Community-Based Intervention to Improve Cardiometabolic Targets in Patients With Stroke
A Randomized Controlled Trial

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Background and Purpose—Many guidelines for secondary prevention of stroke focus on controlling cardiometabolic risk factors. We investigated the effectiveness of a management program for attaining cardiometabolic targets in survivors of stroke/transient ischemic attack.

Methods—Randomized controlled trial of survivors of stroke/transient ischemic attack aged ≥18 years. General practices were randomized to usual care (control) or an intervention comprising specialist review of care plans and nurse education in addition to usual care. The outcome is attainment of pre-defined cardiometabolic targets based on Australian guidelines. Multivariable regression was undertaken to determine efficacy and identify factors associated with attaining targets.

Results—Overall, 283 subjects were randomized to the intervention and 280 to controls. Although we found no between-group difference in overall cardiometabolic targets achieved at 12 months, the intervention group more often achieved control of low-density lipoprotein cholesterol (odds ratio, 1.97; 95% confidence interval, 1.18–3.29) than controls. At 24 months, no between-group differences were observed. Medication adherence was ≥80% at follow-up, but uptake of lifestyle/behavioral habits was poor. Older age, being male, being married/living with partner, and having greater functional ability or a history of diabetes mellitus were associated with attaining targets.

Conclusions—The intervention in this largely negative trial only had a detectable effect on attaining target for lipids but not for other factors at 12 months or any factor at 24 months. This limited effect may be attributable to inadequate uptake of behavioral/lifestyle interventions, highlighting the need for new or better approaches to achieve meaningful behavioral change.

Clinical Trial Registration—URL: http://www.clinicaltrials.gov. Unique identifier: ACTRN12608000166370. (Stroke. 2017;48:2504-2510. DOI: 10.1161/STROKEAHA.117.017499.)

Key Words: cardiovascular diseases ■ goals ■ randomized controlled trial ■ risk factors ■ stroke
However, it is unclear whether this translates to attaining cardiometabolic targets.

In Australia and countries with similar healthcare systems, primary care providers are well placed to implement strategies for managing chronic diseases, such as diabetes mellitus and hypertension. Strategies include ongoing management of risk factors and monitoring adherence to treatment. However, there is limited evidence for the effectiveness of these strategies in the management of stroke. We investigated the effectiveness of an individualized management program for improving attainment of cardiometabolic targets, based on Australian guidelines, in community-dwelling survivors of stroke/TIA. We hypothesized that survivors of stroke/TIA who receive an individualized management program will have better attainment of cardiometabolic targets at 12 and 24 months than those undergoing usual care.

**Methods**

**Trial Design and Subjects**

The STANDFIRM (Shared Team Approach between Nurses and Doctors for Improved Risk Factor Management) is a cluster randomized controlled trial of secondary prevention in people with stroke/TIA. The full trial protocol, including sample size calculation, has been published previously. Briefly, subjects were recruited from 4 tertiary hospitals in Melbourne, Australia, between January 2010 and December 2015. Adults aged 50 years were eligible if they were hospitalized for stroke/TIA and were living within 50 km of recruitment hospitals. We excluded participants participating in another trial, admitted from/discharged to a nursing home, or with a rapidly deteriorating health condition. Potentially eligible subjects were identified during hospitalization by research nurses and stroke physicians and informed about the trial. Final consent was obtained at a baseline in-home visit (median 10 weeks post-discharge). Ethics approval was obtained (HREC 2011000331).

**Randomization and Blinding**

Subjects were randomized into study groups, using a computer-generated, blocked procedure, stratified by recruitment hospital. This method ensured equal allocation to groups within each hospital. Randomization was clustered by general practice to reduce between-group contamination. As part of the consent process, subjects were informed that they would receive treatment A or B with no details about what each entailed to avoid response bias. Similarly, outcome assessors, specialists, and general practitioners (GPs) were blinded to treatment assignment.

**Usual Care**

All subjects continued to receive the usual care provided in their general practices and stroke prevention clinic of participating hospitals.

**Intervention**

To supplement usual care, subjects in the intervention group received a management program, comprising a standard evidence-based care plan, and 3 education sessions. The care plan was individualized to the risk factor profile of subjects and contained clear goals/targets for managing cardiometabolic risk factors (see Table 1 in the online-only Data Supplement), based on recommendations in Australian guidelines.

After a comprehensive blinded assessment of risk factors at baseline, an initial care plan was developed by an unblinded intervention nurse and reviewed by independent stroke specialists. For example, in the case illustrated in the care plan provided in the online-only Data Supplement, the nurse identified problems with attaining targets for BP and lipids (page 1) based on data obtained at the baseline assessment. The specialist then checked these recommendations, made amendments if required, and provided treatment recommendations for the GP to facilitate the subject’s care.

Before sending the management plan to the GP, the intervention nurse undertook in-home visits to discuss tailored behavioral interventions and provide advice on identified care problems/needs; advice included benefits of healthy lifestyle and adherence to medications. The nurse also discussed treatment goals and targets highlighted in the care plan. Subjects were asked if there were any potential barriers to the uptake of healthy lifestyle strategies/adherence to medications. Using a standard education syllabus (see online-only Data Supplement), the nurse provided tailored information to support self-management in overcoming any identified barriers. Finally, the nurse organized appointments for subjects to discuss and agree on their care plan with their GPs.

The format of our care plan is similar to those routinely used for treatment of diabetes mellitus, hypertension, and other chronic conditions and so is familiar to GPs. The care plan complies with the Australian Medicare insurance scheme, and so GPs are reimbursed when used. Reimbursement is greater than standard consultations, thereby providing an incentive to use our care plan.

The process of blinded assessment, preparation of care plan, education, and arrangement of GP appointment was repeated at 3 and 12 months. At the 3- and 12-month education sessions, the intervention nurse discussed barriers/enablers to adhering to treatment targets set at earlier visits. The care plan was again revised and sent to GPs at 6 and 18 months based on information provided by subjects during telephone interviews (described below).

**Baseline and Follow-Up Assessments**

Details of stroke and demographic information were obtained from hospital records. Other baseline data were obtained at in-home nurse visits (median 10-week post-discharge). During baseline visits, subjects underwent blinded, standardized anthropometry, biochemical tests, and assessment of BP, disability, mood disorder, and lifestyle/behavioral habits. Assessments were repeated at 3, 12, and 24 months while brief telephone interviews were conducted at 6 and 18 months to obtain self-reported data on risk factors.

**Outcome Assessment**

The study outcome was attainment of pre-defined targets for 6 cardiometabolic factors at 12 and 24 months. This was based on recommendations in clinical guidelines and reference values recommended in pathology guidelines in Australia (Table 1).

<table>
<thead>
<tr>
<th>Cardiometabolic Factors</th>
<th>Target Values*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood pressure</td>
<td>Systolic ≤120 mm Hg</td>
</tr>
<tr>
<td></td>
<td>Diastolic ≤80 mm Hg</td>
</tr>
<tr>
<td>Lipids</td>
<td>Total cholesterol &lt;4.0 mmol/L</td>
</tr>
<tr>
<td></td>
<td>HDL cholesterol &gt;1.0 mmol/L</td>
</tr>
<tr>
<td></td>
<td>LDL cholesterol &lt;2.5 mmol/L</td>
</tr>
<tr>
<td>Smoking</td>
<td>Undetectable urinary cotinine</td>
</tr>
<tr>
<td>Body weight</td>
<td>BMI ≤25 kg/m²</td>
</tr>
<tr>
<td></td>
<td>Waist circumference &lt;80 cm (women) or &lt;94 cm (men)</td>
</tr>
<tr>
<td>Blood glucose</td>
<td>Hba1c ≤7%</td>
</tr>
<tr>
<td>Kidney function</td>
<td>Creatinine ≤80 µmol/L</td>
</tr>
<tr>
<td></td>
<td>Protein excretion ≤150 mg/dL</td>
</tr>
</tbody>
</table>

BMI indicates body mass index; Hba1c, glycosylated hemoglobin; HDL, high-density lipoprotein; and LDL, low-density lipoprotein.

*Targets are based on Australian guidelines (see Table 1 in the online-only Data Supplement for references).
Statistical Analysis
This is a treatment-based post hoc analysis of the outcome data from the STANDFIRM trial12,14 conducted to evaluate the success of our pragmatic and robust intervention.

Baseline characteristics were compared using χ² test (categorical variables) and Kruskal–Wallis test (continuous variables). Within-group differences in target attainment were estimated using McNemar test (categorical variables) and Wilcoxon signed-rank test (continuous variables). For between-group changes (intention-to-treat analyses), multivariable logistic (categorical variables) and Poisson (count variables) regression models were undertaken (see online-only Data Supplement for details). The robustness of the effect estimates were ascertained in sensitivity analyses, including complete case analyses and analyses restricted to subjects whose risk factor targets were not optimal at baseline.

