one home visit  
Duration: 5-months  
Aims: Provide: (a) advice (b) education (c) support to survivor and carer  
Practitioner: Nurse  
Outcomes: (a) reduced anxiety. (b) decreased reliance on rehabilitation services. (c) no significant effect on QoL. |
| **Carer Support.**  |
| (Buckley, Tran, & Prandoni, 2004) (Tran, Buckley, & Prandoni, 2002) | Design: Descriptive case studies  
Modality: Video-phone base support  
Duration: 5-weeks  
Aims: Support primary carers of stroke survivors  
Practitioner: Nurse  
Outcomes: (a) improved QoL for carers, (b) increased productivity for nurses, (c) reduced indirect costs e.g., transport, (d) carers reported satisfaction with just in time health care advice (e) reduced stress and anxiety. (f) privacy and convenience. |
| **Social Problem Solving.**  |
| (Cumming, Cadilhac, Rubin, Crafti, & Pearce, 2008; Grant, 1999; Grant, Elliot, Weaver, Bartolucci, & Giger, 2002) | Design: RCT  
Modality: Initial face-to-face then telephone  
Duration: 12-weeks  
Aims: (a) enhance carers’ ability to identify and define problems, (b) decide on needs, (c) develop solutions, (d) select and trial appropriate solutions and (e) evaluate the outcomes of the problem solving approach.  
Practitioner: Not specified  
Outcomes: (a) enhanced general health, (b) improved social problem solving ability, (c) satisfaction with health care services, (d) reduced depression, (e) improved caregiver preparedness. |
| **Education**  |
| (Pierce et al., 2004) | Design: Pilot feasibility  
Modality: Internet based education program  
Duration:  
Aims: Provide education and support for rural carers of stroke survivors.  
Practitioner: Nurse  
Outcomes: Major qualitative themes for carers: (a) changing roles and solving problems, (b) seeing the failures and successes of others as their own, (c) feeling connected, (d) being spiritual and (e) balancing successes/problems. Additionally, 89% of carers agreed the tool was necessary. |
| **Passive Case Management.**  |
| (Mayo et al., 2008) | Design: RCT  
Modality: Telephone and home visits  
Duration: 6-months  
Aims: Add: (a) surveillance, (b) information exchange, (c) medication management, (d) health system guidance, (e) active listening, (f) family support, (g) teaching and (h) risk identification  
Practitioner: Nurse  
Outcomes: No significant change in intervention group |
| **Risk Factor Management.**  |
| (Joubert et al., 2008; Joubert et al., 2006) | Design: RCT Intervention group (IC) vs. Usual care (UC)  
Modality: Telephone and face-to-face  
Duration: 12-months  
Aims: (a) GP support, (b) secondary prevention, (c) PSD screening and management  
Practitioner: Nurse  
Outcomes: Improved: SBP, BMI and physical activity. (d) lower depression scores (e) IC received more advice on risk factors. |
diversification of the health workforce through a sustained commitment to ongoing education. Policy makers were asked to consider methods of rewarding health services, insurance providers and patients for making use of evidence based high quality health care services aimed at prevention i.e., Primordial, Primary and Secondary Prevention. Principle 5 – Research Support – called for population based prevention and behavioral research to understand how best to affect individual, family and community lifestyle change.

**Systems of care.** The Helsingborg declaration of 2006 echoed the global call for the development and establishment of standardized systems of stroke care to reduce the growing burden to society (Kjellstrom, Norrving, & Shatchkute, 2007). The US Health Resources and Services Administration defined a health system of care as one that had two fundamental characteristics: (a) that of patients, agencies and services and providers and (b) the interactions between these agencies, services and providers (Schwamm et al., 2009). In 2005 the AHA/ASA convened a multidisciplinary task force to formulate recommendations for the development of a Systems of Care approach, to bring change to the identified, fragmented approach to stroke care (Park & Schwamm, 2008). The task force underlined that in order to effect a systems of care approach, evidence based integration of preventative and treatment services was necessary. The systems approach required coordination and/or linkages between often well developed, but isolated components of the stroke care continuum. The task force identified seven components of a stroke system of care that included (a) sub-acute treatment and secondary prevention along with, (b) primary prevention, (c) emergency service response, (d) acute stroke treatment, (e) rehabilitation, (f) community education, and (g) quality improvement.

The ASA task force recommended that Telehealth was a key service in providing stroke patients with the most appropriate treatments and in providing linkages to critical system components of prevention, treatment and rehabilitation (Schwamm et al., 2009). For secondary
prevention the task force recommended the use of the current AHA/ASA guidelines noting that systems of care could improve the consistency in which the guidelines were put in place regardless of the setting. The task force stipulated commencement of therapy and secondary prevention in hospital and recommended, in line with a systems of care approach, continuity of treatment across care settings with compliance/adherence to therapy in order to maximise health benefits.

The task force made four clear statements regarding secondary prevention: (a) Organised approaches (e.g., stroke teams, stroke units and written protocols should be used to ensure all patients received appropriate care). (b) The stroke system should address all major modifiable risk factors as advocated by the national guidelines (c) Stroke patients and families should receive adequate education on prevention and emergency procedure and (d) The system should ensure a smooth transition across the continuum of care and include timely transfer of discharge information between treating physicians (Schwamm et al., 2009). The PROTECT and Get with the Guidelines (GWTG) stroke programs were successful in effecting significant change within hospital based systems of secondary prevention (Ovbiagele et al., 2004; Park & Schwamm, 2008).

Many initiatives that introduced coordination and linked services and components of the stroke systems in Canada could be achieved at little extra cost (Lyons & Rudd, 2007). Ongoing evaluations of the cost effectiveness of new strategies would identify which components were effective at reducing costs and should be built into the system of care approach. Part of the Canadian Stroke Strategy included the provision of a continuum of services working together to prevent stroke, offer proper acute and rehabilitative services and provide community reintegration and support.

**Stroke care strategy.** In Australia both government and non-government stroke-specific initiatives aimed at improving awareness of stroke, reduction of stroke and improved
access to services. The Department of Human Services (2007) developed the Victorian Stroke Strategy (VSS) and the Stroke Care Pathway informed the development of the Victorian Stroke Care Strategy and the twenty-eight recommendations embodied in the report (Department of Human Services, 2007). The Victorian Stroke Care Strategy aimed to apply evidence based guidelines to stroke care across the care continuum. Much of the strategy was concerned with pre-hospital, acute and sub-acute care. However, recommendations, 1, 11, 21, 22 and 25 were relevant to Telehealth, secondary prevention and lifestyle modification in the community setting.

**Recommendation 1.** Health services and GP’s should manage TIA’s and secondary prevention of stroke in accordance with existing evidence-based clinical practice guidelines. The recommendation aimed to create a greater awareness of stroke, ensuring adequate provision of education to the community regarding stroke symptoms, risk factors and their management.

**Recommendation 11.** GP’s have a pivotal role in supporting stroke survivors and should be engaged in their care as early as possible to ensure ongoing and appropriate risk factor management, linking to appropriate community rehabilitation, self-management programs and appropriate specialist services.

**Recommendation 21.** Focused on the use of Telehealth to improve the acute diagnosis and treatment, especially for rural patients. However, the recommendation considered that further review was necessary for increasing funding for secondary consultation.

**Recommendation 22.** Stroke patients and families required information at different stages throughout the care continuum, to allow participation in decision-making, and ensure that personal choices, values and beliefs are considered in accordance with evidence-based guidelines.
**Recommendation 25.** Noted the difficulty in lifestyle adjustment for stroke survivors and carers, and agreed that accessing information regarding community based supports and peer support programs were often difficult. The recommendation supported the development of guidelines for providing peer support to inpatients, establishing community-based stroke support groups, promoting self-management programs for long-term care and accessing community-based services in accordance with evidence-based guidelines.

**Long-term Risk Factor Management and Secondary Prevention**

Gibbons et al., (2008) made a telling statement that, “Despite the opportunities for effective prevention, cardiovascular risk factor management remains inadequate” (p2210). Data from three separate evaluations characterized the global landscape of risk factor management and secondary prevention. The dire situation that confronted governments and health care providers in both the developed and developing world was exemplified by the results of a longitudinal cohort study that reported implementation of secondary prevention strategies was severely lacking at 7.5 years after an initial event (Li, Engstrom, Janzon, & Hedblad, 2008). In this study, of patients with a history of stroke, 79.4% exhibited hypertension, only half received blood pressure lowering medication and only 11.5% reached recommended BP levels. The majority of patients with hyperlipidemia were not treated with a lipid-lowering agent. Only 38% of stroke survivors were using an antithrombotic. Lifestyle factors remained vastly untreated with 31.2% of stroke survivors continuing to smoke and 63.7% considered overweight (BMI>25) or obese (BMI >30).

In the general population in the US 66% of the population with hypertension did not have BP adequately controlled (Gibbons et al., 2008). Less than half of the population exhibiting symptoms requiring lipid-lowering therapy received therapy. One in five smoked. Hypertension was observed in 53% of stroke survivors in which hypertension was previously diagnosed and in a further 11% in which hypertension was previously undiagnosed (Qureshi,
Suri, Guterman, & Hopkins, 2001). Diabetes was poorly controlled with only 49% of participants with diabetes achieved glycemic target. US evidence suggested that 63% of males and 55% of females were considered overweight with 30% considered obese (Sacco et al., 2006). The Centers for Disease Control and Prevention (CDCP) (2001) reported that 25.4% US citizens engaged in recommended levels of physical activity, 45.9% engaged in insufficient activity and 28.7% engaged in no physical activity (From the Centers for Disease Control and Prevention, 2001).

Data from the South London Stroke Register (SLSR) suggested 30% of stroke survivors requiring treatment with an antihypertensive were not treated, 59% of smokers continued to smoke, 15% of heavy alcohol users continued to use alcohol excessively and 59% of people diagnosed as obese remained obese (Redfern, Rudd, Wolfe, & Mc Kevitt, 2008).

**Factors affecting outcomes in long-term risk factor management and secondary prevention of stroke.** Risk factors were clustered in individuals (Berra, 2010). Twelve percent of adults had more than 3 cardiovascular risk factors and 45% had two risk factors. Berra considered that most risk factors in the US population were manageable through lifestyle changes.

**Non modifiable risk factors.** Factors that contributed to inadequate risk factor management and secondary prevention included race, female gender and age (Qureshi et al., 2001). A high degree of importance was placed upon age as an independent predictor of long-term (five-year) outcome in survivors of a first ever stroke with 64% of survivors < 65 years old more likely to survive and be independent at 6 months, whereas only 20% that were > 84 years of age were likely to survive and be independent (Hankey et al., 2000; Hardie et al., 2003).

**Professional and educational issues.** Therapeutic inertia was regarded as a major contributor to poor uptake of evidence based secondary prevention at the community level.
(Touze et al., 2008). Even though patients with a high risk for CVD presented regularly to a physician they were not offered appropriate therapy (Qureshi et al., 2001). A lack of effective physician training in preventative care and a medical culture that focused upon surgical therapies to effect short term, or acute care solutions, may have contributed to less than effective secondary prevention (Graham et al., 2007). Poor communication between specialist services and primary care physicians and a lack of awareness of guidelines may also have impacted on uptake and maintenance of evidence based therapy.

Within the context of a growing population at risk for stroke recurrence and a diminishing health workforce, Gibbons et al. (2008) recommended that change would require new approaches to workforce education and structure. This report proposed that education and training should support integration of medical, nursing and allied health teams to provide long-term secondary prevention solutions. In this study there was a degree of discussion regarding the importance of developing an understanding of patient-centered approaches to secondary prevention. Problems identified included the common practice of health professionals - educated in a traditional medical approach - often taking control of patient consultation, asking numerous health related questions (to understand and treat a health problem) then discharging the patient to other health services for further care (Redfern et al., 2006). Short follow-up consultations resulted in patients feeling that they had not gained the opportunity to develop a relationship with the health professional that would foster ongoing long-term secondary prevention.

**Medication adherence.** The results of the ChinaQUEST study demonstrated there was a great need for secondary prevention programs to target modifiable risk factors in developing countries (Wei et al., 2010). Seventy-one percent of patients discontinued antiplatelet therapy within 12-months of discharge. Forty percent of patients diagnosed with hypertension discontinued the use of antihypertensive medicines and that up to 60% of patients with
A fundamental problem in treating illness was the patient’s inability to take prescribed medicine correctly. Approximately 66% of Americans failed to take any or all of their prescribed medicines (Miller et al., 2010). Research suggested that simplified medication regimens were more likely to promote long term adherence to therapy. There was a strong indication that in future strategies nurses would be important in educating patients and families and in identifying and advising upon, “…. targeted and feasible interventions to maintain adherence to secondary prevention lifestyle changes and prescribed medical and other therapy recommendations” (p. 26). Successful strategies that promoted medication compliance included: (a) education, (b) contracts, (c) self-monitoring, (d) social support, (e) telephone follow-up and (d) tailoring of messages and interventions to the individual. Involving the patient consistently and in an ongoing manner in establishing, refining and maintaining a health care plan was shown to improve both lifestyle modification and medication compliance.

Patient factors. Stroke Survivors provided insight to the experience of secondary prevention at the community level in a study by (Redfern et al., 2008). Findings suggested that: (a) Patients found that secondary prevention was either provided through an organised modality by a health professional, provided in an opportunistic manner by community providers or supported by family and or friends. (b) Patients were less likely to subscribe to a medical model of risk and were less likely to agree with the concept of recurrence, treating their stroke as a discrete event. (c) Patients did not rate risk factor management highly and were more concerned
with social, economic and other health related issues. (d) Participation in risk management was either hindered or supported by physical, cognitive, social and/or economic circumstances. (e) Patients did not find printed information or risk factor information useful.

Disability and level of activity. For stroke survivors without pre-existing disability and not institutionalized prior to their index stroke approx. 36% were disabled and 14% were institutionalized at 5 years (Hankey et al., 2000). Figures from the U.S. indicated that of the current population of stroke survivors, 30% were unable to walk without assistance and 25% needed assistance with activities of daily living (ADL’s). At 5 years following first ever stroke, presence of recurrent stroke, then severity of initial stroke, then increasing age were strongest predictors of disability. The most important predictor of the likelihood of disability and institutionalisation after first ever stroke was low level of activity prior to a first stroke and more importantly, subsequent low levels of activity preceding a second/recurrent event (Hankey, 2005). According to the Australian Institute of Health and Welfare, of all stroke survivors, 88% of the survivors with a disability lived in independent community housing i.e., not supported accommodation. Of this population 64% required help with health care, 58% with mobility and 47% required help with self-care (AIHW: Senes, 2006).

Cognition. According to Miller et al., (2010) stroke survivors may exhibit, literacy, hearing, language and memory changes that may impair their ability to understand, learn or retain information directed towards ongoing care and secondary prevention. This review encouraged consideration of individualised approaches to secondary prevention that accounted for learning capabilities of stroke survivors.

Psychological state. Psychological states such as depression and dementia would impact strongly on recovery and secondary prevention (Carod-Artal, 2010). There existed a strong association between initial stroke and successive strokes and the onset and progression of the most common forms of dementia. Stroke, Vascular Dementia and Mixed Dementia were
known to produce subtle and heterogeneous changes in cognitive function (Langa, Foster, & Larson, 2004). There was a strong association between post stroke depression, Quality of Life and mortality for stroke survivors. The impact of PSD was demonstrated in reduced participation in stroke rehabilitation, poorer functional outcomes and greater disability. Stroke survivors with PSD exhibited negative changes in quality of life, cognitive function and in their level of dependence upon others. Survivors with PSD exhibited a greater use of health care services, had a greater rate of falls and experienced increased overall rates of mortality. Carers of stroke survivors with PSD were more likely to report excessive strain (Carod-Artal, 2010).

To effect person-centred care in a Telehealth approach, a patient’s cognitive ability should be taken into account when developing a care plan and deciding with whom, how and how often communication would take place. PSD has a major impact on the ability of a stroke survivor and significant others to participate in therapy.

Caregiver preparedness and caregiver strain. The study by Wood et al., (2008) noted that patients making the greatest changes to their lifestyle were more likely to have a significant other making large changes as well. The available evidence supported the notion that ill equipped, overstressed caregivers were more likely to impede successful recovery and increase the likelihood of institutionalization of survivors (Miller et al., 2010).

