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Economic evaluation of phase III international randomised controlled trial of very early mobilisation after stroke (AVERT)

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Title

Economic evaluation of a phase III international randomised controlled trial of very early mobilisation after stroke (AVERT)

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Abstract

Objectives While Very Early Mobilisation (VEM) intervention for stroke patients was shown not to be effective at 3 months, 12 -month clinical and economic outcomes remain unknown. It was aimed to assess cost-effectiveness of a VEM intervention within a Phase III randomised controlled trial (RCT).

Design An economic evaluation alongside a RCT

Setting Multi-country RCT involved 58 stroke centres.

Participants 2104 patients with acute stroke who were admitted to a stroke unit.

Intervention A very early rehabilitation within 24 hours of stroke onset

Methods Cost-utility analyses were undertaken according to pre-specified protocol measuring VEM against usual care (UC) based on 12 -month outcomes. The analysis was conducted using both health sector and societal perspectives. Unit costs were sourced from participating countries. Dichotomised Modified Rankin Scale (mRS) scores (0-2 vs 3-6) and Quality Adjusted Life Years (QALYs) were used to compare the treatment effect of VEM and UC. The base case analysis was performed on an Intention-To-Treat (ITT) basis and 95% confidence intervals (CI) for cost and QALYs were estimated by bootstrapping. Sensitivity analysis were conducted to examine the robustness of base case results.

Results VEM and UC groups were comparable in the quantity of resource use and cost of each component. There were no significant differences in the probability of achieving a favourable mRS outcome (0.030, 95%CI: -0.022 to 0.082), QALYs (0.013, 95%CI: -0.041 to 0.016) and cost (AUD1082, 95%CI: -$2520 to $4685) from a health sector perspective; or AUD$102, 95%CI: -$6907 to $7111, from a societal perspective including productivity cost).

The probability of VEM being cost-effective was between 19% and 44%. Sensitivity analysis achieved results with mostly overlapped CIs.

Conclusions VEM and UC were associated with comparable costs, mRS outcome and QALY gains at 12 months. Compared with to UC, VEM is unlikely to be cost-effective.

Trial registration Australian New Zealand ClinicalTrials Registry, number ACTRN12606000185561.

Strength and limitations

- This is the first economic evaluation assessing the cost-effectiveness of a very early rehabilitation intervention within the largest Phase III randomised controlled trial in patients with stroke;
- The study assessed the long-term cost-effectiveness of this very early rehabilitation intervention at 12-month;
- The difficulty posed by the multi-country design of the trial and the percentage of missing data may undermine the confidence in the results.

Introduction

Stroke is one of the biggest killers and a leading cause of disability worldwide.[1 2] 65% of stroke survivors live with some degree of disability that impedes their ability to carry out daily living activities unassisted.[3] Therefore, ways of improving the outcomes of patients after stroke is an important focus of research.[4 5] Early mobilisation after stroke is believed to contribute to better patient outcomes and clinical trials have been conducted globally.[6 7]

The short-term efficacy and safety of a very early rehabilitation trial after stroke (AVERT) has been evaluated in a phase III randomised controlled trial (RCT) with 2,104 patients enrolled from Australia, New Zealand, United Kingdom, Singapore and Malaysia.[8] The evidence from this trial indicated that at three months after stroke, early mobilisation of patients was associated with a reduction in the probability of a favourable outcome as defined by a modified Rankin Scale (mRS) score of 0-2 compared to that in the UC group.[8] However, it is uncertain whether this intervention effect extended after the acute phase of stroke. Given the implications of stroke burden sustained beyond the acute phase (i.e., 3 months), it is also important to ascertain clinical outcomes at a longer time point. For example, it has been reported that the recurrence rate of stroke between 3 months and 1 year was approximately 3.1%.[9] Moreover, "steady state" after an acute episode of stroke typically occurs within 3-6 months for patients with lower baseline mRS score (i.e. lower disability after stroke) and longer for those with higher initial mRS (i.e. higher level of disability after stroke).[10]

From a decision-maker's perspective, the long-term outcomes of patients after stroke bear substantial economic and policy implications. With increasingly scarce health resources, it is imperative to examine the longer-term cost-effectiveness credentials of VEM in an early rehabilitation setting for patients after stroke even if this intervention was inferior to usual

care at 3-month follow up.[8] The clinical findings from Phase III AVERT trial were inconsistent with that of our Phase II study;[11] however, the short term follow-up (only 3 months), single country study design, and small sample size (N=71) of the Phase II study may account for this discrepancy, and rendered the conclusion of associated economic evaluation not generalizable to a broader context.

This economic evaluation was conducted alongside the Phase III RCT.[8] The aim of this paper is to assess the cost-effectiveness of very early mobilisation within 24 hours after stroke in terms of improving patient outcomes at 12-months, in comparison to usual care (UC).

Methods

The economic analysis was undertaken following the previously published plan.[12] It also conforms to the Consolidated Health Economic Evaluation Reporting Standards (CHEERS) checklist.[13] Ethics approval was granted by relevant institutions.

Intervention and comparator

The trial design has been reported in detail elsewhere.[8] In brief, patients with confirmed stroke who were admitted to a stroke unit within 24 hours of stroke onset were randomised to receive usual stroke-unit care (UC) alone or VEM in addition to UC in a multinational Phase III trial.

Outcomes

The mRS at 12-months, a secondary outcome of the trial, and Quality-Adjusted life years (QALYs) derived from the Assessment of Quality of Life-4D (AQoL-4D)[14] were used as the effectiveness measures in the economic evaluation. The AQoL-4D instrument is a multi-

attribute utility scale used to assess the health-related quality of life (HRQoL)[15]; it was administered at 3 and 12 months.

Outcome of mRS was dichotomised into "favourable" (mRS 0-2) and "poor" (mRS 3-6) based on patients outcomes at 12-month follow up.[8] The difference in the probability of patients achieving a favourable mRS outcome (mRS 0-2) was used to estimate the incremental benefits between treatment groups for the primary efficacy outcome.

Due to the inherent difficulties of administering the AQoL instrument to acute stroke patients, the mRS score at baseline[8] was used as a surrogate measure of patient utility during the acute phase. The detailed methods of this work are reported elsewhere[16] and a brief description is supplied in the online supplementary document 1.

Costs

A societal perspective with a key focus on the health sector was adopted.

Intervention delivery

Intervention delivery costs consisted of the time costs of physiotherapists and nurses delivering VEM (or UC) to patients. The mean of the total physiotherapist time (across whole hospital stay) per patient was calculated. Given insufficient data, physiotherapist's mean time per session was used as a proxy for nurse time spent on delivering either VEM or UC.

Resource use

All resource use during the study period was electronically collated using a validated Cost Case Report Form (Cost CRF) administered and recorded by trained staff at 3- and 12-months using face to face assessments with patients and carers, and medical records. Cost CRF used in Australia is supplied as an example (Supplementary document 2). Cost CRF from other participating countries could be requested from corresponding author.

Unit costing

Costs were computed by applying country-specific unit costs to each resource item utilised. Therefore, five sets of unit costs (one for each of the participating countries) were compiled from the most up-to-date and reliable source (Supplementary document 3). Unit costs from a country with a similar economic status and healthcare system were used where local country-specific unit costs were unavailable.

All costs are expressed in Australian dollars (AUD) for the 2015 reference year value and can be converted to United States dollar (USD) using the Purchasing Power Parity rate 1 USD=1.463 AUD[17]. The currency of other countries was converted to AUD using the corresponding exchange rate. The country-specific Consumer Price Index (CPI) from the health sector was employed to adjust costs not valued in the year of 2015.

The details of resource use and unit cost for acute stroke hospitalisation, rehospitalisation, rehabilitation, non-health sector costs and productivity cost are provided in Supplementary document 3.

Statistical analysis

All the costs that were attributable to stroke including healthcare costs, non-healthcare costs and productivity costs were accounted for in the economic analysis. Since a 12 month economic evaluation was undertaken, no discounting was applied to either costs or benefits.

Quantity of resource use and costs were summarised using medians and interquartile ranges (IQRs) due the skewness of the raw data. Means and standard deviations (SDs) were also reported. Base case analysis of the economic evaluation was performed based on the Intention-to-Treat (ITT) population[18] with an assumption for the main analysis that data were Missing At Random (MAR). The difference in costs was analysed using Generalised Linear regression Model (GLM) with gamma family and a log link, with treatment groups as an independent variable, including baseline NIHSS, baseline mRS[12] and age as treatment covariates.

For the primary outcome, the mRS score at 12 months was compared following the method detailed in the Statistical Analysis Plan.[19] While for the secondary effectiveness outcome (i.e. the QALY gains at 12 months), a linear regression model with treatment group as the factor variable and 12 months AQoL-4D utility value as the dependent variable, adjusted for age, baseline mRS was utilised to estimate the difference in QALY gains over 12 months. Non-parametric bootstrap simulations with 2000 replications were used to calculate 95% confidence intervals (CIs) around mean difference in costs and effects for cost-effectiveness analysis. To examine the cost-effectiveness of VEM measured against UC, Incremental Cost-Effectiveness Ratios (ICERs) were calculated where applicable. For the ICER from a societal perspective, all the costs from health and non-health sector were summed together, including the productivity cost; for ICER of a health sector perspective, all the costs borne by healthcare system were counted (i.e. excluding non-healthcare costs and productivity cost). The differences between groups in terms of costs and benefits (i.e. QALYs) were compared regardless of the statistical significance of the difference.[20] Cost-effectiveness acceptability

curves were plotted to show the probability of VEM being the optimal choice. The ICERs were compared with a common benchmark in Australia of ≤AUD50,000 per QALY.[21] All the analyses were performed using the STATA 14.0 statistical package (StataCorp. 2015. Release 14. StataCorp LP.)

Sensitivity analyses

To investigate the impact of using country-specific costs, a country dummy variable was added to the GLM analysis to adjust for country effect.[22] Subgroup analysis on the basis of individual countries were also conducted to explore the difference in costs and benefits across countries.

Multiple imputation was performed to test the sensitivity of results to the missing data assumption. The missing patterns were explored with the use of logit regression to investigate if any of the other variables predicted whether a given variable was missing[23] (Supplementary document 4).

Secondary analyses were undertaken to assess the robustness of the base case results. Subgroup analyses were performed at the country-specific level to test for differences in efficacy and costs.

Results

Between July 2006 and October 2014, 2,104 patients (VEM 1,054; UC 1,050) were recruited across 58 sites from Australia (1,054), New Zealand (189), United Kingdom (610), Singapore (128) and Malaysia (123). At recruitment, over 80% of patients had no prior history of stroke; NIHSS was greater than 7 points (indicating a moderate to severe stroke) for around 45% of

patients; 26% aged over 80 years and 24% had received recombinant tissue plasminogen activator prior to randomisation[8]. Baseline characteristics were similar between the two treatment groups[8].

Outcomes

In terms of the mRS score, a comparable percentage of patients from both treatment groups achieved a favourable outcome at 12 months after stroke, resulting in a non-significant difference (0.030, 95%CI:-0.022 to 0.082, p=0.252) between groups in the analyses adjusted for baseline age and NIHSS (Supplementary document 5: Table III). Since there was no significant intervention effect together with no accepted willingness-to-pay (WTP) per unit increase in probability of achieving a better mRS outcome, further estimation of the ICER was considered not meaningful (i.e. no cost-effectiveness plane or cost-effectiveness acceptability curve could be generated). For the outcome of QALY gains across 12 months, a non-significant treatment effect was also observed (0.013, 95%CI:-0.041 to 0.016, p=0.389) (Supplementary document 5: Table III).

Given the excessive variability in observed AQoL (i.e. 3 and 12 months) within the same mRS category, it was considered inappropriate to apply the mapped utility to measure the incremental QALY gains between two treatment groups. Instead, the differences in AQoL-4D utility value measured at 12 months follow-up between treatment groups were used to approximate the incremental QALY gains across 12 months provided that patients were well balanced between two groups and there were no significant discrepancies in patients characteristics across all baseline variables, including baseline AQoL-4D utility value.

The results of estimation in QALY gains based on the mapping (i.e. deriving the baseline utility from the baseline mRS score) are provided in the supplementary documents. Generally, the difference in QALY gains between VEM and UC groups were fairly consistent across different methods (Supplementary document 5).

Costs

Generally, the differences between VEM and VC groups was $1082 (95%CI: -$2399, $44563) for the total medical cost (Supplementary document 6: Table III) and $3 (95%CI: -$5, $12) for the productivity cost per person at 12 months. Similarly, the between-group difference in the total non-health care cost was -$1300 (95%CI: -$3361, $760) over the same period of time. The detailed costs of each resource item and summary costs are presented in Supplementary document 6: Table III.

The details relating to the resource use item collected, quantities of resource utilisation and intervention costs are summarized in Supplementary documents 6 and 7.

Cost-effectiveness analysis

The between group difference in both efficacy and cost outcomes generated from the GLM model are presented in Supplementary document 5: Table III.

In the base case health sector perspective analysis, the VEM yielded comparable total medical costs ($1082, 95%CI: -$2520 to $4685, p=0.544) and QALY gains (-0.013, 95%CI: -

0.041 to 0.016) at 12 months, with a 19% probability being a cost-effective intervention compared to UC. When a societal perspective was adopted, the VEM entailed, again, similar costs with the UC group ($102, 95%CI: -$6907 to $7111, p=0.982, including productivity costs) or (-$6, 95%CI: -$5476 to $5463, p=0.933, excluding productivity costs), with a higher probability (42-44%) of being cost-effective (Table 1).

The cost-effectiveness planes and cost-effectiveness acceptability curves from the two perspectives are shown in Figures 1 and 2, and Supplementary document 8: Figures I to IV.

Sensitivity analyses

Inclusion of a country dummy variable in the analysis produced similar results to the base case (Supplementary document 5: Table I).

The analysis from imputed data including all randomised participants produced consistent results with regard to the incremental cost and effectiveness between treatment groups. From a health sector perspective, VEM was associated with similar costs ($940, 95%CI: $-4622 to $4682) and QALY gains (-0.019, 95%CI:-0.044 to 0.005) over 12 months. Likewise, if a societal perspective was taken, VEM was associated with comparable costs ($1413, 95%CI:-$4044 to $6871, including productivity cost; $1704, 95%CI:-$3817 to $7226, excluding productivity cost) and QALY gains (-0.019, 95%CI:-0.044 to 0.005) (Supplementary document 6: Table IV). Even though the point estimate of difference in total costs between groups from a societal perspective varied considerably, the 95% confidence interval derived from base case and multiple imputation analyses were nearly identical (Supplementary document 5: Table IV). The cost-effectiveness plane derived from the multiple imputation

analysis from the two different perspectives are shown in Supplementary document 8: Figures V to VII.

From a health sector perspective, the between-group difference for each participating country yielded consistent conclusions with the base case analysis. VEM was associated with both non-significantly different costs and benefits (i.e. QALY gains at 12 months) compared to the UC, although the point estimate of the cost difference between groups varied from country to country, ranging from -$2836 (New Zealand) to $2937 (UK) (Supplementary document 5: Table II).

The country-specific analysis showed an inconsistent trend in the between-group differences for both costs and QALYs. It was found that VEM was likely to cost less and associated with a greater gain in QALYs in comparison to UC in New Zealand and Singapore. Meanwhile, except for total medical cost, VEM seemed to incur less cost while leading to less gain in QALYs at month 12 months for participants from Australia, whilst in the United Kingdom, VEM was associated with higher cost and lower QALY gains than UC. Lastly, for patients from Malaysia, VEM contributed to higher cost while greater QALY gains at 12 month follow-up. It is worth noting that none of the afore-mentioned between-group differences were statistically significant (Supplementary document 5: Table II).

When a societal perspective was assumed, again, the point estimate of difference in costs between groups across countries varied substantially, with the 95% confidence intervals mostly overlapping (Supplementary document 5: Table II).

Discussion

The 12 months within-trial cost-effectiveness analysis showed that VEM was associated with a low probability (19-49%) of being more cost-effective than UC in patients with stroke. Between-group differences in costs and benefits (probability of achieving a favourable outcome of mRS and differences in QALYs) over the one year study period were not significant, even though the point estimates indicated that VEM was dominated (less effective, more costly) by UC from a health sector perspective. The base case analysis showed that the probability of VEM being cost-effective was 21% from a health sector perspective and 45% from a societal perspective.

The cost-effectiveness acceptability curve showed that, with the increasing WTP per QALY threshold, the probability of the VEM intervention being cost-effective actually decreases. This is probably due to the fact that VEM was both less costly and less effective than UC, so the lower WTP/QALY threshold (<$50,000) afforded a higher probability of being the cost-effective intervention, and vice versa.

Our earlier economic evaluation of the phase II AVERT trial which consisted of only 71 patients (38 VEM and 33 UC) from two Australian centres reported that VEM was likely to be a cost-effective intervention with both less cost and more benefit when compared to UC.[11] Since it was a national pilot study with a limited sample, the direct comparison between the results from this and our current economic evaluation is problematic. In addition, inconsistent with the pilot study, no service shifting was observed in the current study. Across all resource use components, the proportion of patients consuming specific types of resources were comparable between the two groups in this study. On the contrary, in the phase Phase II AVERT trial, patients from VEM group were more likely to be discharged earlier from hospital than their UC counterparts; those discharged early tended to use more care provided in the outpatient setting, which incurred lower costs; and informal care was not costed. In the current study, the LoS for acute hospitalisation and rehabilitation were similar between

treatment groups (median: VEM 16 vs UC 17 days). These differences between the two studies highlight the importance of large, adequately powered studies to inform health care policy.

In this study, resources used were valued on the basis of country-specific unit costs sourced for each participating country. To counteract any concern arising from the adoption of this approach, extensive sensitivity analyses were performed to test the robustness of the results. The conduct of incorporation of a country dummy variable into the model or country-specific analysis did not alter the outcomes substantially, with the resultant 95% confidence intervals overlapping to a great extent. Ramsey et al. 2015 suggest that a country-specific costing approach is likely to yield few qualitative differences in summary measures of cost-effectiveness among countries with similar levels of economic development.[22] Therefore, it was believed that any differences in economic status of the participating countries (as reflected by the unit costs applied in our study) are unlikely to bear a major influence on the results of the cost-effective analysis.

This multinational trial also revealed that in managing patients post-stroke, practice of stroke care varied from country to country. Although 100% of patients with stroke were hospitalised for the initial acute care, the LoS differs significantly greatly, ranging from 4 days (Malaysia) to 25 days (New Zealand), which might be attributable to the different severity of stroke and/or differences in clinical practice care processes. Moreover, in Malaysia, patients tended to receive rehabilitation services in an outpatient rather than inpatient setting, compared to participants from other countries. Patients from western countries consumed more community services than their Asian counterparts, which reflects the difference in social welfare systems. The country-specific subgroup analysis also echoed these findings. It was

observed that, except for Malaysia, VEM was associated with less total non-medical cost than UC. The cost-effectiveness credentials varied from country to country: VEM was dominated by UC in United Kingdom and dominates UC in New Zealand and Singapore, while it was cost saving but had less QALY gains in Australia. This indicates that even though, compared with UC, VEM is unlikely to be cost-effective when compared to UC. However, in some countries (e.g. United Kingdom) where patients tend to have heavy use of non-medical health resources, VEM might be cost-saving in comparison to UC.

Economic evaluations have been conducted for other types of stroke rehabilitation interventions including early-supported discharge service, community- or home-based rehabilitation. [24-32] Generally, these interventions trended towards being cost-saving measured against usual practice. In regards to health-related quality of life (HRQoL) outcomes measured by a series of quality of life instruments (including SF-36, WHOQoL-Bref, Nottingham Health Profile, Sickness Impact Profile and EQ-5D), most studies did not detect an overall significant effect.[24-28 30 31 33] Only one study reported a significant difference improvement in the overall HRQoL score.[32] The conclusions drawn from these economic evaluations of stroke rehabilitation interventions were fairly consistent; the interventions were likely to cost less,[29 30 33-38] although the difference in costs was statistically significant in only one study.[37] None of these studies evaluated the costs and benefits, particularly benefits measured in terms of QALYs, in an aggregated manner, and all were limited by small sample sizes. Another study using a Markov model explored the increased intensity of physiotherapy for stroke patients from a health system perspective, concluding that increased physiotherapy could be cost-effective by improving health outcomes and reducing costs due to the resultant shorter stay in rehabilitation facilities.[39]

Given that it is not practical to obtain a baseline utility value from patients with stroke, in this study, the baseline AQoL value was mapped from mRS score at baseline.[12] Whilst the

mapping exercise was carried out using the baseline mRS score and AQoL values at 3 and 12 months, the significant variation in the mapped baseline utility values for patients falling within the same category of mRS hampered its application to the current economic evaluation. Instead, only the 12-month utility values were compared to approximate the difference in QALY gains over one year between the two treatment groups. Comprehensive sensitivity analyses were undertaken surrounding this assumption. It was observed that there was no noticeable difference among approaches examining the annual QALY gain difference between VEM and UC, and the difference was unanimously statistically insignificant.

Whilst the results from the clinical study showed that there were no significant differences in either costs or effects between treatment groups, the cost-effectiveness analysis was still performed to investigate the possible ICER of the VEM intervention. It is possible to have greater confidence in the joint outcome of costs and QALYs than looking at them individually.[40]

To the best of our knowledge, this study evaluated the cost-effectiveness of the largest international acute stroke rehabilitation trial ever conducted. The cost-effectiveness analysis was performed alongside the randomised controlled trial, where the costs and benefits data were collected prospectively. Moreover, the Cost CRF was completed by trained and blinded assessors via interviews with individual patients/carers and accessing medical records, which provides for greater accuracy than resource use questionnaires or diaries completed by participants themselves. Since the trial was designed in a pragmatic manner, with close resemblance to real clinical practice, it is believed that the assessment of its cost-effectiveness under this setting reflects the actual value for money of this intervention.

This study provides some insights for future economic evaluation alongside multi-country, multi-centre clinical trials. It is important to note that given the large number of centres

involved (56 stroke units across five geographical jurisdictions), it was not practical or reasonable to collect centre-specific unit costs which probably leads to huge variations even within a single country. Country-level unit costs were therefore applied to the valuation of resource uses across the trial sites. However, the heterogeneity in the resource utilisation and unit cost among the included countries undermines confidence in the conclusion. A country-specific economic evaluation might be more appropriate in this regard but the lacking of statistical power poses another concern. The current study made a trade-off between them both approaches by presenting both the aggregated (i.e. base case of pooling all countries) and disaggregated (i.e. sensitivity analysis of individual countries) form of results. The resource utilisation, costs and benefits were also tabulated across all sites and individually to allow close scrutiny from various perspectives. [24] It is believed that this practice can be recommended to other multi-country studies.

A couple of limitations of the study are acknowledged. Firstly, the missing data on total costs from a societal perspective was around 24%, and related mainly to the missing information on community services (10.9%) and productivity loss (10.7%). The base case analysis was based on the ITT population with an assumption of missing pattern being MAR. To account for this, the sensitivity analysis using multiple imputation was undertaken and yielded the identical conclusion (i.e. no significant difference in costs and benefits between treatment groups). Secondly, unit costs originating from individual countries were assigned to value resource use. The differences in health care systems and cost structures among the five participating countries may potentially confound the cost comparisons between groups. However, analysis by country produced results consistent with the base case, which overcomes any concern that the latter were heavily weighted towards Australia, the largest sample country.

Conclusions

This economic evaluation alongside a phase III RCT evidenced that based on the ITT population, the VEM intervention for patients with stroke was associated with higher costs from health sector and societal perspectives, lower QALYs at 12 months, and was unlikely to be cost-effective compared to UC, although the between-group difference in cost and QALYs gains were not statistically significant. The sensitivity analyses based on the multiple imputation and subgroup analyses by each country separately yielded fairly consistent results. Overall, the VEM intervention was demonstrated to be comparable with UC in terms of both benefits and costs at one-year, however given its poorer outcomes at 3 months, VEM cannot be recommended to clinicians, patients or policymakers.

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Figure Legends

Figure 1 cost-effectiveness plane_ health sector perspective

Figure 2 cost-effectiveness plane_ societal perspective (including productivity cost)

Table 1. Baseline cost-utility analysis_ ITT

	QALYs	Per capita mean cost (AUD)	Probability of being cost-effective
Health care perspective			
Total medical costs	-0.013 (-0.041, 0.016)	$1082 (-$2520, $4685)	19%
Societal perspective			
Total medical and non-medical costs (excl. productivity cost)	-0.013 (-0.041, 0.016)	-$6 (-$5476, $5463)	42%
Total medical and non-medical costs (incl. productivity cost)	-0.013 (-0.041, 0.016)	$102 (-$6907, $7111)	44%

ITT: Intention-to-treat; QALYs: Quality-adjusted Life Years; AUD: Australian dollar; excl: excluding; incl: including

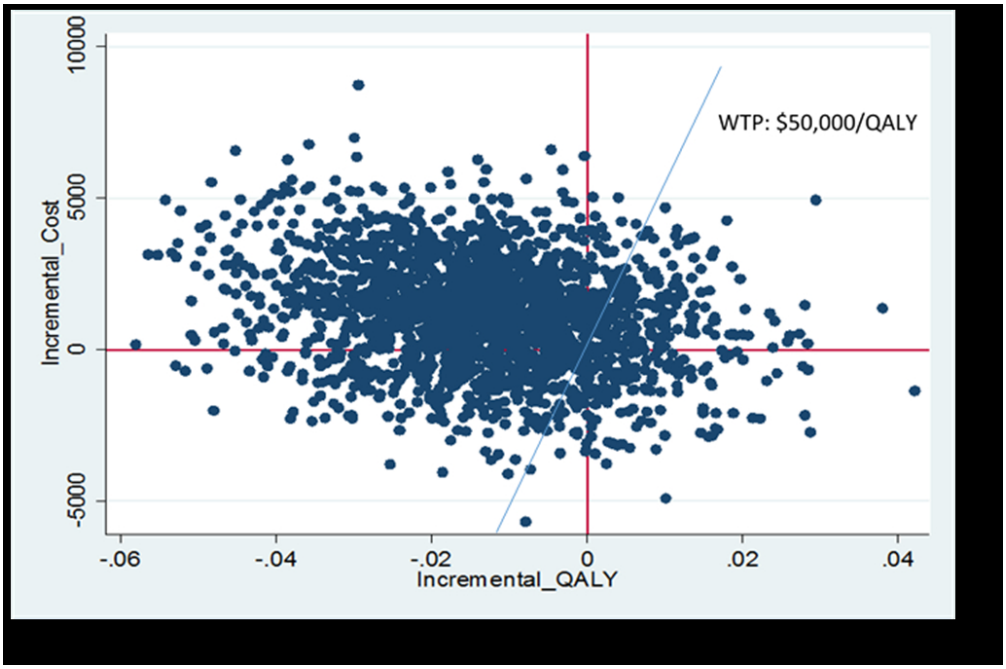

Figure 1 cost-effectiveness plane_ health sector perspective

174x114mm (150 x 150 DPI)

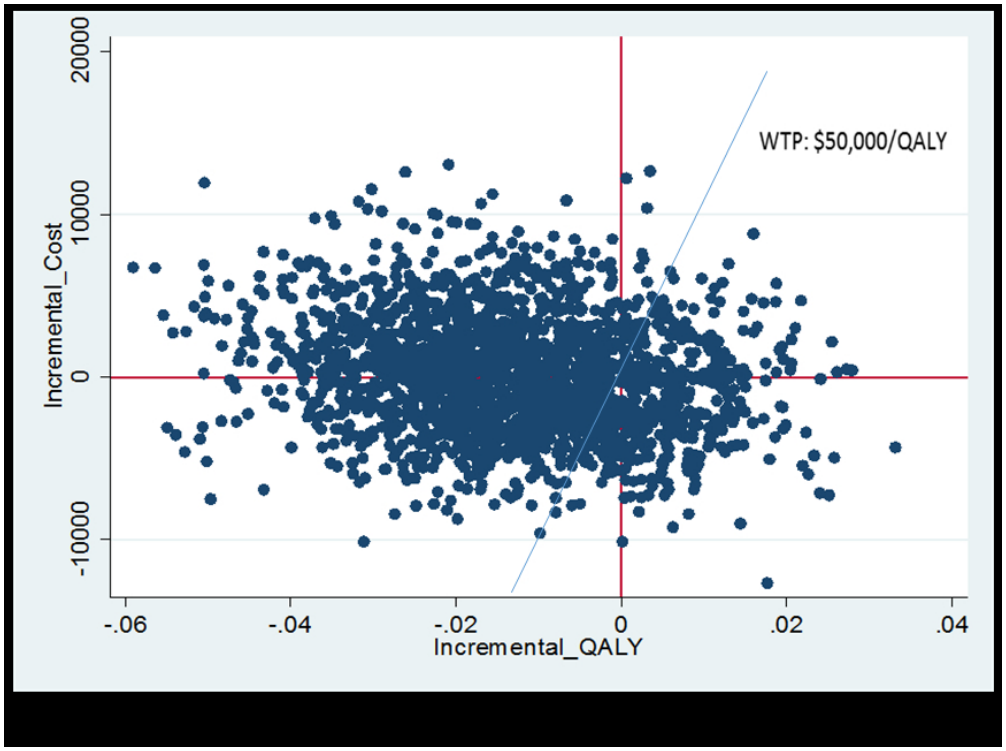

Figure 2 cost-effectiveness plane_ societal perspective (including productivity cost)

146x109mm (150 x 150 DPI)

Supplementary document 1: Mapping baseline mRS score to utility of AQoL-4D

Methods

Generalized additive model (GAM) with spline smother was used to map AQoL from pre-morbid mRS, stroke severity, and/ or age group. The performance of the models was evaluated using mean absolute, mean squared errors (MAE and MSE) and R2. 10-fold cross-validation was implemented for model validation. The mapped baseline utility of AQoL-4D was used in the following models.