To determine factors associated with number of targets attained at 12 and 24 months, multivariable Poisson regression models were constructed using methods similar to those stated above, except that we did not adjust for the baseline status for target attainment. All analyses were conducted using STATA IC 12.1 (StataCorp, 2012), with a 2 tailed P≤0.05.

Results
Study Subjects and Baseline Characteristics
Between January 2010 and November 2013, 5633 patients were assessed for eligibility, of whom 2516 (45%) were eligible (Figure). Among those eligible, 563 (22%) were enrolled: 283 to the intervention and 280 to usual care.14 When compared with subjects who declined participation, those enrolled were more often men (64% versus 55%) and less often aged ≥65 years (63% versus 80%; P<0.001).

Subjects were randomized at median 73 (Q1: 54, Q3: 97) days post-discharge. Baseline characteristics were similar between groups.14 Overall, the median age was 70.1 (Q1: 60.9, Q3: 78.6) years, 65% were men, and 78% had an ischemic stroke. At baseline, ≥80% of subjects were prescribed recommended medications (Table 2). Adherence to recommended lifestyle habits was high for abstaining from smoking (78%) and healthy drinking (95%) but poor for being physically active (12%) and daily consumption of vegetables (4%), fruit (47%), or salt (3%; Table 2).

Follow-up was complete in 533 subjects (95%) at 12 months and 485 (86%) at 24 months (Figure).

Uptake of Secondary Prevention Strategies
There was no significant between-group difference in uptake of pharmacological and behavioral/lifestyle interventions at 12 and 24 months (Table 2). There were consistent declines in the proportion of controls prescribed lipid-lowering therapy and controls who were physically active, from baseline to 24 months (Table 2). Results were similar in analyses excluding deaths and losses to follow-up at any time point (Table II in the online-only Data Supplement). Approximately 10% of subjects who were advised to take prevention medications reported difficulties in following their prescriptions at 12 months. In contrast, 87% of subjects reported difficulties in carrying out advice on diet modification and 82% on improving exercise habits.

Figure. Selection, inclusion, and exclusion of subjects. *Patients may have >1 reason; †include concurrent illness, dementia, or palliated; ‡include too late to recruit, uncontactable, event not stroke, or moving interstate; ‖intervention comprises an individualized management program in addition to usual care.
Outcome Analyses

In both intervention and control groups, there was no detectable within-group difference in the median number of cardiometabolic targets achieved at 12 and 24 months relative to baseline (Table 3). For between-group analyses, we found no detectable difference in total number of cardiometabolic targets achieved at 12 and 24 months in both univariable (adjusting for baseline status for target attainment) and multivariable models (further adjusting for potential confounding factors; Table 4).

For individual cardiometabolic factors, there were declines in the proportion of controls achieving targets for BP, total cholesterol, and low-density lipoprotein cholesterol at 12 and 24 months relative to baseline (Table 3). No other within-group difference was observed at 12 and 24 months relative to baseline. In between-group multivariable analyses adjusting for baseline status for target attainment and potential confounding factors, subjects in the intervention group were more likely than controls to achieve targets for the control of lipids (low-density lipoprotein cholesterol <2.5 mmol/L) in survivors of stroke/TIA but not for other factors at 12 months or any factor at 24 months. Although our intervention appeared to improve the attainment of targets for the control of glycemia (hemoglobin A1c ≤7%), this finding may have been biased by the small sample of subjects whose hemoglobin A1c measures were suboptimal.

In the secondary prevention of stroke, interventions are targeted at improving adherence to treatment and changing lifestyle/behavioral habits. Pharmacological interventions appeared to be the preferred option for modifying risk in our subjects because a large proportion of controls (≥80%) were discharged on recommended medications and few reported difficulties in taking their medications. Prescription of medications remained high in controls throughout follow-up. These findings may even be underestimated as we did not account for subjects who were not prescribed medications because of valid clinical reasons.

Factors independently associated with greater attainment of cardiometabolic targets at 12 months (Table 5) included being aged ≥65 years (incidence rate ratio [IRR], 1.06; 95% CI, 1.01–1.13), being men (IRR, 1.08; 95% CI, 1.02–1.14), and having greater functional ability (IRR, 1.30; 95% CI, 1.06–1.59). In contrast, having a history of diabetes mellitus was associated with poor attainment of targets at 12 months (IRR, 0.91; 95% CI, 0.84–0.98). These findings were consistent at 24 months, except for the identification of 1 additional factor, being married/living with a partner, which was associated with greater attainment of targets (IRR, 1.07; 95% CI, 1.01–1.14).

Discussion

Our comprehensive care planning improved attainment of target for the control of lipids (low-density lipoprotein cholesterol <2.5 mmol/L) in survivors of stroke/TIA but not for other factors at 12 months or any factor at 24 months. Although our intervention appeared to improve the attainment of targets for the control of glycemia (hemoglobin A1c ≤7%), this finding may have been biased by the small sample of subjects whose hemoglobin A1c measures were suboptimal.

In the secondary prevention of stroke, interventions are targeted at improving adherence to treatment and changing lifestyle/behavioral habits. Pharmacological interventions appeared to be the preferred option for modifying risk in our subjects because a large proportion of controls (≥80%) were discharged on recommended medications and few reported difficulties in taking their medications. Prescription of medications remained high in controls throughout follow-up. These findings may even be underestimated as we did not account for subjects who were not prescribed medications because of valid clinical reasons.
In contrast to the use of medications, uptake of recommended risk-modifying behaviors was generally poor in our cohort and may partially explain the undetectable between-group difference in attaining targets. It was particularly surprising that our robust intervention was unsuccessful in a population of highly motivated and relatively less disabled survivors of stroke/TIA, with relatively greater potential to engage in healthy behavior. This finding highlights the difficulty in changing lifestyle/behavioral habits after a stroke/TIA. Our finding also highlights a clear need to modify existing approaches or develop new approaches to appropriately inform practice on the management of stroke.

Similar to our findings, others have reported limited or no benefit of interventions designed to promote behavioral change in people with stroke. Some authors have proposed computer-assisted strategies founded on social cognitive theory to address identified barriers to behavioral change and incorporate standard/evidence-based parameters (ie, dose, length, frequency, setting, and mode of intervention). Another potentially effective strategy is incorporating adoption of behavioral interventions as an important performance indicator in the management of stroke in general practice.

In this study, we identified subgroups of people with stroke/TIA who could benefit from more targeted interventions, that is, women, people aged <65 years, those single/living alone, and those with greater functional disability, poor educational attainment, or a history of diabetes mellitus. Vascular risk factors are particularly difficult to control in the presence of...
diabetes mellitus as shown in a large population-based study conducted in Spain. In this study of people with diabetes mellitus, only 11% met target for managing weight, 28% for BP, and 33% for cholesterol. These findings, and ours, highlight the need for more aggressive treatment of vascular risk factors in survivors of stroke with diabetes mellitus.

Our study may be limited by the relatively low level of evidence for some recommendations in the guidelines for the management of stroke in Australia. However, these guidelines are often used by clinicians to make decisions when treating people with stroke/TIA. Another potential limitation is the possibility of incomplete blinding of subjects to treatment assignment. Incomplete blinding would have been greatly minimized by the fact that subjects were not actively informed about what the additional intervention entailed, as well as the fact that our intervention was already embedded in usual practice in Australia. Furthermore, our findings may not be generalized to the wider stroke population because only 22% of eligible subjects were enrolled. This potential selection bias was also highlighted by the differences between subjects enrolled and those who declined participation.

In conclusion, in this largely negative trial, our intervention improved attainment of targets for the control of lipids in survivors of stroke/TIA after a 12-month follow-up but no detectable differences for other risk factors at 12 months or any factor at 24 months. This poor attainment of treatment targets is likely attributable to lack of improvement in adopting new approaches in the context that our sample appeared to be well treated and able evidence. However, our findings should be interpreted in the context that our sample appeared to be well treated and able evidence.5 However, our findings may not be generalized to the wider stroke population because only 22% of eligible subjects were enrolled. This potential selection bias was also highlighted by the differences between subjects enrolled and those who declined participation. The strength of our study is the careful and extensive assessment of targets for cardiometabolic factors using best available evidence.5 However, our findings should be interpreted in the context that our sample appeared to be well treated and have less severe stroke, as reflected by large proportions of subjects on recommended medications or with no significant disability.14

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Table 4. Intention-to-Treat Analyses of the Effect of Intervention on Attainment of Cardiometabolic Targets at 12 and 24 Months