Recommendations were clear that health teams should involve the carer/families of stroke survivors as members of the multidisciplinary team in their ongoing care, rehabilitation and secondary prevention (Miller et al., 2010). Carers were in a position to provide detailed information on the stroke survivor’s life: pre-stroke, during therapy and during the rehabilitation and reintegration phases of care. Recommendations were made to design studies that included assessment of carer satisfaction/strain from the acute inpatient setting and throughout the care continuum to better understand the needs of persons engaged in this pivotal
role. Assessing family needs as opposed to only the primary carer’s needs was noted as of equal importance.

Accumulated evidence concluded that carers experienced burnout and depression related to social isolation and a lack of education and training in physical assistance and problem solving techniques (Buckley et al., 2004). There was a volatile relationship between available carer support and education and the otherwise gradual decline of the stroke survivor into dependency and death. Further there was evidence of a strong relationship between carer burnout and the stroke survivor’s experience of PSD. Caregivers were highly likely to experience depression (30-52%), indicating that depression was potentially more likely in carers than in stroke survivors. Associated negative impacts of the caring role included social isolation, reduced time for family and friends, poorer reported health states, worse financial and emotional wellbeing, reduced energy and higher rates of mortality.

The AHA recommended, that from the acute phase onwards, health care providers assess and provide carers with information on available community support resources, to assist in the transition from the hospital to the home and community care setting (Miller et al., 2010). The AHA recommended that counseling should be focussed upon, problem-solving, coping and support-seeking behaviors, coupled with education and informational support to promote improved outcomes for carers and stroke survivors. Additionally the AHA recommended that carers be provided with adequate information regarding ongoing secondary prevention, lifestyle change, role changes, grief, loss and information regarding the warning signs of stroke. The recommendations suggested that a multidisciplinary team member provide this type of carer support in an interactive and longitudinal format.

Summed up succinctly, both patient level and provider level factors influenced risk factor control in patients with cardiovascular disease (Fischer, MacKenziew, McCullen, Everhart, & Estacio, 2008). Modifiable patient level barriers to optimal care included lack of
education, resources, motivation and adequate tracking. Provider barriers included the increasing demands of productivity and therefore the shorter time allocated to patient follow-up. Less time translated to less time for assessment and in understanding patients own understanding of their illness and their motivation and ability to change health related behaviors.

**Nursing involvement in Risk Factor Modification and Secondary Prevention**

The AHA Nursing and Rehabilitation Guidelines recognized that secondary prevention required timely interventions across the health landscape (Sacco et al., 2006). Miller et al. (2010) acknowledged that:

> “Nurses traditionally serve a central role in educating patients and their families regarding modifiable, treatable and non-modifiable stroke risk factors and in advocating creation of a feasible action plan, including adherence to prescribed medications and the periodic blood work that may be required. In addition, patient education is a performance standard for primary stroke centres… therefore nurses must be well informed regarding evidence-based and best practices associated with effective lifestyle modification strategies for the diverse population (i.e., age, sex, race, culture).” (p. 26)

Large-scale practice based, heart failure and cardiovascular disease prevention program interventions were previously based on nurse-led programs of ambulatory, family based lifestyle change for secondary prevention (Halcombe, Davidson, Daly, Yallop, & Tofler, 2004; Wood et al., 2008). In the nursing based review by Halcombe et al. (2004) the available narrative literature was able to demonstrate that nurses provided a ‘viable’ solution as an ‘adjunct’ to overstressed GP services. The review emphasised that nurses were demonstrated effective leaders in chronic disease management in diabetes care and heart failure, running programmes in specialist and primary care practice. However, the nursing literature and
evidence base was lacking in homogeneity and the authors considered that it was inaccurate to state that the available literature contributed to a strong evidence base.

Wood et al., (2008) noted that central to the EUROACTION program design, was coordination by nurses, “…because of the evidence that nurse-managed programmes improved lifestyle, risk factor control, use of medications and quality of life” (p. 2010). Khunti et al. (2007) reported on the results of an RCT comparing specialist nurse care of patients with coronary heart disease and congestive heart failure, with care provided by primary healthcare teams. A greater number patients’ in the nurse lead program experienced initiation of treatment of hypertension with a beta blocker (adjusted OR 1.43, 95% CI 1.19 to 1.99) and achieved blood pressure below 140/85mmHg (OR 1.61, 95% CI 1.22 to 2.13). A greater proportion of patients experienced improved control of cholesterol, detection of ventricular systolic dysfunction and more patients showed improvements in quality of life. In the RCT reported by DeBusk et al. (1994) a nurse-led, telephone based, community case management system for people with coronary heart disease and myocardial infarction showed improved results for smoking cessation, cholesterol management and lung capacity in comparison to patients exposed to usual care.

According to Wood et al. (2008), in the nurse-led EUROACTION program 10.4% more people ceased smoking (p=0.06), diet was significantly improved and importantly a greater number (intervention: 65%, control: 55%; 10.4% (p=0.04)) of patients in the intervention group exhibited a blood pressure of less than 140/90 mmHg at one-year of exposure to the nursing intervention. Gibbons et al. (2008) recognised that nurses were important for safety, coordination of care, patient care and chronic disease management.

The medical literature showed a building evidence base for nurse-led programs. The growing volume of nursing literature, although confounded by problems of heterogeneity of methods and poor scientific control, was clearly demonstrating a place for nurse-led programs
in the community. However, what was clearly important was the need for nurses to contribute to the evidence base by designing and providing scientifically robust results from well-designed clinical studies.

**Nurses and Telehealth.** Effectively using technology allowed nurses to extend coverage to patients, carers and families in their own environment and placed nurses in a position to offer timely interventions for those with complex health care needs (Winters & Winters, 2007). Telehealth allowed nurses to facilitate behavior change and compliance monitoring during patients’ transitions across health landscapes. Telehealth had the advantage of retaining experienced nurses in the profession, by utilizing advanced skills and by limiting exposure to the physical component of nursing. Telehealth had the potential to increase the coverage of the community nurse or the advanced practice nurse, allowing more patients to be managed over greater distances.

In the study by Hebert, Korabek, & Scott (2006) diabetes community management homecare nurses would see approximately 58 clients per month. A Telehealth home care strategy had the potential to increase the number of patients managed to 150 per month. Telehealth visits used less time i.e., approximately 18 minutes compared with 45 minutes for a standard home visit and demonstrated a potential cost saving.

A multidisciplinary approach to lipid lowering, by nurses, Pharmacists and Dieticians and physicians - each expert in their own discipline - had been shown to be an effective mechanism for lowering blood cholesterol (Mason, 2009). Nurses and the multidisciplinary team were able to motivate, educate, counsel, increase knowledge and alleviate patient concerns so as to improve medication compliance/adherence. Nurses as part of a multidisciplinary team were well placed to contribute to the multi-factorial management of cardiovascular risk, targeting and assessing those at risk and providing both pharmacological and lifestyle management options.
There was a predicted shortage of physicians in the years ahead, related to growing demand (Gibbons et al., 2008). Although, physician enrolments would increase up to 24%, the demand from the ageing population would outweigh this. The AHA suggested that reform would entail old practices giving way to newer methods of approaching disease management.

There would be a greater need for the use of non-physician service providers i.e. the greater use of nursing staff and allied health teams. There would be an increased need for health care workers “to work as integrated teams in providing preventative services and in managing chronic disease”.

**Finding an effective solution**

A Cochrane review compared clinic-based nurse-led care (Nurse Practitioners, Advanced Practice Nurses, Clinical Nurse Specialists, Practice Nurses), substituted for doctor-led care (Laurant et al., 2004). The review concluded that appropriately trained nurses would provide an equally high standard of care and achieve similar health outcomes for patients as primary care doctors. The review found that nurse-led care (a) produced greater levels of patient satisfaction (b) reduced doctors’ workload (c) reduced the direct costs of care and (d) allowed longer consultation times. Evidence-based, Telehealth facilitated, nurse-led care was regarded as a viable option to fill a growing need for management of chronic illness in both developed and developing economies. Nurse-led models of care, performing either supplementary roles to primary care and/or substitution – that is in no way inferior – held a high degree of potential to reduce costs of care both directly and indirectly.

**Nursing models of care.** Potter, Perry, Stokert, & Hall (2012) advised that new and innovative models of care must be strongly linked to the intended care setting, the needs of the patients, the expected health outcomes and the level of skill of the nurses involved. As such, the models of care would provide the structure for nurses to plan, deliver and evaluate patient care. The authors considered that innovative nursing models should promote wellness and
patient independence through self-care and self-management and be underpinned by solid conceptual foundations, be culturally sensitive, flexible and concerned with meeting expected patient outcomes through collaboration with the patient. Furthermore the authors expressed that nursing models should combine strategies that (a) develop patients knowledge and understanding of their health, their health care plan and the timeframes involved in attaining changes to their condition; (b) develop patient skills in collaborating with the health care team and in participating in a health care plan; (c) develop and provide tools to assist patients to monitor and manage their health; (d) promote healthy lifestyle and risk modification and (e) enhance access to appropriate support services.

**Stroke, Telehealth and nurse-led initiatives.** As previously discussed, Telehealth strategies have been shown to be effective in other chronic disease conditions. Nurse-led behavior change strategies have been successful in managing cardiovascular risk in the community setting (Berra, 2010). Therefore, innovative models of nurse-led stroke secondary prevention and management of PSD may be derived from the successes and failures of previous models and through taking into account opportunities to implement nurse-led strategies within existing structures and in collaboration with groups seeking similar outcomes. Ideally, a nurse led model of stroke risk factor management would: (a) align with National, International and local priorities; (b) follow established evidence-based guidelines; (c) adhere to the fundamental guiding principles of nursing clinical practice; (d) be based within a conceptual framework that would guide the nursing process; and (e) utilise established structures, links, methods, tools and pathways relevant to effecting high quality patient outcomes. (Table 5.)

**Person centered nursing care.** The person-centred care approach, allows nurses to empower patients to be active in their health care, engage them in self-management and promote adherence to therapy (Berra & Miller, 2011). Patient centred nursing was built around a set of four main constructs: (a) prerequisite nursing attributes, (b) prerequisite elements of
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<th>Model Criteria</th>
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<td><strong>Align with National, International and Local Priorities</strong></td>
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<td>• ASA</td>
<td>• Six principles calling for affordable, meaningful, high quality health care for all without gender, race or geographical differences.</td>
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<td>• Victorian Stroke Care Strategy</td>
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<td><strong>Evidence Based Practice</strong></td>
<td>• Sacco et al.</td>
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<td><strong>Grounded in Nursing Principles</strong></td>
<td>• Nursing Process</td>
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<td><strong>Aligned with a conceptual framework</strong></td>
<td>• Person Centred Nursing Care</td>
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<td>• Nursing innovation</td>
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<td><strong>Utilise Established Structures, Links, Tools and Pathways</strong></td>
<td>• Tertiary Hospital Hub</td>
<td>• Stroke Unit Care</td>
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<td>• Stroke Unit</td>
<td>• Liaison and consultation with members of the multidisciplinary team regarding shared decision-making.</td>
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<td>• Multidisciplinary team</td>
<td>• Patient tracking through continuum of care.</td>
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<td>• Rehabilitation</td>
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the care environment; and (c) core activities of the person centred approach, that lead to (d) health related outcomes (McCormack, Karlsson, Dewing, & Lerdal, 2010).

Prerequisite core competencies nurses should possess to practice effectively included knowledge of self, values and beliefs, commitment to ones’ profession and interpersonal, decision making and communication skills (McCormack et al., 2010). The care environment encompassed the setting, the organization structures, the skill-mix, the relationships between staff and the power differential in relation to shared-decision making and innovation in the workplace. McCormack et al., (2010) noted that for person centered nursing care to take place the environment must not only support shared-decision making between, nurses and other health professionals but more importantly between the patient, carer and/or family members. The environment should also support innovation and autonomy and allow an element of risk-taking in order to effect change. The core activities of the person-centered nursing were: (a) working within patients’ own beliefs and values; (b) engaging individuals; (c) being sympathetic (d) sharing decision-making and (e) providing a holistic approach to care. The outcomes of such an approach are measureable in terms of (a) patient satisfaction with care; (b) Patient involvement with the care process; (c) patients’ feelings of wellbeing and in (d) the creation of a therapeutic environment.

**Fundamental nursing activities: the nursing process.** Probably the most fundamental tenet, underpinning clinical nursing practice is the methodology surrounding the nursing process of: (a) assessment; (b) diagnosis; (c) planning; (d) implementation of care and (e) evaluation (Potter et al., 2012). Generally, through gathering data about a patient from multiple sources and through the application of critical thinking the nurse is able to systematically collect, verify, analyse and communicate key information for a patient. The process allows the nurse to order the information to allow priorities to be assigned. In the nursing process, assessment logically supports the development of Nursing Diagnoses and the formulation of a
Nursing Care Plan. The process of case management and the implementation and evaluation of care to achieve expected outcomes stems from the original and ongoing assessment and the negotiated plan of care.

**Advanced nursing activities.** Over the past decade, advanced nursing roles have become important to define and incorporate into health care globally (Callaghan, 2008; Sheer & Wong, 2008). There is a large degree of uncertainty surrounding exactly what is an advanced practice nursing role and in how such roles should be implemented (Chang, Gardner, Duffield, & Ramis, 2012). There was an indication of a degree of overlap between advanced practice nursing roles and roles previously occupied by the medical profession (Ruel & Motyka, 2009). In this age of health care, where physician numbers were falling and the population was growing it was evident that per capita there was a greater ratio of nurses to patients than medical professionals to patients (Sheer & Wong, 2008). Advanced practice nurses were expected to acquire mastery of nursing competencies as well as mastery of components of medical therapy. As described by Ruel and Motyka (2009) the advanced nursing practice model, although embedded in a primarily biomedical model, retained a distinctive nursing culture and the activities of the advanced practice nurse were not substitutes for medicine but part of nursing.

According to Cerinus and Wilson (2009) the advanced practice nurse would hold at least a Masters level of education and likely be employed as a clinical nurse specialist, senior team leader or unit manager or in the role of nurse consultant or nurse practitioner. There was some controversy as to whether the advanced nurse would be a specialist or generalist in their practice. However there was some evidence in the literature to suggest that advanced practice nurses were nurses poised on the journey towards expertise in practice (Dowling, Beauchesne, Farrelly, & Murphy, 2013).

Advanced practice nurses have contributed to health care within a number of health care related domains: (a) advanced clinical practice, (b) practice development, (c) education,
Advanced clinical practice was divided into expert holistic clinical care, direct intervention, clinical reasoning, care coordination, role modelling and being a patient advocate. The appropriately qualified nurse would have the capability of offering expertise in (a) taking comprehensive histories, (b) conducting holistic examinations, (c) making expert diagnoses, (d) making appropriate admissions, discharges and referrals to specialists or for diagnostic testing, (e) deciding upon and initiating appropriate therapies, (f) Planning and providing expert care including involvement of the multidisciplinary team, (g) ensuring continuity of care and follow-up, (h) evaluation of the effectiveness of therapy and adjustment where necessary, (i) be able to work autonomously, (j) screen for risk factors, and (k) provide counseling and health education (Cerinus & Wilson, 2009).

To provide a simple, targeted, feasible and effective nurse-led, community based Telehealth solution to stroke secondary prevention, firstly and foremostly nurses would require access to the most appropriate and cost-effective Telehealth modality. All other factors would be dependent on what the nurse would bring to the equation. In review of the literature the nurse would require a well-developed knowledge base from formal education and work experience and high-level competencies in both nursing and communication skills associated with managing complex patients in the community. Additionally, it would be important for nurses to consider further, appropriate credentialing in behavior change strategies eg., CBT and counseling.