The analyses are structured as follows:

Model 1:

a) A complete case model with the utility value at 12 months as an output, group as an input, and pre- morbid mRS as a covariate;

b) A complete case model with the utility value at 12 months as an output, group as an input, and pre- morbid mRS + stroke severity as covariates;

c) A complete case model with the utility value at 12 months as an output, group as an input, and pre- morbid mRS + stroke severity + age group as covariates;

d) Sensitivity analyses for the unadjusted model using pattern-mixture models that confirm that there is no statistically significant difference between the groups for the plausible range of changes of a parameter that describes the departure from the assumed "missing-at-random" pattern.

Model 2:

a) A complete case model with the difference between utility value at 12 months and baseline mapped utility value as an output and group as an input;

b) A complete case model with the difference between utility value at 12 months and baseline mapped utility value as an output and group as an input + stroke severity as a covariate;

c) A complete case model with the difference between utility value at 12 months and baseline mapped utility value as an output and group as an input + stroke severity and age group as covariates;

d) Sensitivity analyses for the unadjusted model using pattern-mixture models that confirm that there is no statistically significant difference between the groups for the plausible range of changes of a parameter that describes the departure from the assumed "missing-at-random" pattern.

Model 3:

a) A complete case model with the difference between utility value at 12 months and baseline mapped utility value as an output, group as an input, and baseline mapped utility value as a covariate;

b) A complete case model with the difference between utility value at 12 months and baseline mapped utility value as an output, group as an input, and baseline mapped utility value + stroke severity as covariates;

c) A complete case model with the difference between utility value at 12 months and baseline mapped utility value as an output, group as an input, and baseline mapped utility value + stroke severity + age group as covariates;

d) Sensitivity analyses for the unadjusted model using pattern-mixture models that confirm that there is no statistically significant difference between the groups for the plausible range of changes of a parameter that describes the departure from the assumed "missing-at-random" pattern.

Model 4:

a) A complete case model with the utility value at 12 months as an output, group as an input, and baseline mapped utility value as a covariate;

b) A complete case model with the utility value at 12 months as an output, group as an input, and baseline mapped utility value + stroke severity as covariates;

c) A complete case model with the utility value at 12 months as an output, group as an input, and baseline mapped utility value + stroke severity + age group as covariates;

d) Sensitivity analyses for the unadjusted model using pattern-mixture models that confirm that there is no statistically significant difference between the groups for the plausible range of changes of a parameter that describes the departure from the assumed "missing-at-random" pattern.

Results

Table I. Difference in utility values between treatment groups by different models

	a	**b**	**c**	**d**	
				1	**2**
Model 1	-0.011 (-0.042, 0.020)	-0.015 (-0.042, 0.011)	-0.016 (-0.042,0.010)	-0.026 (-0.062, 0.009)	0.006 (-0.030, 0.041)
Model 2*	-0.001 (-0.046, 0.044)	-0.007 (-0.047, 0.034)	-0.008 (-0.048, 0.031)	-0.007 (-0.062, 0.048)	0.005 (-0.050, 0.060)
Model 3*	-0.008 (-0.043, 0.026)	-0.014 (-0.043, 0.016)	-0.015 (-0.043, 0.014)	-0.014 (-0.052, 0.033)	0.002 (-0.050, 0.045)
Model 4	-0.008 (-0.043, 0.026)	-0.014 (-0.043, 0.016)	-0.015 (-0.043, 0.014)	-0.026 (-0.062, 0.010)	0.006 (-0.030, 0.042)

*models 2 and 3 used the mapped baseline AQol utility to estimate the QALY gains over 12 month for each patient.

As shown in Table 1, using the mapped baseline AQoL utility value and the 12 month AQoL

utility value to calculate the difference in QALYs between treatment groups (results from models 2 and 3) yielded similar results to the primary analysis (-0.013 , 95%CI [-0.043, 0.018]), and the 95% confidence

Supplementary document 2: Cost Case Report Form (CRF)

The Cost CRF was originally developed via pathway analysis during Phase II of AVERT to identify resource items associated with the trial11. Since the Phase II of AVERT trial was a national project and resource utilisation tools were tailored to the Australian setting, the form was further modified to accommodate international differences in the acute service delivery, rehabilitation and post-acute care. An extensive review of country-specific literature and consultation with international AVERT project team members based in each country were undertaken to tailor the Cost CRF tool to each participating country.

Case Report Form - Cost

National Stroke Research Institute

PATIENT STUDY NUMBER ☐☐☐☐☐

PATIENT INITIALS ☐☐☐

NOTE: this one form is to be completed AND faxed following BOTH the 3 and 12 month interviews.
When CRF Cost complete at 3 months AND at 12 months, fax all pages 25-36 to the Data Fax.

Instructions to the person responding: These questions are about health care provided as a consequence of the stroke which occurred on (give date of stroke) or as a result of any further stroke. I will be asking about health care such as visits to hospital, rehabilitation, therapy at home, equipment and work. To help us work out the cost of stroke to the community, and to you and your family, I will be asking about how often services were provided and their cost.

Subject's stroke date ☐☐ / ☐☐ / ☐☐☐☐
Obtain from CRF - Screening Day 0

---

3 MONTH DATE OF ASSESSMENT ☐☐ / ☐☐ / ☐☐☐☐ **Assessor initials** ☐☐☐

PERSON RESPONDING

Index case ☐	Other relative ☐
Spouse/partner ☐	Friend/Associate/Neighbour ☐
Sibling ☐	Carer, e.g. nurse ☐
Son/Daughter ☐	Other, unspecified ☐
Parent ☐	

ASSISTANCE FOR INTERVIEW OBTAINED FROM

Index case ☐	Other relative ☐
Spouse/partner ☐	Friend/Associate/Neighbour ☐
Sibling ☐	Carer, e.g. nurse ☐
Son/Daughter ☐	Other, unspecified ☐
Parent ☐	

LIVING ARRANGEMENT OF RESPONDENT*

Living with index ☐
Not living with index ☐
Professional carer in nursing home or hostel ☐

---

12 MONTH DATE OF ASSESSMENT ☐☐ / ☐☐ / ☐☐☐☐ **Assessor initials** ☐☐☐

PERSON RESPONDING

Index case ☐	Other relative ☐
Spouse/partner ☐	Friend/Associate/Neighbour ☐
Sibling ☐	Carer, e.g. nurse ☐
Son/Daughter ☐	Other, unspecified ☐
Parent ☐	

ASSISTANCE FOR INTERVIEW OBTAINED FROM

Index case ☐	Other relative ☐
Spouse/partner ☐	Friend/Associate/Neighbour ☐
Sibling ☐	Carer, e.g. nurse ☐
Son/Daughter ☐	Other, unspecified ☐
Parent ☐	

LIVING ARRANGEMENT OF RESPONDENT*

Living with index ☐
Not living with index ☐
Professional carer in nursing home or hostel ☐

*** Please note:** this is the 'normal' living arrangement of the respondent with respect to the subject, even if the subject is currently in hospital

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Case Report Form - Cost

National Stroke Research Institute

PATIENT STUDY NUMBER

PATIENT INITIALS

1) DISCHARGE

Date of discharge from acute care

/ /

Acute discharge destination

- Home ☐
- Rehabilitation ward/hospital ☐
- Supported residential service (SRS) ☐
- Hostel ☐
- Nursing home ☐
- Other ☐
- Unknown ☐

Date of admission to inpatient rehabilitation

/ /

Date of discharge from inpatient rehabilitation

/ /

Leave dates BLANK if not applicable
Please note: inpatient rehabilitation is inclusive of geriatric evaluation and transitional care.

Discharge destination after inpatient rehab

- Home ☐
- Rehabilitation hospital ☐
- Supported residential service (SRS) ☐
- Hostel ☐
- Nursing home ☐
- Other ☐
- Unknown ☐

Leave BLANK if not applicable

2) LIVING ARRANGEMENT

Pre-stroke residential address

- Own house, flat – alone ☐
- Own house, flat – with family/relative/friend ☐
- Home of relative/friend ☐
- Supported residential service (SRS) ☐
- Hostel ☐
- Nursing home ☐
- Other ☐
- Unknown ☐

Residential address at 3 months*

- Own house, flat – alone ☐
- Own house, flat – with family/relative/friend ☐
- Home of relative/friend ☐
- Supported residential service (SRS) ☐
- Hostel ☐
- Nursing home ☐
- Other ☐
- Unknown ☐

Residential address at 12 months*

- Own house, flat – alone ☐
- Own house, flat – family/relative/friend ☐
- Home of relative/friend ☐
- Supported residential service (SRS) ☐
- Hostel ☐
- Nursing home ☐
- Other ☐
- Unknown ☐

*** Please note if the subject is currently a hospital inpatient (acute or subacute), record their current residential address, NOT the hospital address**

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Case Report Form - Cost

National Stroke Research Institute

PATIENT STUDY NUMBER

PATIENT INITIALS

3) CHANGE IN LIVING ARRANGEMENTS

As a consequence of your stroke, have you needed to change your place of residence?

If NO, proceed to question 4.

*** Please note: if subject has been a hospital inpatient this is NOT a change of residence**

3 months	Yes ☐	No ☐	Unknown ☐
3-12 months	Yes ☐	No ☐	Unknown ☐

	DATE OF MOVE	LOCATION
1)	/ /	Own home or unit ☐ Home of relative/friend ☐ SRS ☐ Hostel ☐ Nursing home ☐ Other ☐
2)	/ /	Own home or unit ☐ Home of relative/friend ☐ SRS ☐ Hostel ☐ Nursing home ☐ Other ☐
3)	/ /	Own home or unit ☐ Home of relative/friend ☐ SRS ☐ Hostel ☐ Nursing home ☐ Other ☐
4)	/ /	Own home or unit ☐ Home of relative/friend ☐ SRS ☐ Hostel ☐ Nursing home ☐ Other ☐

4) AMBULANCE TRANSFERS: EMERGENCY AND NON-EMERGENCY

As a consequence of your stroke, have you required ambulance transport after your acute admission to hospital?*

If NO, please proceed to question 5

3 months	Yes ☐	No ☐	Unknown ☐
3-12 months	Yes ☐	No ☐	Unknown ☐

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Count number of ambulance trips (recruitment to 3 months) ☐☐

Count number of ambulance trips (from 3 to 12 months) ☐☐

*** Include post-acute transfers (eg - acute to rehab)**

Case Report Form - Cost

National Stroke Research Institute

PATIENT STUDY NUMBER

PATIENT INITIALS

5) HOSPITALISATION OR EMERGENCY DEPARTMENT ATTENDANCES

5a) Have you been readmitted to hospital or attended the emergency department as a consequence of another stroke or for any stroke related problems?

3 months	Yes ☐	No ☐	Unknown ☐
3-12 months	Yes ☐	No ☐	Unknown ☐

(ONLY include information for admissions and attendances for stroke-related problems (see below for summary list of stroke-related problems and CRF completion manual for further clarification)

If NO, proceed to question 6

5b) If YES, Start with the earliest admission or attendance. If patient NOT discharged at 3 month assessment, leave discharge dates BLANK (complete dates at 12 month assessment)

	Hospital code	Date admitted	Date discharged	If patient not discharged at 12 month assessment, cross box.
Admission or Attendance 1 - Hospital name		/ /	/ /	☐
Admission or Attendance 2 - Hospital name		/ /	/ /	☐
Admission or Attendance 3 - Hospital name		/ /	/ /	☐
Admission or Attendance 4 - Hospital name		/ /	/ /	☐
Admission or Attendance 5 - Hospital name		/ /	/ /	☐

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Stroke related problems include: 1. Recurrent stroke, 2. TIA or suspected TIA, 3. Seizure, 4. Pneumonia/chest infection, 5. UTI, 6. Urinary catheter-related problem, 7. Mood disorder, 8. Falls, 9. Fractures, 10. DVT, 11. Pulmonary Embolism, 12. Complications of stroke treatment or stroke prevention, 13. Haemorrhage, 14. Nutritional problem, 15. Gastroscopy/colonoscopy/barium enema or other procedure to investigate GI haemorrhage, 16. Cerebral angiography, 17. Carotid endarectomy, 18. Carotid (or other cerebral vessel) angioplasty and/or stenting 19. Surgery or procedural management of of an atrial septal defect or patent foramen ovale, 20. Surgical or electrophysiological procedure to treat AF, 21. Inability to manage at home, 22. Increased confusion or cognitive impairment, 23. Constipation - investigation or treatment, 24. Urinary incontinence, 25. Post-stroke pain (incl. headache), 26. Pressure sores.

Case Report Form - Cost

National Stroke Research Institute

PATIENT STUDY NUMBER

PATIENT INITIALS

6) INPATIENT REHABILITATION ADMISSION

After your stroke on (give date of stroke), were you admitted to a Rehabilitation Hospital or other hospital where you received rehabilitation treatment? Please include admissions with the care type 'rehabilitation', 'geriatric evaluation' and 'transitional care'

3 months	Yes ☐	No ☐	Unknown ☐
3-12 months	Yes ☐	No ☐	Unknown ☐

If NO, proceed to question 7.
If YES, complete inpatient rehabilitation admission details, starting from your first inpatient rehabilitation admission.
If patient NOT discharged at 3 month assessment, leave discharge dates BLANK (complete dates at 12 month assessment)

	Rehab hospital code	Date admitted	Date discharged	If patient not discharged at 12 month assessment, cross box.
Admission 1- Rehabilitation hospital name		/ /	/ /	☐
Admission 2- Rehabilitation hospital name		/ /	/ /	☐
Admission 3- Rehabilitation hospital name		/ /	/ /	☐

7) OUTPATIENT REHABILITATION PROGRAM

Did you attend or are you attending an outpatient rehabilitation program as a consequence of your stroke? e.g. with physiotherapy, occupational therapy, speech therapy, etc
An outpatient rehabilitation program is any rehabilitation program where the patient attends a facility. The program can be located at a hospital or community facility.

3 months	Yes ☐	No ☐	Unknown ☐
3-12 months	Yes ☐	No ☐	Unknown ☐

If NO, proceed to question 8.
If YES, complete outpatient rehabilitation details, starting from your first outpatient rehabilitation visit.
If patient NOT discharged at 3 month assessment, leave discharge dates and number of days attended BLANK (complete dates at 12 month assessment)

	Rehab facility code	Date admitted	Date discharged	Total number of DAYS attended	If patient not discharged at 12 month assessment, cross box.
Admission 1 - Outpatient rehabilitation name		/ /	/ /		☐
Admission 2 - Outpatient rehabilitation name		/ /	/ /		☐
Admission 3 - Outpatient rehabilitation name		/ /	/ /		☐

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Case Report Form - Cost

National Stroke Research Institute

PATIENT STUDY NUMBER

PATIENT INITIALS

8) REHABILITATION SERVICES PROVIDED AT HOME OR IN A NURSING HOME

Have you had a rehabilitation program provided to you at home or a nursing home as a consequence of your stroke? e.g. with physiotherapy, occupational therapy, speech

3 months	Yes ☐	No ☐	Unknown ☐
3-12 months	Yes ☐	No ☐	Unknown ☐

If NO, proceed to question 9.
If YES, complete rehabilitation details, starting from the first visit since your stroke. Count number of sessions.
If patient NOT discharged at 3 month assessment, leave discharge dates and number of sessions BLANK (complete dates at 12 month assessment)

	Rehab service code	Start date	Cease date	Total number of SESSIONS	If patient not discharged at 12 month assessment, cross box.
Time 1 - Rehabilitation service name		/ /	/ /		☐
Time 2 - Rehabilitation service name		/ /	/ /		☐
Time 3 - Rehabilitation service name		/ /	/ /		☐
Time 4 - Rehabilitation service name		/ /	/ /		☐

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Case Report Form - Cost

National Stroke Research Institute

PATIENT STUDY NUMBER

PATIENT INITIALS

9) COMMUNITY SERVICES

9a) Did you receive any community services in the year PRIOR to your stroke? Yes ☐ No ☐ Unknown ☐

Community services are individual care services provided at home and do NOT include rehabilitation therapy.
If NO, proceed to question 9b.
If YES, which service/s did you receive in the year PRIOR to your stroke?

Community service codes
1 = Nursing Service
2 = Delivered Meals
3 = Personal Care (Bath/Shower)
4 = Housework help
5 = Gardening/home maintenance
6 = Home respite
7 = Other service, specify

Which service did you receive? (One service code per line)	How many times in the past year did you receive the service?
☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7	
☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7	
☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7	
☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7	

If "other" (code 7), please specify

9b) Have you received community services SINCE the stroke?

3 months	Yes ☐	No ☐	Unknown ☐
3-12 months	Yes ☐	No ☐	Unknown ☐

Community services are individual care services provided at home and do NOT include rehabilitation therapy.
If NO, proceed to question 10.
If YES, which service/s did you receive AFTER your stroke?
For each service, complete a seperate line. If a service is ongoing at 3 month interview, enter data for 3 months, and then add service data for 3-12 months on a separate line.

Community service codes
1 = Nursing Service
2 = Delivered Meals
3 = Personal Care (Bath/Shower)
4 = Housework help
5 = Gardening/home maintenance
6 = Home respite
7 = Other service, specify

Which service did you receive? (One service code per line)	How many times did you receive the service?	How many hours per service?	Note: hours per service NOT applicable to delivered meals
☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7			
☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7			
☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7			
☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7			
☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7			
☐1 ☐2 ☐3 ☐4 ☐5 ☐6 ☐7			

If "other" (code 7), please specify

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Case Report Form - Cost

National Stroke Research Institute

PATIENT STUDY NUMBER

PATIENT INITIALS

10) HOME MODIFICATIONS

Has your home been modified as a consequence of your stroke?
e.g. installation of rails, bathroom modifications, installation of ramp(s), kitchen modifications etc

If NO, proceed to question 11

If YES, please indicate the type of modifications, who supplied the modifications and estimate any personal cost to you.

3 months	Yes ☐	No ☐	Unknown ☐
3-12 months	Yes ☐	No ☐	Unknown ☐

SUPPLIERS

1 = Hospital/rehabilitation centre	**3 = Veteran's Affairs**	**5 = Housing commision**	**7 = Other (specify)**
2 = Patient/family	**4 = Local Council**	**6 = Charity**	

Type of modification (check box for each type supplied)	**Who supplied the modification?**	**If supplier is "other", please specify**	
☐ Rail(s) for steps/stairs	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7		**Cost to you/family* - $**
☐ Ramp(s)	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7		**Cost to you/family* - $**
☐ Platform step(s)	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7		**Cost to you/family* - $**
☐ Shower, bath and toilet rail(s)	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7		**Cost to you/family* - $**
☐ Shower(s) modification	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7		**Cost to you/family* - $**
☐ Toilet(s) modification	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7		**Cost to you/family* - $**
☐ Remove/modify door(s) from shower/toilet/bath	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7		**Cost to you/family* - $**
☐ Kitchen modifications	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7		**Cost to you/family* - $**
☐ Other modification (specify below)			
Other home modification - 1	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7		**Cost to you/family* - $**
Other home modification - 2	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7		**Cost to you/family* - $**

If total costs includes any aids, describe in brief below (see also list of aids on page 33):

*** If an overall cost is provided, please indicate type of modifications above, and provide the total cost here, INCLUSIVE of any known itemised costs listed above:**

Overall Cost $

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Case Report Form - Cost

National Stroke Research Institute

PATIENT STUDY NUMBER

PATIENT INITIALS

11) SPECIAL EQUIPMENT AND AIDS

Have you been given, hired or purchased any special equipment, aids or special food as a consequence of stroke?

3 months	Yes ☐	No ☐	Unknown ☐
3-12 months	Yes ☐	No ☐	Unknown ☐

Prompt: These may have been provided by an Occupational Therapist or Physiotherapist. What about a....?
If NO, proceed to question 12

Walking aids
- ☐ Single point stick
- ☐ Three or four point stick
- ☐ Walking frame - pick up
- ☐ Walking frame - wheelie
- ☐ Walking frame - gutter (forearm suppt)
- ☐ Crutch(es)

Mobility aids
- ☐ Manual wheelchair
- ☐ Electric wheelchair/scooter
- ☐ Car steering wheel knob

Eating aids
- ☐ Built-up cutlery
- ☐ Plate guard
- ☐ Non-slip mat
- ☐ Special food e.g. NG/PEG

If yes, number of days used:
3 months
3-12 months

Kitchen aids
- ☐ Tap handles
- ☐ Chopping board
- ☐ Modified knife
- ☐ Vitamiser/blender
- ☐ Non-slip mat

Lounge and bedroom equipment
- ☐ Chair platform/blocks raise
- ☐ Cushion to relieve pressure
- ☐ Special chair (NOT wheelchair)
- ☐ Table - bedside/wheelie
- ☐ Bed platform/block raise
- ☐ Bedstick
- ☐ Hospital bed (eg - height/tilt adjust)
- ☐ Mobile hoist/lifter

Bathroom equipment
- ☐ Over-toilet seat
- ☐ Toilet surround
- ☐ Bathroom and grooming aids
- ☐ Shower chair/stool
- ☐ Over bath seat
- ☐ Hand held shower
- ☐ Non-slip mat

Continence aids
- ☐ Urine bottle
- ☐ Bedpan
- ☐ Commode
- ☐ Incontinence sheet (bed protector)
- ☐ Incontinence sheet (kylie/bluey)

If yes, number of days used - 3 months
- ☐ Incontinence pads — 3-12 months

If yes, number of days used - 3 months
- ☐ Catheter — 3-12 months

If yes, number of days used - 3 months
3-12 months

General aids
- ☐ Long handled aid
- ☐ Blood pressure machine
- ☐ Treadmill
- ☐ Stationary bike
- ☐ Intercom (portable)
- ☐ Modified tap handles

If yes, number supplied

- ☐ Personal alarm

If yes, number of days supplied:
3 months
3-12 months

Any other aids/equipment, specify

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Case Report Form - Cost

National Stroke Research Institute

PATIENT STUDY NUMBER

PATIENT INITIALS

12) PRIVATE PHYSIOTHERAPY

Have you paid for private physiotherapy sessions after your stroke? (NOT while a hospital inpatient)

If no, proceed to question 13

3 months	Yes ☐	No ☐	Unknown ☐
3-12 months	Yes ☐	No ☐	Unknown ☐

If yes, number of sessions - 3 months ☐☐☐

3-12 months ☐☐☐

13) RESPITE CARE

As a consequence of your stroke, have you been admitted to a respite bed in a nursing home or hospital?

If NO, proceed to question 14

3 months	Yes ☐	No ☐	Unknown ☐
3-12 months	Yes ☐	No ☐	Unknown ☐

If yes, how many days of respite have you received since your stroke? **3 months** ☐☐☐

3-12 months ☐☐☐

14) EMPLOYMENT STATUS/ PAID WORK

Were you working up to the time of your stroke? Yes ☐ No ☐ Unknown ☐

If YES, what was the nature of this work? Full time ☐ Part time ☐

How many hours did you work each week? ☐☐

Since the stroke, have you returned to this work?

3 months	Yes ☐	No ☐	Unknown ☐
3-12 months	Yes ☐	No ☐	Unknown ☐

Have you returned to normal hours or decreased hours?

3 months	Normal ☐	Decreased ☐
3-12 months	Normal ☐	Decreased ☐

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How many hours per week of work have you performed since the last assessment?

Record average amount per week over the 3 month period ☐☐ **If more than 0 but less than 1hr, record as 1**

Record average amount per week over the period 3 to 12 months ☐☐

Case Report Form - Cost

National Stroke Research Institute

PATIENT STUDY NUMBER

PATIENT INITIALS

15) INFORMAL CARE - 3 MONTHS

NOTE: This question only applies to patients living at home (ie - excludes subjects in residential care and/or current hospital inpatients)

Definition of Informal Carer: That person who is most closely involved in helping the person with stroke to live independently at home. Any assistance provided by an informal carer is **over and above the assistance provided by any formal support service**. A carer is usually a spouse or other member of the family but may be a friend or neighbour.

If the person with stroke needs help with any activities of daily living, the carer is the person who provides most of this help beyond that provided by any formal support services. Assistance that a carer may provide includes: help with community tasks (e.g. shopping, errands, appointments, transport); help with domestic tasks (e.g. house cleaning, garden maintenance, laundry, meal preparation, washing up); help with personal care tasks (e.g. bathing, toileting, transferring, walking indoors, feeding). Supervision of daily activities to ensure safety should also be included as care.

15a) OVER THE LAST WEEK, have you received any assistance with your daily activities from a carer as a result of the stroke? Yes ☐ No ☐

This might include assistance with community tasks (such as help with your banking, paying your bills, shopping or transportation), assistance with domestic tasks (such as cooking and cleaning) or assistance with personal care tasks (such as bathing, toileting and feeding)

If the answer is NO, no further questions are required in this section

15b) If the answer is YES, OVER THE LAST WEEK did you receive any assistance with COMMUNITY tasks? Yes ☐ No ☐

Examples of assistance with community tasks include: banking and paying bills; errands such as posting letters or making appointments; transport to appointments or social occasions; shopping; your carer might also 'check up' on you by visiting or phoning.

If NO, go to question 15c)

If YES, can you estimate how many hours your carer spent helping you with these tasks during the last week? **Hours** ☐☐☐

15c) OVER THE LAST WEEK did you receive any assistance with DOMESTIC tasks? Yes ☐ No ☐

Examples of assistance with domestic tasks include: gardening; handyman tasks; grounds and home maintenance; housework such as laundry, cleaning, washing up; supervision of medication; supervision or assistance to walk outside.