<table>
<thead>
<tr>
<th>Targets</th>
<th>12-mo OR (95% CI)</th>
<th>24-mo OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Univariable</td>
<td>Multivariable*</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>0.97 (0.63, 1.50)</td>
<td>0.91 (0.57, 1.45)</td>
</tr>
<tr>
<td>≥4</td>
<td>1.32 (0.63, 1.50)</td>
<td>1.28 (0.75, 2.18)</td>
</tr>
<tr>
<td>Blood pressure, mmHg†</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Systolic BP ≤120</td>
<td>0.98 (0.62, 1.55)</td>
<td>0.84 (0.51, 1.39)</td>
</tr>
<tr>
<td>Systolic BP ≤140</td>
<td>0.83 (0.57, 1.20)</td>
<td>0.76 (0.51, 1.14)</td>
</tr>
<tr>
<td>Diastolic BP ≤80</td>
<td>0.78 (0.52, 1.17)</td>
<td>0.79 (0.51, 1.22)</td>
</tr>
<tr>
<td>Diastolic BP ≤90</td>
<td>0.96 (0.50, 1.85)</td>
<td>1.10 (0.53, 2.26)</td>
</tr>
<tr>
<td>Lipids, mmol/L‡</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total cholesterol &lt;4.0</td>
<td>1.21 (0.81, 1.81)</td>
<td>1.25 (0.82, 1.92)</td>
</tr>
<tr>
<td>HDL cholesterol &gt;1.0</td>
<td>0.90 (0.56, 1.42)</td>
<td>0.89 (0.53, 1.49)</td>
</tr>
<tr>
<td>LDL cholesterol &lt;2.5</td>
<td>1.75 (1.12, 2.73)</td>
<td>1.97 (1.18, 3.29)</td>
</tr>
<tr>
<td>Smoking</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Undetectable urinary cotinine</td>
<td>0.65 (0.33, 1.29)</td>
<td>0.55 (0.26, 1.20)</td>
</tr>
<tr>
<td>Body weight§</td>
<td>1.13 (0.60, 2.12)</td>
<td>1.00 (0.49, 2.04)</td>
</tr>
<tr>
<td>BMI ≤25 kg/m²</td>
<td>0.88 (0.44, 1.77)</td>
<td>0.93 (0.43, 2.03)</td>
</tr>
<tr>
<td>Waist circumference ≤80 cm (women) and &lt;94 cm (men)</td>
<td>1.12 (0.64, 1.95)</td>
<td>0.97 (0.52, 1.81)</td>
</tr>
<tr>
<td>Blood glucose</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HbA1c ≤7%</td>
<td>3.81 (1.44, 10.06)</td>
<td>4.44 (1.31, 15.08)</td>
</tr>
<tr>
<td>Kidney function¶</td>
<td>0.95 (0.64, 1.42)</td>
<td>1.02 (0.67, 1.56)</td>
</tr>
<tr>
<td>Creatinine ≤80 µmol/L</td>
<td>0.82 (0.53, 1.26)</td>
<td>0.94 (0.31, 2.88)</td>
</tr>
<tr>
<td>Protein excretion ≤150 mg/d</td>
<td>1.65 (0.95, 2.87)</td>
<td>1.65 (0.86, 3.19)</td>
</tr>
</tbody>
</table>

Analyses include 563 subjects after multiple imputation of data. Bolding indicates P < 0.05. BMI indicates body mass index; BP, blood pressure; CI, confidence interval; HbA1c, glycosylated hemoglobin; HDL, high-density lipoprotein; LDL, low-density lipoprotein; and OR, odds ratio.

*Adjusted for medical history, sociodemographic, mental, and functional status, number of prescribed prevention medications, and engagement in healthy lifestyle.
†Maintaining systolic BP ≤120 mmHg and diastolic BP ≤80 mmHg.
‡Maintaining total cholesterol <4.0 mmol/L, LDL cholesterol <2.5 mmol/L, and HDL cholesterol >1.0 mmol/L.
¶Maintaining BMI ≤25 kg/m² and waist circumference ≤80 cm (women) and 94 cm (men).
††Maintaining HbA1c ≤7%. Estimates may not be robust as a result of small sample size.
‡‡Maintaining blood creatinine 45–80 µmol/L and urinary protein ≤150 mg/d.
Table 5. Factors Associated With Attainment of Cardiometabolic Targets at 12 and 24 Months

<table>
<thead>
<tr>
<th>Factors</th>
<th>12-mo IRR (95% CI)</th>
<th>24-mo IRR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Univariable</td>
<td>Multivariable*</td>
</tr>
<tr>
<td></td>
<td>(n=510–526)</td>
<td>(n=511)</td>
</tr>
<tr>
<td>Intervention</td>
<td>1.02 (0.97, 1.08)</td>
<td>1.02 (0.97, 1.07)</td>
</tr>
<tr>
<td>Sociodemographic factors</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aged ≥65 y</td>
<td>1.05 (1.00, 1.11)</td>
<td>1.06 (1.00, 1.12)</td>
</tr>
<tr>
<td>Male</td>
<td>1.06 (1.00, 1.12)</td>
<td>1.08 (1.02, 1.14)</td>
</tr>
<tr>
<td>Vocational/higher education</td>
<td>1.05 (1.00, 1.11)</td>
<td>...</td>
</tr>
<tr>
<td>Married/living with partner</td>
<td>1.03 (0.98, 1.09)</td>
<td>1.06 (1.00, 1.11)</td>
</tr>
<tr>
<td>Health factors</td>
<td></td>
<td></td>
</tr>
<tr>
<td>History of diabetes mellitus</td>
<td>0.90 (0.83, 0.98)</td>
<td>0.92 (0.85, 1.00)</td>
</tr>
<tr>
<td>Disability (per 0.1 LHS)</td>
<td>1.28 (1.05, 1.55)</td>
<td>1.30 (1.06, 1.59)</td>
</tr>
<tr>
<td>Increasing number of prevention medications</td>
<td>...</td>
<td>...</td>
</tr>
</tbody>
</table>

IRR indicates incidence rate ratio; and LHS, London Handicap Scale.

*Stepwise Poisson regression analysis adjusted for all variables listed in Table 4. Only variables retained in the final model were reported.

recommended risk-modifying lifestyle/behaviors, despite our comprehensive intervention. Thus, more effective strategies are needed to enhance uptake of lifestyle interventions in the secondary prevention of stroke, and this might be best targeted at those subgroups identified as most likely to benefit from more targeted interventions.

Acknowledgments

We appreciate the hard work of the research nurses.

Sources of Funding

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Disclosures

Dr Phan received honoraria for presentations given for Bayer/Boehringer Ingelheim/Genzyme/Pfizer/Bristol-Myers Squibb. Dr Nelson is an advisory board member for Amgen and Dr Gerraty for Astra Zeneca. The other authors report no conflicts.

References

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SUPPLEMENTARY MATERIAL

Community-based intervention to improve cardio-metabolic targets in patients with stroke: a randomized controlled trial

Supplemental Methods

1. Template of STANDFIRM chronic disease management plan.
2. Template of STANDFIRM syllabus for nurse education visit.
3. Methods of intention-to-treat analyses

Supplemental Tables

Table I. Target values for cardio-metabolic targets
Table II. Uptake of pharmacological and lifestyle interventions among subjects that undertook all assessments during the two-year follow-up.
Table III. Complete case analysis of the effect of the intervention on attainment of cardio-metabolic targets 12 and 24 months.
Table IV. Intention-to-treat analyses of the effect of the intervention on attainment of cardio-metabolic targets at 12 and 24 months restricted to subjects whose target were not optimal at baseline.

Supplemental References
Supplemental Methods

1. **Template of STANDFIRM chronic disease management plan**

**General Practitioner's Management Plan (Item 721)**

For Patients with Multidisciplinary Care Needs

General Practice Management Plan or Team Care Arrangements each 2 years. Review after 6 months.
New General Practice Management Plan or Team Care Arrangements after 12 months if clinical conditions change markedly.
Review General Practice Management Plan or Team Care Arrangements after 3 months if clinical conditions change markedly.
Copies to be given to the patient and other team members as appropriate.

All participants undertake to retain confidentiality

To claim the rebate for item 721 from Medicare, the following must be completed:
- Patient consent must be obtained.
- Agreed actions in the right hand column must be completed where a risk factor is present.