In many respects the nurse would have a firm understanding of medical therapy and a high level grasp of nursing process and advanced nursing techniques and activities. Likely candidates for such nursing roles would have completed relevant post graduate education i.e., a masters degree in a specialty area or hold the position of clinical nurse specialist and be equipped to practice autonomously within the scope of a particular health service eg., hospital
base or community base. The nurse-led advanced role would revolve around the nursing process and the intuitive selection and inclusion of particular advanced practice activities to effect attenuation of risk factors and behavior change. The role too, would likely involve generalist knowledge regarding health and health related conditions, eg., medication interactions, effects of comorbidities, general health advice etc. The role would also adhere to a set of tight evidence based guidelines and goals for treatment e.g., adhering to a medical model and controlling risk factor parameters through effective communication regarding titration and regulation of therapy.

Furthermore, it would be appropriate for nurses to understand the concepts surrounding disease burden and trends in health policy to understand the policy concerns and directives that shape change in clinical practice. Understanding the potential for change to the current system of care and how and where a novel role may integrate and address a gap in care will be an important motivator to effect change to the system. Such background knowledge would be imperative in order to understand how to adapt knowledge and practice and to be able to harness existing infrastructure, communications modalities and health frameworks to apply nurse-led, Telehealth stroke prevention.
Methods

Introduction

This chapter describes a nursing study (nested within a multicentre RCT) designed to explore a nurse-led Telehealth intervention for secondary stroke prevention. A multidisciplinary group, of investigators from Medicine, Nursing, Social Work, Psychiatry and Allied Health, collaborated in designing the main project. The project aimed to test whether stroke secondary prevention, coordinated from a tertiary hospital stroke centre would be superior to the standard of care available in the community setting. In this model study nurses’ situated within a designated stroke centres performed a range of nursing activities to manage stroke survivor risk factors, primarily by telephone to communication.

The nested nursing study aimed to explore the interaction between the study nurses and stroke survivors and correlate this activity with attenuation of risk factors. The study of the nursing intervention was intended to better inform the design of future community based models of nurse-led, evidence-based Telehealth for the management of cardiovascular disease and stroke sequelae.

Research Design

The study was conceptualised and designed to fit within a multicentre RCT. The nursing study followed a quasi-experimental before and after design for the investigation and analysis of the nurse-led telephone intervention.

Setting. The study was conducted at 6 major metropolitan hospitals. There were 5 tertiary public hospitals (The Royal Melbourne Hospital, Western Hospital, St Vincent’s Hospital (Victoria), Royal Perth Hospital, John Hunter Hospital - Hunter New England Health Service) and one private, not-for-profit hospital (Epworth Healthcare). Each hospital had a designated Neurosciences Division, a Department of Neurology and was accredited as a designated Stroke Centre with a standalone Stroke Care Unit. The public hospitals offered stroke survivors a
stroke follow-up clinic or neurology clinic follow-up appointment, usually within 4 – 12 weeks of discharge, and further outpatient appointments based upon individual needs. One site included a Nurse Practitioner in the continuum of inpatient acute and sub-acute care and in the outpatient follow-up of TIA patients.

Participants. The nursing study primarily focussed upon the telephone interaction between: (a) study nurses and (b) stroke survivors including their carers (if applicable) and family and was designed to take into account interactions with (c) GP’s; (d) specialist neurologists and (e) Allied Health.

Sample. The study sample consisted of patients presenting to a participating hospital assessed using diagnostic imaging and clinical evidence as having experienced ischemic stroke, hemorrhagic stroke or TIA.

Power calculation. Power and sample size was determined based upon results of the pilot study, for comparing means: 1-way ANOVA Pairwise, 2-sided equality SBP. Based upon the mean difference for SBP at 12-months – 12 (mmHg) (SD: 14), number of pairwise comparisons 1, 21 participants were required for 80% power and an alpha of 0.05. Based on a drop-out rate of 20-25%, 27 participants would be required.

Inclusion criteria:

1. Patient’s 18 years or older
2. Diagnosed with stroke (hemorrhage, infarction) or TIA.
3. Returning home (or to a hostel), and to the care of their GP on discharge; and
4. Able to provide informed consent or person responsible unable to provide informed consent.

Exclusion criteria.

1. Patients unable to return home and to the care of their GP.
2. Patients experiencing subarachnoid hemorrhage, traumatic intracerebral bleeding, subdural hematoma or dissection.

3. Patients from international and interstate locations.

4. Patients from rural and remote locations

5. Language barrier insurmountable.


7. Assessed as unlikely to complete study.

Study Interventions

Initial contact with eligible patients. The study design allowed a 3-month window of opportunity from the index stroke event to inclusion. Each participating hospital maintained a log of stroke care unit admissions. The log enabled tracking of eligible patients for participation in the study. Patients were approached during the sub-acute period of admission, or if this was not possible, they were approached either during rehabilitation or at home.

Consent. As part of ethical considerations (see Ethical Considerations), patients assessed as meeting eligibility criteria were approached to provide informed consent.

Randomisation. The randomisation program utilised a small block, per site randomisation schedule across the sites. The randomisation of participants at each site was managed by an independent voice randomisation service (IVRS). Each study site had a separate login to the system.

This study followed on from an earlier pilot project that recruited participants from two of the hospitals (RMH and Western Hospital). To avoid contamination of results by GP’s that had been exposed to parts of the study methodology in the pilot, a list of GP’s was built in to the sophisticated electronic randomisation database. Participants GP’s were allocated an ascending number (stored in a separate log at each site). As required, the randomisation program allocated patients to the group that their GP had previously been exposed to in the
pilot. All new GP’s (and therefore participants) were randomised 50:50 to intervention or control group. In this way, the GP number was used to avoid contamination of the sample, for GP’s with multiple participants.

Therefore, it is important to note that the GP number was used to randomise participants to group. After randomisation participants would either be exposed to one of two study groups: ‘usual care’ (Control Group), or ‘nurse-led care’ (Intervention Group). Participants were assigned a unique identifier by the randomisation program.

**Intervention group.** Two key elements comprised the care of the stroke survivor as illustrated in Figure 1.

*Telephone follow-up based on risk for successive stroke.* The frequency of telephone follow-up was initially based upon participants assessed risk for successive stroke. Patients were allocated to high, medium, or low risk groups based upon age and complexity of risk factors. The potential existed to modify the frequency of telephone follow-up, based upon participants potentially changing health needs and individual circumstance. Therefore, the study nurse was allowed the capacity to negotiate an increase or decrease in the frequency of calls based upon ongoing assessment and participant needs. E.g., a participant on a cycle of monthly calls might have required weekly or fortnightly calls to address a particular health related matter.

2. *Quarterly GP visits.* The process involved the study nurse conducting a semi-structured pre-visit telephone interview with the participant to formally assess and report upon current problems, specific health behaviors, risk factors, post stroke depression and current therapy. The study nurse prepared and faxed a report to the GP to advise on their patient’s condition and to alert the GP that their patient would make an appointment for review of their risk factors. At subsequent telephone contact the study nurse and participant reviewed any changes or uncertainties related to ongoing secondary prevention.
The nursing sub-study was designed to explore the therapeutic interaction within both types of telephone calls. The decision was made that the purpose (as outlined above) of the calls was of less importance to the study than was the content of the calls. Therefore this factor was not considered, and the study methods allowed that the study did not delineate between the types of calls but sought to look at the therapeutic communication contained in telephone calls as a whole.

**Control group.** The current standard of care available in the community without ongoing telephone follow-up.

**Measurement intervals.** Both control and intervention group participants underwent baseline interview and the baseline battery of measures in close proximity to discharge from hospital. Discharge was separation from the acute facility for patients returning directly home, or discharge from inpatient rehabilitation for patients requiring post-stroke rehabilitation. Both groups continued in parallel through discharge and stroke clinic follow-up. After stroke discharge and stroke clinic activities (activities related to usual care) the groups embarked upon separate courses, until 12 month follow-up. Intervention participants were exposed to risk stratified Telehealth interventions and quarterly GP visits with the potential for Shared Care (Fig 1).

At 12-months (outcome), both control and intervention group participants risk factor parameters were collected from their GP and forwarded to the study nurse. Both groups attended an outcome interview with the study nurse.
Ethical Considerations

Ethical Approval was gained from Human Research Ethics Committees (HREC) from all participating sites prior to commencement of recruitment at each site. The nursing sub-study was included as amendment four to the original approval (HREC: 2007.056). Ethical Approval was gained from the University of Melbourne (ID: 0933034.1) after completing a successful Defence of Ethics to the Faculty of Medicine, Dentistry and Health Sciences.

Consent. Prior to taking part in research activities participants were provided with an HREC approved Participant Information and Consent Form (PICF) and given an appropriate period of time in which to consider involvement and gain appropriate answers to questions.
about the research. Research activities commenced only after receiving informed consent from participants.

**Researcher bias.** In this study the investigator was required to fulfil three distinct roles. Firstly, in the role of a service provider, within the framework of the research, as study nurse for a group of intervention participants. In this role, the researcher actively participated in participant recruitment, the intervention and outcome follow-up interviews for both intervention and control participants at 12-months. Secondly for the nursing sub-study the researcher fulfilled the role of investigator. Thirdly, as project manager for the overall project.

Introduction of bias was considered extremely important from the outset of the research. This concern was addressed with members of the Scientific Advisory Committee and the higher degree supervisors’. Both groups provided approval to engage with participants in the dual relationship of study nurse and investigator. To avoid potential bias the research interactions were guided by 10 years of experience in the field of clinical research in order to conduct the research objectively. At all times the researcher and research team practiced in adherence to the National Statement on Ethical Conduct in Human Research (2007).

**Privacy and confidentiality.** All participants were assured confidentiality of their information. Participants were assigned a site-specific unique identifier for all corresponding research transactions. Only site-specific staff had access to participant identification either in hard copy documents or in electronic format in the database. By using a unique site-specific identifier, participants were potentially re-identifiable. Participants were assured that they would not be identified in any publications related to the research. Participants were advised that they would be able to access all information collected about them for the purposes of the research through application to the research group. At all times, in collecting information from or about participants, the research staff took all steps to avoid disclosure of the participant’s information and identity to outside parties.
Data storage. All data was held in the hard copy clinical research file (CRF) stored in a secure research office in accredited research facilities in locked conditions. Site Clinical Research Agreements stipulated that the research documentation would be stored for a period of five years after the completion of the research and then be destroyed.

Data from the CRF was transferred to an electronic database to facilitate analysis. The web-based study database held approved layers of security, including adequate firewall protection of the servers, designated user access permissions, including password and secure login information for site nurses, project management and I.T. support staff. The study database was created for the research only and was approved as not to be used as a databank until further approval was granted.

Data collection. Data was collected from multiple sources, including access to patient hospital records, face to face and telephone interview, through administration of validated research measures and collection of data from GP’s. Data was collected and managed by the study nurses at baseline, during the intervention and at outcome.

Study nurses training

The project manager provided nurses at disparate sites with instruction on the processes of the model. Study nurses were provided with the approved study manual. The manual was a 34-page document providing investigators and site staff with information to understand the workflows and process of the model. A range of study specific guidelines, definitions and helpful documents were appended including: (a) the guidelines for conducting the telephone calls and (b) definitions of nursing activities/interventions of interest.

In the period leading up to a study nurse’s first participant randomisation, the project manager provided the nurse with an equivalent of 1-week of intensive education and process feedback, including both face-to-face and telephone support. In the early phase of site initiation, each study site was visited regularly to ensure the site study nurse was adequately
prepared to undertake screening recruitment and follow-up procedures. After the first randomisation, the project manager offered a high frequency of individual telephone and face-to-face support on a day-to-day basis for study nurses to debrief and discuss the study process. After this initial period of supervision, ongoing support was made available as required. Structured support was made available through monthly teleconferences allowing study nurses the forum to discuss study related matters as a group. In this way consistency of the intervention was monitored regularly.

**Study Measures**

To study the effects of the trial intervention the investigators of the main study selected a range of baseline tests commonly used to measure the effect of new therapies in the field of stroke research. Additional complementary measures from the perspective of social work and psychiatry were chosen to enhance the understanding of the impact of the intervention on social functioning and on PSD.

**Baseline measures.** Baseline measurement aimed to define the characteristics of the research participants. The battery of tests collected epidemiological data to describe both the individual and the group from clinical, economic, neurological, psychological and social perspectives. (See Table 6.)

**Table 6**

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<th>Baseline measures</th>
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<td><strong>Demographics.</strong></td>
<td>Age, gender, education, employment,</td>
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<td><strong>Cardiovascular Risk Factors:</strong></td>
<td>Hypertension, Lipid Profile, Diabetes, Carotid Stenosis, Cardiac Source for Embolism, Smoking, Alcohol Consumption, Physical Activity, BMI.</td>
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<td><strong>National Institutes Health Stroke Scale (NIH-SS)</strong></td>
<td>Measure of neurological functioning</td>
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<td><strong>Barthel Index (BI)</strong></td>
<td>Measure of ability to participate in activities of daily living</td>
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<td><strong>Carer Strain Index (CSI)</strong></td>
<td>Measure of carer strain</td>
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<tr>
<td><strong>Person Health Questionnaire PHQ-9</strong></td>
<td>Brief Screening and measurement of depression tool</td>
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Dependent variables at 12-month interval. To test the effectiveness of the model the baseline measures were repeated at the twelve-month interval. The National Institutes Health-Stroke Scale (NIH-SS) was not repeated, as this was primarily used as a baseline measure of neurological function. The Six Meter Walking Test and the Human Activity Profile (HAP) were added to measure physical activity and the London Handicap Scale (LHS) was used to further measure the participants’ functional ability in relation to the impact of chronic illness on lifestyle.

Nursing Intervention

The nursing intervention consisted of the defined activities, performed and documented during the regular telephone follow-up of participants. The nursing study intended to explore the Telehealth based therapeutic communication within these telephone calls. The regular contact with the participant, their carer and family, provided by this telephone follow-up, constituted the novel intervention. To explore and measure the type of activity and the level of activity the nursing investigator developed an audit tool.

The telephone audit tool. The telephone audit tool was conceptualised during the design period for the nursing study. The concept grew from the nursing investigators prior involvement in the pilot project (Joubert et al., 2006), and from review of related literature. Based upon the literature and the pilot study experience and in consultation with academic staff from the School of Nursing and Social Work, Faculty of Medicine, Dentistry and Allied Health at the University of Melbourne the audit tool was drafted and approved for use in the nursing sub-study by the investigators.

The audit tool collected data on a set of nursing interventions that potentially impact (a) secondary prevention, (b) uptake, maintenance and/or adherence to community rehabilitation, (c) reintegration into the community and (d) continuity of management and care of the chronically ill patient.
The audit tool was designed to record both quantitative and qualitative data from all telephone interactions between the nurse and participant. The tool provided space to record the date and duration of the call and whether the call was incoming or outgoing. The single page was then divided into six key fields that included: (a) Nursing interventions, (b) Reasons for nursing interventions, (c) Research required, (d) Referrals, (e) Persons spoken with and (f) Qualitative notes (See appendix).

**Nursing interventions (Field 1).** To facilitate the exploration of the therapeutic interaction occurring during telephone calls a set of ten predictor variables were selected representing 3 fundamental nursing process activities and 7 related specific advanced nursing activities that held potential to impact upon participant health outcomes. After thorough examination of relevant texts (Crisp & Taylor, 2009 and Gulanick & Myers 2007) the independent variables were defined for the purposes of the study, discussed with the study nurses and appended in the study manual for reference (Gulanick & Myers, 2007; Potter et al., 2012). The nursing activities formed the core nursing intervention under exploration and underpinned the novel model of evidence-based, person-centred, Telehealth nursing care of stroke survivors.

**Assessment.** Assessment was defined as an evaluation of a disease or condition based upon the participant’s subjective report of the symptoms and the course of their illness or condition and the examiner’s objective findings, including data obtained through laboratory tests, physical examination and medical history. Assessment involved the process of objectively gathering and documenting information about a patient’s physiological, psychological, sociological and spiritual state to identify needs and problems in order to form a plan of care.

**Care planning.** Care Planning involved the formulation of a plan based upon assessment and diagnosis that focused on achieving agreed health related outcomes. For the nursing study,
nursing care planning had four main components: (a) Identification of problems or diagnoses and formulation of statements demonstrating pathways towards resolution of the problems. (b) A statement that reflected the potential benefit or potential health outcomes for the participant. (c) A statement that described actions required to achieve the agreed outcomes. (d) An ongoing negotiation and evaluation of the participant’s response to the plan in order to adjust therapeutic measures as necessary.