If NO, go to question 15d)

If YES, can you estimate how many hours your carer spent helping you with these tasks during the last week? **Hours** ☐☐☐

15d) OVER THE LAST WEEK did you receive any assistance with PERSONAL CARE tasks? Yes ☐ No ☐

Examples of assistance with personal care tasks include: eating; grooming; bathing; dressing; toilet use; help with incontinence pads; moving from bed to chair or chair to chair; walking inside the house including stairs.

If NO, you have finished the questions.

If YES, can you estimate how many hours your carer spent helping you with these tasks during the last week? **Hours** ☐☐☐

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Case Report Form - Cost

National Stroke Research Institute

PATIENT STUDY NUMBER

PATIENT INITIALS

16) INFORMAL CARE - 12 MONTHS

NOTE: This question only applies to patients living at home (ie - excludes subjects in residential care and/or current hospital inpatients)

Definition of Informal Carer: That person who is most closely involved in helping the person with stroke to live independently at home. Any assistance provided by an informal carer is **over and above the assistance provided by any formal support service**. A carer is usually a spouse or other member of the family but may be a friend or neighbour.

If the person with stroke needs help with any activities of daily living, the carer is the person who provides most of this help beyond that provided by any formal support services. Assistance that a carer may provide includes: help with community tasks (e.g. shopping, errands, appointments, transport); help with domestic tasks (e.g. house cleaning, garden maintenance, laundry, meal preparation, washing up); help with personal care tasks (e.g. bathing, toileting, transferring, walking indoors, feeding). Supervision of daily activities to ensure safety should also be included as care.

16a) OVER THE LAST WEEK, have you received any assistance with your daily activities from a carer as a result of the stroke? Yes ☐ No ☐

This might include assistance with community tasks (such as help with your banking, paying your bills, shopping or transportation), assistance with domestic tasks (such as cooking and cleaning) or assistance with personal care tasks (such as bathing, toileting and feeding)

If the answer is NO, no further questions are required in this section

16b) If the answer is YES, OVER THE LAST WEEK did you receive any assistance with COMMUNITY tasks? Yes ☐ No ☐

Examples of assistance with community tasks include: banking and paying bills; errands such as posting letters or making appointments; transport to appointments or social occasions; shopping; your carer might also 'check up' on you by visiting or phoning.

If NO, go to question 16c)

If YES, can you estimate how many hours your carer spent helping you with these tasks during the last week? **Hours** ☐☐☐

16c) OVER THE LAST WEEK did you receive any assistance with DOMESTIC tasks? Yes ☐ No ☐

Examples of assistance with domestic tasks include: gardening; handyman tasks; grounds and home maintenance; housework such as laundry, cleaning, washing up; supervision of medication; supervision or assistance to walk outside.

If NO, go to question 16d)

If YES, can you estimate how many hours your carer spent helping you with these tasks during the last week? **Hours** ☐☐☐

16d) OVER THE LAST WEEK did you receive any assistance with PERSONAL CARE tasks? Yes ☐ No ☐

Examples of assistance with personal care tasks include: eating; grooming; bathing; dressing; toilet use; help with incontinence pads; moving from bed to chair or chair to chair; walking inside the house including stairs.

If NO, you have finished the questions.

If YES, can you estimate how many hours your carer spent helping you with these tasks during the last week? **Hours** ☐☐☐

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End Case Report Form - Cost

Supplementary document 3: Resource uses, Unit costs and valuation of costs

Resource use items recorded in the cost CRF

Healthcare resource use

The quantity of resources used for the following health care resource items was recorded: number of ambulance transfers (emergency and non-emergency), acute hospitalisation (including length of stay [LoS]), rehospitalisation (number of occasions and LoS for each occasion), rehabilitation hospital admission (number of occasions and LoS for each occasion), outpatient rehabilitation program (number of occasions and number of days for each occasion), rehabilitation provided at home/nursing facility (number of occasions and number of sessions for each occasion), private physiotherapy (number of sessions), respite care (number of sessions) and individual outpatient (including physiotherapy, occupational therapy, and speech and language therapy) visits (service type and number of sessions) for patients from United Kingdom, Singapore and Malaysia only.

Non-healthcare resource use

The quantity of resources used was recorded for the following non-heath care resource items: accommodation move due to stroke (location moved to and date of move), community service (type of service use and number of service used both for prior to and post-stroke), home modification (type of modification, supplier and cost), special equipment and aids (type of equipment/aids and quantity consumed), informal care (purpose of the care and hours used), live-in maids (number of maids prior to and post stroke) (for Singapore and Malaysia only), changes to employment (employment status and weekly hours of working both prior to and post-stroke).

Resource use reported at 3 (i.e. resources used between 0 and 3 months) and 12 (i.e. resources used between 4 and 12 months) months was used to calculate the total annual resource use for each participant. Generally, where patients were still using a particular resource at the time of 12-month data collection, the last day of 12 months' follow-up (calculated from the day of index stroke) was used to estimate the duration of that resource utilisation. In the event of a

patient dying, resource use data for the period prior to death was ascertained from their carer and medical records, wherever possible.

Unit costs for hospitalisation, rehabilitation, non-health sector costs and productivity costs

Acute stroke hospitalisation costing: Unit costs for acute stroke hospitalisation for all countries at baseline were categorised by stroke severity, using the National Institute of Health Stroke Scale (NIHSS) to group patients into three severity levels: mild (0-7), moderate (8-16) and severe (>16). (1)·(2) It was assumed that severity as classified by the NIHSS was consistent with the stroke severity that corresponded to three levels of unit cost for acute hospitalisation. Length of Stay (LoS) together with stroke severity were used to estimate the cost of acute hospitalisation for Australia and New Zealand patients (i.e. the cost of acute hospitalisation was weighted by the LoS). LoS was taken as the difference between the date of hospital discharge and date of hospital admission (plus one day or not) in accordance with country-specific practice. For the other countries, only stroke severity was considered in the assignment of a unit cost to acute stroke hospitalisation due to insufficient health sector data.

Re-hospitalisation and rehabilitation costing: Due to the diversity of causes for patients being readmitted to hospital after the index stroke, the average daily cost of hospitalisation for all disease conditions from individual countries in combination with LoS was used to gauge the cost of readmission for stroke-related causes, while the average cost for an emergency department visit was assigned whenever a patient was hospitalised for one day only. Similarly, the unit cost of rehabilitation hospital admission was taken from the national average cost for all disease conditions. The median cost was used where there was more than one unit cost identified for the same resource item.

Non-health sector costs: Unit costs of non-health sector resource items (e.g. community service, accommodation changes, special aids and equipment) were sourced on a country-specific basis from official websites or published literature where applicable. No unit cost was retrieved for home modification items since the cost of home modifications was generally reported in the Cost CRF.

Productivity cost: Lost productivity was valued based on a human capital approach using average earnings across all occupations up to normal retirement age. The average wage of a

professional carer was adopted to estimate the cost of informal care.

The currency of other countries was converted to AUD using the corresponding exchange rate. The country-specific Consumer Price Index (CPI) from the health sector was employed to adjust costs not valued in the year of 2015.

All the unit costs from participating countries are summarised in Table I.

Table I. Unit cost (in Australian dollars) across five countries, 2015 reference year

Resource items	**Unit cost (AUD)**				
	AU	**NZ**	**UK**	**SG**	**MA**
Healthcare					
Acute hospitalisation*					
Severe (per episode)	$19157	$10867	$15327	$4371	$2066
Moderate (per episode)	$9553	$6104	$8115	$2126	$1572
Mild (per episode)	$6279	$4370	$4272	$1493	$1363
Stroke-related rehospitalisation (per day)	$1925	$320	$701	$789	$230
Emergency department attendance (per attendance)	$610	$325	$227	$111	$68
Rehabilitation hospital admission†					
Severe (per episode)	$1010‡	$8032	$19136§	$157‡	$1293
Moderate (per episode)		$5727	$29788§		
Mild (per episode)		$5727	$13920§		
Same day (per episode)		$758	N/A		
Outpatient rehab visit (per/session)	$239	$164	$213	$36	$17
Rehab services at home/nursing facility (per/session)	$239	$212	$922	$36	$51
Private physiotherapy (per session)	$64	$153	$162	$116	$8
Respite care (per hour)	$45	$14	$26	$15	$2
Individual allied health visit					
Physiotherapy	N/A	N/A	$243	$239	$8
Occupational therapy	N/A	N/A	$243	$36	$7
Speech and language therapy	N/A	N/A	$69	$36	$4
Ambulance transfer	$508	$646	$575	$265	$52
Non-healthcare					
Community services	*Not listed here due to the number of items*				
Home modifications	*Cost was provided by individual patients*				
Special aids and equipment	*Not listed here due to the substantial number of items*				
Accommodation changes	*Not listed here due to the number of items*				
Professional carer (per hour)	$24	$14	$14	$10	$2
Living-in maid (per month)	N/A	N/A	N/A	$571	$103
Average weekly earnings					
Male	$1137	$621	$1152	$973	$137
Female			$957‖		

Unit cost for intervention[#]					
Hospital physiotherapist (per hour)	$33	$32	$30	$21	$5
Hospital nurse (per hour)	$30	$25	$29	$21	$5

AU: Australia; NZ: New Zealand; UK: United Kingdom; SG: Singapore; MA: Malaysia;
Sources of CPI:
Australian Bureau of Statistics. Consumer price index inflation calculator. Accessed from:Http://www.Abs.Gov.Au/websitedbs/d3310114.Nsf/home/consumer+price+index+inflation+calculator. 2017
Office for National Statistics. Inflation and price indices. Accessed from: Https://www.Ons.Gov.Uk/economy/inflationandpriceindices. 2017
Department of Statistics Singapore. Consumer price index. Accessed from: Https://data.Gov.Sg/dataset/consumer-price-index-annual. 2017
Statistics New Zealand. Consumer price index, accessed from: Http://www.Stats.Govt.Nz/browse_for_stats/economic_indicators/cpi_inflation/info-releases.Aspx. 2017
Department of Statistics Malaysia OP. Consumer price index malaysia. Accessed from: Https://www.Dosm.Gov.My/v1/index.Php?R=column/cthemebycat&cat=106&bul_id=zi9pmutpvzixb042mlptt1buellazz09&menu_id=bthzthqxn1zqmvf6a2i4rkzondfkqt09. 2017

* severity was determined by baseline NIHSS score; † severity was classified by baseline mRS score; ǂ it is the per day cost; § cost was assigned according to the baseline mRS score (mild 0-2; moderate 3-5; severe 6); ǁ the National Survey of Household Income was provided on gender basis, so the weekly earnings for UK patients were assigned corresponding to this; # hourly wage of hospital physiotherapist and nurse were assigned; N/A: not applicable.
Main sources of unit cost: AU: Independent Hospital Pricing Authority (IHPA), Australia, National Efficient Price Data (2015-16); National Hospital Cost Data collection (https://www.ihpa.gov.au/publications/australian-public-hospitals-cost-report-2013-2014-round-18); Department of Health, Revised residential care subsidies (https://agedcare.health.gov.au/aged-care-funding/aged-care-subsidies-and-supplements); Australian Bureau of Statistics (http://www.abs.gov.au/AUSSTATS/abs@.nsf/allprimarymainfeatures/E9FF9F13B417A488CA257F630014DF30?opendocument
NZ: Ministry of Health (http://www.health.govt.nz/nz-health-statistics/data-references/weighted-inlier-equivalent-separations); World Health Organisation (http://www.who.int/choice/country/nzl/cost/en/); Cost Resource Manual Version 2.2 (https://www.pharmac.govt.nz/assets/pfpa-v2-2-cost-resource-manual.pdf); study by Te Ao et al 2011 (Te Ao BJ et al. Are stroke units cost effective? Evidence from a New Zealand stroke incidence and population-based study. Int. J. Stroke. 2012;7:623-630); Statistics New Zealand (http://www.stats.govt.nz/browse_for_stats/income-and-work/employment_and_unemployment/LabourMarketStatistics_HOTPJun15qtr.aspx); District Health Board, Multi Employer Agreement, New Zealand Nurses Organisation(http://www.bopdhb.govt.nz/media/58613/psa-ronz-allied-meca-2015-2017.pdf);
UK: National Health Service (NHS) reference costs 2014 to 2015, United Kingdom (https://www.gov.uk/government/publications/nhs-reference-costs-2014-to-2015) ; NICE Technology Appraisal (Davis,S., Holmes,M., Simpson,E., Sutton,A. Alteplase for the treatment of acute ischaemic stroke [review of technology appraisal 122]: A Single Technology Appraisal. ScHARR, The University of Sheffield 2012, https://www.nice.org.uk/guidance/ta264/documents/stroke-acute-ischaemic-alteplase-review-of-ta122-evidence-review-group-report2); Personal Social Services Research Unit (PSSRU)(http://www.pssru.ac.uk/); Information Services Division, Scotland (http://www.isdscotland.org/); Annual Survey of Hours and Earnings 2015, Office for National Statistics (https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/earningsandworkinghours/bulletins/annualsurveyofhoursandearnings/2015provisionalresults); Payscale UK (http://www.payscale.com/research/UK/Job=Care_Worker/Hourly_Rate); NHS pay and benefits (https://www.healthcareers.nhs.uk/about/careers-nhs/nhs-pay-and-benefits/agenda-change-pay-rates);
SG: Ministry of Health , Hospital Bill Sizes, Singapore (https://www.moh.gov.sg/content/moh_web/home/costs_and_financing/HospitalBillSize/stroke.html.) ; Outpatient Charges, Singapore General Hospital (https://www.sgh.com.sg/patient-services/charges-payment/pages/outpatient-charges.aspx); Charges, Ren Ci Hospital (http://www.renci.org.sg/patients-guide/charges-2/); Hospital rates and charges, Bright Vision Hospital (http://www.bvh.org.sg/hospital-rate-charge.html); Ministry of Manpower (http://stats.mom.gov.sg/Pages/Occupational-Wages-Tables2014.aspx);
MA: study by Mohd Nordin et al 2012 (Mohd Nordin et al.: Estimating cost of in-patientmedical care for stroke using Casemix data. BMC Health Services Research 2012 12(Suppl 1):P10.); Ministry of Health Malaysia (http://www.moh.gov.my/english.php/pages/view/160); Study by Akhavan Hejazi et al 2015(Akhavan Hejazi SM, et al. Cost of post-stroke outpatient care in malaysia. Singapore Med. J. 2015;56:116-119); Department of Statistics Malaysia (https://www.dosm.gov.my/v1/index.php?r=column/pdfPrev&id=czRyNkJIbDFyYXJFbU5YTVJ1V1BHZz09).

Valuation of costs

For the ICER from a societal perspective, all the costs from health and non-health sector were summed together, including the productivity cost; for ICER of a health sector perspective, all the costs borne by healthcare system were counted (i.e. excluding non-healthcare costs and productivity cost).

Supplementary document 4. Missing cost data analyses

Table I. Number of missing data for each cost item

Cost variable	Missing										
	Total	AU		NZ		UK		SG		MA	
	N=2104	VEM N=522	UC N=532	VEM N=94	UC N=95	VEM N=311	UC N=299	VEM N=64	UC N=64	VEM N=62	UC N=61
Acute hospitalisation	1(0.05%)	1(0.2%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)
Stroke-related rehospitalisation	51(2.4%)	8(1.5%)	7(1.3%)	0(0%)	0(0%)	17(5.5%)	8(2.7%)	0(0%)	3(4.7%)	7(11.3%)	1(1.6%)
Ambulance transfer	53(2.5%)	8(1.5%)	10(1.9%)	0(0%)	0(0%)	16(5.1%)	7(2.3%)	1(1.6%)	3(4.7%)	7(11.3%)	1(1.6%)
Rehabilitation hospital admission	55(2.6%)	9(1.7%)	9(1.7%)	0(0%)	0(0%)	18(5.8%)	8(2.7%)	0(0%)	3(4.7%)	7(11.3%)	1(1.6%)
Outpatient rehabilitation program	47(2.2%)	0(0%)	0(0%)	0(0%)	0(0%)	23(7.4%)	10(3.3%)	0(0%)	3(4.7%)	9(14.5%)	2(3.3%)
Rehabilitation provided at home/nursing facility	67(3.2%)	11(2.1%)	10(1.9%)	0(0%)	0(0%)	23(7.4%)	1(3.7%)	0(0%)	3(4.7%)	7(11.3%)	1(1.6%)
Individual allied health visit[§]	0(0%)	-	-	-	-	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)
Private physiotherapy	76(3.6%)	12(2.3%)	11(2.1%)	0(0%)	1(1.1%)	27(8.7%)	13(4.4%)	1(1.6%)	3(4.7%)	7(11.3%)	1(1.6%)
Respite care	77(3.7%)	12(2.3%)	11(2.1%)	1(1.1%)	1(1.1%)	27(8.7%)	13(4.4%)	1(1.6%)	3(4.7%)	7(11.3%)	1(1.6%)
Subtotal (medical cost)	**94(10.7%)**	**14(2.7%)**	**13(2.4%)**	**1(1%)**	**1(1.1%)**	**36(11.6%)**	**14(4.7%)**	**1(1.6%)**	**3(4.7%)**	**9(14.5%)**	**2(3.3%)**
Accommodation moves	60(2.9%)	15(2.9%)	11(2.1%)	1(1.1%)	1(1.1%)	15(4.8%)	10(3.3%)	0(0%)	2(3.1%)	5(8.1%)	0(0%)
Community services	230(10.9%)	63(12.1%)	87(16.4%)	4(4.3%)	5(5.3%)	32(10.3%)	27(9.0%)	1(1.6%)	3(4.7%)	7(11.3%)	1(1.6%)
Home modifications	13(0.6%)	3(2.6%)	6(1.1%)	0(0%)	1(1.1%)	0(0%)	2(0.7%)	0(0%)	1(1.6%)	0(0%)	0(0%)
Special aids and equipment	48(2.3%)	7(1.3%)	8(1.5%)	1(1.1%)	1(1.1%)	16(5.1%)	14(4.7%)	1(1.6%)	0(0%)	0(0%)	0(0%)
Informal care	72(3.4%)	11(2.1%)	12(2.3%)	0(0%)	1(1.1%)	26(8.4%)	10(3.3%)	1(1.6%)	3(4.7%)	7(11.3%)	1(1.6%)
Living-in maids[ǂ]	-	-	-	-	-	-	-	1(1.6%)	3(4.7%)	7(11.3%)	2(3.3%)
Subtotal (non-medical cost)	**304(14.5%)**	**77(14.8)%**	**97(18.2%)**	**6(6.4%)**	**7(7.4%)**	**54(17.4%)**	**46(15.4%)**	**2(3.1%)**	**5(7.8%)**	**8(12.9%)**	**2(3.3%)**
Productivity cost	225(10.7%)	50(9.6%)	46(8.7%)	14(14.9%)	10(10.5%)	27(8.7%)	23(7.7%)	17(25.6%)	13(20.3%)	14(22.6%)	11(18.0%)
Total cost (exc. productivity cost)	319(15.2%)	80(15.3%)	97(18.2%)	6(6.4%)	7(7.4%)	61(19.6%)	48(16.1%)	2(3.1%)	5(7.8%)	10(16.1%)	3(4.9%)
Total cost	512(24.3%)	124(23.8%)	136(25.6%)	20(21.3%)	16(16.8%)	80(25.7%)	68(22.7%)	17(26.6%)	16(25.0%)	22(35.5%)	13(21.3%)

[§]only applicable to UK, Singapore and Malaysia patients; [ǂ]only applicable to Singapore and Malaysia patients

Table II. Missing pattern analysis based on logit regression

Resource use items with missing data	Predictor of missingness
Stroke-related rehospitalisation	Age (p=0.001)
Rehabilitation hospital admission	Age (p=0.009), NIHSCORE (p=0.037)
Outpatient rehabilitation program	Age (p=-0.003)
Rehabilitation service provided at home/nursing facility	Age (p=0.014),
Community services used prior to stroke	NIHSCORE (p=0.001)
Community services used at 3 months	Age (p=0.003)
Community services used at 12 months	NIHSCORE (p=0.008)
Aids or special equipment uses at 3 months	Age (p=0.012)
Aids or special equipment uses at 12 months	Age (p=0.035), NIHSCORE (p=0.013)
Private physiotherapy uses at 3 months	Age (p<0.0001)
Private physiotherapy uses at 12 months	Age (p=0.006), NIHSCORE (p=0.034)
Respite care use at 3 months	Age (p<0.0001)
Respite care use at 12 months	Age (p=0.017), NIHSCORE (P=0.018)
Informal care use at 3 months	Age (p=0.003)
Informal care use at 12 months	Age (p<0.0001)

If any of the other variables were able to predict the missingness of a given variable representing resource use, the MAR assumption was deemed to be held true. More specifically, multiple imputations were used to replace the missing values (missing mRS, AQoL-4D data or cost categories) with plausible estimates, and generated 30 datasets. Results were provided as pooled estimates of these sets. Identical analyses were carried out to estimate the incremental costs and benefits between groups on the basis of imputed data following the methods outlined in the statistical analysis section above. As the probability of all the resource use items being missing could be predicted by one or more of the other variables, it is likely that the Missing-at-Random (MAR) assumption could be held true. (https://www.ssc.wisc.edu/sscc/pubs/stata_mi_decide.htm).

Supplementary document 5. Sensitivity analyses

Generally, the difference in QALY gains between VEM and UC groups were fairly consistent across different methods.

Table I. Between-group differences based on the Generalised Linear Model

	Adding country dummies		
	mRS	**QALYs**	**Cost**
Total medical costs	0.031(-0.021, 0.083)	-0.013(-0.042, 0.015)	$704 (-$1968, $3376)
Total cost (excl. productivity cost)	0.031(-0.021, 0.083)	-0.013(-0.042, 0.015)	-$335 (-$4953, $4283)
Total cost (incl. productivity cost)	0.031(-0.021, 0.083)	-0.013(-0.042, 0.015)	-$238 (-$6012, $5537)

mRS: modified Rankin Scale; QALYs: Quality-adjusted Life Years

*the p-value was >0.05 for the between-group difference in mRS score, QALYs and cost

Table II. Results of country-specific analysis of costs and benefits

	AU (N=1054)	**NZ (N=189)**	**UK (N=610)**	**SG (N=128)**	**MA (N=123)**
Total medical costs	$948 (-$4352, $6248)	-$2836 (-$8403, $2730)	$2937 (-$3635, $9509)	-$81 (-$2789, $2627)	$137 (-$324, $599)
Total non-medical costs	-$1318 (-$3038, $403)	-$3959 (-$7769, -$150)	-$1387 (-$7331, $4557)	-$3164 (-$6834, $505)	$200 (-$232, $631)
Total cost (incl. productivity)	-$1735 (-$8482, 5013)	-$8981 (-$18380, $418)	$1870 (-$13955, $17694)	-$2636 (-$9233, $3961)	$479 (-$487, $1446)
Total cost (excl. productivity)	-$1185 (-$7184, $4815)	-$7610 (-$15302, $82)	$2552 (-$11377, $16481)	-$1534 (-$6464, $3395)	$416 (-$364, $1196)
QALY gains	-0.036 (-0.076, 0.003)	0.086 (-0.003, 0.176)	-0.010 (-0.064, 0.044)	0.008 (-0.106, 0.123)	0.003 (-0.126, 0.132)

AU: Australia; NZ: New Zealand; UK: United Kingdom; SG: Singapore; MA: Malaysia; QALY: Quality-adjusted Life Year.

*the p-value was >0.05 for the between-group difference in QALYs and cost

From a health sector perspective, VEM was associated with similar costs ($940, 95%CI: $-4622 to $4682) and QALY gains (-0.019, 95%CI:-0.044 to 0.005) over 12 months. Likewise, if a societal perspective was taken, VEM was associated with comparable costs ($1413, 95%CI:-$4044 to $6871, including productivity cost; $1704, 95%CI:-$3817 to $7226, excluding productivity cost) and QALY gains (-0.019, 95%CI:-0.044 to 0.005) (Supplementary document 6: Table IV). Even though the point estimate of difference in total costs between groups from a societal perspective varied considerably, the 95% confidence interval derived from base case and multiple imputation analyses were nearly identical (Supplementary document 6: Table IV).

From a health sector perspective, the between-group difference for each participating country yielded consistent conclusions with the base case analysis. VEM was associated with both non-significantly different costs and benefits (i.e. QALY gains at 12 months) compared to the UC, although the point estimate of the cost difference between groups varied from country to country, ranging from -$2836 (New Zealand) to $2937 (UK) (Supplementary document 6: Table II).

It was found that VEM was likely to cost less and associated with a greater gain in QALYs in comparison to UC in New Zealand and Singapore., Meanwhile, except for total medical cost, VEM seemed to incur less cost while leading to less gain in QALYs at month 12 months for participants from Australia, whilst in the United Kingdom, VEM was associated with higher

cost and lower QALY gains than UC. Lastly, for patients from Malaysia, VEM contributed to higher cost while greater QALY gains at 12 month follow-up. However, none of the afore-mentioned between-group differences were statistically significant.

When a societal perspective was assumed, again, the point estimate of difference in costs between groups across countries varied substantially, with the 95% confidence intervals mostly overlapping

Table III. Between-group differences based on the Generalised Linear Model_ base case analysis vs. multiple imputation analysis

	ITT (not imputed)			ITT (imputed)		
	mRS score	**QALYs**	**Cost (AUD)**	**mRS**	**QALYs**	**Cost (AUD)**
Health Sector Perspective						
Total medical costs	0.030 (-0.022, 0.082)	-0.013 (-0.041, 0.016)	$1082 (-$2399, $4563)	0.042 (-0.008, 0.092)	-0.019 (-0.046, 0.007)	$940 (-$2584, $4465)
Societal Perspective						
Total cost (excl. productivity cost)	0.030 (-0.022, 0.082)	-0.013 (-0.041, 0.016)	-$6 (-$5703, $5690)	0.042 (-0.008, 0.092)	-0.019 (-0.046, 0.007)	$1704 (-$5423, $8832)
Total cost (incl. productivity cost)	0.030 (-0.022, 0.082)	-0.013 (-0.041, 0.016)	$102 (-$6945, $7149)	0.042 (-0.008, 0.092)	-0.019 (-0.046, 0.007)	$1413 (-$5940, $8766)

ITT: intention to treatment; mRS: modified Rankin Scale; AUD: Australian dollars

*the p-value was >0.05 for the between-group difference in mRS score, QALYs and cost

Table IV. Cost-utility analysis based on multiple imputation analysis

	Efficacy (QALYs)	Cost (AUD)	Probability of being cost-effective
Health Sector Perspective			
Total medical costs	-0.019 (-0.044, 0.005)	$940 (-$4622, $4682)	25%
Societal Perspective			
Total cost (excl. productivity cost)	-0.019 (-0.044, 0.005)	$1704 (-$3817, $7226)	20%
Total cost (incl. productivity cost)	-0.019 (-0.044, 0.005)	$1413 (-$4044, $6871)	23%

QALYs: Quality-adjusted Life Years; AUD: Australian dollar.

*the p-value was >0.05 for the between-group difference in QALYs and cost

Supplementary document 6. Outcomes

Table I. Results of mRS score at 3 and 12 months follow-up

Modified Rankin Scale Score	**UC group n=1050**		**VEM group n=1054**	
	3M	**12M**	**3M**	**12M**
0	96	132	90	137
1	204	231	200	219
2	225	175	190	166
3	218	199	238	186
4	127	95	140	113
5	103	83	92	59
6	72	118	88	139
Total	**1045**	**1033**	**1038**	**1019**
Missing data	**5**	**17**	**16**	**35**

Number of patients falling into each category

Since there was no significant intervention effect together with no accepted willingness-to-pay (WTP) per unit increase in probability of achieving a better mRS outcome, further estimation of the ICER was considered not meaningful (i.e. no cost-effectiveness plane or cost-effectiveness acceptability curve could be generated).