<table>
<thead>
<tr>
<th>PATIENT DETAILS</th>
<th>File No:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medicare No:</td>
<td></td>
</tr>
<tr>
<td>Date of Birth:</td>
<td>Gender:</td>
</tr>
<tr>
<td>Language Spoken:</td>
<td>Male</td>
</tr>
<tr>
<td>Interpreter may be required:</td>
<td>No</td>
</tr>
</tbody>
</table>

**Details of stroke**

Date of stroke: 09/07/2011
Hospital Name: XYZ
Date of Admission: 09/07/2011
Date of Discharge: 21/07/2011
Discharged to: XYZ
- Home □ Rehabilitation ☒

**Type of event:** Ischaemic Stroke

**Mechanism of ischaemic stroke**
- Cardioembolic ☐
- Non-cardioembolic ☒

<table>
<thead>
<tr>
<th>GP DETAILS</th>
<th>Is patient eligible for Veteran Affairs?</th>
<th>Yes ☐ No ☐</th>
</tr>
</thead>
<tbody>
<tr>
<td>Send a copy to DVA:</td>
<td>Yes ☐ No ☐</td>
<td></td>
</tr>
</tbody>
</table>

**GP Management Plan prepared by:**

Absolute Risk of Stroke in the next 10 years: 21.7%

Date of last Care Plan/GP Management Plan (if done): Nil

<table>
<thead>
<tr>
<th>RECOMMENDED PLAN FOR STROKE PREVENTION</th>
<th>GP to Consider based on information provided</th>
</tr>
</thead>
<tbody>
<tr>
<td>BP lowering medications</td>
<td>Referral to dietitian (for cholesterol/diabetes/kidney)</td>
</tr>
<tr>
<td>Lipid lowering therapy</td>
<td>Referral to nephrologist (for kidney function)</td>
</tr>
<tr>
<td>Antiplatelet therapy</td>
<td>Information on medications, reminders, self-monitoring, reinforcement, counselling, family therapy</td>
</tr>
<tr>
<td>Anticoagulant therapy</td>
<td>Interventions for mood (e.g. counselling, psychotherapy etc.)</td>
</tr>
<tr>
<td>Measures to cease or avoid exposure to smoking</td>
<td>Multi-compartment medication compliance device</td>
</tr>
<tr>
<td>Increase physical activity</td>
<td></td>
</tr>
<tr>
<td>Reduce alcohol consumption</td>
<td></td>
</tr>
<tr>
<td>Increase fruit and vegetable intake</td>
<td></td>
</tr>
<tr>
<td>Reduce fat intake (meat and dairy)</td>
<td></td>
</tr>
<tr>
<td>Reduce salt intake</td>
<td></td>
</tr>
</tbody>
</table>

**MEDICAL HISTORY**

Hypertension
Other notes or comments relevant to the patient’s management plan:
R MCA Infarct 11 Years Ago
R Carotid Endarterectomy
Fasting Glucose 9.2 Not Confirmed Diabetic. Awaiting Glucose Tolerance Test

FAMILY HISTORY (Reported by patient)
Family history of heart disease
Family history of hypertension

MEDICATIONS
VERAPAMIL 160MG ONE TABLET DAILY
PLAVIX 75MG ONE TABLET DAILY
TRANDOLAPRIL 2MG ONE TABLET DAILY
LIPITOR 80MG ONE TABLET DAILY
MULTIVITAMIN 150MG ONE TABLET DAILY
OSTEVIT-D 0.03MG ONE TABLET DAILY
COLOXYL & SENNA 120MG TWO TABLETS DAILY

ALLERGIES
Nil

OTHER COMMENTS

NURSE SUMMARY OF HOME VISIT

Blood Pressure: (25/10/2012): 148/59 mmHg

Overweight (BMI > 25kg/m²):  Yes ☐ No ✗
Weight Assessed: 25/10/2012
BMI = 24.2 kg/m²
Waist Circumference = 92 cm
Waist-Hip Ratio: 0.9

Smoker:  Current ☐ Past ✗ Never ☐
Past smoker, ceased 15/04/1982
Cotinine (a measure of recent smoking exposure): None detected

Alcohol:
How often drink?: 2-3 times per week
No. standard drinks on each occasion: 1 to 2
No. occasions drinking ≥6 drinks: Never

Blood Tests 05/11/2012 Fasting

Cholesterol:
- Total [Recommended < 4.0]: 4 mmol/L
- LDL [Recommended <2.5]: 1.8 mmol/L
- HDL [Recommended >1.0]: 1.2 mmol/L
- Triglycerides [Ref Range <2.0]: 2.2 mmol/L

Diabetes: Yes ☐ No ✗
- HbA1c [Ref Range 0.0-6.0]: 4.6%
- Glucose [Ref Range 4.0-7.0]: 4.9 mmol/L

Physical Activity (as per Lifescripts)
- No. times/week exercising vigorously (≥ 20 minutes): 0
- No. times/week walking ≥30 minutes: 7
- No. times/week undertaking other moderate-intensity physical activity that increases heart rate (≥30 minutes): 0

Interpretation of Physical Activity: Active – sufficient physical activity for health benefits.
**Nutrition (as per Lifescripts)**
- Chooses low fat dairy products: Yes
- No. serves vegetables/day: 2
- No. serves fruit/day: 0
- Eats pies, pastries, fried foods or take-away meals more than once a week: No
- Drinks soft drinks, cordials, sports drinks or fruit juice on most days of the week: No
- Salt added to food at the table: No
- Adds >1 teaspoon salt to meals/day: No
- Salt excretion per day (Recommended range 40-220): 55 mmol/day

**Other Test Results**
- Creatinine: [Ref Range 45-80]: 80 µmol/L
- Sodium excretion: [Ref Range 40-220]: 55 mmol/day
- Potassium excretion: [Ref Range 30-90]: 54 mmol/day
- Creatinine excretion: [Ref Range 7.1-17.7]: 8.4 mmol/day
- Protein excretion: [Ref Range 0.00-0.15]: 0.05 g/day

**CONSENT TO PREPARE MANAGEMENT PLAN**
My GP has explained the purpose of the Management Plan and I give / my carer gives permission to prepare a Management Plan.
Patient/Carer signature: ........................................................ Date: ...............................................

<table>
<thead>
<tr>
<th>CURRENT HEALTH NEEDS/PROBLEMS (SPECIALIST/NURSE TO COMPLETE)</th>
<th>GOAL</th>
<th>GP TO COMPLETE TO REFLECT AGREED ACTIONS (TICK THOSE APPLICABLE)</th>
</tr>
</thead>
</table>
| **Blood Pressure management**
Measured blood pressure (at home): 148/59 mmHg 25/10/2012
BP of concern
☐ Yes
☐ No
☐ Please Review | GOAL | Review: |
| Maintain blood pressure as close as possible to 120/80 if it is higher. | | ☐ Regularly monitor BP
☐ Add/titrate BP lowering medications
☐ Cease/reduce prohypertensive medications or other remedies
☐ Exercise
☐ Diet (reduce weight, salt, and alcohol where appropriate) |
| *Antiplatelet Therapy*
Type of event:
☒ Ischaemic Stroke
☐ Intracerebral Haemorrhage
☐ Transient Ischaemic Attack (TIA) | GOAL | Review: |
| For patients with ischaemic stroke or TIA: Daily antiplatelet therapy if not on anticoagulants for another indication (unless otherwise contraindicated). | | Antiplatelet therapy: |
| ☐ Low dose aspirin and modified release dipyridamole or
☐ Aspirin alone, or
☐ Clopidogrel alone | After review, no action |
| ☐ Not recommended (Specialist to tick if applicable) |
| *Anticoagulation Therapy*
Risk of cardioembolism:
☐ Yes
☐ No | GOAL | Review: |
| For patients with ischaemic stroke or TIA: Daily anticoagulation therapy. | | ☐ After review, no action
☐ Oral anticoagulant therapy
☐ Not recommended
☐ Monitor INR |
| *Lipid Lowering Therapy/Diet*
Date of Blood Test: 25/10/2012
Fasting
Cholesterol:
Total: 4 mmol/L.
LDL: 1.8 mmol/L.
HDL: 1.2 mmol/L.
Patient at target level. | GOAL | Review: |
| Total Cholesterol < 4.0 mmol/L
LDL Cholesterol <2.5 mmol/L
HDL Cholesterol >1.0 mmol/L | After review, no action needed
☐ Annual lipid monitoring
☐ Lipid-lowering therapy
☐ Reduce fat intake (meat and dairy)
☐ Increase fruit and vegetable intake
☐ Referral to dietitian |
| ☐ Statin not recommended |
### Alcohol

- **Drinks alcohol:** 2-3 times per week
- **Number of occasions drinking 6 or more drinks:** Never

<table>
<thead>
<tr>
<th>GOAL</th>
<th>Review:</th>
</tr>
</thead>
</table>
| Limit daily alcohol consumption to 2 standard drinks for men and women. | [ ] Reduce alcohol consumption  
[ ] After review, no action |

### Physical Activity

- **Exercises vigorously:** 0 times/wk
- **Walks 30 minutes or more:** 7 times/wk

<table>
<thead>
<tr>
<th>GOAL</th>
<th>Review:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undertake regular (daily) physical exercise.</td>
<td>[ ] Current Physical Activity</td>
</tr>
</tbody>
</table>

### Smoking

<table>
<thead>
<tr>
<th>Consider:</th>
</tr>
</thead>
</table>
| [ ] Current replacement therapy  
[ ] Bupropion or nortriptyline therapy  
[ ] Nicotine receptor partial agonist therapy  
[ ] Behavioural therapy  
[ ] Recommend Quitline  
[ ] Avoid exposure to second hand smoking  
[ ] After review, no action |

- **Never:** Yes
- **Current:** No
- **Past:** Yes, ceased 15/04/1982

### Self-management Skills

<table>
<thead>
<tr>
<th>Medications</th>
<th>Review:</th>
</tr>
</thead>
</table>
| [ ] Patient is taking 7 medications. | [ ] Provide written information  
[ ] Increase physical activity  
[ ] After review, no action |