Case management. Case Management was defined as a collaborative process that included coordination of medical and associated services, patient assessment, planning, advocacy, referral, problem solving and follow-up to effectively utilize available health related resources to meet cost-effective and quality individualised health outcomes.

Education. Education was defined as the act of imparting knowledge and skills to patients in an effort to effect health outcomes and self-care.

Advocacy. Advocacy was defined as a process whereby a health professional provided a patient with the information to facilitate or make specific health care decisions. For the nursing study advocacy involved empowering patients and carers with a greater understanding of health care information. Advocacy was aimed towards promoting self-care and an enhanced quality of life. The study nurses were encouraged to use the skills of education, problem solving, mediation, negotiation, coordination and clarification.

Consultation. Consultation was defined as a process in which the help of a specialist or other members of the multidisciplinary team was sought to identify ways to handle problems in patient management or in the planning and implementation of health care.

Behavior change. The process of Behavior change involved the study nurses considering a range of strategies or tools directed towards effecting self-care in individuals.

1. Employing the use of tools encapsulated in the trans theoretical model to assess willingness to change (Bandura, Prochaska, & Velicer, 1997; Prochaska & Velicer,
1997). Nurses were asked to use a scale of 1 – 10 to ask participants to rate their level of confidence in making a health related behavior change. Scores of 7 and above indicated that the participant was potentially ready to initiate change.

2. Being mindful of the five stages of change and to be able to understand how and when to engage in therapeutic communication related to each stage of change (Norcross, Krebs, & Prochaska, 2011). The patient phases in the stages of change involved: (a) Precontemplation, (b) Contemplation, (c) Preparation, (d) Action and (e) Maintenance.

3. Alongside counseling, using Motivational Interviewing techniques, the nurses were asked to use empathetic and reflective listening to understand an individual’s readiness to change, from the individuals own perspective (Miller, & Rollnick, 2002). Nurses were advised to use open-ended questioning to assess the subjects own perspective. The nurses were asked to use reflective responses to guide the participant and to use positive feedback and appreciation of the subject’s efforts, to influence the participant and show confidence in their ability to make change.

**Counseling.** Counseling was defined as the act of providing advice and guidance to a patient or the patient’s family. Counseling was suggested as a technique that would help the participant recognise and manage stress and facilitate interpersonal relationships between the patient and the family, significant others or the health care team (Geldard & Geldard, 2008). Counseling was aimed to assist the participant to openly discuss their feelings and potentially explore a range of experiences including difficulties, distress, dissatisfaction with life, or the loss of direction and purpose. Through counseling and the process of active listening it was considered possible that the study nurse, seeing matters from the participant’s perspective, would potentially enable the patient to understand matters from an alternative perspective. Counseling during brief clinical encounters, was considered a relatively effective method of systematically influencing behavior change through the use of the 5 A’s to assess, modify and
evaluate participants thoughts about their situation: (i) Assessing, (ii) Advising, (iii) Agreeing, (iv) Assisting and (v) Arranging.

Study nurses were advised that counseling may involve problem-solving skills, but that the act should not be judgemental, nor should the counselor become overly burdened by the client’s problems. The nurse was expected to show acceptance and respect for the participant in order to allow trust to develop, thus opening pathways to enable the participant to look at aspects of their life, their relationships and themselves that were previously not addressed.

*Crisis intervention.* Crisis intervention involved the potential for an immediate, short-term therapeutic response to an emergency situation, an acute illness episode, personal crisis or a threat within a person’s immediate environment.

**Referrals (Field 2).** This section of the audit tool was used to record whether the study nurse initiated referral to other health care professionals or health service providers based upon the content of the particular telephone interaction. The section enabled coding for: (a) GP, (b) Specialist, (c) Community Service Provider (d) Allied Health (e) Nursing Services. Details were maintained in written documentation and progress notes.

**Research required (Field 3).** The aim of this section was to record ongoing educational activities engaged in by the study nurses related to the content of the interaction. The educational activities would provide examples of how often study nurse required additional resources and how this additional information was sourced. This section was divided into 4 variables: (a) Web-based (b) Within the institution (c) External to the facility and/or (d) Evidence-based.

**Indicator for nursing interventions (Field 4).** A separate and adjacent section of the telephone audit tool held a list of reasons for nursing interventions. Twenty-five different reasons were provided (See appendix). The reasons were provided to enable nurses to code a range and/or combination of factors that may motivate engagement in a nursing based
intervention from Field 1. The factors were selected for their relationship to the aims of the interventions. For example, factors provided included medication compliance, shared care, risk factor management, adjustment to behavior change, adjustment to health condition and carer support. The factors represented reasons for interventions that were tied to the key aims of the integrated model and the goals of the nursing sub-study. i.e., to influence positively (a) secondary prevention, (b) community rehabilitation, (c) reintegration and (d) longer-term management of the stroke survivor.

**Quantitative data (Field 5).** The audit tool was designed to collect quantitative data related to (a) the frequency of both outgoing and incoming telephone calls per participant, (b) the number or combination of different nursing interventions delivered per individual call, (c) the number and type of factors influencing the interventions.

Temporal data was collected to indicate the sum of the duration of the telephone calls (total call duration in minutes) and the relative time expended on individual nursing interventions (minutes per intervention).

**Qualitative data (Field 6).** The audit tool was designed to collect written progress reports on the participant’s condition to allow subsequent, further detailed analysis of embedded themes arising in the therapeutic communication, to better understand the needs of stroke survivors, their carers and families and to understand nursing responses.

**Correspondence.** Selected data from baseline and throughout the intervention was used to populate the various letters and reports as part of the Integrated Care Model. Data entered into the study database was automatically uploaded into the abovementioned patient specific documents. Documents could then be downloaded from the database to facilitate the model. Correspondence was stored in a site secure document repository within the database. Identifiable hard-copy documents were stored separately from the de-identified study CRF.
Validity and reliability. The Internal Validity (Quantitative) of the study was improved by using a RCT design. The most salient threat to the study was loss to follow-up related to the small population size achieved in the study time frame. This was of concern as the intervention involved performing markedly different activities with the experimental and control groups. A concern was that highly controlled clinical trials that include lifestyle interventions, often attract low numbers of highly selective populations willing to undertake participation (Laws et al., 2013). An example cited was that only 2.4% of the originally screened population in a US Diabetes prevention trial agreed to take part. This trend towards a low uptake of participation was evident in screening and randomisation at all sites involved in this trial (Figure 2). The potential constraints of a small sample size posed a major concern in case the remaining participants differed from those who withdrew, thereby nullifying the sought after equivalence of the groups established by using a randomised controlled design (Polit & Beck, 2006).

Hypotheses

The objective of the research was to relate the impact of the nurse telephone calls to improved risk factor outcomes. The concept of ‘level of activity’ was considered as one valid and plausible way of describing this part of the nursing intervention. The level of activity was defined as the frequency of selected nurse specific interventions (see pp: 72-75. Assessment, care planning, case management, education, advocacy, consultation, behaviour change, counselling and crisis intervention), in conjunction with the total time and relative time expended on the intervention.

Primary hypothesis. That the nursing telephone intervention, as measured by frequency of telephone interaction and both total time and relative time provided to participants, would impact positively on modifiable cardiovascular risk factors after 12-months exposure to the nursing intervention.
Secondary hypothesis. That exposure to the nursing intervention would reduce the occurrence of post stroke depression.

Analyses.

The study had 13 dependent variables of which all were continuous variables. The primary goal of this study was to understand whether there was a significant relationship between the independent group variable (intervention and control), and each outcome or dependent variable. A one-way analysis of covariance or One-way ANCOVA was considered appropriate to evaluate the impact to the nursing Telehealth intervention on each of the dependent variables.

Statistical software. The output from the main study database was stored in a Microsoft Excel spreadsheet. The data was transferred from Excel to IBM SPSS version 19.0 for analysis of study results.
Results

Participation

**Eligible participants.** Cleaned data was made available from four participating Stroke Centres (two sites had no completed participants) and released for analysis for the nursing study. A total of 1872 patients fitting the potential for a diagnosis of stroke were screened. Of this pool of patients 1638 patients were excluded related to:

1. Participating in other research (183)
2. Severely cognitively impaired (120)
3. Insurmountable language barrier (181)
4. Comorbidities or non-compliant with protocol (135)
5. Death, poor prognosis or discharge to high-level care (262)
6. Rural, remote, interstate or international visitors (230)
7. Other reasons (527) (*available resources eg., time, leave, weekend presentations*)

A total of 234 patients were eligible to participate. Of this subset of patients 123 refused to take part in the research, leaving a total of 111 patients who agreed to take part. (See Figure 2)

**Revoked consent.** Patients that provided Informed Consent were randomised by the study IVRS to either control or Intervention group as per the method described in the Chapter Three Methodology. Fifty-seven participants were randomised to Control conditions and 54 participants were randomised to the Intervention. For the Control group, five participants revoked their consent during the one-year follow-up period. For the Intervention group 11 participants withdrew consent during the follow-up period.
Figure 2

Study flow chart

Study Flow Chart

Enrollment

Assessed for Eligibility (n=1872)

Excluded (n=1683)
  - Not meeting inclusion criteria (n=1033)
  - Declined to participate (n=123)
  - Other reasons (n=527)

Randomised (n=111)

Allocation

Allocated to intervention (n=54)
  - Received intervention (n=54)
  - Did not receive intervention (n=0)

Allocated to control (n=57)
  - Received allocated control (n=57)
  - Did not receive allocated control (n=0)

Follow-up

Lost to follow-up (n=11)
  Discontinued intervention:
    Revoked consent (n=11)

Lost to follow-up (n=6)
  Discontinued intervention:
    Deceased (n=1)
    Revoked Consent (n=5)

Analysis

Analysed (n=43)
  Excluded from analysis (n=1) outlier detected.

Analysed (n=50)
  Excluded from analysis (n=0)
Deceased participants. For the control group one participant was deceased at the outcome study follow-up. Cause of death was recorded as recurrent stroke. There were no further recorded instances of vascular events at 12-months for either group.

Baseline Characteristics

Gender. Of the 93 participants that completed participation in the study, 63 were males (67.74%), of which 35 were Controls (37.63%) and 28 were in the Intervention group (30.11%). There were 30 Female participants that comprised 32.26% of study the population. Although similar for both groups less females were recruited and remained as participants in this study. The intervention group comprised of 28 males (65.10%) and 15 females (34.90%) (See Table 7). The control group was made up of 35 males (70.00%) and 15 females (30.00%). The data shows that both groups comprised of similar proportion of males and females.

Age. The Average age was 72 for the intervention group and 70 for the control group. (See Table 7)

Education. Inequality was seen in the distribution of the level of education between the Control and Intervention groups (See Table 7). A larger proportion of control participants (25 or 50% of the control group) attained only Primary School Education, compared with 13 in the intervention group (30%). A greater proportion of intervention participants (11 or 25% of the intervention group) completed higher school education compared with 7 in the control group (14%). For post high school education including, certificate, diploma, tertiary education and higher university education both groups were relatively evenly matched. Data was not recorded for 6 participants five of whom were in the intervention group.

Occupation. Occupation was similarly represented among Professionals (Intervention 26%, Control 22%), Associate Professionals (Intervention 2%, Control 2%) and Managers and Administrators (Intervention 9%, Control 8%). Clerical sales and service workers were less
Table 7  
**Descriptive Demographic Statistics**

<table>
<thead>
<tr>
<th></th>
<th>Intervention</th>
<th>%</th>
<th>Control</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>15</td>
<td>35</td>
<td>15</td>
<td>30</td>
</tr>
<tr>
<td>Male</td>
<td>28</td>
<td>65</td>
<td>35</td>
<td>70</td>
</tr>
<tr>
<td><strong>Mean age</strong></td>
<td>71.51</td>
<td></td>
<td>69.98</td>
<td></td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>No formal Education</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Primary School</td>
<td>13</td>
<td>30</td>
<td>25</td>
<td>50</td>
</tr>
<tr>
<td>High School certificate or diploma</td>
<td>11</td>
<td>26</td>
<td>7</td>
<td>14</td>
</tr>
<tr>
<td>Post school certificate of diploma</td>
<td>8</td>
<td>19</td>
<td>7</td>
<td>14</td>
</tr>
<tr>
<td>University degree</td>
<td>3</td>
<td>7</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Higher university degree</td>
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<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Missing</td>
<td>5</td>
<td>12</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td><strong>Occupation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Professionals</td>
<td>11</td>
<td>26</td>
<td>11</td>
<td>22</td>
</tr>
<tr>
<td>Associate professionals</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Managers and administrators</td>
<td>4</td>
<td>9</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Advanced clerical, sales and service workers</td>
<td>2</td>
<td>5</td>
<td>7</td>
<td>14</td>
</tr>
<tr>
<td>Intermediate clerical, sales and service workers</td>
<td>4</td>
<td>9</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Elementary clerical, sales and service workers</td>
<td>2</td>
<td>5</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Intermediate production and transport workers</td>
<td>3</td>
<td>7</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Tradespersons and related workers</td>
<td>4</td>
<td>9</td>
<td>9</td>
<td>18</td>
</tr>
<tr>
<td>Laborers and related workers</td>
<td>5</td>
<td>12</td>
<td>11</td>
<td>22</td>
</tr>
<tr>
<td>Never had a paid job</td>
<td>2</td>
<td>5</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Missing</td>
<td>5</td>
<td>12</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td><strong>Employment at time of stroke</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employed</td>
<td>9</td>
<td>21</td>
<td>14</td>
<td>28</td>
</tr>
<tr>
<td>Retired age related</td>
<td>22</td>
<td>51</td>
<td>28</td>
<td>56</td>
</tr>
<tr>
<td>Retired health related</td>
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<td>2</td>
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<td>6</td>
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<tr>
<td>Unemployed</td>
<td>3</td>
<td>7</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Working in the home</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Missing</td>
<td>6</td>
<td>14</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td><strong>Annual Household income</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AUD $52,428</td>
<td>43</td>
<td>100</td>
<td>50</td>
<td>100</td>
</tr>
</tbody>
</table>

...equally represented in the study at advanced, intermediate and elementary levels as shown in Table 7. There were more tradespersons in the control group (18%) than in the intervention (9%). There were more labourers in the control group (22%) compared with 12% in the intervention group. There were 3 participants (2 Intervention group) that never held a paid job,
and data was not recorded for 9 participants relatively equally spread between control and intervention groups.

**Employment at time of stroke.** A greater proportion of Control participants (28%) were employed at the time of their stroke (Intervention 21%). A greater proportion of control participants (62%) were retired related either health or age, compared with 54% or the intervention group. Data was not recorded for 8 participants. (See Table 7.)

**Income.** Baseline annual household income was captured in the database in a range of $10,000 increments e.g., $10,000 – 20,000, $20,000 – 30,000 and so on. For the purpose of establishing a mean income range, the figures entered into the database were the median value for the range selected by the participant e.g., if $40,000 – 50,000 was selected the value entered into the database was $45,000. Table 7 shows that the mean income for participants in the intervention group was $52,428 (Median = 35,000, Mode = 25,000, SD = 46,358.12) and exceeded that of the control group Annual Household Income at $46,463 (Median = 35,000, Mode = 25,000, SD = 32,523.91). However, the differing mean incomes may be explained by the annual household income of one participant (outlier) in the intervention group of $205,000.

**Stroke subtype.** TOAST criteria were recorded for all participants. Similarity was found for the subtypes: cardioembolism (14% Intervention, 18% Control), Large-artery Atherosclerosis (14% Intervention, 10% Control), Small Vessel Occlusion (14% Intervention, 16% Control), and Stroke of Other Determined Etiology (14% Intervention, 16% Control. As can be seen in Table 8, at discharge (baseline interview) there was a high proportion of cases that required further outpatient diagnostic testing to confirm etiology (44% Intervention, 34% Control).
Between Control and intervention groups there was a similarity displayed for percentage of participants with Lacunar Infarction (Intervention 12%, Control 12%), Partial Anterior Circulation Infarction (Intervention 40%, Control 30%) and Posterior Circulation Infarction (Intervention 21%, Control 26%). The largest proportions of participants were grouped within the three aforementioned classifications (Intervention 72%, Control 68%).