Table II. Time and cost associated with delivering VEM and UC (mean, 95%CI)

	VEM		UC		Between group difference	
	Total time (min)	Cost (AUD)	Total time (min)	Cost (AUD)	Total time (min)	Cost (AUD)
Physiotherapist	243 (232, 254)	$117 ($111, $123)	95 (90, 101)	$48 ($45, $51)	147 (135, 159)*	$69 ($63, $75)*
Nurse†	494 (456, 532)	$225 ($207, $244)	439 (404, 474)	$202 ($185, $219)	55 (4, 106)*	$23 (-$2, $48)
Total cost	-	$342 ($320, $364)	-	$250 ($231, $269)	-	$92 ($63, $121)*

VEM: very early mobilisation; UC: usual care; CI: confidence interval

*p<0.0001 (adjusted for age, baseline NIHSS and mRS); † nurse's time devoted to delivery of VEM/UC was not recorded in the process of data collection, so the physiotherapist time was used as a proxy

Because VEM and UC were supplied by the same group of physiotherapists and nurses, the key difference was that a patient randomised to VEM received early rehabilitation within 24 hours of stroke onset and more out-of-bed mobilisation sessions of early mobilisation.

The total health practitioner (physiotherapist and nurses) time devoted to the delivery of the VEM and UC differed significantly, with the VEM group receiving substantially longer mean service time from both the physiotherapist (VEM: 243 mins, 95%CI: 232 to 254 vs UC: 95 mins, 95%CI: 90 to 101, p<0.0001) and nurse (VEM: 494 mins, 95%CI: 456 to 532 vs UC: 439 mins, 95%CI: 404 to 474, p<0.0001). The resultant difference in costs between groups was significant ($92, 95%CI: $63 to $121, p<0.0001).

Table III. Cost of all the resources used over 12 months (AUD)

	AU (N=1054)		NZ (N=189)		UK (N=610)		SG (N=128)		MA (N=123)		All Countries	
	VEM	UC	VEM	UC	VEM	UC	VEM	UC	VEM	UC	VEM	UC
Health care cost (AUD)												
Acute hospitalisation												
Median, IQR	$6294 (6294, 9553)	$6294 (6294, 9553)	$6104 (4370, 6104)	$6104 (4370, 6104)	$2763 (1382, 6563)	$3109 (1727, 6563)	$1493 (1493, 1809)	$1493 (1493, 1493)	$1363 (1363, 1572)	$1363 (1363, 1572)	$6294 (2279, 9535)	$6294 (2418, 9553)
Mean, SD	$9883 (9484)	$10010(10508)	$6635 (3244)	$6549 (3555)	$5714(7876)	$5885 (7101)	$1721 (547)	$1676 (432)	$1482 (212)	$1472 (200)	$7369 (8469)	$7521 (8916)
Stroke-related rehospitalisation												
Median, IQR	$0 (0, 3850)	$0 (0, 3850)	$0 (0, 325)	$0 (0, 2243)	$227 (227, 1401)	$227 (227, 227)	$111 (111, 111)	$111 (111, 111)	$68 (68, 68)	$68 (68, 68)	$111 (0, 1401)	$111 (0, 610)
Mean, SD	$6030 (17114)	$6473 (21590)	$651 (1371)	$1507 (2828)	$4524 (13968)	$3494(11349)	$2756 (7565)	$1679 (3465)	$714 (1608)	$603 (1479)	$4610 (14518)	$4551 (16707)
Admission to rehab hospital												
Median, IQR	$13134 (0, 36371)	$13134 (0, 38391)	$11262 (0, 30983)	$11262 (0, 26486)	$0 (0, 29788)	$0 (0, 29788)	$0 (0, 2921)	$1298 (0, 3570)	$0 (0, 0)	$0 (0, 0)	$0 (0, 29788)	$1136 (0, 29788)
Mean, SD	$25667 (38892)	$26648(38315)	$16871(18536)	$15573(16848)	$12539(19682)	$11758 (18390)	$1815 (2759)	$2798 (5082)	$0 (0)	$43 (234)	$18197 (31241)	$18458 (30811)
Outpatient rehab program (AUD)												
Median, IQR	$0 (0, 2451)	$0 (0, 1913)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 36)	$33 (0, 265)	$0 (0, 249)	$0 (0, 478)	$0 (0, 239)
Mean, SD	$2081 (4183)	$1934 (5316)	$821 (2236)	$721 (1991)	$266 (1026)	$155 (676)	$364 (1090)	$562 (1478)	$174 (286)	$126 (206)	$1246 (3244)	$1142 (3976)
Rehab provided at home/nursing facility												
Median, IQR	$0 (0, 717)	$0 (0, 956)	$1168 (0, 4299)	$212 (0, 3821)	$922 (0, 11064)	$0 (0, 11064)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 1913)	$0 (0, 1913)
Mean, SD	$1382 (4069)	$1551 (4252)	$3171 (4960)	$3111 (5754)	$12085 (28516)	$11051 (26723)	$93 (570)	$5 (42)	$97 (719)	$7 (53)	$4447 (16294)	$4180 (15203)
Individual allied health visit												
Median, IQR	N/A	N/A	N/A	N/A	$0 (0,0)	$0 (0,0)	$0 (0,0)	$0 (0,179)	$0 (0,0)	$0 (0,0)	N/A	N/A
Mean, SD	N/A	N/A	N/A	N/A	$375 (1144)	$329 (1291)	$432 (1521)	$1126 (3150)	$0 (0)	$0.2 (2)	N/A	N/A
Ambulance transfers												
Median, IQR	$508 (0, 1015)	$508 (0, 1015)	$0 (0, 646)	$0 (0, 646)	$0 (0, 1150)	$0 (0, 575)	$0 (0, 265)	$0 (0, 265)	$0 (0, 0)	$0 (0, 0)	$0 (0, 611)	$0 (0, 610)
Mean, SD	$671 (1057)	$623 (946)	$543 (1082)	$605 (928)	$790 (3209)	$701 (3150)	$164 (348)	$113 (208)	$6 (26)	$14 (64)	$627 (1920)	$578 (1838)
Private physiotherapy												
Median, IQR	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)
Mean, SD	$70 (375)	$124 (797)	$245 (1308)	$4 (36)	$128 (780)	$174 (2102)	$238 (1096)	$333 (1938)	$4 (19)	$1 (9)	$109 (693)	$132 (1336)
Respite care												
Median, IQR	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)
Mean, SD	$48 (355)	$20 (182)	$7 (46)	$2 (15)	$9 (95)	$58 (686)	$0 (0)	$0 (0)	$0 (0)	$1 (8)	$27 (259)	$27 (386)

	AU (N=1054)		NZ (N=189)		UK (N=610)		SG (N=128)		MA (N=123)		All Countries	
	VEM	UC	VEM	UC	VEM	UC	VEM	UC	VEM	UC	VEM	UC
Sub-total												
Median (IQR)	$29278 (8218, 63622)	$29441 (9811, 62489)	$20621 (6068, 46909)	$23722 (7316, 40162)	$18896 (4030, 48999)	$20843 (3682, 47908)	$4525 (1604, 8668)	$4687 (2724, 10926)	$1713 (1431, 2532)	$1746 (1431, 2348)	$19271 (6294, 52637)	$20411 (7238, 63835)
Mean (SD)	$45620 (51458)	$47453(53715)	$28898 (25011)	$27986(22676)	$34863 (42509)	$32842 (39517)	$7681 (8828)	$8358 (8787)	$2385(1587)	$2269(1574)	$36351 (45620)	$36604 (46309)
Non-health care cost												
Accommodation moves												
Median, IQR	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)
Mean, SD	$2089 (8518)	$2482 (9323)	$5975 (19614)	$9135 (26918)	$2901 (12958)	$2532 (11125)	$72 (578)	$108 (507)	$425 (1893)	$104 (501)	$2460 (11036)	$2821 (12212)
Community services												
Median, IQR	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 430)	$0 (0, 174)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)
Mean, SD	$570 (2681)	$1091 (8556)	$238 (950)	$1022 (4113)	$22275 (294988)	$10738 (57306)	$0 (0)	$244 (1902)	$21 (110)	$0 (0)	$6870 (160318)	$3786 (31893)
Home modifications												
Median, IQR	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)
Mean, SD	$805 (6338)	$751 (7715)	$833 (4862)	$565 (3204)	$352 (2133)	$834 (7091)	$234 (1079)	$62 (299)	$49 (369)	$64 (237)	594 (4840)	$676 (6734)
Special aids and equipment												
Median, IQR	$0 (0, 332)	$0 (0, 318)	$70 (0, 549)	$103 (0, 357)	$27 (0, 786)	$0 (0, 846)	$0 (0, 240)	$0 (0, 210)	$15 (0, 218)	$36 (0, 186)	$0 (0, 414)	$0 (0, 414)
Mean, SD	$1986 (7668)	$2787 (10396)	$2198 (7993)	$1798 (7229)	$1354(3649)	$1720 (5083)	$1117 (5843)	$1079 (5483)	$153 (252)	$193 (658)	$1660 (6426)	$2141 (8328)
Informal care												
Median, IQR	$24 (0, 503)	$48 (0, 455)	$14 (0, 283)	$0 (0, 149)	$29 (0, 471)	$29 (0, 375)	$0 (0, 114)	$0 (0, 238)	$24 (0, 60)	$9 (0, 50)	$24 (0, 407)	$24 (0, 407)
Mean, SD	$414 (747)	$405 (758)	$236 (536)	$152 (311)	$324 (516)	$324 (645)	$144 (285)	$159 (300)	$43 (57)	$27 (34)	$335 (633)	$322 (660)
Living-in maids												
Median, IQR	N/A	N/A	N/A	N/A	N/A	N/A	$0 (0,0)	$0 (0,0)	$0 (0,0)	$0 (0,0)	N/A	N/A
Mean, SD	N/A	N/A	N/A	N/A	N/A	N/A	$3154 (8146)	$4268(11338)	$179 (930)	$83 (504)	N/A	N/A
Sub-total												
Median (IGR)	$459 (0, 3334)	$673 (0, 5209)	$381 (0, 3674)	$638 (103, 14551)	$758 (0, 5097)	$471 (0, 4725)	$25 (0, 1293)	$194 (0, 6999)	$74 (0, 285)	$57 (0, 318)	$358 (0, 3334)	$438 (0, 4561)
Mean (SD)	$6104 (15582)	$6985 (17554)	$7752 (17751)	$11981(27676)	$27892 (306917)	$15345(61750)	$4802 (10366)	$6177 (13942)	$861 (2272)	$484 (1113)	$12043 (164026)	$9360 (36504)
Productivity cost												
Median, IQR	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)
Mean, SD	$75 (317)	$84 (391)	$29 (130)	$14 (54)	$17 (152)	$44 (245)	$6 (29)	$8 (35)	$1 (4)	$0.4 (3)	$46 (246)	$58 (312)
Total cost												

	AU (N=1054)		NZ (N=189)		UK (N=610)		SG (N=128)		MA (N=123)		All Countries	
	VEM	UC	VEM	UC	VEM	UC	VEM	UC	VEM	UC	VEM	UC
Median (IGR)	$33203 (9687, 71902)	$35143 (12696, 74070)	$29934 (8528, 65781)	$32216 (15710, 68292)	$25374 (4712, 64285)	$30537 (4629, 67012)	$6960 (1674, 26187)	$8810 (3426, 19493)	$2016 (1561, 3994)	$1816 (1537, 3301)	$25675 (6766, 63617)	$27042 (7257, 63824)
Mean (SD)	$52456(57264)	$56408(62536)	$40381(37242)	$43901(43170)	$65530(332044)	$49627(78644)	$15036(16921)	$16340(19650)	$3609(3985)	$2938(2350)	$50448(184931)	$47627(64249)

Where only a low proportion (i.e. less than 50%) of patient reported certain types of resource utilisation, zero median and/or IQR are reported. *In Malaysia, the length of stay for acute stroke hospitalisation includes a patient's immediate admission to rehabilitation hospital on discharge from hospital as the rehabilitation service immediately following the acute stroke hospitalisation is not routinely provided.

interval overlapped to a great extent. Given the concern raised by the large variability in mapped utility for patients within the same mRS category (≤2 or ≥3) and the fairly consistent results across different models, only the 12 month AQol utility values were employed to estimate the difference in QALYs gains between two treatment groups.

Supplementary document 7. Quantity of resource use over 12 months (ITT) (median, IQR)

	AU (N=1054)		NZ (N=189)		UK (N=610)		SG (N=128)		MA (N=123)		All Countries	
	VEM	**UC**	**VEM**	**UC**	**VEM**	**UC**	**VEM**	**UC**	**VEM**	**UC**	**VEM**	**UC**
Acute hospitalisation												
% of patients using	100	100	100	100	100	100	100	100	100	100	100	100
LoS (days)	21(6-42)	22(7-46)	23(6-57)	25(8-48)	12(4-45)	13(5-4)	16(4-25)	18(4-25)	5(3-8)	4(2-8)	16(4-41)	17(5-41)
Stroke-related rehospitalisation												
% of patients using	30	29	28	33	28	23	20	20	18	23	28	27
No. readmission/s	1(1-2)	1(1-2)	1(1-2)	1(1-2)	1(1-2)	1(1-2)	1(1-2)	2(1-2)	1(1-2)	1(1-2)	1(1-2)	1(1-2)
Admission to rehabilitation hospital[ǂ]												
% of patients using	62	56	60	65	35	34	45	56	0	2	50	47
No. of admission/s	1(0-1)	1(0-1)	1(0-1)	1(0-1)	0(0-1)	0(0-1)	0(0-1)	1(0-1)	0(0-0)	0(0-0)	0(0-1)	1(1-1)
Outpatient rehabilitation program												
% of patients using	40	39	23	19	12	10	19	25	52	48	30	28
No. of services	15(6-29)	12(6-28)	16(7-28)	17(12-34)	12(6-21)	7(4-14)	32(20-77)	29(3-116)	15(7-24)	16(4-22)	15(6-28)	12(6-27)
Rehabilitation provided at home/nursing facility												
% of patients using	30	33	57	52	50	46	3	2	2	2	35	34
No. of services	9(4-22)	10(4-25)	18(8-29)	16(9-30)	12(6-28)	12(6-30)	81(63-99)	9(9-9)	104(104-104)	8(8-8)	12(5-27)	12(5-28)
Ambulance transfer												
% of pts using	51	53	34	48	41	38	36	28	5	8	43	44
No. of trips	2(1-3)	2(1-3)	2(1-3)	1(1-3)	2(1-3)	2(1-3)	1(1-2)	1(1-2)	2(2-3)	2(1-3)	2(1-3)	2(1-3)
Individual allied health therapy												
% of pts using	N/A	N/A	N/A	N/A	19	15	-	2	20	25	-	-

	AU (N=1054)		NZ (N=189)		UK (N=610)		SG (N=128)		MA (N=123)		All Countries	
	VEM	UC	VEM	UC	VEM	UC	VEM	UC	VEM	UC	VEM	UC
No. of services	N/A	N/A	N/A	N/A	8(2-12)	8(4-15)	-	2(2-2)	8(3-10)	16(8-31)	-	-
Private physiotherapy												
% of pts using	9	8	11	1	5	5	8	8	3	2	8	6
No. of services	5(3-19)	6(4-19)	13(6-18)	3(3-3)	12(6-33)	7(1-14)	18(16-24)	14(7-24)	12(11-13)	8(8-8)	15(4-20)	24(3-19)
Respite care												
% of pts using	3	2	3	2	2	3	-	-	-	2	2	2
No. of services	21(10-43)	15(11-35)	12(10-20)	7(5-8)	24(9-40)	21(12-80)	-	-	-	30(N/A)	18(9-39)	18(9-41)
Accommodation moves												
% of pts using	18	17	19	28	13	14	11	20	23	10	16	17
No. of moves	1(1-1)	1(1-1)	1(1-1)	1(1-1)	1(1-1)	1(1-1)	1(1-1)	1(1-1)	1(1-2)	2(1-2)	1(1-1)	1(1-1)
Community Services used prior to having a stroke over the past year												
% of pts using	13	17	6	7	5	5	-	-	-	-	9	11
No. of services	26(26-52)	26(26-52)	52(39-88)	46(14-52)	52(25-104)	40(15-131)	-	-	-	-	27(26-52)	26(26-52)
Community services used over 12 months after stroke												
% of pts using	30	35	32	28	31	28	-	3	6	-	27	28
No. of services	28(18-72)	32(12-78)	130(47-233)	48(17-256)	42(12-185)	90(12-310)	-	3(3-3)	6(3-73)	-	39(14-119)	39(12-124)
Home modifications undertaken over 12 months												
% of pts using	27	30	20	17	36	33	16	19	3	10	27	28
No. of mods	2(1-2)	2(1-2)	1(1-2)	2(1-2)	1(1-2)	2(1-2)	1(1-2)	1(1-2)	1(1-1)	1(1-1)	1(1-2)	2(1-2)
Aids and appliances used over 12 months												
% of pts using	46	47	55	63	58	51	44	45	58	59	51	50
No. of aids/appliance used	2(1-5)	2(1-4)	3(2-6)	2(1-4)	4(2-6)	4(2-6)	2(2-3)	2(1-3)	2(1-3)	2(1-3)	3(1-5)	3(1-5)
Working prior to stroke												

	AU (N=1054)		NZ (N=189)		UK (N=610)		SG (N=128)		MA (N=123)		All Countries	
	VEM	**UC**	**VEM**	**UC**	**VEM**	**UC**	**VEM**	**UC**	**VEM**	**UC**	**VEM**	**UC**
% of patients	24	23	38	34	19	21	52	52	45	33	27	26
Hrs worked/week	40(27-50)	40(30-50)	40(37-40)	40(37-40)	40(25-48)	37(25-40)	48(40-56)	45(36-50)	42(40-56)	45(32-50)	40(30-50)	40(30-50)
Proportion working at 12 months												
% of patients	15	12	20	16	7	9	25	22	24	15	14	12
Hrs worked/week	38(18-40)	25(12-40)	40(20-40)	40(38-40)	35(26-40)	30(24-37)	39(16-46)	35(23-44)	40(32-47)	45(30-50)	38(20-41)	30(16-40)
Patients from Malaysia and Singapore who had a maid prior to stroke												
% of patients	-	-	-	-	-	-	19	16	5	10	-	-
No. of maids	-	-	-	-	-	-	1(1-1)	1(1-1)	1(1-1)	1(1-1)	-	-
Patients from Singapore and Malaysia who had a maid at 12 months following stroke												
% of patients	-	-	-	-	-	-	23	22	5	7	-	-
No. of maids	-	-	-	-	-	-	1(1-1)	1(1-1)	1(1-1)	1(1-1)	-	-
Receipt of informal care at 12 months												
% of patients	35	39	37	33	41	40	30	36	42	44	37	39
No. of hrs/week	15(6-34)	12(4-31)	8(3-21)	14(6-30)	21(9-34)	17(7-35)	35(13-46)	16(4-30)	22(10-38)	16(5-26)	18(7-35)	14(5-32)

ITT: Intention-to-treat; AU: Australia; NZ: New Zealand; UK: United Kingdom; SG: Singapore; MA: Malaysia; LoS: length of stay; pts: patients; No.: number; hrs: hours; mod: modification; -: no such resource use; all numbers were expressed as median and interquartile range (IQR); ǂ includes any admissions to rehabilitation hospital following the indexed stroke;

Supplementary document 8: Figures

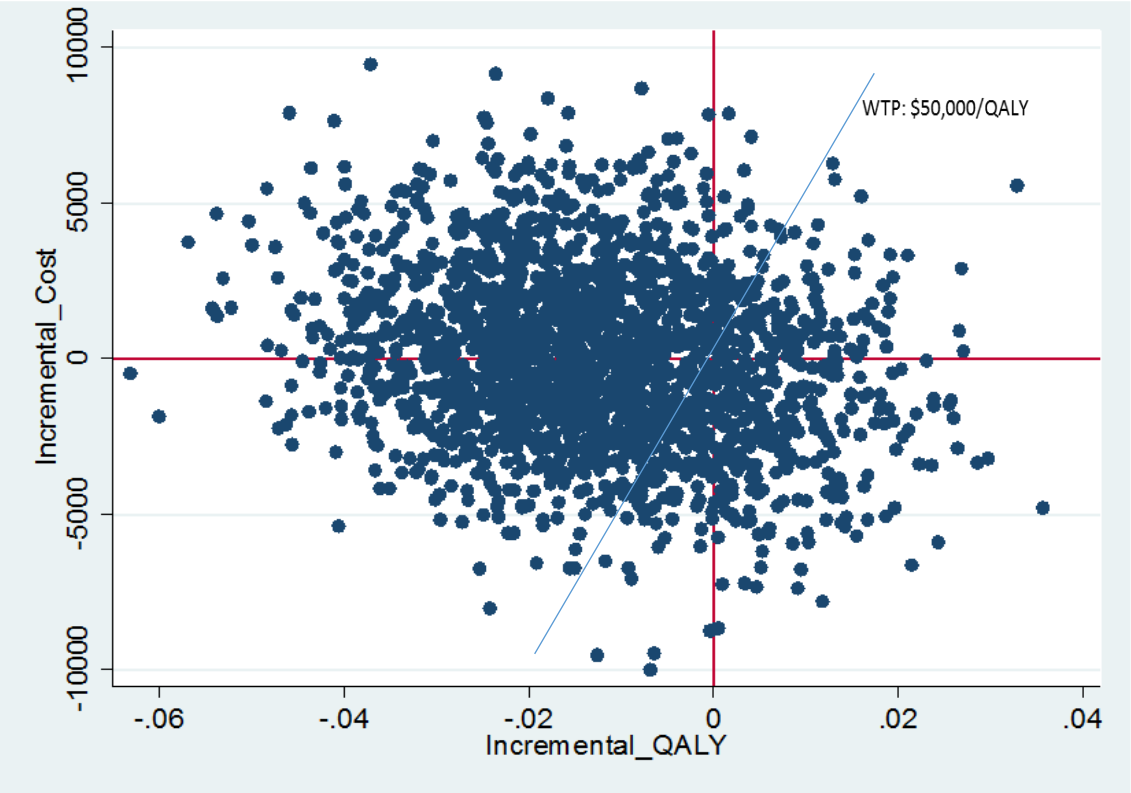

Figure I cost-effectiveness plane_ societal perspective (excl. productivity cost)

*Probability of VEM being cost-effective is 42%; WTP: willingness-to-pay; QALY: quality-adjusted life year

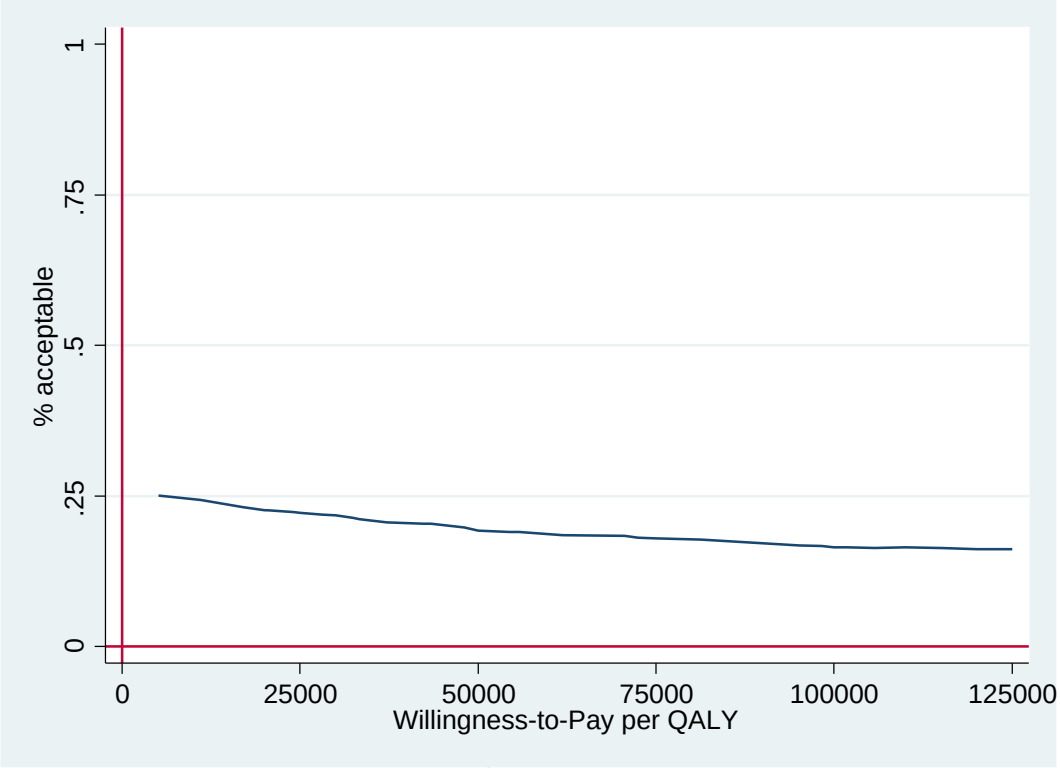

Figure II Cost-effectiveness acceptability curve for medical cost

Note: The probability of VEM being cost-effective decreases with the increasing WTP/QALY threshold because the VEM is associated with less costs

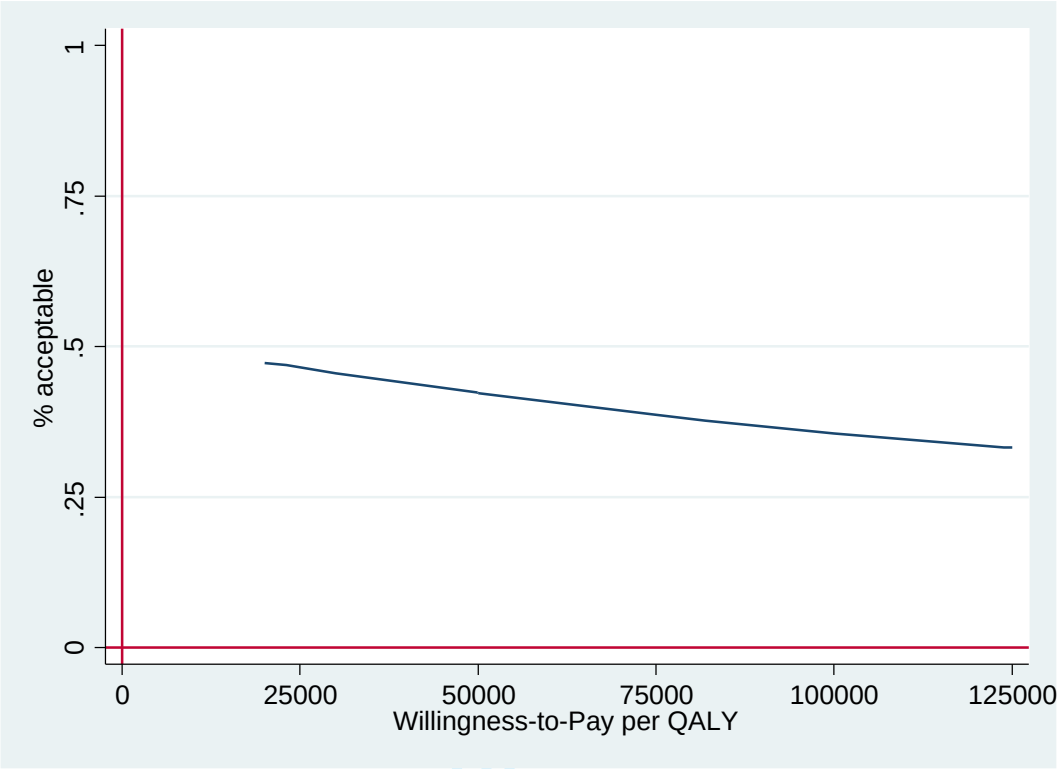

Figure III Cost-effectiveness acceptability curve for total cost excluding productivity cost