### Chronic disease self-management skills

- To learn about and increase chronic disease self-management skills:
  - Healthy eating
  - Physical activity
  - Managing stress
  - Effective communication with health professionals
  - Setting personal health goals

### Overweight

- **(BMI > 25kg/m²):** No
- **Weight:** 25/10/2012
  - **BMI:** 24.2 kg/m²
  - **Waist:** 92 cm
  - **Waist: Hip Ratio:** 0.9

<table>
<thead>
<tr>
<th>GOAL</th>
<th>Review:</th>
</tr>
</thead>
</table>
| Reduce weight if BMI > 25kg/m² or waist ≥ 80 cm (women) and ≥ 94 cm (men) | [ ] Diet  
[ ] Exercise  
[ ] After review, no action |

### High Blood Sugar Levels

<table>
<thead>
<tr>
<th>Diabetes</th>
<th>Review:</th>
</tr>
</thead>
</table>
| [ ] Yes  
[ ] No | [ ] 3-monthly blood test for HbA1c  
[ ] Diet  
[ ] Education  
[ ] Referral to dietitian  
[ ] Referral to diabetes educator  
[ ] After review, no action |

- **Date of Blood Tests:** 05/11/2012
- **Fasting**
  - **HbA1c:** 4.6%  
  - **[Ref Range 0.0-6.0]**
  - **Glucose:** 4.9 mmol/L  
  - **[Ref Range 4.0-7.0]**

### Kidney Function

<table>
<thead>
<tr>
<th>Consider:</th>
</tr>
</thead>
</table>
| [ ] Reminders, reinforcement, counselling, family therapy;  
[ ] Once daily and combination dosing  
[ ] Multi-compartment medication compliance device;  
[ ] Home medicines review  
[ ] After consideration, no action |

- **Creatinine:** 80 µmol/L  
  - **[Ref Range 45-80]**
- **Protein:** 0.05 g/day  
  - **[Ref Range 0.00-0.15]**

### Mood Assessment

<table>
<thead>
<tr>
<th>Consider:</th>
</tr>
</thead>
</table>
| [ ] Patient education  
[ ] Counselling  
[ ] Referral to Allied Health Professional  
[ ] After consideration, no action |

- **HADS screening scores for:** Depression* = 2
- **Mood is frequently affected following stroke.**

### Kidney Function

<table>
<thead>
<tr>
<th>Review:</th>
</tr>
</thead>
</table>
| [ ] Annual urine test for urinary ACR  
[ ] Diet  
[ ] Education  
[ ] Referral to a nephrologist  
[ ] Referral to dietitian  
[ ] After review, no action |

<table>
<thead>
<tr>
<th>HADS screening scores for:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depression* = 2</td>
</tr>
</tbody>
</table>
Anxiety† = 1
*For Scores ≥ 7 consider depression.
† For scores ≥ 8 consider morbid anxiety.

The most common mood alteration is depression.

Consider:
- CBT
- Counselling
- Psychotherapy
- Relaxation training
- Referral to Allied Health Professional
- Referral to Psychiatrist
- After consideration, no action

Other, please state

---

ISSUES ARISING FROM GP CONSULTATION

Other patient issues identified at home visit:
- [ ] Concern about ability to manage medications
- [ ] Safety concerns for falls
- [ ] Patient wanting to return to driving
- [ ] Loss of confidence in mobility
- [ ] Concerns about speech, communications and/or memory
- [ ] Sexual dysfunction
- [ ] Other _________________________

Summary of Management Plan for Patient/Carer:

---

Copy of Management Plan provided to patient:   Yes [ ]   No [ ]

GP Management Plan Review Date:
(Recommendations: 6 months after GP initiated Management Plan)

Will extra patient visits be required for risk factor management within this time period?   Yes [ ]   No [ ]

Does patient need referral for Team Care Arrangement?   Yes [ ]   No [ ]
(Consider referral in 4 weeks).

Please fax copy back to:
Please DO NOT SEND to Specialist.
2. Template of STANDFIRM syllabus for nurse education visit

<table>
<thead>
<tr>
<th>PATIENT DETAILS</th>
<th>GP DETAILS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date of Birth:</td>
<td>Gender:</td>
</tr>
<tr>
<td>Language Spoken:</td>
<td>Interpreter may be required:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Details of stroke</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Date of stroke:</td>
<td>Type of stroke: Ischaemic Stroke</td>
</tr>
<tr>
<td>Hospital Name:</td>
<td>Follow-up Assessment Date:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MEDICAL HISTORY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetes</td>
</tr>
<tr>
<td>High cholesterol</td>
</tr>
<tr>
<td>Ischemic heart disease</td>
</tr>
<tr>
<td>Heart failure</td>
</tr>
</tbody>
</table>

| Other notes or comments relevant to the patient’s management plan: |
| Coronary artery bypass graft (x5), TIA, foot ulcer |

<table>
<thead>
<tr>
<th>FAMILY HISTORY (Reported by patient)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family history of hypertension</td>
</tr>
<tr>
<td>Family history of heart disease</td>
</tr>
<tr>
<td>Family history of high cholesterol</td>
</tr>
<tr>
<td>Family history of diabetes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MEDICATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gliclazide 60mg One Tablet Daily</td>
</tr>
<tr>
<td>Rosuvastatin 5mg One Tablet Daily</td>
</tr>
<tr>
<td>Atenolol 50mg One half Tablet Daily</td>
</tr>
<tr>
<td>Metformin 850mg One Tablet Daily</td>
</tr>
<tr>
<td>Clopidogrel 75mg One Tablet Daily</td>
</tr>
<tr>
<td>Ezetrol 10mg One Tablet Daily</td>
</tr>
<tr>
<td>Levemir/Flexipen 100 u/ml</td>
</tr>
<tr>
<td>Vitamin D3 1000IU Daily</td>
</tr>
<tr>
<td>Initiation Champix 1mg Twice Daily</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ALLERGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nil Known</td>
</tr>
</tbody>
</table>

1. What are your main concerns about having a stroke?

If they are worried about having another stroke, discuss available options for support (use help after stroke card):

- National Stroke Foundation Helpline
- Encourage to discuss with GP
- If you experience symptoms dial 000 (and offer emergency card)
Please document main issues for the participant and advice offered

American Stroke website was found to be very informative. National Stroke Foundation information is disjointed. Participant complained of not being provided adequate information when first being treated. Participant was not happy with service or follow-up treatment from the GP and wants a different GP. However, participant requires correspondence from the GP for insurance purposes. Participant would not hesitate to call 000.

If they are worried about living with the effects of stroke provide details about:

- Peer support (i.e. Stroke Association of Victoria, and Carers Australia)
- National Stroke Foundation Helpline
- Encourage to discuss with GP
- Beyond Blue Helpline
- Functional and impairment concerns (e.g. continence, speech, inability to walk, mood)

Please document main issues for the participant and advice offered

- Mobility
- Driving
- Speech/Communication
- Medication Use
- Support system at home
- Sexual Dysfunction

1. Participant has right sided strength and fine motor movement.
2. Participant had right limb restriction causing instabilities and weakness, can only drive locally.
3. Participant had severe mood swing and anger management issues, been on medication for years and aware of most medications.
4. Wife supports for small activities of daily living.

II. Stroke Prevention Education

SMOKING
Past smoker, ceased XX/XX/XX Cotinine: Detected

Education: The risk of heart disease halves within 12 months of quitting. The risk of stroke becomes the same as that for a never smoker after 5 years. Lung function improves within 3 months. Passive smoking is associated with a high risk of stroke to a similar level as for people who smoke, and exposure must be avoided in the home and other social environments.

Goal: Cease smoking (or remain smoke-free) and to steer clear of exposure to smoking (including in the home). Ban or restrict smoking by others in the home.

Interest in quitting (score out of 7; 7 = very keen): out of 7. What would need to happen to make you more keen to quit - say to give a score of 6 or 7 out of 7 instead?

Confidence in quitting (score out of 7; 7 = very confident): out of 7. What would be the hardest thing about quitting? What made it difficult to quit the last time you tried? What would need to happen to increase your confidence to 6 or 7? Explore and tackle barriers (e.g. withdrawal, stress reduction, weight control). Identify support, e.g. partner, GP. Refer to Quitline.

Exposure to passive smoking. Determine whether passive smoking is an issue in the home, car
and elsewhere. Discuss strategies to avoid exposure to environmental tobacco smoke (e.g. banning smoking inside the home or in cars).

Please document main issues for the participant and advice offered
Participant smokes marijuana 4-5 times per week. Smokes 3 joints a session. Participant is not interested in quitting at present. Discussed risk increase with smoking. Participant was smoking cigarettes (15 a day pre-stroke), went on CHAMPIX after stroke and ceased ordinary cigarettes. Participant was provided with literature regarding the QUIT program.