For the Control group Partial Anterior Circulation (16%) was dissimilar to the Intervention group (5%). Hemorrhage was evident in 9% of the Intervention group and 6% of the Control group. Syndromes (LACS, PACS and POCS) selected for cases diagnosed as Transient Ischemic Attack made-up 16% or the Intervention group and 24% of the control group. (see Table 9)

Severity of stroke. The collected data allows the researcher to infer that participants enrolled in this study were mildly affected by the index stroke or transient ischemic attack (Table 10). At baseline the mean National Institutes Stroke Scale score was 2.05 for the intervention group and 1.68 for the control group suggesting only mild neurological impairment for participants in both groups. The mean Modified Rankin Scale score, (intervention: 2, control: 1.72) at baseline, indicated that most participants had some residual

### Table 8

**Stroke sub-type**

<table>
<thead>
<tr>
<th>TOAST (Stroke Subtype)</th>
<th>Intervention</th>
<th>%</th>
<th>Control</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardioembolism</td>
<td>6</td>
<td>14</td>
<td>9</td>
<td>18</td>
</tr>
<tr>
<td>Large-artery Atherosclerosis</td>
<td>6</td>
<td>14</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>Small Vessel Occlusion</td>
<td>6</td>
<td>14</td>
<td>8</td>
<td>16</td>
</tr>
<tr>
<td>Stroke of Other Determined Etiology</td>
<td>6</td>
<td>14</td>
<td>8</td>
<td>16</td>
</tr>
<tr>
<td>Stroke of Undetermined Etiology</td>
<td>19</td>
<td>44.2</td>
<td>17</td>
<td>34</td>
</tr>
<tr>
<td>Missing</td>
<td></td>
<td></td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>N</td>
<td>50</td>
<td>100</td>
<td>43</td>
<td>100</td>
</tr>
</tbody>
</table>
stroke symptoms, that they were able to look after their own affairs, but many cases were unable to return to normal activities.

Table 9
Oxfordshire classification

<table>
<thead>
<tr>
<th>Oxfordshire Classification</th>
<th>Intervention</th>
<th>%</th>
<th>Control</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>TACI</td>
<td>1</td>
<td>2.3</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>LACH</td>
<td>1</td>
<td>2.3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>LACI</td>
<td>5</td>
<td>11.6</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>LACS</td>
<td>3</td>
<td>7</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>PACH</td>
<td>1</td>
<td>2.3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>PACI</td>
<td>17</td>
<td>39.5</td>
<td>15</td>
<td>30</td>
</tr>
<tr>
<td>PACS</td>
<td>2</td>
<td>4.7</td>
<td>8</td>
<td>16</td>
</tr>
<tr>
<td>POCH</td>
<td>2</td>
<td>4.7</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>POCI</td>
<td>9</td>
<td>20.9</td>
<td>13</td>
<td>26</td>
</tr>
<tr>
<td>POCS</td>
<td>2</td>
<td>4.7</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>N</td>
<td>43</td>
<td>100</td>
<td>50</td>
<td>100</td>
</tr>
</tbody>
</table>

TA = total anterior, PA = partial anterior, PO = posterior, L = lacunar
S = syndrome, I = infarction, H = hemorrhage, C = circulation

Barthel Index scores of 90 indicate that both control and intervention participants may have been dependent on assistance in at least one or two categories of the scale, a score of 100 indicating independence. Similar mean scores for the Modified Mini Mental State Examination (intervention: 26.79, control: 26.86) suggest that participants in both groups’ exhibited minor impairment. Similar mean scores were evident for the intervention and control groups for receptive and expressive aphasia indicating that for both groups, participants’ ability to communicate effectively was mildly impaired.
Table 10
Severity of stroke

<table>
<thead>
<tr>
<th>Baseline Stroke Severity Measures (Mean Scores)</th>
<th>Intervention (M)</th>
<th>Control (M)</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Institutes Health Stroke Scale</td>
<td>2.05</td>
<td>1.68</td>
</tr>
<tr>
<td>Modified Rankin Scale</td>
<td>2.00</td>
<td>1.72</td>
</tr>
<tr>
<td>Barthel Index</td>
<td>90.70</td>
<td>91.35</td>
</tr>
<tr>
<td>Modified Mini Mental State Examination</td>
<td>26.79</td>
<td>26.86</td>
</tr>
<tr>
<td>Frenchay Aphasia Screening Test</td>
<td>18.05</td>
<td>17.90</td>
</tr>
</tbody>
</table>

**Risk factors.** At baseline hypertension (Intervention: 79%, Control: 86%) and hyperlipidemia (intervention: 86%, control: 80%) were similarly distributed amongst the two groups. Diabetes was not evenly distributed between the groups (intervention: 14%, control: 42%). Cardiac Source for Embolism (intervention: 16%, control: 20%), Transient Ischemic Attack (intervention: 33%, control: 34%) and Large Artery Atherosclerosis (intervention: 14%, control: 14%) were relatively balanced between the groups as were low physical activity (intervention: 56%, control: 62%), excessive weight (intervention: 56%, control: 60%) and depression (intervention: 40%, control: 34%). (See Table 11) (See Table 2 for definition or classification of risk factor parameters)

Table 11
Risk factors

<table>
<thead>
<tr>
<th>Baseline Risk Factors</th>
<th>Intervention</th>
<th>%</th>
<th>Control</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypertension</td>
<td>34</td>
<td>79.1</td>
<td>43</td>
<td>86</td>
</tr>
<tr>
<td>Hyperlipidemia</td>
<td>37</td>
<td>86</td>
<td>40</td>
<td>80</td>
</tr>
<tr>
<td>Diabetes</td>
<td>6</td>
<td>14</td>
<td>21</td>
<td>42</td>
</tr>
<tr>
<td>Cardiac Source for Embolism</td>
<td>7</td>
<td>16.3</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>Transient Ischemic Attack</td>
<td>14</td>
<td>32.6</td>
<td>17</td>
<td>34</td>
</tr>
<tr>
<td>Large Artery Atherosclerosis</td>
<td>6</td>
<td>14</td>
<td>7</td>
<td>14</td>
</tr>
<tr>
<td>Smoking</td>
<td>9</td>
<td>20.9</td>
<td>15</td>
<td>30</td>
</tr>
<tr>
<td>Excessive Alcohol</td>
<td>9</td>
<td>20.9</td>
<td>7</td>
<td>14</td>
</tr>
<tr>
<td>Excessive Weight</td>
<td>24</td>
<td>55.8</td>
<td>30</td>
<td>60</td>
</tr>
<tr>
<td>Low Physical Activity</td>
<td>24</td>
<td>55.8</td>
<td>31</td>
<td>62</td>
</tr>
<tr>
<td>Depression</td>
<td>17</td>
<td>39.5</td>
<td>17</td>
<td>34</td>
</tr>
</tbody>
</table>
Nursing Activities: Intervention Findings

Table 12 displays information regarding the nursing activities associated with the telephone intervention. Columns one to three show, the number of calls in total (879), the frequency of occasions for each nursing intervention and the percentage value of this figure expressed against the total number of calls. Additionally, the table indicates the maximum time spent on calls and on interventions and the mean and standard deviation.

For the 43 intervention participants, there were 879 telephone calls performed as part of the intervention, of which 798 (90.78%) were outgoing (Mean calls per participant = 20.44, Median = 19, Mode = 19, SD = 6.53, Min = 10, Max = 36). There were 394 calls to participants that were coded as less than one minute that included calls to message bank and unanswered calls. These calls were removed from the dataset as there was no coded therapeutic interaction recorded.

As seen in Table 12 there was overlap between interventions during a call e.g., assessment was often ongoing throughout the interaction and would overlap with for example education, where the nurse would seek to assess the participant’s uptake and understanding of education. Therefore, the sum of all interventions performed in a single telephone interaction would potentially exceed the total time taken for the call e.g., a 10-minute telephone call would potentially have 10 minutes of Assessment, 2 minutes of Advocacy, 3 minutes of Education and 6 minutes of Case Management. Therefore, 21 minutes of time spent in nursing interventions relative to the 10-minute telephone call.

Nursing intervention statistics (number of calls and time).

Assessment. Assessment took place on 578 occasions i.e., taking place on approximately 66% of calls. The mean time recorded on Assessment was 7.95 min, (Max = 40 min, SD = 5.75) indicating that Assessment was the most frequently occurring intervention and that the third largest proportion of time was expended upon it.
**Case management.** The study nurses participated in Case Management on 344 occasions, occupying 39% of the calls. The mean time for Case Management was 8.20 minutes, \((Max = 40 \text{ min}, SD = 6.60)\), indicating that Case Management was a relatively frequent activity, that required a large proportion of the nurses’ time.

**Education.** The provision of Education took place on 300 occasions, or was performed on 34.13% of telephone calls. The mean time recorded for Education was approximately 4.29 minutes, \((Max = 25 \text{ min}, SD = 3.31)\) indicating that education was provided in smaller increments of time when compared to Case Management and Assessment.

**Table 12**

*Telephone intervention data*

<table>
<thead>
<tr>
<th>Telephone intervention</th>
<th>Number of Occasions</th>
<th>%</th>
<th>Minimum (min)</th>
<th>Maximum (min)</th>
<th>Mean (min)</th>
<th>Std. Deviation (min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calls</td>
<td>879</td>
<td></td>
<td>1</td>
<td>60</td>
<td>10.00</td>
<td>7.96</td>
</tr>
<tr>
<td>Advocacy</td>
<td>122</td>
<td>13.88</td>
<td>1</td>
<td>15</td>
<td>4.35</td>
<td>2.71</td>
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<tr>
<td>Assessment</td>
<td>578</td>
<td>65.76</td>
<td>1</td>
<td>40</td>
<td>7.95</td>
<td>5.75</td>
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<tr>
<td>Consultation</td>
<td>174</td>
<td>19.80</td>
<td>1</td>
<td>40</td>
<td>7.80</td>
<td>6.73</td>
</tr>
<tr>
<td>Counselling</td>
<td>149</td>
<td>16.95</td>
<td>1</td>
<td>35</td>
<td>5.46</td>
<td>4.94</td>
</tr>
<tr>
<td>Care planning</td>
<td>152</td>
<td>17.29</td>
<td>1</td>
<td>25</td>
<td>5.07</td>
<td>3.70</td>
</tr>
<tr>
<td>Case management</td>
<td>344</td>
<td>39.14</td>
<td>1</td>
<td>40</td>
<td>8.20</td>
<td>6.60</td>
</tr>
<tr>
<td>Crisis intervention</td>
<td>23</td>
<td>2.62</td>
<td>1</td>
<td>34</td>
<td>8.43</td>
<td>7.47</td>
</tr>
<tr>
<td>Education</td>
<td>300</td>
<td>34.13</td>
<td>0</td>
<td>25</td>
<td>4.29</td>
<td>3.31</td>
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<tr>
<td>Behaviour modification</td>
<td>281</td>
<td>31.97</td>
<td>1</td>
<td>20</td>
<td>3.88</td>
<td>2.68</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Valid N (listwise)</strong></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

**Behavior modification.** The study nurses recorded that telephone activity focused upon Behavior Modification took place on 281 occasions or approximately 32% of calls. The Mean time recorded for Behavior Modification was 3.88 minutes, \((Max = 20 \text{ min}, SD = 2.68)\).

**Consultation.** Study nurses noted that they provided the service of Consultation on 174 occasions or on approximately 20% of calls). The Mean time was 7.80 minutes, \((Max = 40 \text{ min}, SD = 6.73)\).

**Care planning.** Care Planning took place on 152 occasions or was performed on approximately 17% of calls. The average time recorded was 5.07 minutes, \((Max = 25 \text{ min}, SD = 3.70)\).
**Counseling.** Counseling took place on 149 occasions or on 17% of calls. The mean time devoted to Counseling was 5.46 minutes, \((\text{Max} = 35 \text{ min}, \text{SD} = 4.94)\).

**Advocacy.** The nurses engaged in Advocacy on 122 occasions otherwise expressed as on 14% of calls. The mean time expended on Advocacy was 4.35 min, \((\text{Max} = 15 \text{ min}, \text{SD} = 2.71)\).

**Crisis intervention.** Crisis Intervention took place on 23 occasions or 2.62% of calls. The average time recorded as spent on Crisis Intervention was the largest in relation to other interventions \((\text{M} = 8.43 \text{ min}, \text{Max} = 34 \text{ min}, \text{SD} = 7.47)\).

**The participants in telephone calls.** The audit tool allowed the nurse to note who participated in each telephone call. On occasion more than one person associated with the participant participated in the call. The nurse spoke with the Stroke Survivor on 689 (77.5% of 879 calls) occasions. The Carer was spoken with on 189 occasions (21.3%). Health Professionals were spoken with on 47 (5.3%) calls and other family members on 34 (3.9%) of calls.

**Dependent variables at 12-months**

For each dependent variable the analysis followed the predetermined analysis plan outlined in Chapter Three Methodology. The results are presented in Table 14. A detailed example of the analysis is presented in the following text for systolic blood pressure.

**Systolic blood pressure (SBP).**

Prior to conducting the analysis, careful review of the full dataset showed that for one intervention group participant (61A042AH) SBP was well controlled at the 3, 6, and 9-months intervals. A file note related to the outcome telephone follow-up from that site, captured information that indicated that at 12-month GP review the participant experienced a stressful reaction to an event at the GP visit. The file note indicated that the participant received transport and was accompanied to the outcome GP visit by a neighbour. The note explains that after
waiting for 2 hours to see the GP, the neighbour became very upset. The ongoing interaction between participant and the neighbour, in conjunction with a 2-hour wait to see the GP greatly distressed the participant. The resultant outcome SBP as taken by the GP was 180 mmHg. The researcher elected to perform a repeat analysis of outcome SBP after removal of this outlier from the dataset.

For outcome SBP (outlier removed), an independent samples t-test for difference in means, showed a significant difference for the control ($M = 133.33$, $SD = 14.06$) and intervention groups ($M = 127.34$, $SD = 14.67$; $t(87) = -1.96$, $p = .05$, two-tailed). The magnitude of the difference in the means (mean difference = -5.97, 95% CI: -12.03 to .095) was small $\eta^2 = .04$ (see table 13).

Further testing of the relationship between groups for outcome SBP (with outlier removed), through testing of the relationship between the baseline SBP and group indicated a non-significant relationship between the baseline SBP and group. $F(1,85) = .82$, $p = .37$. The result of one-way ANCOVA, after adjusting for baseline SBP, demonstrated a significant difference between the two groups for outcome SBP, $F(1,86) = 4.27$, $p = .04$, $\eta^2 = .04$. Outcome SBP was lower under the intervention ($M = 127.37$) than control ($M = 133.33$) condition as expected.

To add weight to this result, review of frequency tables showed that 71% of the intervention group participants achieved the target outcome SBP < 130 mmHg, compared with 48% in the control group.

**Post stroke depression PHQ-9 score.** The results of One-way ANCOVA, after adjusting for baseline PHQ-9 score, indicated there was a significant difference between the two groups for PHQ-9 score at outcome, $F(1,88) = 4.26$, $p = .04$, $\eta^2 = .05$ as expected.
For the intervention group 85.70% of participants achieved a PHQ-9 score of 5 or less, 48% scoring 0 or no symptoms of depression. For the control group 70.80% of participants achieved an outcome PHQ-9 score of 5 or less and 35.40% scored 0.

Review of the frequency table showed that 84% of the intervention group had a PHQ-9 score less than 5 at outcome in comparison to 68% of the control group. (PHQ-9 scores less than 5 indicate that the subject is less likely to be experiencing symptoms of depression) (Kroenke, Spitzer, & Williams, 2001). Additionally, a greater proportion of Intervention participants (48%) exhibited a score of 0 compared with 35% of the control group.

**Physical activity occasions/walks per week.** The results of One-way ANCOVA, after adjusting for baseline physical activity occasions/walks per week, indicated there was a significant difference between the two groups for physical activity occasions/walks per week at outcome, $F(1,72) = 10.89, p = .002, \eta^2 = .13$ as expected.