Note: The probability of VEM being cost-effective decreases with the increasing WTP/QALY threshold because the VEM is associated with less costs

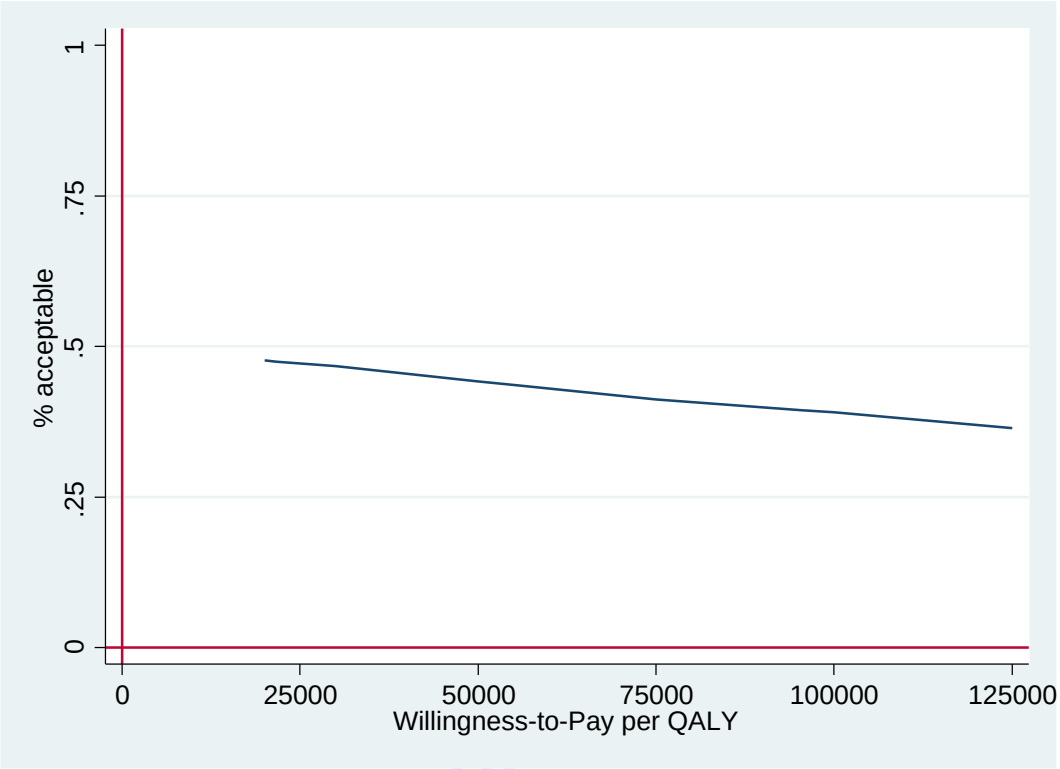

Figure IV Cost-effectiveness acceptability curve for total cost including productivity cost

Note: The probability of VEM being cost-effective decreases with the increasing WTP/QALY threshold because the VEM is associated with less costs

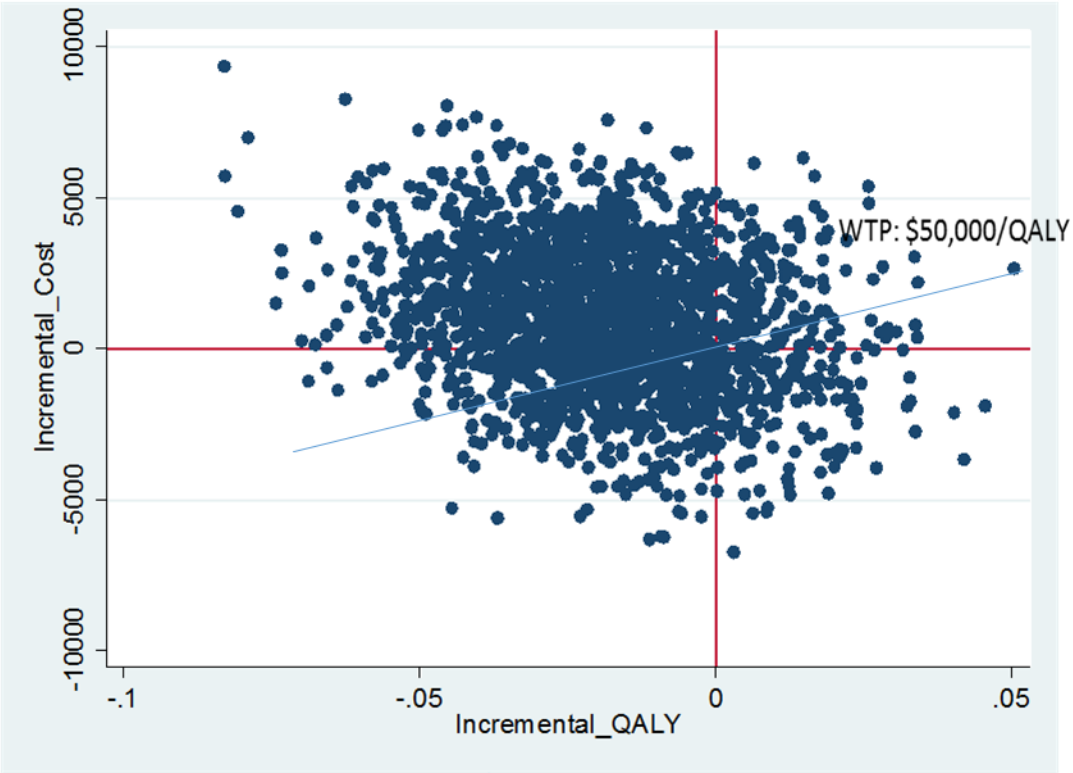

Figure V Cost-effectiveness plane_ health sector perspective (multiple imputation analysis)

WTP: willingness-to-pay; QALY: quality-adjusted life year

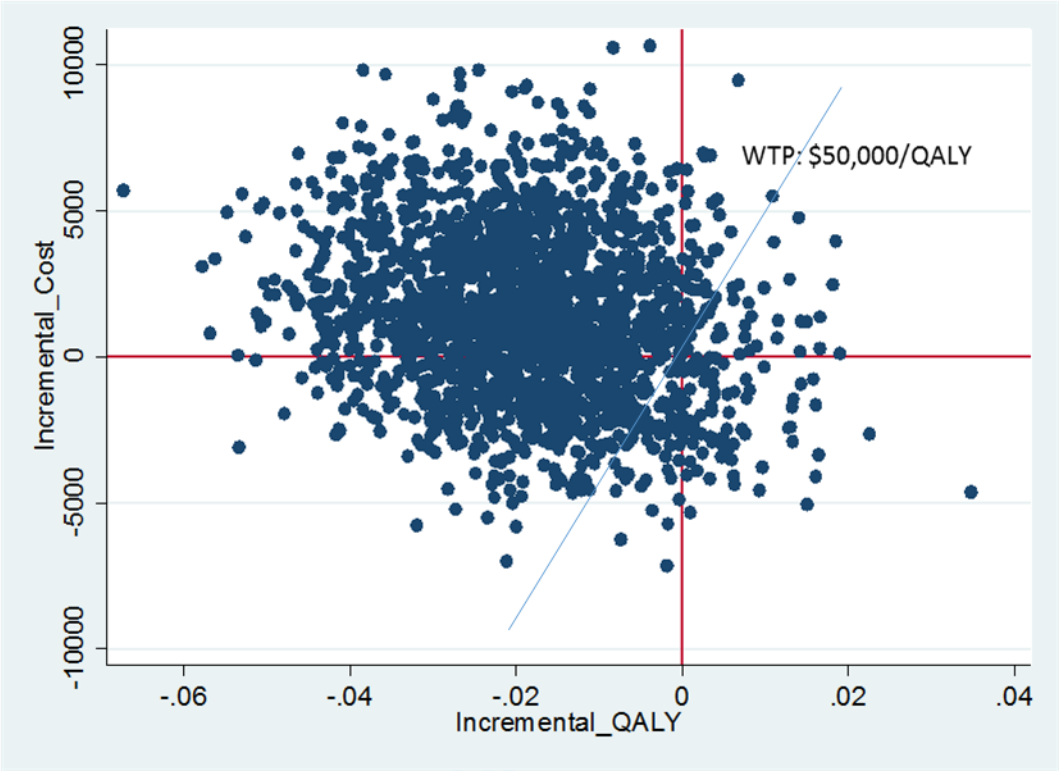

Figure VI Cost-effectiveness plane_ societal perspective including productivity cost (multiple imputation analysis)

WTP: willingness-to-pay; QALY: quality-adjusted life year

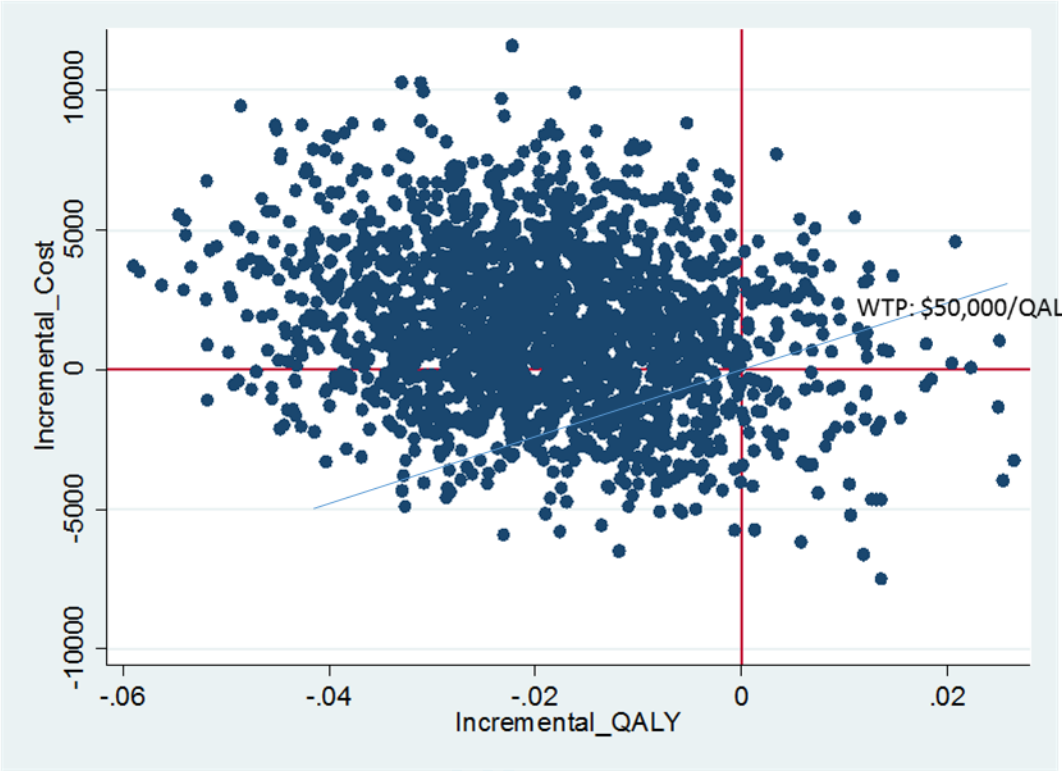

Figure VII Cost-effectiveness plane_ societal perspective excluding productivity cost (multiple imputation analysis)

WTP: willingness-to-pay; QALY: quality-adjusted life year

References

1. Claesson L, Gosman-Hedstrom G, Johannesson M, Fagerberg B, Blomstrand C. Resource utilization and costs of stroke unit care integrated in a care continuum: A 1-year controlled, prospective, randomized study in elderly patients: the Goteborg 70+ Stroke Study. Stroke 2000;31(11):2569-77.
2. Bernhardt J, Dewey H, Thrift A, Collier J, Donnan G. A very early rehabilitation trial for stroke (AVERT) phase II safety and feasibility. Stroke 2008;39(2):390-6.

Section/item	Item No	Recommendation	Reported on page No/ line No
Title and abstract			
Title	1	Identify the study as an economic evaluation or use more specific terms such as "cost-effectiveness analysis", and describe the interventions compared.	1
Abstract	2	Provide a structured summary of objectives, perspective, setting, methods (including study design and inputs), results (including base case and uncertainty analyses), and conclusions.	4-5
Introduction			
Background and objectives	3	Provide an explicit statement of the broader context for the study.	7
		Present the study question and its relevance for health policy or practice decisions.	8
Methods			
Target population and subgroups	4	Describe characteristics of the base case population and subgroups analysed, including why they were chosen.	12
Setting and location	5	State relevant aspects of the system(s) in which the decision(s) need(s) to be made.	9
Study perspective	6	Describe the perspective of the study and relate this to the costs being evaluated.	9
Comparators	7	Describe the interventions or strategies being compared and state why they were chosen.	8
Time horizon	8	State the time horizon(s) over which costs and consequences are being evaluated and say why appropriate.	11
Discount rate	9	Report the choice of discount rate(s) used for costs and outcomes and say why appropriate.	11
Choice of health outcomes	10	Describe what outcomes were used as the measure(s) of benefit in the evaluation and their relevance for the type of analysis performed.	8-9
Measurement of effectiveness	11a	*Single study-based estimates:* Describe fully the design features of the single effectiveness study and why the single study was a sufficient source of clinical effectiveness data.	12
	11b	*Synthesis-based estimates:* Describe fully the methods used for identification of included studies and synthesis of clinical effectiveness data.	
Measurement and valuation of preference based outcomes	12	If applicable, describe the population and methods used to elicit preferences for outcomes.	9
Estimating resources and costs	13a	*Single study-based economic evaluation:* Describe approaches used to estimate resource use associated with the alternative interventions. Describe primary or secondary research methods for valuing each resource item in terms of its unit cost. Describe any adjustments made to approximate to opportunity costs.	9-10
	13b	*Model-based economic evaluation:* Describe approaches and data sources used to estimate resource use associated with model health states. Describe primary or secondary research methods for valuing each resource item in terms of its unit cost. Describe any adjustments made to approximate to opportunity costs.	
Currency, price date, and conversion	14	Report the dates of the estimated resource quantities and unit costs. Describe methods for adjusting estimated unit costs to the year of reported costs if necessary. Describe methods for converting costs into a common currency base and the exchange rate.	10
Choice of model	15	Describe and give reasons for the specific type of decision-analytical model used. Providing a figure to show model structure is strongly recommended.	
Assumptions	16	Describe all structural or other assumptions underpinning the decision-analytical model.	
Analytical methods	17	Describe all analytical methods supporting the evaluation. This could include methods for dealing with skewed, missing, or censored data; extrapolation methods; methods for pooling data; approaches to validate or make adjustments (such as half cycle corrections) to a model; and methods for handling population heterogeneity and uncertainty.	11-12
Results			
Study parameters	18	Report the values, ranges, references, and, if used, probability distributions for all parameters. Report reasons or sources for distributions used to represent uncertainty where appropriate. Providing a table to show the input values is strongly recommended.	N/A
Incremental costs and outcomes	19	For each intervention, report mean values for the main categories of estimated costs and outcomes of interest, as well as mean differences between the comparator groups. If applicable, report incremental cost-effectiveness ratios.	14-15
Characterising uncertainty	20a	*Single study-based economic evaluation:* Describe the effects of sampling uncertainty for the estimated incremental cost and incremental effectiveness parameters, together with the impact of methodological assumptions (such as discount rate, study perspective).	14
	20b	*Model-based economic evaluation:* Describe the effects on the results of uncertainty for all input parameters, and uncertainty related to the structure of the model and assumptions.	
Characterising heterogeneity	21	If applicable, report differences in costs, outcomes, or cost-effectiveness that can be explained by variations between subgroups of patients with different baseline characteristics or other observed variability in effects that are not reducible by more information.	
Discussion			
Study findings, limitations, generalisability, and current	22	Summarise key study findings and describe how they support the conclusions reached. Discuss limitations and the generalisability of the findings and how the findings fit with current knowledge.	16-21

knowledge

Other			
Source of funding	23	Describe how the study was funded and the role of the funder in the identification, design, conduct, and reporting of the analysis. Describe other non-monetary sources of support.	22
Conflicts of interest	24	Describe any potential for conflict of interest of study contributors in accordance with journal policy. In the absence of a journal policy, we recommend authors comply with International Committee of Medical Journal Editors recommendations.	22

For consistency, the CHEERS statement checklist format is based on the format of the CONSORT statement checklist

BMJ Open

Economic evaluation of a phase III international randomised controlled trial of very early mobilisation after stroke (AVERT)

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Primary Subject Heading:	Neurology
Secondary Subject Heading:	Rehabilitation medicine
Keywords:	Stroke < NEUROLOGY, rehabilitation, AVERT, economic evaluation, cost-effectiveness analysis, cost-utility analysis

Title Page

Title

Economic evaluation of a phase III international randomised controlled trial of very early mobilisation after stroke (AVERT)

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Cover title

Economic evaluation of AVERT trial

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Abstract

Objectives While Very Early Mobilisation (VEM) intervention for stroke patients was shown not to be effective at 3 months, 12 -month clinical and economic outcomes remain unknown. It was aimed to assess cost-effectiveness of a VEM intervention within a Phase III randomised controlled trial (RCT).

Design An economic evaluation alongside a RCT

Setting Multi-country RCT involved 58 stroke centres.

Participants 2104 patients with acute stroke who were admitted to a stroke unit.

Intervention A very early rehabilitation within 24 hours of stroke onset

Methods Cost-utility analyses were undertaken according to pre-specified protocol measuring VEM against usual care (UC) based on 12 -month outcomes. The analysis was conducted using both health sector and societal perspectives. Unit costs were sourced from participating countries. Details on resource use (both health and non-health) were sourced from Cost Case Report Form. Dichotomised Modified Rankin Scale (mRS) scores (0-2 vs 3-6) and Quality Adjusted Life Years (QALYs) were used to compare the treatment effect of VEM and UC. The base case analysis was performed on an Intention-To-Treat (ITT) basis and 95% confidence intervals (CI) for cost and QALYs were estimated by bootstrapping. Sensitivity analysis were conducted to examine the robustness of base case results.

Results VEM and UC groups were comparable in the quantity of resource use and cost of each component. There were no differences in the probability of achieving a favourable mRS outcome (0.030, 95%CI: -0.022 to 0.082), QALYs (0.013, 95%CI: -0.041 to 0.016) and cost (AUD1082, 95%CI: -$2520 to $4685) from a health sector perspective; or AUD$102, 95%CI:

-$6907 to $7111, from a societal perspective including productivity cost). Sensitivity analysis achieved results with mostly overlapped CIs.

Conclusions VEM and UC were associated with comparable costs, mRS outcome and QALY gains at 12 months. Compared with to UC, VEM is unlikely to be cost-effective.

Trial registration Australian New Zealand ClinicalTrials Registry, number ACTRN12606000185561.

Strength and limitations

- This is the first economic evaluation assessing the cost-effectiveness of a very early rehabilitation intervention within the largest Phase III randomised controlled trial in patients with stroke;
- The study assessed the long-term cost and cost-effectiveness of this very early rehabilitation intervention at 12-month;
- The difficulty posed by the multi-country design of the trial and the percentage of missing data may undermine the confidence in the results.

Introduction

Stroke is one of the biggest killers and a leading cause of disability worldwide.[1 2] 65% of stroke survivors live with some degree of disability that impedes their ability to carry out daily living activities unassisted.[3] Therefore, ways of improving the outcomes of patients after stroke is an important focus of research.[4 5] Early mobilisation after stroke is believed to contribute to better patient outcomes and clinical trials have been conducted globally.[6-9]

The short-term efficacy and safety of a very early rehabilitation trial after stroke (AVERT) has been evaluated in a phase III randomised controlled trial (RCT) with 2,104 patients enrolled from Australia, New Zealand, United Kingdom, Singapore and Malaysia.[10] The evidence from this trial indicated that at three months after stroke, very early mobilisation (VEM) of patients was associated with a reduction in the probability of a favourable outcome as defined by a modified Rankin Scale (mRS) score of 0-2 compared to that in the usual care (UC) group.[10] In the research field of stroke, primary endpoint is usually assessed at month 3 after stroke[11-14], which means there is a paucity of data in terms of long-term resource use and cost of care for patients with stroke. Given AVERT provided a longer-term (i.e. 12 months) comprehensive measurement of costs relating to stroke care (i.e. direct medical, direct non-medical, and indirect costs), and the broader representativeness of patients across countries and regions (>2000 patients were recruited from both developing and developed world), together with the implications of stroke economic burden sustained beyond the acute phase (i.e., 3 months), holistically examining the cost of stroke care that falls within health and non-health sectors could potentially advance understanding of pattern of resource use post stroke and identify any gaps to improve care for stroke and chances to curb the increasing economic burden of disease.

This examination also benefits healthcare funders (i.e. governments, insurance companies) and the public with addition of substantial knowledge of long-term rehabilitation cost for stroke.

This economic evaluation, which was part of the registered trial protocol (Australian New Zealand Clinical Trials Registry, ACTRN12606000185561) and planned prior to knowledge of outcomes, was conducted alongside the Phase III RCT,[10] The aim of this paper is to assess the cost-effectiveness of very early mobilisation within 24 hours after stroke in terms of improving patient outcomes at 12-months, in comparison to usual care (UC), with a particular focus on examining the resource use and cost of care after stroke.

Methods

The economic analysis was undertaken following the previously published plan.[15] It also conforms to the Consolidated Health Economic Evaluation Reporting Standards (CHEERS) checklist.[16] Ethics approval was granted by relevant institutions.

Intervention and comparator

The trial design has been reported in detail elsewhere.[10] In brief, patients with confirmed stroke who were admitted to a stroke unit within 24 hours of stroke onset were randomised to receive usual stroke-unit care (UC) alone or VEM in addition to UC in a multinational Phase III trial.

Outcomes

The mRS at 12-months, a secondary outcome of the trial, and Quality-Adjusted life years (QALYs) derived from the Assessment of Quality of Life-4D (AQoL-4D)[17] were used as the effectiveness measures in the economic evaluation. The AQoL-4D instrument is a multi-

attribute utility scale used to assess the health-related quality of life (HRQoL)[18]; it was administered at 3 and 12 months.

Outcome of mRS was dichotomised into "favourable" (mRS 0-2) and "poor" (mRS 3-6) based on patients outcomes at 12-month follow up.[10] The difference in the probability of patients achieving a favourable mRS outcome (mRS 0-2) was used to estimate the incremental benefits between treatment groups for the primary efficacy outcome.

Due to the inherent difficulties of administering the AQoL instrument to acute stroke patients (i.e. most of patients were not able to respond to these questions at baseline), the mRS score at baseline[10] was used as a surrogate measure of patient utility during the acute phase. The detailed methods of this work are reported elsewhere[19] and a brief description is supplied in the online Supplementary document 1.

Costs

A societal perspective with a key focus on the health sector was adopted.

Intervention delivery

Intervention delivery costs consisted of the time costs of physiotherapists (PT) and nurses delivering VEM (or UC) to patients. The mean of the total physiotherapist time (recorded by a log documented by each participating PT across whole hospital stay) per patient was calculated. Given insufficient data, physiotherapist's mean time per session was used as a proxy for nurse time spent on delivering either VEM or UC.

Resource use

All resource use during the study period was electronically collated using a validated Cost Case Report Form (Cost CRF) administered and recorded by trained staff at 3- and 12-months using face to face assessments with patients and carers, and medical records. Cost CRF used in Australia is supplied as an example (Supplementary document 2). Cost CRF from other participating countries could be requested from corresponding author.

Healthcare resource use

The quantity of resources used for the following health care resource items was recorded: number of ambulance transfers (emergency and non-emergency), acute hospitalisation (including length of stay, LoS), rehospitalisation (number of occasions and LoS for each occasion), rehabilitation hospital admission (number of occasions and LoS for each occasion), outpatient rehabilitation program (number of occasions and number of days for each occasion), rehabilitation provided at home/nursing facility (number of occasions and number of sessions for each occasion), private physiotherapy (number of sessions), respite care (number of sessions) and individual outpatient (including physiotherapy, occupational therapy, and speech and language therapy) visits (service type and number of sessions) for patients from United Kingdom, Singapore and Malaysia only.

Non-healthcare resource use

The quantity of resources used was recorded for the following non-heath care resource items: accommodation move due to stroke (location moved to and date of move), community service (type of service use and number of service used both for prior to and post-stroke), home modification (type of modification, supplier and cost), special equipment and aids (type of equipment/aids and quantity consumed), informal care (purpose of the care and hours used), live-in maids (number of maids prior to and post stroke) (for Singapore and Malaysia only),

changes to employment (employment status and weekly hours of working both prior to and post-stroke).

Resource use reported at 3 (i.e. resources used between 0 and 3 months) and 12 (i.e. resources used between 4 and 12 months) months was used to calculate the total annual resource use for each participant. Generally, where patients were still using a particular resource at the time of 12-month data collection, the last day of 12 months' follow-up (calculated from the day of index stroke) was used to estimate the duration of that resource utilisation. In the event of a patient dying, resource use data for the period prior to death was ascertained from their carer and medical records, wherever possible.

Unit costing

Costs were computed by applying country-specific unit costs to each resource item utilised. Therefore, five sets of unit costs (one for each of the participating countries) were compiled from the most up-to-date and reliable source (Supplementary document 3). Unit costs from a country with a similar economic status and healthcare system were used where local country-specific unit costs were unavailable.

All costs are expressed in Australian dollars (AUD) for the 2015 reference year value and can be converted to United States dollar (USD) using the Purchasing Power Parity rate 1 USD=1.463 AUD[20] (December 2015). The currency of other countries was converted to AUD using the corresponding exchange rate. The country-specific Consumer Price Index (CPI) from the health sector was employed to adjust costs not valued in the year of 2015.

The details of unit cost for acute stroke hospitalisation, rehospitalisation, rehabilitation (inpatient and outpatient), non-health sector costs (home modifications, community services, aids etc.) and productivity cost are provided in Supplementary document 3.

Statistical analysis

All the costs that were attributable to stroke including healthcare costs, non-healthcare costs and productivity costs were accounted for in the economic analysis. Since a 12 month economic evaluation was undertaken, no discounting was applied to either costs or benefits.

Quantity of resource use and costs were summarised using medians and interquartile ranges (IQRs) due the skewness of the raw data. Means and standard deviations (SDs) were also reported. Base case analysis of the economic evaluation was performed based on the Intention-to-Treat (ITT) population[21] with an assumption for the main analysis that data were Missing At Random (MAR). The difference in costs was analysed using Generalised Linear regression Model (GLM) with gamma family and a log link, with treatment groups as an independent variable, including baseline National Institutes of Health Stroke Scale (NIHSS), baseline mRS[15] and age as treatment covariates.