BLOOD PRESSURE
Measured blood pressure at home on XX/XX/XX; BP = 121/65 mmHg
Weight Assessed at home on XX/XX/XX; BMI = 23.4 kg/m² Waist (<80 F, < 94 M) = 95 cm
Waist-Hip Ratio: 1.0

Participant is currently gaining weight without trying to. Participant has gained more than 10 kg since late teens or early twenties.
Participant exercises vigorously (≥ 20 minutes) 0 times/wk. Walks 30 minutes or more 0 times/wk. Undertakes moderate-intensity activity that increases heart rate (≥30 minutes) 0 times/wk.
Participant does not add salt to food at the table.
Salt excretion per day (Recommended range 40-220): 106 mmol/day

Education: It is recommended that all people who have had a stroke, regardless of blood pressure level, should receive blood pressure lowering therapy (unless you are prone to dizziness from very low blood pressure). Other ways to help reduce blood pressure include weight loss, increasing physical activity (to help with weight loss, improve cardiovascular fitness and mood, and reduce stress), reduce salt intake to less than 1 teaspoon per day, avoid processed food because these have high sources of salt and fat (particularly bread and ice cream), and increasing fruit and vegetable intake. GPs and pharmacists can provide support in these areas.

Goal: Lower blood pressure irrespective of baseline level. This minimizes damage to small blood vessels throughout the body.

Snoring and or sleep apnoea: Determine whether patient has ever been told that they have sleep apnoea. Are they being treated for sleep apnoea? Presence of sleep apnoea may increase blood pressure and treatment has been shown to lower blood pressure (Continuous Positive Airway Pressure (CPAP)).

Please document main issues for the participant and advice offered
GP has never taken BP. Endocrinologist takes BP each time (visits 3-4 times a year) Discussed the possibility of changing BP.
Participant has been on medications since 2007.
Weight has gone up 4-5 kgs since stroke due to sedentary lifestyle. Discussed related risk factors Participant is a bad snorer and has not been tested for sleep apnoea. Suggested the need to see specialist.

ATRIAL FIBRILLATION
Heart Rhythm: Regular

Education: Irregular heart beat is associated with a very high risk of stroke and stroke recurrence. Medication can reduce this risk. Smoking may exacerbate this condition. Atrial fibrillation can be
difficult to control. It is important to have your response to medication regularly monitored. Regular contact with your general practitioner may be needed. Teach the participant how to take their pulse and check for AF.

**Goal:** If AF present or suspected, seek medical advice (GP).

**Please document main issues for the participant and advice offered**

*No known issues.*

---

**DIABETES**

**Date of Blood Tests:** XX/XX/XX; **Fasting** HbA1c: 7.3% **Glucose** (Recommended < 7.0): 5.8 mmol/l

[A level of less than 7% is very good, a level between 7% & 8% is adequate, between 8% & 9% suggests the need for improvement, and over 9% is associated with poor control of blood sugar levels]

**Diabetic status:** Determine how long participant has been aware of diabetic status, and current management strategies.

**Education:** The risk of heart disease, stroke and recurrent stroke is much greater in people with diabetes. Control of your glucose levels significantly reduces these risks. Ways to improve your blood sugar levels are:

- A healthy eating plan (e.g. lower total fat intake and find substitutes for saturated fat, reduce sugar intake, and increase consumption of fruit and vegetables)
- Optimizing weight
- Regular physical activity to improve metabolic control
- Medication may be required, but does not substitute for healthy eating and activity
- Encourage participant to discuss diabetes management with GP
- Advise that there is a Diabetes Australia Helpline for further information and support (see contacts card).

**Goal:** Achieve a stable blood glucose level that is below 7 mmol.

**Potential referral:** Determine interest in seeing a dietitian.

**Please document main issues for the participant and advice offered**

*Participant has been diabetic for 7 years.*

*Participant is on insulin for the past 2 years and has regular HbA1c done. Participant is under the care of an endocrinologist.*

*Participant maintains diet, generally eating fish more than meat. Has cereals, vegetables, fruit (diet well balanced).*

*Participant is aware of Diabetes Australia Helpline, but relies on endocrinologist for general health care.*

---

**CHOLESTEROL**

**Total cholesterol level:** 2.4 mmol/l  **LDL:** 1.2 mmol/l  **HDL:** 0.6 mmol/l  **Triglycerides:** 1.3 mmol/l

**Education:** High cholesterol levels are associated with a greater risk of heart disease and stroke recurrence. It is recommended that all people who have had an ischaemic stroke should receive cholesterol lowering therapy. Other ways to help reduce cholesterol levels include increase physical activity, avoid processed food because these have high sources of fat, and increased fruit
and vegetable intake. GPs and pharmacists can provide support in these areas.

**Goal:** Maintain a normal cholesterol level, and have an annual cholesterol test.

**Please document main issues for the participant and advice offered**
*Participant used to be 9 mmol/l 25 years ago. Participant has now changed diet. Participant has been on medications for over 5 years and cholesterol has dropped significantly. Participant eats a lot of Asian style food, and has reduced sweets.*

---

**EXCESSIVE ALCOHOL INTAKE**
The participant drinks 2 to 4 times per month. On each occasion, the participant takes 1 to 2 drinks.

**Education:** Heavy drinking can raise your blood pressure and increase your risk of stroke. It is a good idea to discuss your alcohol intake with your doctor as alcohol may interact with some of your medications or make it harder to control blood pressure.

**Goal:** Limit daily alcohol consumption to 2 standard drinks for men and 1 standard drink for women (show pictures). Everyone should have at least one or two alcohol free days every week.

**If heavy drinker:** Determine whether they may be dependent or not. If dependency is suspected, administer AUDIT questionnaire.

**Interest in cutting down.** Determine whether the patient is interested in cutting down.

**Confidence about succeeding.** Determine how confident the patient is in cutting down. Find out what would be required to increase their confidence in cutting down. Discuss barriers to reducing alcohol. Negotiate and set realistic goals.

**Potential referral:** Determine interest in seeing an alcohol dependency specialist.

**Please document main issues for the participant and advice offered**
*Participant has 2 stubbies of light beer once per week. Participant has occasional social drink usually limited to one red or white wine glass, 1-2 times per month.*

---

**OVERALL WELL-BEING (Physical Activity, Weight Loss, and Nutrition)**

**Exercise:** the participant:
- Exercises vigorously 0 times/week;
- Walks 30 minutes or more 0 times/week;
- Undertakes moderate-intensity activity 0 times/week.

**Weight** assessed at home: XX/XX/XX; BMI = 23.4 kg/m²; Waist circumference = 95 cm; Waist-Hip Ratio: 1.0

The participant:
- Currently gaining weight without trying to;
- Has gained more than 10 kg since late teens and early twenties.

**Nutrition:**
- Does not choose low fat dairy products;
- Eats 2 serves of vegetables per day (Recommended = 5 serves/day);
- Eats 1 serves of fruit per day (Recommended = 2 serves/day);
- Does not eat pies, pastries, fried foods or takeaway meals more than once a week;
- Drinks soft drinks, cordials, sport drinks or fruit juice on most days of the week;
- Sodium excretion (Recommended range 40-220): 190 mmol/day
- Does not add salt to food at the table;
- Does not add more than 1 teaspoon salt per day at the table.
**Education:** Physical activity, weight, and nutrition all impact on the occurrence of risk factor (e.g. high blood pressure, cholesterol). People who exercise regularly are about 30% less likely to have a stroke and 50% less likely to have cardiovascular disease. Regular exercise can reduce the risk of stroke by lowering blood pressure, assisting in weight loss and reducing cholesterol. Losing weight improves blood pressure and blood glucose levels. Diets rich in fruit and vegetables are associated with a lower risk of heart disease and stroke, and reduce the likelihood of developing type 2 diabetes and high blood pressure.

**Activity Goal:** Just 30 minutes per day of moderate-intensity physical activity (either continuous or in bouts of 10-minute intervals) provides health benefits.

**Weight Goal:** Reduce weight if BMI > 25kg/m²

**Nutrition Goals:**
- Include 5 serves of vegetables in your diet every day
- Include 2 serves of fruit in your diet every day
- Avoid eating saturated fats in your diet (e.g. butter, cheese, hidden fats in cakes and pastries)

**Potential referral:** Determine interest in seeing a dietitian.

**Please document main issues for the participant and advice offered**

*Participant’s daily activities involved work and walking.*

*Participant is limited as the right-hand side is weak. Also left foot ulcer interferes with an increased exercise regime.*

*Discussed exercises with weights for upper limb activities. Also discussed weight gain and related risk factors with stroke and diabetes.*

*Participant eats balanced diet.*

---

**MEDICATIONS AFTER STROKE**
The patient is currently taking 9 medications.

**Education:** There are many different medications that your doctor may prescribe to reduce your risk of having another stroke or TIA.