The percentage of participants in the intervention group that participated in physical activity or walks on greater than 5 occasions per week was 63%. For the control group 28% participated in physical activity or walks on 5 or more days per week.

**Physical activity occasions/walks per day.** The results of One-way ANCOVA, after adjusting for the baseline physical activity occasions/walks per day, indicated there was a significant difference between the two groups for physical activity occasions/walks per day at outcome, $F(1,69) = 5.83, p = .02, \eta^2 = .08$ although this effect size was small.

Review of the frequency table showed that intervention participants (65%) walked or participated in a physical exercise activity once per day (42% control). For participants in the intervention group only 3% (32% control) did not participate in walking or in Physical activity for exercise.
Table 13

Results of one-way ANCOVA controlling for baseline value of the dependent variable

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Group</th>
<th>t-test</th>
<th>Outcome (ANCOVA)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mean</td>
<td>MD</td>
<td>95% CI</td>
</tr>
<tr>
<td>SBP (mmHg)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Int:</td>
<td>127.37</td>
<td>-5.97</td>
<td>12.03 to .095</td>
</tr>
<tr>
<td>con:</td>
<td>133.33</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PSD PHQ-9 score (mmHg)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Int:</td>
<td>2.09</td>
<td>-1.76</td>
<td>-3.52 to .00</td>
</tr>
<tr>
<td>con:</td>
<td>3.85</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical activity (walks per week)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Int:</td>
<td>5.13</td>
<td>2.01</td>
<td>.82 to 3.19</td>
</tr>
<tr>
<td>con:</td>
<td>3.12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical activity (walks per day)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Int:</td>
<td>1.12</td>
<td>-2.6</td>
<td>-.14 to .67</td>
</tr>
<tr>
<td>con:</td>
<td>.86</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HbA1C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Int:</td>
<td>6.05</td>
<td>-1.64</td>
<td>-2.90 to -3.8</td>
</tr>
<tr>
<td>con:</td>
<td>7.69</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DBP (mmHg)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Int:</td>
<td>74.64</td>
<td>1.49</td>
<td>-2.96 to 5.94</td>
</tr>
<tr>
<td>con:</td>
<td>73.13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T.Chol (mmol/L)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Int:</td>
<td>4.06</td>
<td>.12</td>
<td>-.25 to .50</td>
</tr>
<tr>
<td>con:</td>
<td>3.93</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HDL C (mmol/L)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Int:</td>
<td>1.31</td>
<td>.11</td>
<td>-.06 to .28</td>
</tr>
<tr>
<td>con:</td>
<td>1.20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LDL C (mmol/L)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Int:</td>
<td>2.10</td>
<td>.04</td>
<td>-.29 to .37</td>
</tr>
<tr>
<td>con:</td>
<td>2.06</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cigarettes (per day)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Int:</td>
<td>6.00</td>
<td>-5.50</td>
<td>-16.20 to 5.20</td>
</tr>
<tr>
<td>con:</td>
<td>11.50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standard alcoholic drinks (per day)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Int:</td>
<td>.63</td>
<td>.3</td>
<td>-.89 to .49</td>
</tr>
<tr>
<td>con:</td>
<td>.83</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standard alcoholic drinks (per week)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Int:</td>
<td>2.17</td>
<td>-1.45</td>
<td>-3.99 to 1.20</td>
</tr>
<tr>
<td>con:</td>
<td>3.62</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BMI</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Int:</td>
<td>27.65</td>
<td>-1.17</td>
<td>-3.78 to 1.44</td>
</tr>
<tr>
<td>con:</td>
<td>28.82</td>
<td></td>
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</tr>
</tbody>
</table>

**Glycated hemoglobin.** Results of One-way ANCOVA, after adjusting for the baseline HbA1C, indicated that the difference between the two groups for Hba1c at outcome was not significant, *F* (1,14) = 1.84, *p* = .20, η² = .12, although a trend was evident for intervention participants reaching target HbA1C of less than 7% (intervention: *M* = 6.05%, control group *M* = 7.69%).
Diastolic blood pressure. One-way ANCOVA adjusting for the baseline Dbp, showed there was no significant difference between the two groups for outcome Dbp, $F(1,86) = .32, p = .57, \eta^2 = .00$.

Total cholesterol. Results of One-way ANCOVA demonstrated no significant difference between the two groups for outcome TChol, $F(1,77) = .006, p = .94, \eta^2 = .00$.

High density lipoprotein. The result of one-way ANCOVA demonstrated there was no significant difference between the two groups for Hdlc, $F(1,64) = 1.78, p = .19, \eta^2 = .03$. The frequency table showed that 87% of intervention participants achieved target Hdlc in comparison to 76% of the control group. The trend exhibited was towards a better control of Hdlc in the intervention group.

Low density lipoprotein. Results after adjusting for the baseline Ldlc, showed there was no significant difference between the two groups for outcome Ld jc, $F(1,65) = .13, p = .72, \eta^2 = .01$.

Cigarettes per day. After adjusting for baseline cigarettes smoked per day, there was no significant difference between the two groups for outcome cigarettes smoked per day, $F(1,9) = 1.82, p = .21, \eta^2 = .17$.

Standard alcoholic drinks per day. Results of One-way ANCOVA demonstrated no significant difference between the two groups for standard alcoholic drinks consumed per day, $F(1,70) = .67, p = .41, \eta^2 = .01$.

Standard alcoholic drinks per week. For outcome standard alcoholic drinks consumed per week, after adjusting for the baseline standard alcoholic drinks consumed per week, there was no significant difference between the two groups, $F(1,75) = 2.062, p = .16, \eta^2 = .03$. 
Body mass index. After performing One-way ANCOVA, adjusting for the baseline BMI, there was no significant difference between the two groups for outcome body mass index, $F(1,73) = 2.06, p = .16, \eta^2 = .03$. 
Discussion

Introduction.

The limited results of the study only partially describe a novel nurse-led Telehealth strategy aimed at providing evidence based, person-centred care to stroke survivors living in the community over the period of 12-months after experiencing a stroke. Through the use of the audit tool the study intended to explore communication taking place between nurses and stroke survivors and carers, family members and health professionals concerned with their ongoing health care. The study was able to provide an initial exploration of the activities study nurses considered important and used in their practice when adopting the telephone modality to implement care. Additionally, the study was able to offer an indication that the nursing Telehealth intervention may have contributed to attenuation of specific clinical risk factors and mood.

Limitations. At the point where the literature review was constructed and the body of the thesis well developed, the Principal Investigator (PI) granted permission to carve out the data for the first 100 completed participants to use in the nursing sub-study. The data was cleaned and manipulated to commence the intended analyses. Initial descriptive results and the ANOVA and ANCOVA analysis were presented to my supervisors. From ongoing analyses, emerging results from the initial regression models were encouraging.

In an unexpected turn of events, the PI and my primary supervisor, at the time, completely changed their direction, stipulating that the candidate only report basic descriptive and exploratory results of the nurse’s contribution. A conflict of interest became evident. The PI and supervisor stated that no outcomes could be reported. Under extraordinary circumstances further access to the data was denied and I was instructed to hand back the
cleaned data. Therefore, all quantitative and qualitative data related to the Audit Tool, dependent (risk factor data) and all descriptive data was handed back.

From this point matters deteriorated to such an extent that over a four-year period a rare series of events unfolded involving intervention by Research Ethics and Integrity, the Deputy Dean of Research and Training, the Head of School of Nursing, MSGR the group of investigators and the Melbourne Health Office for Research. In all instances this body of research experts agreed that the analysis used was agreed upon and that the initial thesis method and proposed analysis were appropriate. It was suggested that the intensity of this particular conflict of interest and debate over intellectual property was rare and fitted a very small percentage of breakdowns in higher degree candidature. It is worth noting that discussions held up until this time were clear that the results of the sub-study would not be reported until the results of the main study were released ie., Academic convention would have been followed.

Numerous documented failed attempts were made to negotiate access to the data. At the the end of the candidature, it was only possible to comment on the initial descriptive analysis and the results of ANOVA and ANCOVA. In discussion with my supervisors, an embargo was placed on the thesis and the decision made that no publications would result. This was less than what was considered desirable from the stand-point of contributing to the science, but this was the only way forward to reach a point of submission of the thesis for examination. The analysis contained in this thesis does not provide answers to the four pre-specified questions. The analysis presented is basic and only partly contributes to answering the questions. The data was not made available to perform inferential statistics.

The Audit Tool data and the combined baseline and follow-up data was extensive and of high quality and had the capacity to provide novel and interesting results that would have provided the answers to the listed questions and indeed much more. There remains much
interest in addressing secondary prevention and assistance to stroke survivors and carers in
the community. It is of importance to note that to date, there are no results of the completed
project as a whole published.

The idea of encouraging the use of behaviour change was brought on by the excitement in the stroke community at the time to adopt such strategies. As stated appropriate credentialing of practitioners would be mandatory to ensure valid results and to ensure patient well-being.

**The role of the nurse.** The audit tool, collected data to explore the nursing intervention. Data was collected on the number, frequency and direction of calls and included temporal data to assist with understanding how much time was used in the nurse-patient interaction. Temporal data regarding the specific set of fundamental interventions involved in the nursing process was collected to explore and understand a nursing role in Telehealth. Similarly data was collected on a set of more advanced nursing interventions considered to be potentially important for effecting care for stroke survivors. For all activities data was reviewed to explore the number of times that a particular nursing activity occurred.

The results showed that 879 telephone interactions occurred between the nurses and the participants. There was a mean of approximately 20 calls for each participant averaging 10 minutes per call i.e., the real equivalent of time in minutes engaged with the participant. The minimum time recorded for therapeutic interaction was 2 minutes the maximum therapeutic call duration was 60 minutes.

The frequency of calls to participants was initially dictated by the participants assessed risk for recurrent stroke, though study nurses used clinical reasoning to exercise a degree of flexibility in negotiating continued frequency related to individual participant life circumstances. For example, 61A070TO a participant at high-risk at discharge, remained a high functioning professional that regularly travelled internationally with associated business
commitments impeding engagement with the service on a weekly basis. The qualitative case notes indicated that the study nurse and participant negotiated and agreed to a call frequency that would allow adequate follow-up, but that would not inconvenience the participant. The progress notes indicate that the participant was aware that it was possible to contact the service at all times if there was a need for support. In this instance the number of calls was less than indicated by the participants’ risk factor profile.

A second example of the flexibility in the interpretation of the algorithm would include participants that took long international holidays. A third example would include a medium risk participant that according to the algorithm would require approximately 15 calls, that required additional intensive follow-up to coordinate care activities on up to 3 calls per week for a fortnight.

For stroke survivors and families, recommendations by the Agency for Health Care and Policy Research supported monthly evaluation of progress after return to community (Buckley et al., 2004). Previous studies with stroke survivors and carers included an evaluation of 3 telephone calls and a home visit within 5 months of discharge from acute care (general support, education and advice) (Boter, 2004; Camilo & Goldstein, 2003). Another study involved telephone support to caregivers of ischemic stroke survivors for 12 weeks, weekly in the first four weeks and bi-weekly in the second four weeks (Grant et al., 2002). In another study support was given to caregivers of stroke survivors for 3 months in bi-monthly telephone calls lasting approximately 20 minutes (Pierce et al., 2004). Previous research by Joubert et al. (2006) involved telephone contact between study nurse and patient at 3 monthly intervals in the first year after an index stroke. The results of the current study demonstrate a greater frequency of calls compared with the expectations of policy makers and previous research. The model allows for adjustment of the frequency of contact with stroke survivors as necessary.
At the time of writing, usual care post discharge case-management, follow-up and secondary prevention strategies involved visits to the GP (or home visits), specialist clinic visits, private specialist consultations or a combination of two or more components of follow-up care. The model in this study potentially enhances the existing model by allowing a less restricted access to the patient in the community and through the provision of a centralised service to disseminate pertinent up-to-date health care information to health care providers. Additionally, the model exhibits the potential to reduce the occurrence of repeated testing by providers, by coordinating the sharing of information. The model required only telephone, facsimile and an initial mail-out of documents to effect coordinated care and transfer of medical information between key health care providers. Although not measured in this study, savings in time and in expenditure on wages and infrastructure appear to be potential advantages. Previous home-based strategies involved up to 30-60 minute visits coupled with additional transport times of up to 30 minutes to and from the dwelling (Buckley 2002). In the current model, in a set time period i.e., a working day, there is greater potential to use the available time to achieve greater access to patients and focus this time on direct patient care. Viewed from another perspective, telephone, fax and mail facilities form part of the fixed infrastructure within most health services. Therefore, to implement a similar model on a large scale there would likely be minimal further capital expenditure or upgrades on telecommunications infrastructure to facilitate such a system of care.

**Nursing Process and fundamental nursing activities.** The results of the exploration of the fundamental nursing activities opened a window to the therapeutic interaction with the stroke survivors, their families and the health related professionals connected with their care. The audit tool and the supplied definitions and education guided the study nurses’ secondary prevention practice, follow-up and support, by emphasising fundamental nursing skills and associated specialist nursing knowledge. The data collected showed the number of occurrences
of particular nursing interventions, including how many times the activity occurred expressed as a percentage within the total number of calls. Importantly the data showed the average time allowed for each nursing activity.

**Assessment.** The baseline interview allowed the study nurse to assess the participant from multiple perspectives and build a holistic understanding of their ongoing care and secondary prevention needs. However, for ongoing care, at each successive telephone interaction the study nurses recorded that assessment was a major part of each telephone interaction.

The nurses were briefed to objectively gather and document information about each patient’s, physiological, psychological, sociological and spiritual state to identify needs and problems in order to form a plan of care. The study nurses were asked to probe using trigger questions and record the results in progress notes. Assessment formed the platform on which to base the stroke survivors’ ongoing care.

In a previous study 91% percent of the nurse case manager’s time was spent in “surveillance” or assessment (Mayo et al., 2008). In the current study assessment did not occur as frequently. This may be partly explained by the number of other activities engaged in by the study nurses and subsequently coded e.g., advocacy, education or case management. As assessment is often ongoing throughout the whole communication, and can be considered an intrinsic part of therapeutic communication, the actual occurrence may not have been consciously considered and recorded when viewed in relation to other pressing, specific or higher-level activities engaged in during a telephone call. For example, assessment would likely form a large component of a behavioral modification attempt, e.g., a smoking cessation intervention, whereby assessment is ongoing in monitoring participant’s reactions to counseling and education. Alternatively, quizzing participants on their current medications in relation to aberrant clinical results is in its basic form assessment and could also be interpreted
as educational depending on the delivery. There is a level of subjectivity in how the study nurses interpreted their activity. In the abovementioned, study by Mayo et al. (2008), independent observers coded the results from qualitative notes. In the current study the study nurses coded their own activities. Therefore, there exists a difference in the methods employed to extract this information. The results support the inclusion of assessment as an important fundamental activity in future Telehealth models.

**Care planning.** The study nurses were encouraged to identify and document problems and formulate diagnoses and define pathways towards resolution of the problems. Secondly, study nurses were encouraged to make clear statements of the potential benefits for the patient and thirdly describe what activities needed to be performed to achieve the stated outcomes. In similarly to strategies of behavior change study nurses were encouraged to evaluate the response to therapy in order to adjust the approach as necessary.

In digesting the results of the study, care planning appears linked to assessment and as an activity that was part of or a subsidiary of Case management. In review of the data, related to the lower frequency of activity, it may be possible to suggest that once a care plan was developed the study nurse implemented the activities in an effort to achieve stated outcomes. Care planning may have been revisited or adjusted if the participant response was not as expected or if new diagnoses were found through assessment suggesting that 1 or 2 adjustments may have been made to the plan of care during the one-year intervention. Additionally, an effective care plan may be considered to underpin effective case management by providing considered diagnoses and a roadmap to achieve a set of documented goals.

**Case management.** This activity was the second most frequent. The process included coordination of medical services (GP appointments, specialist review and shared care), patient assessment, planning, advocacy, referral, follow-up and problem solving to effectively utilize available health related resources to meet cost-effective and quality health outcomes. At 8.20
minutes, case management occupied a large proportion of the nurses’ time. This may be explained by the fact that case management involves other important activities e.g., assessment, care-planning, advocacy and the coordination of services.