For the primary outcome, the mRS score at 12 months was compared following the method detailed in the Statistical Analysis Plan.[22] While for the secondary effectiveness outcome (i.e. the QALY gains at 12 months), a linear regression model with treatment group as the factor variable and 12 months AQoL-4D utility value as the dependent variable, adjusted for age, baseline mRS was utilised to estimate the difference in QALY gains over 12 months. Non-parametric bootstrap simulations with 2000 replications were used to calculate 95% confidence intervals (CIs) around mean difference in costs and effects for cost-effectiveness analysis. To

examine the cost-effectiveness of VEM measured against UC, Incremental Cost-Effectiveness Ratios (ICERs) were calculated where applicable. For the ICER from a societal perspective, all the costs from health and non-health sector were summed together, including the productivity cost; for ICER of a health sector perspective, all the costs borne by healthcare system were counted (i.e. excluding non-healthcare costs and productivity cost). The differences between groups in terms of costs and benefits (i.e. QALYs) were compared regardless of the statistical significance of the difference.[23] Cost-effectiveness acceptability curves were plotted to show the probability of VEM being the optimal choice. The ICERs were compared with a common benchmark in Australia of ≤AUD50,000 per QALY.[24] All the analyses were performed using the STATA 14.0 statistical package (StataCorp. 2015. Release 14. StataCorp LP.)

Sensitivity analyses

To investigate the impact of using country-specific costs, a country dummy variable was added to the GLM analysis to adjust for country effect.[25] Subgroup analysis on the basis of individual countries were also conducted to explore the difference in costs and benefits across countries.

Multiple imputation was performed to test the sensitivity of results to the missing data assumption. The missing patterns were explored with the use of logit regression to investigate if any of the other variables predicted whether a given variable was missing[26] (Supplementary document 4).

Secondary analyses were undertaken to assess the robustness of the base case results. Subgroup analyses were performed at the country-specific level to test for differences in efficacy and costs.

Patient and Public involvement

No patient and public were involved.

Results

Between July 2006 and October 2014, 2,104 patients (VEM 1,054; UC 1,050) were recruited across 58 sites from Australia (N=1,054, 24 sites), New Zealand (N=189, 1 site), United Kingdom (N=610, 29 sites), Singapore (N=128, 1 site) and Malaysia (N=123, 1 site). At recruitment, over 80% of patients had no prior history of stroke; NIHSS was greater than 7 points (indicating a moderate to severe stroke) for around 45% of patients; 26% aged over 80 years and 24% had received recombinant tissue plasminogen activator prior to randomisation[10]. Baseline characteristics were similar between the two treatment groups[10].

Outcomes

There was no difference between VEM and UC groups in terms of favourable mRS outcome and quality of life (as measured by AQoL-4D) at month 12. Specifically, a comparable percentage of patients from both treatment groups achieved a favourable outcome at 12 months after stroke (between-group difference in probability: 0.030, 95%CI:-0.021 to 0.082, adjusted for baseline age and NIHSS). Likewise, for the outcome of AQoL-4D at 12 months, no between-group difference was observed (-0.013, 95%CI:-0.043 to 0.017). The detailed mRS outcomes are presented in Supplementary document 5: Table I.

Resource use and costs

The proportion of patients reporting use of a specific resource varied from item to item (Table 1). In relation to the healthcare resource items, nearly half of patients experienced rehabilitation hospital admission and more than a quarter of patients had a stroke-related rehospitalisation, rehabilitation service use (outpatient/provided at home or nursing facility) and ambulant transfers whereas only a small proportion of patients (less than 10%) recorded the use of private physiotherapy and/or respite care. Regarding non-health-related resource use, the majority of patients (>50%) used some form of special aids or equipment during the 12 months after their index stroke, whilst nearly 40% of patients received informal care, and around 27% reported the use of community services and home modifications. Only 16% (VEM) and 17% (UC) of patients respectively, experienced accommodation changes due to the index stroke. For maid's service use in the home in Singapore and Malaysia, a small proportion (less than 10%) of patients hired a maid both before and after the index stroke.

With respect to productivity, nearly one in four patients were employed prior to their stroke; this proportion fell to only one in eight patients at 12 months follow up. Generally, resource use was comparable between VEM and UC groups ($p > 0.05$) across all items (Table 1).

The median total medical cost was marginally higher in the UC group ($20,411, IQR: $7,238 to $63,835) than in the VEM group ($19,271, IQR: $6,294 to $52,637), primarily due to the higher rehabilitation admission cost in UC. In both groups, the major cost component was acute hospitalisation which accounted for around 30% of medical costs. The median non-medical cost was also marginally higher in the UC group ($438, IQR: $0 to $4,561) than in the VEM group ($358, IQR: $0 to $3,334). The median productivity cost was zero for both treatment groups given that less than one quarter of patients were in paid employment before the index stroke. Overall, the median total cost (including productivity cost and non-medical costs) were nominally higher in the UC group ($27,042, IQR: $7,257 to $63,824) compared to the VEM group ($25,675, IQR: $6,766 to $63,617). The detailed costs of each resource item and

summary costs are presented in Table 2. The costs for VEM and UC interventions are summarised in Supplementary document 5: Table II.

Generally, the cost from VEM and UC groups were comparable: the differences between VEM and UC groups was $1082 (95%CI: -$2399, $4563) for the total medical cost (Supplementary document 6: Table I) and $3 (95%CI: -$5, $12) for the productivity cost per person at 12 months; the between-group difference in the total non-health care cost was -$1300 (95%CI: -$3361, $760) over the same period of time.

Cost-effectiveness analysis

The between group difference in both efficacy and cost outcomes generated from the GLM model are presented in Supplementary document 6: Table I.

In the base case health sector perspective analysis, the VEM yielded comparable total medical costs ($1082, 95%CI: -$2520 to $4685, p=0.544) and QALY gains (-0.013, 95%CI: -0.041 to 0.016) at 12 months. When a societal perspective was adopted, the VEM entailed, again, similar costs with the UC group ($102, 95%CI: -$6907 to $7111, p=0.982, including productivity costs) or (-$6, 95%CI: -$5476 to $5463, p=0.933, excluding productivity costs) (Table 3).

The cost-effectiveness planes and cost-effectiveness acceptability curves from the two perspectives are shown in Supplementary document 7: Figures I to V.

Sensitivity analyses

Inclusion of a country dummy variable in the analysis produced similar results to the base case (Supplementary document 6: Table II).

The analysis from imputed data including all randomised participants produced consistent results with regard to the incremental cost and effectiveness between treatment groups. For example, from a health sector perspective, VEM was associated with similar costs ($940, 95%CI: $-4622 to $4682) and QALY gains (-0.019, 95%CI:-0.044 to 0.005) over 12 months. (Supplementary document 6: Table III and Supplementary document 7: Figures VI-VIII)

The country-specific analysis showed similar results in the between-group differences for both costs and QALYs, indicating that VEM and UC yielded comparable results within each participating countries (Table 4).

When a societal perspective was assumed, again, the point estimate of difference in costs between groups across countries varied substantially, with the 95% confidence intervals mostly overlapping (Table 4).

Discussion

The 12 months within-trial cost-effectiveness analysis showed that VEM was unlikely to be cost-effective than UC in patients with stroke. Between-group differences in costs and benefits (probability of achieving a favourable outcome of mRS and differences in QALYs) over the one year study period were comparable from a health sector perspective. The findings from this economic evaluation is also underpinning an adapted version of trial underway to investigate the effectiveness of optimal rehabilitation in patients with mild to moderate stroke

(i.e. AVERT-DOSE, National Health and Medical Research Council Australia, project grant #1139712).

Our earlier economic evaluation of the phase II AVERT trial which consisted of only 71 patients (38 VEM and 33 UC) from two Australian centres reported that VEM was likely to be a cost-effective intervention with both less cost and more benefit when compared to UC.[27] Since it was a national pilot study with a limited sample, the direct comparison between the results from this and our current economic evaluation is problematic. In addition, inconsistent with the pilot study, no service shifting was observed in the current study. Across all resource use components, the proportion of patients consuming specific types of resources were comparable between the two groups in this study. On the contrary, in the Phase II AVERT trial, patients from VEM group were more likely to be discharged earlier from hospital than their UC counterparts; those discharged early tended to use more care provided in the outpatient setting, which incurred lower costs; and informal care was not costed. In the current study, the LoS for acute hospitalisation and rehabilitation were similar between treatment groups (median: VEM 16 vs UC 17 days). These differences between the two studies highlight the importance of large, adequately powered studies to inform health care policy.

In this study, resources used were valued on the basis of country-specific unit costs sourced for each participating country. To counteract any concern arising from the adoption of this approach, extensive sensitivity analyses were performed to test the robustness of the results. The conduct of incorporation of a country dummy variable into the model or country-specific analysis did not alter the outcomes substantially, with the resultant 95% confidence intervals overlapping to a great extent. Ramsey et al. 2015 suggest that a country-specific costing approach is likely to yield few qualitative differences in summary measures of cost-effectiveness among countries with similar levels of economic development.[25] Therefore, it was believed that any differences in economic status of the participating countries (as reflected

by the unit costs applied in our study) are unlikely to bear a major influence on the results of the cost-effective analysis.

This multinational trial also revealed that in managing patients post-stroke, practice of stroke care varied from country to country. Although 100% of patients with stroke were hospitalised for the initial acute care, the LoS differs significantly greatly, ranging from 4 days (Malaysia) to 25 days (New Zealand), which might be attributable to the different severity of stroke and/or differences in clinical practice care processes. Moreover, in Malaysia, patients tended to receive rehabilitation services in an outpatient (i.e. up to 52% of patients received the outpatients rehabilitation program services) rather than inpatient (i.e. only up to 2% patients were admitted to rehabilitation hospital) setting; and patients were less likely to utilise ambulant transfer and apply home modifications, as compared to participants from other countries. This might be a signal for future study around stroke care in Malaysia, research potentially could be helpful to improve the service delivery for outpatient rehabilitation program. Patients from western countries consumed more community services and rehabilitation services that provided at home/nursing home than their Asian counterparts, which reflects the difference in social welfare and healthcare systems.

Economic evaluations have been conducted for other types of stroke rehabilitation interventions including early-supported discharge service, community- or home-based rehabilitation. [28-36] Generally, these interventions trended towards being cost-saving measured against usual practice. In regards to health-related quality of life (HRQoL) outcomes measured by a series of quality of life instruments (including SF-36, WHOQoL-Bref, Nottingham Health Profile, Sickness Impact Profile and EQ-5D), most studies did not detect an overall significant effect.[28-32 34 35 37] Only one study reported a significant difference improvement in the overall

HRQoL score.[36] The conclusions drawn from these economic evaluations of stroke rehabilitation interventions were fairly consistent; the interventions were likely to cost less,[33 34 37-42] although the difference in costs was statistically significant in only one study.[41] None of these studies evaluated the costs and benefits, particularly benefits measured in terms of QALYs, in an aggregated manner, and all were limited by small sample sizes. Another study using a Markov model explored the increased intensity of physiotherapy for stroke patients from a health system perspective, concluding that increased physiotherapy could be cost-effective by improving health outcomes and reducing costs due to the resultant shorter stay in rehabilitation facilities.[43]

Given that it is not practical to obtain a baseline utility value from patients with stroke, in this study, the baseline AQoL value was mapped from mRS score at baseline.[15] Whilst the mapping exercise was carried out using the baseline mRS score and AQoL values at 3 and 12 months, the significant variation in the mapped baseline utility values for patients falling within the same category of mRS hampered its application to the current economic evaluation. Instead, only the 12-month utility values were compared to approximate the difference in QALY gains over one year between the two treatment groups. Comprehensive sensitivity analyses were undertaken surrounding this assumption. It was observed that there was no noticeable difference among approaches examining the annual QALY gain difference between VEM and UC.

Whilst the results from the clinical study showed that there were no significant differences in either costs or effects between treatment groups, the cost-effectiveness analysis was still performed to investigate the possible ICER of the VEM intervention. It is possible to have greater confidence in the joint outcome of costs and QALYs than looking at them individually.[44]

To the best of our knowledge, this study evaluated the cost-effectiveness of the largest international acute stroke rehabilitation trial ever conducted. The cost-effectiveness analysis was performed alongside the randomised controlled trial, where the costs and benefits data were collected prospectively. Moreover, the Cost CRF was completed by trained and blinded assessors via interviews with individual patients/carers and accessing medical records, which provides for greater accuracy than resource use questionnaires or diaries completed by participants themselves. Since the trial was designed in a pragmatic manner, with close resemblance to real clinical practice, it is believed that the assessment of its cost and cost-effectiveness under this setting reflects the real-life resource use (health and non-health).

This study provides some insights for future economic evaluation alongside multi-country, multi-centre clinical trials. It is important to note that given the large number of centres involved (56 stroke units across five geographical jurisdictions), it was not practical or reasonable to collect centre-specific unit costs which probably leads to huge variations even within a single country. Country-level unit costs were therefore applied to the valuation of resource uses across the trial sites. However, the heterogeneity in the resource utilisation and unit cost among the included countries undermines confidence in the conclusion. A country-specific economic evaluation might be more appropriate in this regard but the lacking of statistical power poses another concern. The current study made a trade-off between them both approaches by presenting both the aggregated (i.e. base case of pooling all countries) and disaggregated (i.e. sensitivity analysis of individual countries) form of results. The resource utilisation, costs and benefits were also tabulated across all sites and individually to allow close scrutiny from various perspectives. [28] It is believed that this practice can be recommended to other multi-country studies.

A couple of limitations of the study are acknowledged. Firstly, the missing data on total costs from a societal perspective was around 24%, and related mainly to the missing information on

community services (10.9%) and productivity loss (10.7%). The base case analysis was based on the ITT population with an assumption of missing pattern being MAR. To account for this, the sensitivity analysis using multiple imputation was undertaken and yielded the identical conclusion (i.e. comparable results in costs and benefits between treatment groups). Secondly, unit costs originating from individual countries were assigned to value resource use. The differences in health care systems and cost structures among the five participating countries may potentially confound the cost comparisons between groups. However, analysis by country produced results consistent with the base case, which overcomes any concern that the latter were heavily weighted towards Australia, the largest sample country.

Conclusions

This economic evaluation alongside a phase III RCT evidenced that based on the ITT population, the VEM intervention for patients with stroke was unlikely to be cost-effective compared to UC. The sensitivity analyses based on the multiple imputation and subgroup analyses by each country separately yielded fairly consistent results. Overall, the VEM intervention was demonstrated to be comparable with UC in terms of both benefits and costs at one-year, however given its poorer outcomes at 3 months, VEM cannot be recommended to clinicians, patients or policymakers.

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Authors' Contribution

Conception/design, revising and final approval: LG, LS, LC, OW, MM, JC, FE, JB, HD, MMoodie. Methodology: LG, MM, LS, LC, MMoodie, OW. Data analysis: LG, LS, MM, LC. Drafting: LG, MMoodie.

Competing Interests Statement

All authors confirm that there is nothing to declare.

Data Availability Statement

No additional data available

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Tables

Table 1. Quantity of resource use over 12 months (ITT) (median, IQR)

	AU (N=1054)		NZ (N=189)		UK (N=610)		SG (N=128)		MA (N=123)		All Countries	
	VEM	UC	VEM	UC	VEM	UC	VEM	UC	VEM	UC	VEM	UC
Acute hospitalisation												
% of patients using	100	100	100	100	100	100	100	100	100	100	100	100
LoS (days)	21(6-42)	22(7-46)	23(6-57)	25(8-48)	12(4-45)	13(5-4)	16(4-25)	18(4-25)	5(3-8)	4(2-8)	16(4-41)	17(5-41)
Stroke-related rehospitalisation												
% of patients using	30	29	28	33	28	23	20	20	18	23	28	27
No. readmission/s	1(1-2)	1(1-2)	1(1-2)	1(1-2)	1(1-2)	1(1-2)	1(1-2)	2(1-2)	1(1-2)	1(1-2)	1(1-2)	1(1-2)
Admission to rehabilitation hospital[‡]												
% of patients using	62	56	60	65	35	34	45	56	0	2	50	47
No. of admission/s	1(0-1)	1(0-1)	1(0-1)	1(0-1)	0(0-1)	0(0-1)	0(0-1)	1(0-1)	0(0-0)	0(0-0)	0(0-1)	1(1-1)
Outpatient rehabilitation program												
% of patients using	40	39	23	19	12	10	19	25	52	48	30	28
No. of services	15(6-29)	12(6-28)	16(7-28)	17(12-34)	12(6-21)	7(4-14)	32(20-77)	29(3-116)	15(7-24)	16(4-22)	15(6-28)	12(6-27)
Rehabilitation provided at home/nursing facility												
% of patients using	30	33	57	52	50	46	3	2	2	2	35	34
No. of services	9(4-22)	10(4-25)	18(8-29)	16(9-30)	12(6-28)	12(6-30)	81(63-99)	9(9-9)	104(104-104)	8(8-8)	12(5-27)	12(5-28)
Ambulance transfer												
% of pts using	51	53	34	48	41	38	36	28	5	8	43	44
No. of trips	2(1-3)	2(1-3)	2(1-3)	1(1-3)	2(1-3)	2(1-3)	1(1-2)	1(1-2)	2(2-3)	2(1-3)	2(1-3)	2(1-3)
Individual allied health therapy												
% of pts using	N/A	N/A	N/A	N/A	19	15	-	2	20	25	-	-
No. of services	N/A	N/A	N/A	N/A	8(2-12)	8(4-15)	-	2(2-2)	8(3-10)	16(8-31)	-	-
Private physiotherapy												

% of pts using	9	8	11	1	5	5	8	8	3	2	8	6
No. of services	5(3-19)	6(4-19)	13(6-18)	3(3-3)	12(6-33)	7(1-14)	18(16-24)	14(7-24)	12(11-13)	8(8-8)	15(4-20)	24(3-19)
Respite care												
% of pts using	3	2	3	2	2	3	-	-	-	2	2	2
No. of services	21(10-43)	15(11-35)	12(10-20)	7(5-8)	24(9-40)	21(12-80)	-	-	-	30(N/A)	18(9-39)	18(9-41)
Accommodation moves												
% of pts using	18	17	19	28	13	14	11	20	23	10	16	17
No. of moves	1(1-1)	1(1-1)	1(1-1)	1(1-1)	1(1-1)	1(1-1)	1(1-1)	1(1-1)	1(1-2)	2(1-2)	1(1-1)	1(1-1)
Community Services used prior to having a stroke over the past year												
% of pts using	13	17	6	7	5	5	-	-	-	-	9	11
No. of services	26(26-52)	26(26-52)	52(39-88)	46(14-52)	52(25-104)	40(15-131)	-	-	-	-	27(26-52)	26(26-52)
Community services used over 12 months after stroke												
% of pts using	30	35	32	28	31	28	-	3	6	-	27	28
No. of services	28(18-72)	32(12-78)	130(47-233)	48(17-256)	42(12-185)	90(12-310)	-	3(3-3)	6(3-73)	-	39(14-119)	39(12-124)
Home modifications undertaken over 12 months												
% of pts using	27	30	20	17	36	33	16	19	3	10	27	28
No. of mods	2(1-2)	2(1-2)	1(1-2)	2(1-2)	1(1-2)	2(1-2)	1(1-2)	1(1-2)	1(1-1)	1(1-1)	1(1-2)	2(1-2)
Aids and appliances used over 12 months												
% of pts using	46	47	55	63	58	51	44	45	58	59	51	50
No. of aids/appliance used	2(1-5)	2(1-4)	3(2-6)	2(1-4)	4(2-6)	4(2-6)	2(2-3)	2(1-3)	2(1-3)	2(1-3)	3(1-5)	3(1-5)
Working prior to stroke												
% of patients	24	23	38	34	19	21	52	52	45	33	27	26
Hrs worked/week	40(27-50)	40(30-50)	40(37-40)	40(37-40)	40(25-48)	37(25-40)	48(40-56)	45(36-50)	42(40-56)	45(32-50)	40(30-50)	40(30-50)
Proportion working at 12 months												
% of patients	15	12	20	16	7	9	25	22	24	15	14	12
Hrs worked/week	38(18-40)	25(12-40)	40(20-40)	40(38-40)	35(26-40)	30(24-37)	39(16-46)	35(23-44)	40(32-47)	45(30-50)	38(20-41)	30(16-40)

Patients from Malaysia and Singapore who had a maid prior to stroke												
% of patients	-	-	-	-	-	-	19	16	5	10	-	-
No. of maids	-	-	-	-	-	-	1(1-1)	1(1-1)	1(1-1)	1(1-1)	-	-
Patients from Singapore and Malaysia who had a maid at 12 months following stroke												
% of patients	-	-	-	-	-	-	23	22	5	7	-	-
No. of maids	-	-	-	-	-	-	1(1-1)	1(1-1)	1(1-1)	1(1-1)	-	-
Receipt of informal care at 12 months												
% of patients	35	39	37	33	41	40	30	36	42	44	37	39
No. of hrs/week	15(6-34)	12(4-31)	8(3-21)	14(6-30)	21(9-34)	17(7-35)	35(13-46)	16(4-30)	22(10-38)	16(5-26)	18(7-35)	14(5-32)

ITT: Intention-to-treat; AU: Australia; NZ: New Zealand; UK: United Kingdom; SG: Singapore; MA: Malaysia; LoS: length of stay; pts: patients; No.: number; hrs: hours; mod: modification; -: no such resource use; all numbers were expressed as median and interquartile range (IQR); [‡] includes any admissions to rehabilitation hospital following the indexed stroke;

Table 2 Cost of all the resources used over 12 months (AUD)

	AU (N=1054)		NZ (N=189)		UK (N=610)		SG (N=128)		MA (N=123)		All Countries	
	VEM	UC	VEM	UC	VEM	UC	VEM	UC	VEM	UC	VEM	UC
Health care cost (AUD)												
Acute hospitalisation												
Median, IQR	$6294 (6294, 9553)	$6294 (6294, 9553)	$6104 (4370, 6104)	$6104 (4370, 6104)	$2763 (1382, 6563)	$3109 (1727, 6563)	$1493 (1493, 1809)	$1493 (1493, 1493)	$1363 (1363, 1572)	$1363 (1363, 1572)	$6294 (2279, 9535)	$6294 (2418, 9553)
Mean, SD	$9883 (9484)	$10010(10508)	$6635 (3244)	$6549 (3555)	$5714(7876)	$5885 (7101)	$1721 (547)	$1676 (432)	$1482 (212)	$1472 (200)	$7369 (8469)	$7521 (8916)
Stroke-related rehospitalisation												
Median, IQR	$0 (0, 3850)	$0 (0, 3850)	$0 (0, 325)	$0 (0, 2243)	$227 (227, 1401)	$227 (227, 227)	$111 (111, 111)	$111 (111, 111)	$68 (68, 68)	$68 (68, 68)	$111 (0, 1401)	$111 (0, 610)
Mean, SD	$6030 (17114)	$6473 (21590)	$651 (1371)	$1507 (2828)	$4524 (13968)	$3494(11349)	$2756 (7565)	$1679 (3465)	$714 (1608)	$603 (1479)	$4610 (14518)	$4551 (16707)
Admission to rehab hospital												
Median, IQR	$13134 (0, 36371)	$13134 (0, 38391)	$11262 (0, 30983)	$11262 (0, 26486)	$0 (0, 29788)	$0 (0, 29788)	$0 (0, 2921)	$1298 (0, 3570)	$0 (0, 0)	$0 (0, 0)	$0 (0, 29788)	$1136 (0, 29788)
Mean, SD	$25667 (38892)	$26648(38315)	$16871(18536)	$15573(16848)	$12539(19682)	$11758 (18390)	$1815 (2759)	$2798 (5082)	$0 (0)	$43 (234)	$18197 (31241)	$18458 (30811)
Outpatient rehab program												
Median, IQR	$0 (0, 2451)	$0 (0, 1913)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 36)	$33 (0, 265)	$0 (0, 249)	$0 (0, 478)	$0 (0, 239)
Mean, SD	$2081 (4183)	$1934 (5316)	$821 (2236)	$721 (1991)	$266 (1026)	$155 (676)	$364 (1090)	$562 (1478)	$174 (286)	$126 (206)	$1246 (3244)	$1142 (3976)
Rehab provided at home/nursing facility												
Median, IQR	$0 (0, 717)	$0 (0, 956)	$1168 (0, 4299)	$212 (0, 3821)	$922 (0, 11064)	$0 (0, 11064)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 1913)	$0 (0, 1913)
Mean, SD	$1382 (4069)	$1551 (4252)	$3171 (4960)	$3111 (5754)	$12085 (28516)	$11051 (26723)	$93 (570)	$5 (42)	$97 (719)	$7 (53)	$4447 (16294)	$4180 (15203)
Individual allied health visit												
Median, IQR	N/A	N/A	N/A	N/A	$0 (0,0)	$0 (0,0)	$0 (0,0)	$0 (0,179)	$0 (0,0)	$0 (0,0)	N/A	N/A
Mean, SD	N/A	N/A	N/A	N/A	$375 (1144)	$329 (1291)	$432 (1521)	$1126 (3150)	$0 (0)	$0.2 (2)	N/A	N/A
Ambulance transfers												
Median, IQR	$508 (0, 1015)	$508 (0, 1015)	$0 (0, 646)	$0 (0, 646)	$0 (0, 1150)	$0 (0, 575)	$0 (0, 265)	$0 (0, 265)	$0 (0, 0)	$0 (0, 0)	$0 (0, 611)	$0 (0, 610)
Mean, SD	$671 (1057)	$623 (946)	$543 (1082)	$605 (928)	$790 (3209)	$701 (3150)	$164 (348)	$113 (208)	$6 (26)	$14 (64)	$627 (1920)	$578 (1838)
Private physiotherapy												
Median, IQR	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)
Mean, SD	$70 (375)	$124 (797)	$245 (1308)	$4 (36)	$128 (780)	$174 (2102)	$238 (1096)	$333 (1938)	$4 (19)	$1 (9)	$109 (693)	$132 (1336)
Respite care												
Median, IQR	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)
Mean, SD	$48 (355)	$20 (182)	$7 (46)	$2 (15)	$9 (95)	$58 (686)	$0 (0)	$0 (0)	$0 (0)	$1 (8)	$27 (259)	$27 (386)
	AU (N=1054)		NZ (N=189)		UK (N=610)		SG (N=128)		MA (N=123)		All Countries	
	VEM	UC	VEM	UC	VEM	UC	VEM	UC	VEM	UC	VEM	UC

Sub-total												
Median (IQR)	$29278 (8218, 63622)	$29441 (9811, 62489)	$20621 (6068, 46909)	$23722 (7316, 40162)	$18896 (4030, 48999)	$20843 (3682, 47908)	$4525 (1604, 8668)	$4687 (2724, 10926)	$1713 (1431, 2532)	$1746 (1431, 2348)	$19271 (6294, 52637)	$20411 (7238, 63835)
Mean (SD)	$45620 (51458)	$47453(53715)	$28898 (25011)	$27986(22676)	$34863 (42509)	$32842 (39517)	$7681 (8828)	$8358 (8787)	$2385(1587)	$2269(1574)	$36351 (45620)	$36604 (46309)
Non-health care cost												
Accommodation moves												
Median, IQR	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)
Mean, SD	$2089 (8518)	$2482 (9323)	$5975 (19614)	$9135 (26918)	$2901 (12958)	$2532 (11125)	$72 (578)	$108 (507)	$425 (1893)	$104 (501)	$2460 (11036)	$2821 (12212)
Community services												
Median, IQR	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 430)	$0 (0, 174)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)
Mean, SD	$570 (2681)	$1091 (8556)	$238 (950)	$1022 (4113)	$22275(294988)	$10738 (57306)	$0 (0)	$244 (1902)	$21 (110)	$0 (0)	$6870 (160318)	$3786 (31893)
Home modifications												
Median, IQR	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)
Mean, SD	$805 (6338)	$751 (7715)	$833 (4862)	$565 (3204)	$352 (2133)	$834 (7091)	$234 (1079)	$62 (299)	$49 (369)	$64 (237)	594 (4840)	$676 (6734)
Special aids and equipment												
Median, IQR	$0 (0, 332)	$0 (0, 318)	$70 (0, 549)	$103 (0, 357)	$27 (0, 786)	$0 (0, 846)	$0 (0, 240)	$0 (0, 210)	$15 (0, 218)	$36 (0, 186)	$0 (0, 414)	$0 (0, 414)
Mean, SD	$1986 (7668)	$2787 (10396)	$2198 (7993)	$1798 (7229)	$1354(3649)	$1720 (5083)	$1117 (5843)	$1079 (5483)	$153 (252)	$193 (658)	$1660 (6426)	$2141 (8328)
Informal care												
Median, IQR	$24 (0, 503)	$48 (0, 455)	$14 (0, 283)	$0 (0, 149)	$29 (0, 471)	$29 (0, 375)	$0 (0, 114)	$0 (0, 238)	$24 (0, 60)	$9 (0, 50)	$24 (0, 407)	$24 (0, 407)
Mean, SD	$414 (747)	$405 (758)	$236 (536)	$152 (311)	$324 (516)	$324 (645)	$144 (285)	$159 (300)	$43 (57)	$27 (34)	$335 (633)	$322 (660)
Living-in maids												
Median, IQR	N/A	N/A	N/A	N/A	N/A	N/A	$0 (0,0)	$0 (0,0)	$0 (0,0)	$0 (0,0)	N/A	N/A
Mean, SD	N/A	N/A	N/A	N/A	N/A	N/A	$3154 (8146)	$4268(11338)	$179 (930)	$83 (504)	N/A	N/A
Sub-total												
Median (IGR)	$459 (0, 3334)	$673 (0, 5209)	$381 (0, 3674)	$638 (103, 14551)	$758 (0, 5097)	$471 (0, 4725)	$25 (0, 1293)	$194 (0, 6999)	$74 (0, 285)	$57 (0, 318)	$358 (0, 3334)	$438 (0, 4561)
Mean (SD)	$6104 (15582)	$6985 (17554)	$7752 (17751)	$11981(27676)	$27892(306917)	$15345(61750)	$4802 (10366)	$6177 (13942)	$861 (2272)	$484 (1113)	$12043 (164026)	$9360 (36504)
Productivity cost												
Median, IQR	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)
Mean, SD	$75 (317)	$84 (391)	$29 (130)	$14 (54)	$17 (152)	$44 (245)	$6 (29)	$8 (35)	$1 (4)	$0.4 (3)	$46 (246)	$58 (312)
Total cost												
Median (IGR)	$33203 (9687, 71902)	$35143 (12696, 74070)	$29934 (8528, 65781)	$32216 (15710, 68292)	$25374 (4712, 64285)	$30537 (4629, 67012)	$6960 (1674, 26187)	$8810 (3426, 19493)	$2016 (1561, 3994)	$1816 (1537, 3301)	$25675 (6766, 63617)	$27042 (7257, 63824)
Mean (SD)	$52456(57264)	$56408(62536)	$40381(37242)	$43901(43170)	$65530(332044)	$49627(78644)	$15036(16921)	$16340(19650)	$3609(3985)	$2938(2350)	$50448(184931)	$47627(64249)

Where only a low proportion (i.e. less than 50%) of patient reported certain types of resource utilisation, zero median and/or IQR are reported. *In Malaysia, the length of stay for acute stroke hospitalisation includes a patient's immediate admission to rehabilitation hospital on discharge from hospital as the rehabilitation service immediately following the acute stroke hospitalisation is not routinely provided.