**Goal:** If your doctor prescribes medication, it is important to continue taking it unless the doctor tells you to stop. If you have difficulty in remembering to take your medications then you can try:
- Taking your medication at the same time every day. It is important to get into a routine.
- Using a pill box or dispenser that notes day and times. You can organize this with your local pharmacist.
- Using a medication diary or daily chart to keep track of your medications. Your doctor will help you to work out the right medication, dosage and timing for your lifestyle. Never stop taking your medication or change how much you take without talking to your doctor. In some cases, suddenly stopping your medication can be dangerous. If you do not understand any of these things, please discuss with your doctor. Also remember to report any side-effects of your drugs to your doctor. Also remember to tell your doctor about any other medications that you may be taking that were not prescribed by the doctor.

**Encourage patient to talk to their doctor about the medications they are taking.**

**Please document main issues for the participant and advice offered**

*All medications are well tolerated*

*Participant has issues with GP making scripts out to patient.*
Please list other family members involved in discussion, and responsibility (e.g. spouse cooking or son smoking).

*Participant relies on wife for a variety of activities of daily living*

Make appointment with GP for Management Plan in about 1 week (remember to tell receptionist that this will be for a long visit).
3. Methods of intention-to-treat analyses

Missing 12-month outcome data were replaced with outcome data obtained at 3 months provided the subjects were alive at 12 months and measurements were obtained at baseline. In cases where subjects were not alive at 12 months or measurements were not obtained at baseline, data were assumed to be missing at random and were therefore imputed in regression models using multiple imputation by chained equations (m=40 imputations). Full regression models included baseline variables such as age, sex, education, socio-economic position, marital status; history of comorbidities; and baseline status of targets attained. Models also included variables obtained at 12 months (for 12-month outcome analyses) or 24 months (for 24-month outcome analyses). These variables included mental and functional status, number of prescribed prevention medications, measures of healthy lifestyle and medical advice provided. Models were not adjusted for potential cluster effect because the intra-cluster correlation coefficient, estimated using multilevel mixed-effects regression models, approached zero. Variables were manually and systematically eliminated until suitable models were obtained. Apart from variables such as age, sex, and baseline status for target attainment, only variables with a P <0.05 were retained in final multivariable models.
Supplemental Tables

Table I. Target values for cardio-metabolic targets

<table>
<thead>
<tr>
<th>Cardio-metabolic factors</th>
<th>Target values*</th>
</tr>
</thead>
</table>
| Blood pressure 2,3       | Systolic ≤120 mmHg  
|                          | Diastolic ≤80 mmHg  |
| Lipids 2,4               | Total Cholesterol ≤4.0 mmol/L  
|                          | HDL-Cholesterol ≥1.0 mmol/L  
|                          | LDL-Cholesterol ≤2.5 mmol/L  |
| Smoking 2,4              | Undetectable urinary cotinine |
| Body weight 2,5          | BMI ≤25 kg/m²  
|                          | Waist circumference ≤80 cm (women) or ≤94 cm (men) |
| Blood glucose 2,4        | HbA1c ≤7%  |
| Kidney function 4,6      | Creatinine ≤80 µmol/L  
|                          | Protein excretion ≤150 mg/day |

LDL, low-density lipoprotein; HDL, high-density lipoprotein; BMI, body mass index; HbA1c, glycosylated haemoglobin.
### Table II. Uptake of pharmacological and lifestyle interventions among subjects who undertook all assessments during the two-year follow-up

<table>
<thead>
<tr>
<th>Use of medications</th>
<th>Intervention N (%) (n=242)</th>
<th>Control N (%) (n=243)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline 12 months 24 months</td>
<td>Baseline 12 months 24 months</td>
</tr>
<tr>
<td>Antihypertensive therapy</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>196 (81.0) 197 (81.4) 195 (80.6)</td>
<td>206 (84.8) 204 (84.0) 198 (81.5)</td>
</tr>
<tr>
<td>Cholesterol lowering therapy†</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>213 (88.0) 206 (85.1) 201 (83.1)</td>
<td>208 (85.6) 199 (81.9) 195 (80.3)*</td>
</tr>
<tr>
<td>Antithrombotic therapy‡</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>219 (90.5) 214 (88.4) 208 (86.0)*</td>
<td>222 (91.4) 218 (89.7) 210 (86.4)*</td>
</tr>
<tr>
<td>Lifestyle factors</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current non-smoking‡</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>204 (84.3) 197 (81.3) 203 (83.9)</td>
<td>206 (84.8) 207 (85.2) 209 (86.0)</td>
</tr>
<tr>
<td>Current healthy drinking§</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>230 (95.0) 228 (94.2) 232 (95.9)</td>
<td>229 (94.2) 230 (94.7) 233 (95.9)</td>
</tr>
<tr>
<td>Daily healthy eating</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥5 servings of vegetables</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>10 (4.1) 12 (5.0) 10 (4.1)</td>
<td>14 (5.7) 20 (8.2) 18 (7.4)</td>
</tr>
<tr>
<td>≥2 servings of fruit</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>116 (47.9) 129 (53.3) 120 (49.6)</td>
<td>109 (44.9) 135 (55.6)* 125 (51.4)</td>
</tr>
<tr>
<td>&lt;5g salt‖</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>8 (3.4) 2 (0.9) 8 (3.4)</td>
<td>4 (1.7) 5 (2.2) 10 (4.3)</td>
</tr>
<tr>
<td>Physically active§</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>31 (12.8) 28 (11.6) 20 (8.3)*</td>
<td>33 (13.6) 26 (10.7) 15 (6.2)*</td>
</tr>
</tbody>
</table>

*Estimates in bold are those that showed significant difference (P ≤0.05) when compared to data obtained at baseline; †In patients with ischaemic stroke or transient ischaemic attack; ‡Self-report and absence of detectable levels of urinary cotinine; §<2 drinks/day (women) or <4 drinks/day (men); †Data missing for 7 participants in the intervention group and 10 participants in the control group; ‡Undertaking ≥30 minutes of moderate-intensity or ≥20 minutes or of vigorous-intensity physical activity ≥3 times/week. Moderate-intensity physical activity increases the heart rate or causes breathing harder than normal. Vigorous-intensity physical activity causes sweating/puffing/panting.
### Table III. Complete case analyses of the effect of the intervention on attainment of cardio-metabolic targets at 12 and 24 months