There are limited examples of effective standalone Telehealth based case management in stroke secondary prevention, although many more examples exist in Chronic Disease Management in general. Mayo et al. (2008) listed passive case management as a part of the nurse’s role in bridging the gap between primary care physicians and stroke survivors; however, the nurse as a passive case manager did not improve outcomes on the primary endpoints of improved social functioning and reduction in utilisation of services. The authors concluded that the intervention needed to address more potent factors such as enhancing medication compliance, in detecting health threats and in enhancing function. In the current model care planning formed an important guide to directing the nurses’ efforts in case management.

There are a number of examples of Telehealth based chronic disease management models that have documented case management as a main ingredient in disease states such as diabetes or Chronic Obstructive Pulmonary Disease. One similarly motivated study for cardiovascular risk management, reported that a system of protocol driven, individualised case management combining telephone and face-to-face case interaction produced modest effects on cardiovascular risk management (Ma et al., 2009). The study intervention was performed by both nurses and dieticians and involved the use of behavioral change theory in particular motivational interviewing techniques.

Mayo et al., (2008) concluded that Case Management would be more effective when embedded in an integrated approach. Within the current model the study nurse was integrated with the respective stroke service and embedded in a multi-directional pathway of communication with primary care physicians and specialist services. Case management as part
of the current study was probably more active (as opposed to passive) and potentially enhanced by ongoing assessment and planning.

**Advanced nursing activities.**

**Education.** Study nurses were advised that education embodied the act of imparting knowledge and skills to patients in an effort to effect health outcomes and self-care. Compared with the study reported on by Mayo et al. in the current study there was a larger component of education (34%) when compared with 23% in passive case management.

The study nurse assessed the stroke survivor, carer and family needs and subsequently developed an understanding of their educational requirements. In the model of care, education would potentially be viewed as an activity that occurred as a part of case management and after initial assessment and care planning had taken place. The content and delivery of education would be likely adjusted over the course of the study as ongoing assessment and planning took place.

The study nurses were encouraged to assist participants towards self-care and towards improved health related behaviors. The data suggests (*Mean* = 4.29 minutes, *Median* = 4 minutes, *Mode* = 5 minutes) that education may have been frequently delivered in short focused periods of the telephone calls. The data also suggests that at times the participant and nurse may have engaged in longer periods of education as indicated by the maximum of 25 minutes.

Pierce et al., (2004) reported on internet based education and support for rural carers. In this study the focus was on assisting carers to navigate changing roles and solve problems, to understand failures and successes of others to understand their own, to achieve a feeling of being connected, being spiritual and to balance successes/problems. In the current study the nursing staff practised from within the bounds of their own knowledge of stroke care with a primary objective of modifying cardiovascular risk factors and screening and ensuring management of post stroke depression. The selected study nurses practised with advanced
knowledge of nursing practice, of stroke and stroke recovery, with knowledge of the difficulties of caring for stroke survivors and of stroke prevention strategies. In the current study the study manual and audit tool directed the study nurses practice towards educational support to both participants and carers, in helping to understand new roles and changed life conditions, and to gain insight into how other stroke survivors successfully negotiated the health landscape.

In the current model study nurses targeted education towards risk factors and worked to equip survivors, carers and family members with an improved knowledge base from which to navigate their future health care needs. Study nurses were briefed to discuss risk factors, current therapy or potential changes to therapy and the significance of the participant’s ongoing results in comparison to normal values. In training study nurses were encouraged to discuss the contents of the home pantry or fridge and delineate between good and bad fats or enlighten participants about the origins of saturated fats and in what foods these fats would be found. The study nurses were tasked with discussing the benefits of walking and exercise and in providing education about alternative physical activity. In this way education was often tied to managing health related behavior change.

Education was also aimed at a general health promotion. Assisting both survivors and carers to understand the signs and symptoms of stroke e.g., The Face, Arm, Speech, Time (FAST) NSF initiative. Education comprised discussion about the logical approach to a successive stroke emergency, to ensure that a participant understood that time was ultimately important in surviving stroke.

In the study each participants ongoing education was individualised. The telephone follow-up, education and support addressed the individual’s health status. If the participant smoked, consumed excessive alcohol and was diagnosed with hypertension, education was directed to assist the participants to a better understanding of their own health, the best ways of maintaining or achieving health and the importance of addressing pertinent risk factors in
both the short and longer term. For each telephone call the matters addressed during the call were entered into a section of the audit tool that captured qualitative data, or progress notes. The study nurse was able to use the progress notes for reference during subsequent calls and to provide a basis for reflective practice.

Redfern et al., (2008) reported on an approach to individualised community stroke education. The complex model targeted patients, carers and primary care physicians. All participants were provided with individualized care packages. For the patients the hope was to assist with navigating transitions through the health landscapes and assist towards self-care. However, patients and carers expressed difficulty in understanding technical terms, expressed difficulty with reading related to eyesight and literacy and were found to disregard information as irrelevant even though the information was individualised. In the current study education was provided to individuals and significant others in an individualized and ongoing manner. The study nurse picked-up the theme of the previous call in the next call and assessed knowledge or compliance, evaluated effectiveness and where necessary modified the delivery of ongoing education in an attempt to reach the participants through their own particular learning style. For the individual their age, level of education, disability i.e., hearing or sight or the presence of dysphasia were amongst other factors, that were taken into account when individualising delivery of education. If the patient had difficulty with uptake or understanding the study nurse was able to follow-up and modify the education strategy accordingly. Nurses in the current study took into account the individual characteristics and circumstance of the patient in terms of access to knowledge and actual knowledge.

**Behavior modification.** Behavior modification was directed at helping participants to review, understand and modify health related behaviors over the one-year intervention. Change in physical activity, smoking, excessive alcohol consumption, and dietary intake were the main focus. The study nurses were provided with definitions and strategies to assist with effecting
behavior change. The theories were adopted and used interchangeably based upon individual cases. In practice the theories (5A’s, Self Efficacy Theory, Trans-theoretical Theory and Motivational Interviewing) commenced with assessment of the individual and in assisting the individual to assess their own position in the continuum of change. All theories progressed to identifying and nurturing the participant’s motivation to change, then providing encouragement and the best available environment to effect the change when the participant was assessed as ready. Providing support and feedback to maintain the change and the ability to redirect and encourage when change failed were part of the challenge to the nurse.

As indicated by Koelewijn-van Loon et al., (2009) nurses were early adopters of behavior change theories. Although Motivational interviewing, self-efficacy theory and the stages of change model have been used internationally in chronic disease management models, studies addressing behavior change are limited in stroke survivors. A program of motivational interviewing was shown to improve Post Stroke Depression at 3 months following stroke (Watkins et al., 2007). In the IMPALA (Koelewijn-van Loon et al., 2009), Project Sugar (Ma et al., 2009) and EUROACTION (Wood et al., 2008) trials, nurses addressed behavior change with promising results in patients with a high risk for cardiovascular disease. Physical activity and dietary change were behaviors that responded to behavioral change strategies.

In the current study the study nurses included the models of behavior change in their practice. The results of the current study are especially promising demonstrating improved physical activity. This is especially encouraging as a standalone achievement and when the contribution to reducing the risk of comorbid conditions e.g., hypertension, obesity is considered (Koelewijn-van Loon M.S. 2009). Further formal education or accreditation in behavioral change strategies would potentially improve upon and add to the validity and reliability of results.
**Consultation.** As an integrated service, the study nurses were embedded in the stroke service with access to specialist input from neurologists, nurse practitioners, other nursing colleagues and allied health professionals. This result shows that the study nurses were supported by the service and were able to draw upon resources to support decision-making and development of strategies for dealing with complex care situations. The result also takes into account time involved in coordinating shared care.

**Counseling.** A major challenge of the telephone intervention was to develop a trusting relationship with the participant in which to explore difficult or distressing matters. As indicated in the study definition, counseling was initiated by the participant in response to ongoing difficulty. Counseling encompassed the skills associated with problem solving and behavior change i.e., motivational interviewing, stages of change theory and trans theoretical theory. There is extensive evidence of telephone and web-based counseling services for smoking cessation (Quit, or Queensland Government Health Care Center Health Counselors), drug dependence (Direct-Line), Mental Health (Kids Help Line, Beyond Blue) However, at the time of writing there was little evidence of studies that directly addressed telephone counseling of stroke survivors and carers in the community. Grant et al., (2002) commented on the results of a study of face-to-face and telephone problem solving in a group of carers of stroke survivors. The study indicated that carers exposed to 12 weeks of telephone calls (weekly in the first 4 weeks to biweekly in the latter weeks), exhibited improved general health, social problem solving ability, satisfaction with health care services, depression and caregiver preparedness but did not show an improvement in alleviating caregiver burden.

Nurses in the current study aimed to assist stroke survivors and carers to navigate the changed conditions associated with surviving a stroke. In particular, to maintain connectedness, to express problems, fears and grief in an open way, to avoid depression, and to develop and understand potential solutions to problems.
The relatively low frequency of counseling activity is likely influenced by the fact that many stroke survivors in this study had mild residual effects from their stroke. Therefore, both survivors and carers were less likely to approach the documented difficulties associated with disability, carer strain and depression and dependency. An alternate explanation may be that counseling is an advanced skill that the nurses in this study were not entirely comfortable in engaging with patients at that particular level, or that they felt that they were not actively engaging in counseling. Nevertheless, depression scores were significantly lower for participants exposed to the nursing intervention. A subsequent analysis of counseling and depression scores may provide a clue to how activities affected outcomes.

**Advocacy.** Alongside Education and Behavior change, Advocacy hinged on empowering stroke survivors and carers towards self-care, though an improved knowledge of the health care landscape. Essentially enhancing the participants’ ability to access appropriate health care of a high standard. Within the umbrella of education and contrary to the act of direct referral, advocacy provided the participant with advice or information on the availability of services or on the standards that should be met. Advocacy took the form of guiding participants towards understanding appropriate health care choices and in achieving health related behavior change. To a degree advocacy also took the form of assisting stroke survivors in communicating their health care needs with carers, family members or associated health care providers to achieve improved health outcomes.

Again there is little evidence of studies or initiatives that report on telephone based advocacy for stroke survivors. Mayo et al., (2008) noted that 41% of time was spent on health system guidance. For the current study, education (34%) was provided on health and the health system and advocacy (14%) was focused on improved choices in health care and behavior. Importantly advocacy formed a more assertive outreach to the stroke survivors as in comparison to the less effective passive outreach found in previous stroke based studies.
Crisis intervention. On a number of occasions, the participants were found in a crisis event. On a few occasions the participant or carer called the study nurse. In most documented crises the study nurse, on calling the participant, found the participant in crisis. Falls, recurrent stroke, exacerbation of a depressive episode acute illness and disputes between family members were recorded in the progress notes.

The average time taken to intervene in a crisis was relatively large in comparison to other activities. In review, in complex situations, initial calls that included assessment and formulation of a plan were longer. However, in these complex cases, a number of calls were necessary to complete the intervention e.g., to a health service provider, specialist or family member. There were also repeat calls to the participant. Therefore, in some cases numerous shorter calls were evident for crisis intervention in order to coordinate care.

The provision of crisis intervention is similar to the results of previous Telehealth research. Both Tran et al., (2002) and Kondalsamy-Chennakesavan et al., (2004) commented that Telehealth provided an advantage to patients and carers by allowing access to ‘just in time’ responses to health crises. For the current study participants were given contacts for the study nurse and for emergency services. The observation was that in a number of instances, as would be expected in the event of a crisis, participants accessed appropriate services directly and only through the scheduled calls was the study nurse aware that a crisis had taken place. But it was observed that there were a number of scheduled calls that found a participant in crisis without having made any attempts to seek appropriate assistance. In a number of cases the participant contacted the nurse directly to seek assistance with a developing problem. The bi-directional call structure in the model of care allowed the flexibility and coverage by the study nurses to allow participants to seek assistance and gain support when in crisis.

Risk factor findings. The study set out to explore a novel nursing role in integrated stroke secondary prevention and to compare the results between the group exposed to the
intervention with the control group. The intervention aimed to attenuate modifiable cardiovascular risk factors and post stroke depression by following current evidence based guidelines and by applying the recommendations. For the study nurses’ involved in telephone follow-up the intent was to achieve recommended target risk factor values and ensure management of post stroke depression for participants in the intervention group. After adjustment for one outlier the results showed that mean SBP at outcome was significantly improved in the intervention group compared to the control group. There was a significant difference in PHQ-9 depression screening scores at outcome for the intervention group. Physical activity or walks per week was significantly improved in the intervention group as was walks per day. For diabetic control, attenuation of glycated hemoglobin was not significantly improved. However, the results showed that the mean HbA1C for the control group was within target and the control group HbA1C results exceeded the target range.

As part of the standard of care, in the acute stage, both control and intervention participants were admitted to designated Stroke Care Centres and treated according to current evidence-based stroke and TIA pathways. On admission to a designated SCU participants were appropriately assessed, treated and commenced on recommended secondary prevention therapy by the multidisciplinary stroke team (Weir & Cadilhac, 2007). After discharge to the community, participants were offered progress review at a Stroke Follow-up Clinic appointment within 3-months.

In this strategy of care nurses played an important role in acute assessment, implementation of therapy and in commencing secondary prevention in the hospital setting. Ward nurses, the stroke nurse specialist and where available stroke nurse practitioner would have commenced secondary prevention with the multidisciplinary team, and offered education on ongoing therapy and advice on lifestyle modification (Weir & Cadilhac, 2007). The stroke nurse specialist would have offered patients and families’ education and insight into how to
seek help and what to expect after discharge. In this way nurses commence assisting patients to navigate a complex continuing health care experience.

In the current standard of care, stroke survivors are discharged to the care of their GP. Additionally, there are numerous high standard government funded and charitable organisations including consumer groups that offer services for the stroke survivors, that include but are not limited to, services that provide education and support on secondary prevention, carer help, respite care, rehabilitation, continence, speech therapy, diet, physical activity and depression. Review suggests however that in most countries the existence of services is not well communicated to the stroke survivor related to the fragmentation in the current systems of care (Schwamm et al., 2009).

After discharge from hospital, in the first year after stroke, it was predicted that one in six survivors would experience a second stroke (Miller et al., 2010). In five years after a first stroke up to 30% of survivors would suffer successive stroke (Hardie et al., 2003). The evidence suggested that only by adopting recommended secondary prevention strategies would there be the potential to reduce risk of recurrent stroke. Alongside the improved in-hospital up-take of evidence-based guidelines, there is a need to improve the quality of secondary prevention and management of ongoing risk in the community. Strategies are required to overcome the documented therapeutic inertia in primary care settings.

The literature on longer term, stroke secondary prevention strategies was limited for secondary prevention initiatives at the primary care level (Miller et al., 2010; Redfern et al., 2006). Most secondary prevention strategies were tested and implemented in the hospital setting, with limited longer-term follow-up, surveillance and support of participants in the community. One community based study highlighted the fact that although 92% of stroke survivors had a GP, at 2-years compliance with recommended secondary prevention therapy was poor (Joubert et al., 2009). Another cohort study indicated 79.4% of patients with a history
of stroke exhibited hypertension with only half receiving blood pressure lowering medication and only 11.5% reaching recommended BP levels (Li et al., 2008). A majority of this cohort diagnosed with hyperlipidemia were not treated with a lipid lowering agent and only 38% of stroke survivors were using an antithrombotic. Lifestyle factors remained vastly untreated with 31.2% of stroke survivors still smoking and 63.7 were overweight (BMI>25) or obese (BMI >30).

Compared with other conditions, stroke survivors are often older, have a complex range of comorbid conditions and will have a residual physical and or cognitive disability after their stroke. Factors that may impact on outcomes along the continuum of care from hospitalization to community re-integration include loss of body functions, activity limitations, restricted participation and personal and environmental factors (Miller et al., 2010). Research suggests beside medical preventative therapy, stroke survivors also require social and psychological support to assist in coming to understand and navigate their life after stroke. Studies indicated that the population susceptible to stroke was often socioeconomically disadvantaged and less likely to have access to education about risk factors (Muller-Nordhorn, Nolte, Rossnagel, & Jungehulsing, 2006). Research suggests that stroke survivors and their carers will require complex strategies to manage ongoing secondary prevention and psychosocial wellbeing in transitions across the community based care continuum (Cameron et al., 2008; Lyons & Rudd, 2007; Redfern et al., 2006; Schwamm et al., 2009).