Table 3. Baseline cost-utility analysis_ ITT

	QALYs	Per capita mean cost (AUD)
Health care perspective		
Total medical costs	-0.013 (-0.041, 0.016)	$1082 (-$2520, $4685)
Societal perspective		
Total medical and non-medical costs (excl. productivity cost)	-0.013 (-0.041, 0.016)	-$6 (-$5476, $5463)
Total medical and non-medical costs (incl. productivity cost)	-0.013 (-0.041, 0.016)	$102 (-$6907, $7111)

ITT: Intention-to-treat; QALYs: Quality-adjusted Life Years; AUD: Australian dollar; excl: excluding; incl: including

Table 4 Results of country-specific analysis of costs and benefits

	AU (N=1054)	NZ (N=189)	UK (N=610)	SG (N=128)	MA (N=123)
Total medical costs	$948 (-$4352, $6248)	-$2836 (-$8403, $2730)	$2937 (-$3635, $9509)	-$81 (-$2789, $2627)	$137 (-$324, $599)
Total non-medical costs	-$1318 (-$3038, $403)	-$3959 (-$7769, -$150)	-$1387 (-$7331, $4557)	-$3164 (-$6834, $505)	$200 (-$232, $631)
Total cost (incl. productivity)	-$1735 (-$8482, 5013)	-$8981 (-$18380, $418)	$1870 (-$13955, $17694)	-$2636 (-$9233, $3961)	$479 (-$487, $1446)
Total cost (excl. productivity)	-$1185 (-$7184, $4815)	-$7610 (-$15302, $82)	$2552 (-$11377, $16481)	-$1534 (-$6464, $3395)	$416 (-$364, $1196)
QALY gains	-0.036 (-0.076, 0.003)	0.086 (-0.003, 0.176)	-0.010 (-0.064, 0.044)	0.008 (-0.106, 0.123)	0.003 (-0.126, 0.132)

AU: Australia; NZ: New Zealand; UK: United Kingdom; SG: Singapore; MA: Malaysia; QALY: Quality-adjusted Life Year.
*the p-value was >0.05 for the between-group difference in QALYs and cost

Supplementary document 1: Mapping baseline mRS score to utility of AQoL-4D

Methods

Generalized additive model (GAM) with spline smother was used to map AQoL from pre-morbid mRS, stroke severity, and/ or age group. The performance of the models was evaluated using mean absolute, mean squared errors (MAE and MSE) and R2. 10-fold cross- validation was implemented for model validation. The mapped baseline utility of AQoL-4D was used in the following models.

The analyses are structured as follows:

Model 1:

a) A complete case model with the utility value at 12 months as an output, group as an input, and pre- morbid mRS as a covariate;

b) A complete case model with the utility value at 12 months as an output, group as an input, and pre- morbid mRS + stroke severity as covariates;

c) A complete case model with the utility value at 12 months as an output, group as an input, and pre- morbid mRS + stroke severity + age group as covariates;

d) Sensitivity analyses for the unadjusted model using pattern-mixture models that confirm that there is no statistically significant difference between the groups for the plausible range of changes of a parameter that describes the departure from the assumed "missing-at-random" pattern.

Model 2:

a) A complete case model with the difference between utility value at 12 months and baseline mapped utility value as an output and group as an input;

b) A complete case model with the difference between utility value at 12 months and baseline mapped utility value as an output and group as an input + stroke severity as a covariate;

c) A complete case model with the difference between utility value at 12 months and baseline mapped utility value as an output and group as an input + stroke severity and age group as covariates;

d) Sensitivity analyses for the unadjusted model using pattern-mixture models that confirm that there is no statistically significant difference between the groups for the plausible range of changes of a parameter that describes the departure from the assumed "missing-at-random" pattern.

Model 3:

a) A complete case model with the difference between utility value at 12 months and baseline mapped utility value as an output, group as an input, and baseline mapped utility value as a covariate;

b) A complete case model with the difference between utility value at 12 months and baseline mapped utility value as an output, group as an input, and baseline mapped utility value + stroke severity as covariates;

c) A complete case model with the difference between utility value at 12 months and baseline mapped utility value as an output, group as an input, and baseline mapped utility value + stroke severity + age group as covariates;

d) Sensitivity analyses for the unadjusted model using pattern-mixture models that confirm that there is no statistically significant difference between the groups for the plausible range of changes of a parameter that describes the departure from the assumed "missing-at-random" pattern.

Model 4:

a) A complete case model with the utility value at 12 months as an output, group as an input, and baseline mapped utility value as a covariate;

b) A complete case model with the utility value at 12 months as an output, group as an input, and baseline mapped utility value + stroke severity as covariates;

c) A complete case model with the utility value at 12 months as an output, group as an input, and baseline mapped utility value + stroke severity + age group as covariates;

d) Sensitivity analyses for the unadjusted model using pattern-mixture models that confirm that there is no statistically significant difference between the groups for the plausible range of changes of a parameter that describes the departure from the assumed "missing-at-random" pattern.

Results

Table I. Difference in utility values between treatment groups by different models

	a	**b**	**c**	**d**	
				1	**2**
Model 1	-0.011 (-0.042, 0.020)	-0.015 (-0.042, 0.011)	-0.016 (-0.042,0.010)	-0.026 (-0.062, 0.009)	0.006 (-0.030, 0.041)
Model 2*	-0.001 (-0.046, 0.044)	-0.007 (-0.047, 0.034)	-0.008 (-0.048, 0.031)	-0.007 (-0.062, 0.048)	0.005 (-0.050, 0.060)
Model 3*	-0.008 (-0.043, 0.026)	-0.014 (-0.043, 0.016)	-0.015 (-0.043, 0.014)	-0.014 (-0.052, 0.033)	0.002 (-0.050, 0.045)
Model 4	-0.008 (-0.043, 0.026)	-0.014 (-0.043, 0.016)	-0.015 (-0.043, 0.014)	-0.026 (-0.062, 0.010)	0.006 (-0.030, 0.042)

*models 2 and 3 used the mapped baseline AQol utility to estimate the QALY gains over 12 month for each patient.

As shown in Table 1, using the mapped baseline AQoL utility value and the 12 month AQoL

utility value to calculate the difference in QALYs between treatment groups (results from models 2 and 3) yielded similar results to the primary analysis (-0.013 , 95%CI [-0.043, 0.018]), and the 95% confidence

Supplementary document 2: Cost Case Report Form (CRF)

The Cost CRF was originally developed via pathway analysis during Phase II of AVERT to identify resource items associated with the trial11. Since the Phase II of AVERT trial was a national project and resource utilisation tools were tailored to the Australian setting, the form was further modified to accommodate international differences in the acute service delivery, rehabilitation and post-acute care. An extensive review of country-specific literature and consultation with international AVERT project team members based in each country were undertaken to tailor the Cost CRF tool to each participating country.

Case Report Form - Cost

National Stroke Research Institute

PATIENT STUDY NUMBER ☐☐☐☐☐

PATIENT INITIALS ☐☐☐

NOTE: this one form is to be completed AND faxed following BOTH the 3 and 12 month interviews.
When CRF Cost complete at 3 months AND at 12 months, fax all pages 25-36 to the Data Fax.

Instructions to the person responding: These questions are about health care provided as a consequence of the stroke which occurred on (give date of stroke) or as a result of any further stroke. I will be asking about health care such as visits to hospital, rehabilitation, therapy at home, equipment and work. To help us work out the cost of stroke to the community, and to you and your family, I will be asking about how often services were provided and their cost.

Subject's stroke date
Obtain from CRF - Screening Day 0 ☐☐ / ☐☐ / ☐☐☐☐

---

3 MONTH DATE OF ASSESSMENT ☐☐ / ☐☐ / ☐☐☐☐ **Assessor initials** ☐☐☐

PERSON RESPONDING

- Index case ☐
- Spouse/partner ☐
- Sibling ☐
- Son/Daughter ☐
- Parent ☐
- Other relative ☐
- Friend/Associate/Neighbour ☐
- Carer, e.g. nurse ☐
- Other, unspecified ☐

ASSISTANCE FOR INTERVIEW OBTAINED FROM

- Index case ☐
- Spouse/partner ☐
- Sibling ☐
- Son/Daughter ☐
- Parent ☐
- Other relative ☐
- Friend/Associate/Neighbour ☐
- Carer, e.g. nurse ☐
- Other, unspecified ☐

LIVING ARRANGEMENT OF RESPONDENT*

- Living with index ☐
- Not living with index ☐
- Professional carer in nursing home or hostel ☐

---

12 MONTH DATE OF ASSESSMENT ☐☐ / ☐☐ / ☐☐☐☐ **Assessor initials** ☐☐☐

PERSON RESPONDING

- Index case ☐
- Spouse/partner ☐
- Sibling ☐
- Son/Daughter ☐
- Parent ☐
- Other relative ☐
- Friend/Associate/Neighbour ☐
- Carer, e.g. nurse ☐
- Other, unspecified ☐

ASSISTANCE FOR INTERVIEW OBTAINED FROM

- Index case ☐
- Spouse/partner ☐
- Sibling ☐
- Son/Daughter ☐
- Parent ☐
- Other relative ☐
- Friend/Associate/Neighbour ☐
- Carer, e.g. nurse ☐
- Other, unspecified ☐

LIVING ARRANGEMENT OF RESPONDENT*

- Living with index ☐
- Not living with index ☐
- Professional carer in nursing home or hostel ☐

*** Please note:** this is the 'normal' living arrangement of the respondent with respect to the subject, even if the subject is currently in hospital

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Case Report Form - Cost

National Stroke Research Institute

PATIENT STUDY NUMBER ☐☐☐☐☐

PATIENT INITIALS ☐☐☐

1) DISCHARGE

Date of discharge from acute care

☐☐ / ☐☐ / ☐☐☐☐

Acute discharge destination

- Home ☐
- Rehabilitation ward/hospital ☐
- Supported residential service (SRS) ☐
- Hostel ☐
- Nursing home ☐
- Other ☐
- Unknown ☐

Date of admission to inpatient rehabilitation

☐☐ / ☐☐ / ☐☐☐☐

Date of discharge from inpatient rehabilitation

☐☐ / ☐☐ / ☐☐☐☐

Leave dates BLANK if not applicable
Please note: inpatient rehabilitation is inclusive of geriatric evaluation and transitional care.

Discharge destination after inpatient rehab

- Home ☐
- Rehabilitation hospital ☐
- Supported residential service (SRS) ☐
- Hostel ☐
- Nursing home ☐
- Other ☐
- Unknown ☐

Leave BLANK if not applicable

2) LIVING ARRANGEMENT

Pre-stroke residential address

- Own house, flat – alone ☐
- Own house, flat – with family/relative/friend ☐
- Home of relative/friend ☐
- Supported residential service (SRS) ☐
- Hostel ☐
- Nursing home ☐
- Other ☐
- Unknown ☐

Residential address at 3 months*

- Own house, flat – alone ☐
- Own house, flat – with family/relative/friend ☐
- Home of relative/friend ☐
- Supported residential service (SRS) ☐
- Hostel ☐
- Nursing home ☐
- Other ☐
- Unknown ☐

Residential address at 12 months*

- Own house, flat – alone ☐
- Own house, flat – family/relative/friend ☐
- Home of relative/friend ☐
- Supported residential service (SRS) ☐
- Hostel ☐
- Nursing home ☐
- Other ☐
- Unknown ☐

*** Please note if the subject is currently a hospital inpatient (acute or subacute), record their current residential address, NOT the hospital address**

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Case Report Form - Cost

National Stroke Research Institute

PATIENT STUDY NUMBER

PATIENT INITIALS

3) CHANGE IN LIVING ARRANGEMENTS

As a consequence of your stroke, have you needed to change your place of residence?

If NO, proceed to question 4.

*** Please note: if subject has been a hospital inpatient this is NOT a change of residence**

3 months	Yes ☐	No ☐	Unknown ☐
3-12 months	Yes ☐	No ☐	Unknown ☐

	DATE OF MOVE	LOCATION
1)	/ /	Own home or unit ☐ Home of relative/friend ☐ SRS ☐ Hostel ☐ Nursing home ☐ Other ☐
2)	/ /	Own home or unit ☐ Home of relative/friend ☐ SRS ☐ Hostel ☐ Nursing home ☐ Other ☐
3)	/ /	Own home or unit ☐ Home of relative/friend ☐ SRS ☐ Hostel ☐ Nursing home ☐ Other ☐
4)	/ /	Own home or unit ☐ Home of relative/friend ☐ SRS ☐ Hostel ☐ Nursing home ☐ Other ☐

4) AMBULANCE TRANSFERS: EMERGENCY AND NON-EMERGENCY

As a consequence of your stroke, have you required ambulance transport after your acute admission to hospital?*

If NO, please proceed to question 5

3 months	Yes ☐	No ☐	Unknown ☐
3-12 months	Yes ☐	No ☐	Unknown ☐

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Count number of ambulance trips (recruitment to 3 months) ☐☐

Count number of ambulance trips (from 3 to 12 months) ☐☐

*** Include post-acute transfers (eg - acute to rehab)**

Case Report Form - Cost

National Stroke Research Institute

PATIENT STUDY NUMBER

PATIENT INITIALS

5) HOSPITALISATION OR EMERGENCY DEPARTMENT ATTENDANCES

5a) Have you been readmitted to hospital or attended the emergency department as a consequence of another stroke or for any stroke related problems?

3 months	Yes ☐	No ☐	Unknown ☐
3-12 months	Yes ☐	No ☐	Unknown ☐

(ONLY include information for admissions and attendances for stroke-related problems (see below for summary list of stroke-related problems and CRF completion manual for further clarification)

If NO, proceed to question 6

5b) If YES, Start with the earliest admission or attendance. If patient NOT discharged at 3 month assessment, leave discharge dates BLANK (complete dates at 12 month assessment)

	Hospital code	Date admitted	Date discharged	If patient not discharged at 12 month assessment, cross box.
Admission or Attendance 1 - Hospital name		/ /	/ /	☐
Admission or Attendance 2 - Hospital name		/ /	/ /	☐
Admission or Attendance 3 - Hospital name		/ /	/ /	☐
Admission or Attendance 4 - Hospital name		/ /	/ /	☐
Admission or Attendance 5 - Hospital name		/ /	/ /	☐

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Stroke related problems include: 1. Recurrent stroke, 2. TIA or suspected TIA, 3. Seizure, 4. Pneumonia/chest infection, 5. UTI, 6. Urinary catheter-related problem, 7. Mood disorder, 8. Falls, 9. Fractures, 10. DVT, 11. Pulmonary Embolism, 12. Complications of stroke treatment or stroke prevention, 13. Haemorrhage, 14. Nutritional problem, 15. Gastroscopy/colonoscopy/barium enema or other procedure to investigate GI haemorrhage, 16. Cerebral angiography, 17. Carotid endarectomy, 18. Carotid (or other cerebral vessel) angioplasty and/or stenting 19. Surgery or procedural management of of an atrial septal defect or patent foramen ovale, 20. Surgical or electrophysiological procedure to treat AF, 21. Inability to manage at home, 22. Increased confusion or cognitive impairment, 23. Constipation - investigation or treatment, 24. Urinary incontinence, 25. Post-stroke pain (incl. headache), 26. Pressure sores.

Case Report Form - Cost

National Stroke Research Institute

PATIENT STUDY NUMBER

PATIENT INITIALS

6) INPATIENT REHABILITATION ADMISSION

After your stroke on (give date of stroke), were you admitted to a Rehabilitation Hospital or other hospital where you received rehabilitation treatment? Please include admissions with the care type 'rehabilitation', 'geriatric evaluation' and 'transitional care'

3 months	Yes ☐	No ☐	Unknown ☐
3-12 months	Yes ☐	No ☐	Unknown ☐

If NO, proceed to question 7.
If YES, complete inpatient rehabilitation admission details, starting from your first inpatient rehabilitation admission.
If patient NOT discharged at 3 month assessment, leave discharge dates BLANK (complete dates at 12 month assessment)

	Rehab hospital code	Date admitted	Date discharged	If patient not discharged at 12 month assessment, cross box.
Admission 1- Rehabilitation hospital name		/ /	/ /	☐
Admission 2- Rehabilitation hospital name		/ /	/ /	☐
Admission 3- Rehabilitation hospital name		/ /	/ /	☐

7) OUTPATIENT REHABILITATION PROGRAM

Did you attend or are you attending an outpatient rehabilitation program as a consequence of your stroke?
e.g. with physiotherapy, occupational therapy, speech therapy, etc
An outpatient rehabilitation program is any rehabilitation program where the patient attends a facility. The program can be located at a hospital or community facility.

3 months	Yes ☐	No ☐	Unknown ☐
3-12 months	Yes ☐	No ☐	Unknown ☐

If NO, proceed to question 8.
If YES, complete outpatient rehabilitation details, starting from your first outpatient rehabilitation visit.
If patient NOT discharged at 3 month assessment, leave discharge dates and number of days attended BLANK (complete dates at 12 month assessment)

	Rehab facility code	Date admitted	Date discharged	Total number of DAYS attended	If patient not discharged at 12 month assessment, cross box.
Admission 1 - Outpatient rehabilitation name		/ /	/ /		☐
Admission 2 - Outpatient rehabilitation name		/ /	/ /		☐
Admission 3 - Outpatient rehabilitation name		/ /	/ /		☐

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Case Report Form - Cost

National Stroke Research Institute

PATIENT STUDY NUMBER

PATIENT INITIALS

8) REHABILITATION SERVICES PROVIDED AT HOME OR IN A NURSING HOME

Have you had a rehabilitation program provided to you at home or a nursing home as a consequence of your stroke? e.g. with physiotherapy, occupational therapy, speech

3 months	Yes ☐	No ☐	Unknown ☐
3-12 months	Yes ☐	No ☐	Unknown ☐

If NO, proceed to question 9.
If YES, complete rehabilitation details, starting from the first visit since your stroke. Count number of sessions.
If patient NOT discharged at 3 month assessment, leave discharge dates and number of sessions BLANK (complete dates at 12 month assessment)

	Rehab service code	Start date	Cease date	Total number of SESSIONS	If patient not discharged at 12 month assessment, cross box.
Time 1 - Rehabilitation service name		/ /	/ /		☐
Time 2 - Rehabilitation service name		/ /	/ /		☐
Time 3 - Rehabilitation service name		/ /	/ /		☐
Time 4 - Rehabilitation service name		/ /	/ /		☐

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Case Report Form - Cost

National Stroke Research Institute

PATIENT STUDY NUMBER

PATIENT INITIALS

9) COMMUNITY SERVICES

9a) Did you receive any community services in the year PRIOR to your stroke? Yes ☐ No ☐ Unknown ☐

Community services are individual care services provided at home and do NOT include rehabilitation therapy.
If NO, proceed to question 9b.
If YES, which service/s did you receive in the year PRIOR to your stroke?

Community service codes
1 = Nursing Service
2 = Delivered Meals
3 = Personal Care (Bath/Shower)
4 = Housework help
5 = Gardening/home maintenance
6 = Home respite
7 = Other service, specify

Which service did you receive? (One service code per line)	How many times in the past year did you receive the service?
☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7	
☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7	
☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7	
☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7	

If "other" (code 7), please specify

9b) Have you received community services SINCE the stroke?

3 months	Yes ☐	No ☐	Unknown ☐
3-12 months	Yes ☐	No ☐	Unknown ☐

Community services are individual care services provided at home and do NOT include rehabilitation therapy.
If NO, proceed to question 10.
If YES, which service/s did you receive AFTER your stroke?
For each service, complete a seperate line. If a service is ongoing at 3 month interview, enter data for 3 months, and then add service data for 3-12 months on a separate line.

Note: hours per service NOT applicable to delivered meals

Community service codes
1 = Nursing Service
2 = Delivered Meals
3 = Personal Care (Bath/Shower)
4 = Housework help
5 = Gardening/home maintenance
6 = Home respite
7 = Other service, specify

Which service did you receive? (One service code per line)	How many times did you receive the service?	How many hours per service?
☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7		
☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7		
☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7		
☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7		
☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7		
☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7		

If "other" (code 7), please specify

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Case Report Form - Cost

National Stroke Research Institute

PATIENT STUDY NUMBER

PATIENT INITIALS

10) HOME MODIFICATIONS

Has your home been modified as a consequence of your stroke?
e.g. installation of rails, bathroom modifications, installation of ramp(s), kitchen modifications etc
If NO, proceed to question 11
If YES, please indicate the type of modifications, who supplied the modifications and estimate any personal cost to you.

3 months	Yes ☐	No ☐	Unknown ☐
3-12 months	Yes ☐	No ☐	Unknown ☐

SUPPLIERS
1 = Hospital/rehabilitation centre **3 = Veteran's Affairs** **5 = Housing commision** **7 = Other (specify)**
2 = Patient/family **4 = Local Council** **6 = Charity**

Type of modification (check box for each type supplied)	Who supplied the modification?	If supplier is "other", please specify	
☐ Rail(s) for steps/stairs	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7		Cost to you/family* - $
☐ Ramp(s)	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7		Cost to you/family* - $
☐ Platform step(s)	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7		Cost to you/family* - $
☐ Shower, bath and toilet rail(s)	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7		Cost to you/family* - $
☐ Shower(s) modification	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7		Cost to you/family* - $
☐ Toilet(s) modification	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7		Cost to you/family* - $
☐ Remove/modify door(s) from shower/toilet/bath	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7		Cost to you/family* - $
☐ Kitchen modifications	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7		Cost to you/family* - $
☐ Other modification (specify below)			
Other home modification - 1	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7		Cost to you/family* - $
Other home modification - 2	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7		Cost to you/family* - $

If total costs includes any aids, describe in brief below (see also list of aids on page 33):

*** If an overall cost is provided, please indicate type of modifications above, and provide the total cost here, INCLUSIVE of any known itemised costs listed above:**

Overall Cost $

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Case Report Form - Cost

National Stroke Research Institute

PATIENT STUDY NUMBER

PATIENT INITIALS

11) SPECIAL EQUIPMENT AND AIDS

Have you been given, hired or purchased any special equipment, aids or special food as a consequence of stroke?

3 months	Yes ☐	No ☐	Unknown ☐
3-12 months	Yes ☐	No ☐	Unknown ☐

Prompt: These may have been provided by an Occupational Therapist or Physiotherapist. What about a....?
If NO, proceed to question 12

Walking aids
- ☐ Single point stick
- ☐ Three or four point stick
- ☐ Walking frame - pick up
- ☐ Walking frame - wheelie
- ☐ Walking frame - gutter (forearm suppt)
- ☐ Crutch(es)

Mobility aids
- ☐ Manual wheelchair
- ☐ Electric wheelchair/scooter
- ☐ Car steering wheel knob

Eating aids
- ☐ Built-up cutlery
- ☐ Plate guard
- ☐ Non-slip mat
- ☐ Special food e.g. NG/PEG

If yes, number of days used:
3 months
3-12 months

Kitchen aids
- ☐ Tap handles
- ☐ Chopping board
- ☐ Modified knife
- ☐ Vitamiser/blender
- ☐ Non-slip mat

Lounge and bedroom equipment
- ☐ Chair platform/blocks raise
- ☐ Cushion to relieve pressure
- ☐ Special chair (NOT wheelchair)
- ☐ Table - bedside/wheelie
- ☐ Bed platform/block raise
- ☐ Bedstick
- ☐ Hospital bed (eg - height/tilt adjust)
- ☐ Mobile hoist/lifter

Bathroom equipment
- ☐ Over-toilet seat
- ☐ Toilet surround
- ☐ Bathroom and grooming aids
- ☐ Shower chair/stool
- ☐ Over bath seat
- ☐ Hand held shower
- ☐ Non-slip mat

Continence aids
- ☐ Urine bottle
- ☐ Bedpan
- ☐ Commode
- ☐ Incontinence sheet (bed protector)
- ☐ Incontinence sheet (kylie/bluey)

If yes, number of days used - 3 months
- ☐ Incontinence pads — 3-12 months

If yes, number of days used - 3 months
- ☐ Catheter — 3-12 months

If yes, number of days used - 3 months
3-12 months

General aids
- ☐ Long handled aid
- ☐ Blood pressure machine
- ☐ Treadmill
- ☐ Stationary bike
- ☐ Intercom (portable)
- ☐ Modified tap handles

If yes, number supplied

- ☐ Personal alarm

If yes, number of days supplied:
3 months
3-12 months

Any other aids/equipment, specify

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Case Report Form - Cost

National Stroke Research Institute

PATIENT STUDY NUMBER ☐☐☐☐☐

PATIENT INITIALS ☐☐☐

NOTE: this one form is to be completed AND faxed following BOTH the 3 and 12 month interviews.
When CRF Cost complete at 3 months AND at 12 months, fax all pages 25-36 to the Data Fax.