<table>
<thead>
<tr>
<th>Targets</th>
<th>12-month follow-up, OR (95% CI)</th>
<th>24-month follow-up, OR (95% CI)</th>
<th>P-value</th>
<th>12-month follow-up, OR (95% CI)</th>
<th>24-month follow-up, OR (95% CI)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Univariable (n=526-533)</td>
<td>Multivariable* (n=474-507)</td>
<td></td>
<td>Univariable (n=468-485)</td>
<td>Multivariable* (n=454-466)</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td>P-value</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤2</td>
<td>1</td>
<td>1</td>
<td>0.897</td>
<td>0.80 (0.51, 1.24)</td>
<td>0.73 (0.46, 1.17)</td>
<td>0.189</td>
</tr>
<tr>
<td>3</td>
<td>1.31 (0.79, 2.18)</td>
<td>1.25 (0.74, 2.12)</td>
<td>0.409</td>
<td>1.08 (0.62, 1.82)</td>
<td>0.96 (0.56, 1.66)</td>
<td>0.890</td>
</tr>
<tr>
<td>≥4</td>
<td>1.12 (0.71, 1.77)</td>
<td>0.94 (0.56, 1.60)</td>
<td>0.826</td>
<td>1.03 (0.64, 1.67)</td>
<td>0.99 (0.59, 1.64)</td>
<td>0.959</td>
</tr>
<tr>
<td><strong>Blood pressure (mmHg)</strong>†</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Systolic BP ≤120</td>
<td>0.98 (0.62, 1.54)</td>
<td>0.80 (0.47, 1.35)</td>
<td>0.403</td>
<td>0.89 (0.56, 1.42)</td>
<td>0.82 (0.50, 1.35)</td>
<td>0.444</td>
</tr>
<tr>
<td>Systolic BP ≤140</td>
<td>0.79 (0.55, 1.14)</td>
<td>0.69 (0.45, 1.06)</td>
<td>0.088</td>
<td>0.86 (0.58, 1.29)</td>
<td>0.74 (0.48, 1.15)</td>
<td>0.183</td>
</tr>
<tr>
<td>Diastolic BP ≤80</td>
<td>0.82 (0.55, 1.22)</td>
<td>0.76 (0.49, 1.20)</td>
<td>0.241</td>
<td>0.95 (0.63, 1.45)</td>
<td>0.89 (0.57, 1.40)</td>
<td>0.618</td>
</tr>
<tr>
<td>Diastolic BP ≤90</td>
<td>0.98 (0.52, 1.85)</td>
<td>0.99 (0.48, 2.01)</td>
<td>0.970</td>
<td>0.58 (0.30, 1.13)</td>
<td>0.63 (0.32, 1.24)</td>
<td>0.179</td>
</tr>
<tr>
<td><strong>Lipids (mmol/L)</strong>‡</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total cholesterol &lt;4.0</td>
<td>1.17 (0.78, 1.74)</td>
<td>1.24 (0.79, 1.94)</td>
<td>0.359</td>
<td>1.02 (0.69, 1.52)</td>
<td>1.05 (0.69, 1.61)</td>
<td>0.805</td>
</tr>
<tr>
<td>HDL Cholesterol &gt;1.0</td>
<td>0.88 (0.55, 1.39)</td>
<td>0.86 (0.51, 1.48)</td>
<td>0.593</td>
<td>1.36 (0.85, 2.18)</td>
<td>1.40 (0.85, 2.32)</td>
<td>0.188</td>
</tr>
<tr>
<td>LDL Cholesterol &lt;2.5</td>
<td><strong>1.75 (1.11, 2.74)</strong></td>
<td><strong>2.12 (1.26, 3.57)</strong></td>
<td><strong>0.005</strong></td>
<td>1.35 (0.88, 2.09)</td>
<td>1.40 (0.89, 2.21)</td>
<td>0.145</td>
</tr>
<tr>
<td><strong>Smoking</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Undetectable urinary cotinine</td>
<td>0.66 (0.34, 1.31)</td>
<td>0.55 (0.25, 1.23)</td>
<td>0.147</td>
<td>0.76 (0.38, 1.52)</td>
<td>0.67 (0.29, 1.56)</td>
<td>0.354</td>
</tr>
<tr>
<td><strong>Body weight</strong>§</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BMI ≤25 kg/m²</td>
<td>1.13 (0.60, 2.12)</td>
<td>0.97 (0.47, 1.99)</td>
<td>0.927</td>
<td>0.82 (0.43, 1.53)</td>
<td>0.93 (0.45, 1.92)</td>
<td>0.843</td>
</tr>
<tr>
<td>Waist circumference &lt;80 cm</td>
<td>0.91 (0.46, 1.78)</td>
<td>0.92 (0.44, 1.94)</td>
<td>0.828</td>
<td>0.64 (0.33, 1.25)</td>
<td>0.94 (0.33, 2.64)</td>
<td>0.904</td>
</tr>
<tr>
<td>(women) and &lt;94 cm (men)</td>
<td>1.17 (0.64, 1.95)</td>
<td>0.97 (0.52, 1.81)</td>
<td>0.918</td>
<td>0.68 (0.39, 1.19)</td>
<td>0.31 (0.09, 1.04)</td>
<td>0.058</td>
</tr>
<tr>
<td><strong>Blood glucose‖</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HbA1c ≤7%</td>
<td>3.48 (1.32, 9.17)</td>
<td><strong>8.60 (1.20, 61.57)</strong></td>
<td><strong>0.032</strong></td>
<td>1.98 (0.82, 4.79)</td>
<td>2.30 (0.56, 9.34)</td>
<td>0.245</td>
</tr>
<tr>
<td><strong>Kidney function¶</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Creatinine ≤80 μmol/L</td>
<td>0.98 (0.66, 1.45)</td>
<td>1.04 (0.66, 1.62)</td>
<td>0.885</td>
<td>0.94 (0.64, 1.40)</td>
<td>0.94 (0.61, 1.45)</td>
<td>0.779</td>
</tr>
<tr>
<td>Protein excretion ≤15 mg/day</td>
<td>0.80 (0.53, 1.20)</td>
<td>0.87 (0.55, 1.39)</td>
<td>0.573</td>
<td>0.83 (0.54, 1.25)</td>
<td>0.80 (0.51, 1.27)</td>
<td>0.352</td>
</tr>
</tbody>
</table>

BP, blood pressure; HDL, high-density lipoprotein; LDL, low-density lipoprotein; BMI, body mass index; HbA1c, glycosylated haemoglobin. Bolding indicates P<0.05.

*Adjusted for medical history, socio-demographic, mental, and functional status, number of prescribed prevention medications, and engagement in healthy lifestyle. †Maintaining Systolic BP ≤120 mmHg and Diastolic BP ≤80 mmHg; ‡Maintaining Total-Cholesterol <4.0 mmol/L, LDL-Cholesterol <2.5 mmol/L, and HDL-Cholesterol >1.0 mmol/L; §Maintaining BMI ≤25 kg/m² and waist circumference <80 cm (women)/<94 cm (men); ‖Maintaining HbA1c ≤7%; ¶Maintaining blood creatinine 45-80 mol/L and urinary protein ≤15 mg/day.
### Table IV. Intention-to-treat analyses of the effect of the intervention on attainment of cardio-metabolic targets at 12 and 24 months restricted to subjects whose target were not optimal at baseline

<table>
<thead>
<tr>
<th>Targets</th>
<th>12-month follow-up, OR (95% CI)</th>
<th>24-month follow-up, OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Univariable</td>
<td>Multivariable</td>
</tr>
<tr>
<td>Blood pressure (mmHg)†</td>
<td>1.68 (0.90, 3.12)</td>
<td>1.28 (0.65, 2.50)</td>
</tr>
<tr>
<td>Systolic BP ≤120</td>
<td>1.48 (0.79, 2.77)</td>
<td>1.09 (0.56, 2.13)</td>
</tr>
<tr>
<td>Systolic BP ≤140</td>
<td>0.88 (0.60, 1.30)</td>
<td>0.78 (0.51, 1.20)</td>
</tr>
<tr>
<td>Diastolic BP ≤80</td>
<td>0.95 (0.49, 1.85)</td>
<td>1.24 (0.84, 2.84)</td>
</tr>
<tr>
<td>Diastolic BP ≤90</td>
<td>1.61 (0.47, 5.50)</td>
<td>NA</td>
</tr>
<tr>
<td>Lipids (mmol/L)‡</td>
<td>1.83 (1.04, 3.24)</td>
<td>2.15 (1.16, 3.95)</td>
</tr>
<tr>
<td>Total cholesterol &lt;4.0</td>
<td>2.55 (1.30, 5.01)</td>
<td>3.52 (1.61, 7.68)</td>
</tr>
<tr>
<td>HDL Cholesterol &gt;1.0</td>
<td>0.86 (0.49, 1.63)</td>
<td>0.77 (0.34, 1.77)</td>
</tr>
<tr>
<td>LDL Cholesterol &lt;2.5</td>
<td>2.87 (1.33, 6.21)</td>
<td>5.01 (1.79, 13.98)</td>
</tr>
<tr>
<td>Smoking</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Undetectable urinary cotinine</td>
<td>0.90 (0.30, 2.74)</td>
<td>NA</td>
</tr>
<tr>
<td>Body weight§</td>
<td>1.07 (0.46, 2.48)</td>
<td>1.01 (0.39, 2.76)</td>
</tr>
<tr>
<td>BMI ≤25 kg/m²</td>
<td>1.04 (0.38, 2.82)</td>
<td>0.77 (0.22, 2.73)</td>
</tr>
<tr>
<td>Waist circumference ≤80 cm (women) and ≤94 cm (men)</td>
<td>0.99 (0.47, 2.07)</td>
<td>0.86 (0.35, 2.12)</td>
</tr>
<tr>
<td>Blood glucose‖</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HbA1c ≤7%</td>
<td>5.06 (1.29, 19.78)</td>
<td>NA</td>
</tr>
<tr>
<td>Kidney function¶</td>
<td>0.81 (0.46, 1.41)</td>
<td>1.03 (0.54, 1.95)</td>
</tr>
<tr>
<td>Creatinine ≤80 µmol/L</td>
<td>0.74 (0.39, 1.40)</td>
<td>0.78 (0.30, 2.10)</td>
</tr>
<tr>
<td>Protein excretion ≤15 mg/day</td>
<td>1.73 (0.65, 4.62)</td>
<td>1.45 (0.35, 6.08)</td>
</tr>
</tbody>
</table>

Sample size (n) for regression models ranged from 50 subjects for HbA1c ≤7% and 471 subjects for body weight.

BP, blood pressure; NA, robust effect estimate could not be obtained as a result of small sample size; HDL, high-density lipoprotein; LDL, low-density lipoprotein; BMI, body mass index; HbA1c, glycosylated haemoglobin.

Bolding indicates P<0.05.

*Adjusted for medical history, socio-demographic, mental, and functional status, number of prescribed prevention medications, and engagement in healthy lifestyle.
†Maintaining Systolic BP ≤120 mmHg and Diastolic BP ≤80 mmHg;
‡Maintaining Total-Cholesterol <4.0 mmol/L, LDL-Cholesterol <2.5 mmol/L, and HDL-Cholesterol >1.0 mmol/L;
§Maintaining BMI ≤25 kg/m² and waist circumference <80 cm (women)/<94 cm (men);
‖Maintaining HbA1c ≤7%; ¶Maintaining blood creatinine 45-80 mol/L and urinary protein ≤15 mg/day
Supplemental References