The current study tested a complex strategy of Telehealth based community care in a model enhanced by the greater involvement of nursing staff in the follow-up and support of stroke survivors, their families and GP’s. Joubert et al., (2006) reported that a model of shared care showed improved results in risk factor control (SBP and physical activity) and post stroke depression identification and management. The study concluded that future studies should research the mechanisms that improved risk factor control and post stroke depression. In the
current nursing model under investigation, attenuated telephone follow-up was added to the original model. This new component individualised and tailored contact with survivors and families and facilitated the potential to extend the reach of specialist stroke nurses and nursing process into the community setting. Additionally, the model opened up the potential for nurses to use advanced skills of education, behavior modification, counseling, advocacy and crisis intervention in assisting survivors.

In the pilot study results of 80 participants (35 intervention) showed that 52.3% of participants in the intervention group achieved a target SBP at outcome of 140 mmHg \((p = ns)\) and that the mean SBP at outcome dropped by a mean of 2mmHg to 132 mmHg \((p = ns)\). In the current study \((n = 90)\) results for mean SBP at outcome showed that 71% of intervention participants achieved a SBP at outcome of less than the recommended 130 mmHg compared with 48% of the control group. The difference between means for the intervention \((M = 127.37)\) and control \((M = 133.33)\) was significant \((p = .04)\).

The model provided the nurse with a vehicle in which to continue fundamental nursing activities. The results for SBP at outcome show that the model was enhanced by increasing the reach of the nurse. What is potentially demonstrated by the results is that continued assessment on up to 66% of the approximately 20 telephone calls per patient, may have contributed to participants achieving a target SBP of less than 130mmHg within 1- year of stroke. The results suggest that one year of longitudinal telephone based case management \((39\% \text{ of calls})\), that included assessment, care planning \((17\%)\) education \((34\%)\), Behavior modification \((32\%)\), consultation \((20\%)\), advocacy \((14\%)\) and where necessary crisis intervention \((2.6\%)\) demonstrated the potential to improve upon the pilot study results for the primary hypothesis and add supporting data to explain the mechanism for achieving the current results. In both the pilot and the current study the study nurse had the ability to provide valuable support to the GP in identifying aberrant blood pressures at the quarterly reviews.
In the pilot study 45% of the control group screened positively for depression compared to 20% of the intervention group \((p = .06)\). In the current study there was a significant difference in mean PHQ-9 scores at outcome \((p = .04)\). For intervention group 86% of participants achieved a PHQ-9 score of 5 or less, 48% scoring 0 or no symptoms of depression. For the control group 70% of participants achieved an outcome PHQ-9 score of 5 or less and 35.40% scored 0. The results support the case that the model contributes to improved management of post stroke depression for stroke survivors in the community setting.

Post stroke depression management is a major focus of the model, as driven by protocol mandated quarterly assessment of mood with the PHQ-9. Through review of past history, baseline screening and through ongoing assessment of mood during follow-up calls the nurse was able to plan effectively and coordinate and alert the GP to the potential for depression. The mechanism of this enhanced management may be attributed to the year of case management and frequent assessment of the participants. The regular call structure enabled the potential for help and the provision of education regarding the benefits of both pharmaceutical and psychosocial therapy. The potential existed for nurses to engage in counseling and advocacy to assist with access to the appropriate therapy and/or follow-up with the GP for referral and access to the government subsidised mental health care package.

A common thread for telephone communications with stroke survivors was to encourage an appropriate form of physical activity for all participants dependent on their condition. Intervention participants were encouraged to take part in physical activity for at least 30 minutes, on at the minimum, every second day, as their condition permitted. Reviewing and encouraging physical activity, especially when participants were not meeting planned goals, was an important function of the calls. The results showed that stroke survivors exposed to the intervention were more likely to walk or participate in exercise on one occasion per day and
participated in a significantly greater number of walks per week control group ($M = 3.12$, $SD = 3.12$) and intervention groups ($M = 5.13$, $SD = 2.08$ ($p = .001$)

Case management including assessment, planning and behavior modification form the basis of the approach to changing participants’ behavior and in maintaining a physical activity regimen after a stroke.

For the intervention group Glycated Hemoglobin showed a trend towards improvement, but was not significant ($p = .20$). Case management, care planning, advocacy and behavior modification appear to be part of an effective strategy to effect change in dietary choices and in rigorous monitoring of diabetes control for diabetics and those in a pre-diabetic state. In this study the number of participants diagnosed with diabetes and subsequently tested for HbA1C was low ($n = 15$). As this current cohort represent only approximately 40% of the total sample recruited for the main study, analysis of the full sample would hopefully achieve a significant result.

Both Smoking and consumption of excessive alcohol showed improvement from baseline scores to outcome for the intervention group however these changes were not significant. It is likely again that this was related to the small numbers of smokers and consumers of a greater than recommended quota of alcohol. For smokers and those who consumed more than the recommended number of standard drinks the study nurse planned and persisted in an ongoing campaign to educate, counsel and advocate towards behavior change. Review of progress notes reveals that the greatest successes were achieved in hospital at baseline just after the index event and in close proximity to discharge. Successful transitions from smoker to non-smoker were assessed and reinforced in a strategy to maintain abstinence. For continuing smokers; education regarding potential quitting strategies, presence and availability of support groups and advocacy for the participant with their GP was part of the approach. For consumers of excessive alcohol, both male and female participants were
regularly assessed and advised on levels of appropriate consumption according to published guidelines and education was provided on the impact of alcohol on stroke and general health. In future it would be appropriate for nurses to refer participants with intractable substance abuse problems to experts to attempt behavior change.

Throughout the intervention lipids were reviewed intermittently at 3-months, as a mandatory stipulation at 6-months, if necessary at 9-months and again as a mandate at 12-months. During the 1-year lipid results were reviewed with participants when tests were performed by the GP and the importance of therapy and the significance of results was covered in ongoing education. Where necessary, education on diet, smoking, alcohol consumption and physical activity were included in the strategy towards managing lipids.

Both groups showed similar mean values for outcome total cholesterol, high density lipoprotein and low density lipoprotein. In all three cases there was a statistically significant relationship between the baseline value and the group variable. An alternative hypothesis as to why a difference was not apparent may be that ischemic stroke and TIA patients are commenced on statin therapy or have their statin dose or agent titrated during acute and sub-acute hospitalisation as part of evidence based secondary prevention. Further examination of the medication profile for participants in both groups would be required to ascertain whether the study influenced further titration of lipid lowering medications. With 76% control participants and 87% of intervention participants reaching target levels this supports the theory that both groups are maximally treated following an event.

Finally, the results achieved for BMI were perplexing, as the manual encouraged study nurses to discuss appropriate dietary choices and physical activity as part of common call content. One interpretation of this finding is that older stroke survivors are less likely to modify the delicate balance between dietary intake and the regular level and frequency of physical activity required to make a significant change in BMI. The finding suggests that although study
nurses encouraged physical activity and dietary modifications, the message was not strongly associated with weight loss, BMI and cardiovascular risk.
Conclusions

The results were encouraging and supportive of further research into nurse-led, evidence based Telehealth initiatives for shared support for stroke survivors in the community. Importantly, the results demonstrated that the added component of flexible telephone support delivered by nurses may have made an important contribution to enhanced attenuation of important modifiable risk factors and key health related lifestyle choices. In particular, for those participants exposed to the nursing intervention, the results showed significant improvement of systolic blood pressure, post stroke depression and physical activity 12-months after the index stroke event. Furthermore, a greater proportion of the intervention participants trended towards meeting targeted levels for risk factor control. The results support and encourage the tentative conclusion that the additional time devoted to the combination of fundamental and advanced nursing activities in the intervention possibly contributed to improved patient outcomes. In comparison to results exhibited by previous studies and the pilot study, the results of this nursing study demonstrate that an increased frequency of specialist nursing input into follow-up of stroke survivors in the community may have contributed to health related benefits.

The study was unable to answer the questions regarding the contribution of the frequency of activities and the amount of time expended on activities on outcomes. However, after consultation with a statistician, using multiple regression procedures on a larger population may uncover the relationships between the nursing activities and dependent variables. Therefore, it is difficult to make any statements as to whether there were any high impact nursing interventions. Nonetheless, if gut-feeling serves to provide any direction to further nursing inquiry, a more detailed within-groups analysis of the nursing activities in Telehealth may consider the impact of care planning and case management on outcomes and the latent factors that influence these activities.
In line with recommendations to improve care across the health care continuum, the results support further inquiry into the extension of the role of hospital-based nurses in providing valuable individualised input into the care of stroke survivors in the community. These limited, but promising results should help to alert researchers, industry stakeholders and policy makers that nurses may play a larger more important role in the implementation and testing of future community based secondary prevention strategies. This study demonstrated that specialist nurses as part of the multidisciplinary team may extend the reach of hospital-based experts well beyond the immediate, physical hospital environment, and add valuable influence to support and enhance primary care management of the stroke survivor. A logical extension of hub and spoke Telehealth strategies (Table 1) now actively deployed to effect acute stroke care, would be to extend Telehealth support through nurse-led secondary prevention for rural and remote stroke survivors.

The nursing input to Telehealth holds the potential to positively impact upon secondary prevention and make a strong contribution to reducing economic burden. There are potentially large savings generated through a Telehealth based specialist nursing model of community stroke management, increasing the number of interactions possible between health care providers within a set timeframe. When compared to home visits alone, savings are evident in time (wages) and in transport and infrastructure costs. The use of existing telecommunications devices and networks may mean that there is minimal additional expenditure on infrastructure. Future work in this area should incorporate a health economic analysis as a major component of the analysis plan. Future research in such models of care should be directed towards understanding potential savings generated by prevention of expensive hospitalisations and by reducing the impact of disability, especially from successive stroke.

In this study experienced nurses were able to translate the use of the nursing process and advanced skills into a Telehealth model. The therapeutic communication was driven by the
fundamental and advanced activities. Future thematic analysis of the qualitative data collected in the audit tool may serve to add depth to the understanding of the nurses’ responses to health related issues faced by this population. This qualitative data may illuminate the particular nursing activities that contributed to resolving complex health matters. In addition, the audit tool captured a set of predefined latent variables to determine why the nurses undertook a recorded set of interventions during a telephone call. A path analysis of the audit tool i.e., the reasons for the interactions and the content of the interactions will provide a greater understanding of this nursing role.

Specialist nurses are highly likely to be well versed in the nursing process and exhibit highly attuned skills in assessment, care planning and case management. However, more advanced activities (counseling, cognitive behavioral therapy and motivational interviewing) would require the nurses to engage in ongoing formal education, training and accreditation to be effective leaders in this area of health care. For the graduate nursing scholar, there exists great potential for universities to deliver modules or course material in secondary prevention and in the potential for Telehealth. At a scholarly level there is great potential for collaboration with clinical psychologists versed in behavioral modification techniques that may benefit and enhance nursing research.

Such a model holds the promise of enticing experienced nurses back into the workforce in a specialist nursing capacity. The potential exists to develop the model and the role for the nurse practitioner. Within the nursing scope of practice is a definite pathway for specialist nurses to apply their knowledge across the health care continuum and in specific niche areas of practice. Nurse Practitioners are based in acute, sub-acute and post-acute care hospital settings and in the community. There is great potential for aspiring Stroke Nurses to develop such a model into a Telehealth Stroke Nurse Specialist or a Stroke Nurse Practitioner role.
In order to guide nursing practice in Telehealth and community care, further nursing research may focus on the development of a document of reference for post-acute and community care Telehealth for stroke survivors. The document would be of relevance to hospital and clinic based nurses and case managers in the community. The document should contain risk factor targets and goals and the methods both pharmacological and behavioral for assisting patients to reach these goals. The document should logically contain references to current guidelines and provide contacts for expert groups and specialist services.

Lastly, it may be important to consider the main participants in stroke prevention and Telehealth interactions. In this study the survivor was the most frequently contacted participant. Given the potential for subtle changes in cognition, PSD, anxiety and physical disability for the stroke survivor there may be an indication to test shifting the main contact to the carer in order to address clinical risk and mood for the stroke survivor. Empowering the carer may also contribute to better outcomes for both the survivor and carer and decrease the likelihood of burnout and institutionalisation. Future studies may seek to explore this mechanism.

Based on population statistics, cardiovascular disease and stroke will maintain a high incidence. Advances in acute therapies and in hospital prevention strategies will contribute to stroke survivors being increasingly prevalent in both developed and developing societies. Considering the ongoing advances in treating stroke and the likelihood of more survivors, secondary prevention should be at the top of research agendas. Funding bodies may consider a shift from the funding of acute therapies to a greater contribution to post-acute and community based secondary prevention research. Backed by adequate research funding, nurses have the potential to make a strong contribution to improving the care offered to survivors and their families. Funding organisations must recognise the expert clinical knowledge and strong research track records possessed by members of the nursing workforce and fund scientifically sound nurse-led initiatives.
References


Casey M, Call K, & Klingner J. (2001). Are rural residents less likely to obtain recommended preventative health care services? *American Journal of Preventative Medicine, 2*, 182-188.


Appendix A. Audit Tool.

## Telephone Audit Tool

<table>
<thead>
<tr>
<th>Call Number:</th>
<th>Patient Number:</th>
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### Telephone Tracking Log

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### Variable 1

**Intervention Type**

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<td>3. Case Planning</td>
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<td>4. Case Management</td>
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<td>6. Counselling</td>
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<tr>
<td>7. Behaviour Modification</td>
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### Variable 2

**Recommendation to see:**

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### Variable 3

**Research Required**

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<td>4. Web-based</td>
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### Variable 4

**Indicator for Intervention**

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</tr>
<tr>
<td>5. Carer Support</td>
<td>5</td>
</tr>
<tr>
<td>6. Carer Absence</td>
<td>6</td>
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<tr>
<td>7. Community Services Coordination / Plan</td>
<td>7</td>
</tr>
<tr>
<td>8. Elder Protective Issues (abuse / neglect)</td>
<td>8</td>
</tr>
<tr>
<td>10. Acute Illness</td>
<td>10</td>
</tr>
<tr>
<td>11. Medical Emergency</td>
<td>11</td>
</tr>
<tr>
<td>12. Other Chronic Illness / Comorbidity</td>
<td>12</td>
</tr>
<tr>
<td>13. Mental Health Issues (e.g., depression)</td>
<td>13</td>
</tr>
<tr>
<td>14. Medication Compliance</td>
<td>14</td>
</tr>
<tr>
<td>15. Legal Issues (competency / guardianship)</td>
<td>15</td>
</tr>
<tr>
<td>16. Research Study Compliance</td>
<td>16</td>
</tr>
<tr>
<td>17. Risk Factor Management</td>
<td>17</td>
</tr>
<tr>
<td>18. Resource Needs (e.g., financial, material)</td>
<td>18</td>
</tr>
<tr>
<td>19. Placement</td>
<td>19</td>
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<tr>
<td>20. Respite Care</td>
<td>20</td>
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<tr>
<td>21. Substance Abuse</td>
<td>21</td>
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<tr>
<td>22. Transport</td>
<td>22</td>
</tr>
<tr>
<td>23. Housing</td>
<td>23</td>
</tr>
<tr>
<td>24. Information Requested by Carer</td>
<td>24</td>
</tr>
<tr>
<td>25. Participant Actively Seeking Advice</td>
<td>25</td>
</tr>
</tbody>
</table>

### Progress Note:

Write: Topics discussed. Use clear concise terms. Note who asked questions & answers

### Tick Persons Spoken With:

- Carer
- Care Recipient
- Family Member (other)
- Health Professional
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Author/s: Jackson, David Andrew Gardner

Title: An exploration of the nursing role in a telehealth based stroke secondary prevention program

Date: 2017

Persistent Link: http://hdl.handle.net/11343/142365

File Description: An Exploration of the Nursing Role in a Telehealth Based Stroke Secondary Prevention Program

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