Instructions to the person responding: These questions are about health care provided as a consequence of the stroke which occurred on (give date of stroke) or as a result of any further stroke. I will be asking about health care such as visits to hospital, rehabilitation, therapy at home, equipment and work. To help us work out the cost of stroke to the community, and to you and your family, I will be asking about how often services were provided and their cost.

Subject's stroke date ☐☐ / ☐☐ / ☐☐☐☐
Obtain from CRF - Screening Day 0

---

3 MONTH DATE OF ASSESSMENT ☐☐ / ☐☐ / ☐☐☐☐ **Assessor initials** ☐☐☐

PERSON RESPONDING

Index case ☐ Other relative ☐
Spouse/partner ☐ Friend/Associate/Neighbour ☐
Sibling ☐ Carer, e.g. nurse ☐
Son/Daughter ☐ Other, unspecified ☐
Parent ☐

ASSISTANCE FOR INTERVIEW OBTAINED FROM

Index case ☐ Other relative ☐
Spouse/partner ☐ Friend/Associate/Neighbour ☐
Sibling ☐ Carer, e.g. nurse ☐
Son/Daughter ☐ Other, unspecified ☐
Parent ☐

LIVING ARRANGEMENT OF RESPONDENT*

Living with index ☐
Not living with index ☐
Professional carer in nursing home or hostel ☐

---

12 MONTH DATE OF ASSESSMENT ☐☐ / ☐☐ / ☐☐☐☐ **Assessor initials** ☐☐☐

PERSON RESPONDING

Index case ☐ Other relative ☐
Spouse/partner ☐ Friend/Associate/Neighbour ☐
Sibling ☐ Carer, e.g. nurse ☐
Son/Daughter ☐ Other, unspecified ☐
Parent ☐

ASSISTANCE FOR INTERVIEW OBTAINED FROM

Index case ☐ Other relative ☐
Spouse/partner ☐ Friend/Associate/Neighbour ☐
Sibling ☐ Carer, e.g. nurse ☐
Son/Daughter ☐ Other, unspecified ☐
Parent ☐

LIVING ARRANGEMENT OF RESPONDENT*

Living with index ☐
Not living with index ☐
Professional carer in nursing home or hostel ☐

*** Please note:** this is the 'normal' living arrangement of the respondent with respect to the subject, even if the subject is currently in hospital

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Case Report Form - Cost

National Stroke Research Institute

PATIENT STUDY NUMBER ☐☐☐☐☐

PATIENT INITIALS ☐☐☐

1) DISCHARGE

Date of discharge from acute care

☐☐ / ☐☐ / ☐☐☐☐

Acute discharge destination

- Home ☐
- Rehabilitation ward/hospital ☐
- Supported residential service (SRS) ☐
- Hostel ☐
- Nursing home ☐
- Other ☐
- Unknown ☐

Date of admission to inpatient rehabilitation

☐☐ / ☐☐ / ☐☐☐☐

Date of discharge from inpatient rehabilitation

☐☐ / ☐☐ / ☐☐☐☐

Leave dates BLANK if not applicable

Please note: inpatient rehabilitation is inclusive of geriatric evaluation and transitional care.

Discharge destination after inpatient rehab

- Home ☐
- Rehabilitation hospital ☐
- Supported residential service (SRS) ☐
- Hostel ☐
- Nursing home ☐
- Other ☐
- Unknown ☐

Leave BLANK if not applicable

2) LIVING ARRANGEMENT

Pre-stroke residential address

- Own house, flat – alone ☐
- Own house, flat – with family/relative/friend ☐
- Home of relative/friend ☐
- Supported residential service (SRS) ☐
- Hostel ☐
- Nursing home ☐
- Other ☐
- Unknown ☐

Residential address at 3 months*

- Own house, flat – alone ☐
- Own house, flat – with family/relative/friend ☐
- Home of relative/friend ☐
- Supported residential service (SRS) ☐
- Hostel ☐
- Nursing home ☐
- Other ☐
- Unknown ☐

Residential address at 12 months*

- Own house, flat – alone ☐
- Own house, flat – family/relative/friend ☐
- Home of relative/friend ☐
- Supported residential service (SRS) ☐
- Hostel ☐
- Nursing home ☐
- Other ☐
- Unknown ☐

*** Please note if the subject is currently a hospital inpatient (acute or subacute), record their current residential address, NOT the hospital address**

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Case Report Form - Cost

National Stroke Research Institute

PATIENT STUDY NUMBER

PATIENT INITIALS

3) CHANGE IN LIVING ARRANGEMENTS

As a consequence of your stroke, have you needed to change your place of residence?

If NO, proceed to question 4.

*** Please note: if subject has been a hospital inpatient this is NOT a change of residence**

3 months	Yes ☐	No ☐	Unknown ☐
3-12 months	Yes ☐	No ☐	Unknown ☐

	DATE OF MOVE	LOCATION
1)	/ /	Own home or unit ☐ Home of relative/friend ☐ SRS ☐ Hostel ☐ Nursing home ☐ Other ☐
2)	/ /	Own home or unit ☐ Home of relative/friend ☐ SRS ☐ Hostel ☐ Nursing home ☐ Other ☐
3)	/ /	Own home or unit ☐ Home of relative/friend ☐ SRS ☐ Hostel ☐ Nursing home ☐ Other ☐
4)	/ /	Own home or unit ☐ Home of relative/friend ☐ SRS ☐ Hostel ☐ Nursing home ☐ Other ☐

4) AMBULANCE TRANSFERS: EMERGENCY AND NON-EMERGENCY

As a consequence of your stroke, have you required ambulance transport after your acute admission to hospital?*

If NO, please proceed to question 5

3 months	Yes ☐	No ☐	Unknown ☐
3-12 months	Yes ☐	No ☐	Unknown ☐

Count number of ambulance trips (recruitment to 3 months) ☐☐

Count number of ambulance trips (from 3 to 12 months) ☐☐

*** Include post-acute transfers (eg - acute to rehab)**

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5) HOSPITALISATION OR EMERGENCY DEPARTMENT ATTENDANCES

5a) Have you been readmitted to hospital or attended the emergency department as a consequence of another stroke or for any stroke related problems?

(ONLY include information for admissions and attendances for stroke-related problems (see below for summary list of stroke-related problems and CRF completion manual for further clarification)

If NO, proceed to question 6

3 months	Yes ☐	No ☐	Unknown ☐
3-12 months	Yes ☐	No ☐	Unknown ☐

5b) If YES, Start with the earliest admission or attendance. If patient NOT discharged at 3 month assessment, leave discharge dates BLANK (complete dates at 12 month assessment)

	Hospital code	Date admitted	Date discharged	If patient not discharged at 12 month assessment, cross box.
Admission or Attendance 1 - Hospital name		/ /	/ /	☐
Admission or Attendance 2 - Hospital name		/ /	/ /	☐
Admission or Attendance 3 - Hospital name		/ /	/ /	☐
Admission or Attendance 4 - Hospital name		/ /	/ /	☐
Admission or Attendance 5 - Hospital name		/ /	/ /	☐

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Stroke related problems include: 1. Recurrent stroke, 2. TIA or suspected TIA, 3. Seizure, 4. Pneumonia/chest infection, 5. UTI, 6. Urinary catheter-related problem, 7. Mood disorder, 8. Falls, 9. Fractures, 10. DVT, 11. Pulmonary Embolism, 12. Complications of stroke treatment or stroke prevention, 13. Haemorrhage, 14. Nutritional problem, 15. Gastroscopy/colonoscopy/barium enema or other procedure to investigate GI haemorrhage, 16. Cerebral angiography, 17. Carotid endarectomy, 18. Carotid (or other cerebral vessel) angioplasty and/or stenting 19. Surgery or procedural management of of an atrial septal defect or patent foramen ovale, 20. Surgical or electrophysiological procedure to treat AF, 21. Inability to manage at home, 22. Increased confusion or cognitive impairment, 23. Constipation - investigation or treatment, 24. Urinary incontinence, 25. Post-stroke pain (incl. headache), 26. Pressure sores.

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6) INPATIENT REHABILITATION ADMISSION

After your stroke on (give date of stroke), were you admitted to a Rehabilitation Hospital or other hospital where you received rehabilitation treatment? Please include admissions with the care type 'rehabilitation', 'geriatric evaluation' and 'transitional care'

3 months	Yes ☐	No ☐	Unknown ☐
3-12 months	Yes ☐	No ☐	Unknown ☐

If NO, proceed to question 7.
If YES, complete inpatient rehabilitation admission details, starting from your first inpatient rehabilitation admission.
If patient NOT discharged at 3 month assessment, leave discharge dates BLANK (complete dates at 12 month assessment)

	Rehab hospital code	Date admitted	Date discharged	If patient not discharged at 12 month assessment, cross box.
Admission 1- Rehabilitation hospital name		/ /	/ /	☐
Admission 2- Rehabilitation hospital name		/ /	/ /	☐
Admission 3- Rehabilitation hospital name		/ /	/ /	☐

7) OUTPATIENT REHABILITATION PROGRAM

Did you attend or are you attending an outpatient rehabilitation program as a consequence of your stroke? e.g. with physiotherapy, occupational therapy, speech therapy, etc
An outpatient rehabilitation program is any rehabilitation program where the patient attends a facility. The program can be located at a hospital or community facility.

3 months	Yes ☐	No ☐	Unknown ☐
3-12 months	Yes ☐	No ☐	Unknown ☐

If NO, proceed to question 8.
If YES, complete outpatient rehabilitation details, starting from your first outpatient rehabilitation visit.
If patient NOT discharged at 3 month assessment, leave discharge dates and number of days attended BLANK (complete dates at 12 month assessment)

	Rehab facility code	Date admitted	Date discharged	Total number of DAYS attended	If patient not discharged at 12 month assessment, cross box.
Admission 1 - Outpatient rehabilitation name		/ /	/ /		☐
Admission 2 - Outpatient rehabilitation name		/ /	/ /		☐
Admission 3 - Outpatient rehabilitation name		/ /	/ /		☐

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8) REHABILITATION SERVICES PROVIDED AT HOME OR IN A NURSING HOME

Have you had a rehabilitation program provided to you at home or a nursing home as a consequence of your stroke? e.g. with physiotherapy, occupational therapy, speech

3 months	Yes ☐	No ☐	Unknown ☐
3-12 months	Yes ☐	No ☐	Unknown ☐

If NO, proceed to question 9.
If YES, complete rehabilitation details, starting from the first visit since your stroke. Count number of sessions.
If patient NOT discharged at 3 month assessment, leave discharge dates and number of sessions BLANK (complete dates at 12 month assessment)

	Rehab service code	Start date	Cease date	Total number of SESSIONS	If patient not discharged at 12 month assessment, cross box.
Time 1 - Rehabilitation service name		/ /	/ /		☐
Time 2 - Rehabilitation service name		/ /	/ /		☐
Time 3 - Rehabilitation service name		/ /	/ /		☐
Time 4 - Rehabilitation service name		/ /	/ /		☐

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PATIENT INITIALS _ _ _

9) COMMUNITY SERVICES

9a) Did you receive any community services in the year PRIOR to your stroke? Yes ☐ No ☐ Unknown ☐

Community services are individual care services provided at home and do NOT include rehabilitation therapy.
If NO, proceed to question 9b.
If YES, which service/s did you receive in the year PRIOR to your stroke?

Community service codes
1 = Nursing Service
2 = Delivered Meals
3 = Personal Care (Bath/Shower)
4 = Housework help
5 = Gardening/home maintenance
6 = Home respite
7 = Other service, specify

Which service did you receive? (One service code per line)	How many times in the past year did you receive the service?
☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7	☐☐☐
☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7	☐☐☐
☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7	☐☐☐
☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7	☐☐☐

If "other" (code 7), please specify

|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|

9b) Have you received community services SINCE the stroke?

3 months	Yes ☐	No ☐	Unknown ☐
3-12 months	Yes ☐	No ☐	Unknown ☐

Community services are individual care services provided at home and do NOT include rehabilitation therapy.
If NO, proceed to question 10.
If YES, which service/s did you receive AFTER your stroke?
For each service, complete a seperate line. If a service is ongoing at 3 month interview, enter data for 3 months, and then add service data for 3-12 months on a separate line.

Note: hours per service NOT applicable to delivered meals

Community service codes
1 = Nursing Service
2 = Delivered Meals
3 = Personal Care (Bath/Shower)
4 = Housework help
5 = Gardening/home maintenance
6 = Home respite
7 = Other service, specify

Which service did you receive? (One service code per line)	How many times did you receive the service?	How many hours per service?
☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7	☐☐☐	☐☐
☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7	☐☐☐	☐☐
☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7	☐☐☐	☐☐
☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7	☐☐☐	☐☐
☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7	☐☐☐	☐☐
☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7	☐☐☐	☐☐

If "other" (code 7), please specify

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PATIENT INITIALS

10) HOME MODIFICATIONS

Has your home been modified as a consequence of your stroke?
e.g. installation of rails, bathroom modifications, installation of ramp(s), kitchen modifications etc
If NO, proceed to question 11
If YES, please indicate the type of modifications, who supplied the modifications and estimate any personal cost to you.

3 months	Yes ☐	No ☐	Unknown ☐
3-12 months	Yes ☐	No ☐	Unknown ☐

SUPPLIERS
1 = Hospital/rehabilitation centre **3 = Veteran's Affairs** **5 = Housing commision** **7 = Other (specify)**
2 = Patient/family **4 = Local Council** **6 = Charity**

Type of modification (check box for each type supplied)	Who supplied the modification?	If supplier is "other", please specify	
☐ Rail(s) for steps/stairs	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7		Cost to you/family* - $
☐ Ramp(s)	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7		Cost to you/family* - $
☐ Platform step(s)	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7		Cost to you/family* - $
☐ Shower, bath and toilet rail(s)	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7		Cost to you/family* - $
☐ Shower(s) modification	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7		Cost to you/family* - $
☐ Toilet(s) modification	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7		Cost to you/family* - $
☐ Remove/modify door(s) from shower/toilet/bath	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7		Cost to you/family* - $
☐ Kitchen modifications	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7		Cost to you/family* - $
☐ Other modification (specify below)			
Other home modification - 1	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7		Cost to you/family* - $
Other home modification - 2	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7		Cost to you/family* - $

If total costs includes any aids, describe in brief below (see also list of aids on page 33):

*** If an overall cost is provided, please indicate type of modifications above, and provide the total cost here, INCLUSIVE of any known itemised costs listed above:**

Overall Cost $

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Case Report Form - Cost

National Stroke Research Institute

PATIENT STUDY NUMBER

PATIENT INITIALS

11) SPECIAL EQUIPMENT AND AIDS

Have you been given, hired or purchased any special equipment, aids or special food as a consequence of stroke?

3 months	Yes ☐	No ☐	Unknown ☐
3-12 months	Yes ☐	No ☐	Unknown ☐

Prompt: These may have been provided by an Occupational Therapist or Physiotherapist. What about a....?
If NO, proceed to question 12

Walking aids
- ☐ Single point stick
- ☐ Three or four point stick
- ☐ Walking frame - pick up
- ☐ Walking frame - wheelie
- ☐ Walking frame - gutter (forearm suppt)
- ☐ Crutch(es)

Mobility aids
- ☐ Manual wheelchair
- ☐ Electric wheelchair/scooter
- ☐ Car steering wheel knob

Eating aids
- ☐ Built-up cutlery
- ☐ Plate guard
- ☐ Non-slip mat
- ☐ Special food e.g. NG/PEG

If yes, number of days used:
3 months ☐☐☐
3-12 months ☐☐☐

Kitchen aids
- ☐ Tap handles
- ☐ Chopping board
- ☐ Modified knife
- ☐ Vitamiser/blender
- ☐ Non-slip mat

Lounge and bedroom equipment
- ☐ Chair platform/blocks raise
- ☐ Cushion to relieve pressure
- ☐ Special chair (NOT wheelchair)
- ☐ Table - bedside/wheelie
- ☐ Bed platform/block raise
- ☐ Bedstick
- ☐ Hospital bed (eg - height/tilt adjust)
- ☐ Mobile hoist/lifter

Bathroom equipment
- ☐ Over-toilet seat
- ☐ Toilet surround
- ☐ Bathroom and grooming aids
- ☐ Shower chair/stool
- ☐ Over bath seat
- ☐ Hand held shower
- ☐ Non-slip mat

Continence aids
- ☐ Urine bottle
- ☐ Bedpan
- ☐ Commode
- ☐ Incontinence sheet (bed protector)
- ☐ Incontinence sheet (kylie/bluey)

If yes, number of days used - 3 months ☐☐☐
- ☐ Incontinence pads — 3-12 months ☐☐☐

If yes, number of days used - 3 months ☐☐☐
- ☐ Catheter — 3-12 months ☐☐☐

If yes, number of days used - 3 months ☐☐☐
3-12 months ☐☐☐

General aids
- ☐ Long handled aid
- ☐ Blood pressure machine
- ☐ Treadmill
- ☐ Stationary bike
- ☐ Intercom (portable)
- ☐ Modified tap handles
  If yes, number supplied ☐☐
- ☐ Personal alarm
  If yes, number of days supplied:
  3 months ☐☐☐
  3-12 months ☐☐☐

Any other aids/equipment, specify

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12) PRIVATE PHYSIOTHERAPY

Have you paid for private physiotherapy sessions after your stroke? (NOT while a hospital inpatient)

If no, proceed to question 13

3 months	Yes ☐	No ☐	Unknown ☐
3-12 months	Yes ☐	No ☐	Unknown ☐

If yes, number of sessions - 3 months ☐☐☐

3-12 months ☐☐☐

13) RESPITE CARE

As a consequence of your stroke, have you been admitted to a respite bed in a nursing home or hospital?

If NO, proceed to question 14

3 months	Yes ☐	No ☐	Unknown ☐
3-12 months	Yes ☐	No ☐	Unknown ☐

If yes, how many days of respite have you received since your stroke? **3 months** ☐☐☐

3-12 months ☐☐☐

14) EMPLOYMENT STATUS/ PAID WORK

Were you working up to the time of your stroke? Yes ☐ No ☐ Unknown ☐

If YES, what was the nature of this work? Full time ☐ Part time ☐

How many hours did you work each week? ☐☐

Since the stroke, have you returned to this work?

3 months	Yes ☐	No ☐	Unknown ☐
3-12 months	Yes ☐	No ☐	Unknown ☐

Have you returned to normal hours or decreased hours?

3 months	Normal ☐	Decreased ☐
3-12 months	Normal ☐	Decreased ☐

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How many hours per week of work have you performed since the last assessment?

Record average amount per week over the 3 month period ☐☐ **If more than 0 but less than 1hr, record as 1**

Record average amount per week over the period 3 to 12 months ☐☐

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PATIENT STUDY NUMBER

PATIENT INITIALS

15) INFORMAL CARE - 3 MONTHS

NOTE: This question only applies to patients living at home (ie - excludes subjects in residential care and/or current hospital inpatients)

Definition of Informal Carer: That person who is most closely involved in helping the person with stroke to live independently at home. Any assistance provided by an informal carer is **over and above the assistance provided by any formal support service**. A carer is usually a spouse or other member of the family but may be a friend or neighbour.

If the person with stroke needs help with any activities of daily living, the carer is the person who provides most of this help beyond that provided by any formal support services. Assistance that a carer may provide includes: help with community tasks (e.g. shopping, errands, appointments, transport); help with domestic tasks (e.g. house cleaning, garden maintenance, laundry, meal preparation, washing up); help with personal care tasks (e.g. bathing, toileting, transferring, walking indoors, feeding). Supervision of daily activities to ensure safety should also be included as care.

15a) OVER THE LAST WEEK, have you received any assistance with your daily activities from a carer as a result of the stroke? Yes ☐ No ☐

This might include assistance with community tasks (such as help with your banking, paying your bills, shopping or transportation), assistance with domestic tasks (such as cooking and cleaning) or assistance with personal care tasks (such as bathing, toileting and feeding)

If the answer is NO, no further questions are required in this section

15b) If the answer is YES, OVER THE LAST WEEK did you receive any assistance with COMMUNITY tasks? Yes ☐ No ☐

Examples of assistance with community tasks include: banking and paying bills; errands such as posting letters or making appointments; transport to appointments or social occasions; shopping; your carer might also 'check up' on you by visiting or phoning.

If NO, go to question 15c)

If YES, can you estimate how many hours your carer spent helping you with these tasks during the last week? **Hours** ☐☐☐

15c) OVER THE LAST WEEK did you receive any assistance with DOMESTIC tasks? Yes ☐ No ☐

Examples of assistance with domestic tasks include: gardening; handyman tasks; grounds and home maintenance; housework such as laundry, cleaning, washing up; supervision of medication; supervision or assistance to walk outside.

If NO, go to question 15d)

If YES, can you estimate how many hours your carer spent helping you with these tasks during the last week? **Hours** ☐☐☐

15d) OVER THE LAST WEEK did you receive any assistance with PERSONAL CARE tasks? Yes ☐ No ☐

Examples of assistance with personal care tasks include: eating; grooming; bathing; dressing; toilet use; help with incontinence pads; moving from bed to chair or chair to chair; walking inside the house including stairs.

If NO, you have finished the questions.

If YES, can you estimate how many hours your carer spent helping you with these tasks during the last week? **Hours** ☐☐☐

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PATIENT STUDY NUMBER

PATIENT INITIALS

16) INFORMAL CARE - 12 MONTHS

NOTE: This question only applies to patients living at home (ie - excludes subjects in residential care and/or current hospital inpatients)

Definition of Informal Carer: That person who is most closely involved in helping the person with stroke to live independently at home. Any assistance provided by an informal carer is **over and above the assistance provided by any formal support service**. A carer is usually a spouse or other member of the family but may be a friend or neighbour.

If the person with stroke needs help with any activities of daily living, the carer is the person who provides most of this help beyond that provided by any formal support services. Assistance that a carer may provide includes: help with community tasks (e.g. shopping, errands, appointments, transport); help with domestic tasks (e.g. house cleaning, garden maintenance, laundry, meal preparation, washing up); help with personal care tasks (e.g. bathing, toileting, transferring, walking indoors, feeding). Supervision of daily activities to ensure safety should also be included as care.

16a) OVER THE LAST WEEK, have you received any assistance with your daily activities from a carer as a result of the stroke? Yes ☐ No ☐

This might include assistance with community tasks (such as help with your banking, paying your bills, shopping or transportation), assistance with domestic tasks (such as cooking and cleaning) or assistance with personal care tasks (such as bathing, toileting and feeding)

If the answer is NO, no further questions are required in this section

16b) If the answer is YES, OVER THE LAST WEEK did you receive any assistance with COMMUNITY tasks? Yes ☐ No ☐

Examples of assistance with community tasks include: banking and paying bills; errands such as posting letters or making appointments; transport to appointments or social occasions; shopping; your carer might also 'check up' on you by visiting or phoning.

If NO, go to question 16c)

If YES, can you estimate how many hours your carer spent helping you with these tasks during the last week? **Hours** ☐☐☐

16c) OVER THE LAST WEEK did you receive any assistance with DOMESTIC tasks? Yes ☐ No ☐

Examples of assistance with domestic tasks include: gardening; handyman tasks; grounds and home maintenance; housework such as laundry, cleaning, washing up; supervision of medication; supervision or assistance to walk outside.

If NO, go to question 16d)

If YES, can you estimate how many hours your carer spent helping you with these tasks during the last week? **Hours** ☐☐☐

16d) OVER THE LAST WEEK did you receive any assistance with PERSONAL CARE tasks? Yes ☐ No ☐

Examples of assistance with personal care tasks include: eating; grooming; bathing; dressing; toilet use; help with incontinence pads; moving from bed to chair or chair to chair; walking inside the house including stairs.

If NO, you have finished the questions.

If YES, can you estimate how many hours your carer spent helping you with these tasks during the last week? **Hours** ☐☐☐

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End Case Report Form - Cost

Supplementary document 3: Unit costs and valuation of costs

Unit costs for hospitalisation, rehabilitation, non-health sector costs and productivity costs

Acute stroke hospitalisation costing: Unit costs for acute stroke hospitalisation for all countries at baseline were categorised by stroke severity, using the National Institute of Health Stroke Scale (NIHSS) to group patients into three severity levels: mild (0-7), moderate (8-16) and severe (>16). (1)·(2) It was assumed that severity as classified by the NIHSS was consistent with the stroke severity that corresponded to three levels of unit cost for acute hospitalisation. Length of Stay (LoS) together with stroke severity were used to estimate the cost of acute hospitalisation for Australia and New Zealand patients (i.e. the cost of acute hospitalisation was weighted by the LoS). LoS was taken as the difference between the date of hospital discharge and date of hospital admission (plus one day or not) in accordance with country-specific practice. For the other countries, only stroke severity was considered in the assignment of a unit cost to acute stroke hospitalisation due to insufficient health sector data.

Re-hospitalisation and rehabilitation costing: Due to the diversity of causes for patients being readmitted to hospital after the index stroke, the average daily cost of hospitalisation for all disease conditions from individual countries in combination with LoS was used to gauge the cost of readmission for stroke-related causes, while the average cost for an emergency department visit was assigned whenever a patient was hospitalised for one day only. Similarly, the unit cost of rehabilitation hospital admission was taken from the national average cost for all disease conditions. The median cost was used where there was more than one unit cost identified for the same resource item.

Non-health sector costs: Unit costs of non-health sector resource items (e.g. community service, accommodation changes, special aids and equipment) were sourced on a country- specific basis from official websites or published literature where applicable. No unit cost was retrieved for home modification items since the cost of home modifications was generally reported in the Cost CRF.

Productivity cost: Lost productivity was valued based on a human capital approach using average earnings across all occupations up to normal retirement age. The average wage of a

professional carer was adopted to estimate the cost of informal care.

The currency of other countries was converted to AUD using the corresponding exchange rate. The country-specific Consumer Price Index (CPI) from the health sector was employed to adjust costs not valued in the year of 2015.

All the unit costs from participating countries are summarised in Table I.

Table I. Unit cost (in Australian dollars) across five countries, 2015 reference year

Resource items	Unit cost (AUD)				
	AU	NZ	UK	SG	MA
Healthcare					
Acute hospitalisation*					
Severe (per episode)	$19157	$10867	$15327	$4371	$2066
Moderate (per episode)	$9553	$6104	$8115	$2126	$1572
Mild (per episode)	$6279	$4370	$4272	$1493	$1363
Stroke-related rehospitalisation (per day)	$1925	$320	$701	$789	$230
Emergency department attendance (per attendance)	$610	$325	$227	$111	$68
Rehabilitation hospital admission†					
Severe (per episode)	$1010‡	$8032	$19136§	$157‡	$1293
Moderate (per episode)		$5727	$29788§		
Mild (per episode)		$5727	$13920§		
Same day (per episode)		$758	N/A		
Outpatient rehab visit (per/session)	$239	$164	$213	$36	$17
Rehab services at home/nursing facility (per/session)	$239	$212	$922	$36	$51
Private physiotherapy (per session)	$64	$153	$162	$116	$8
Respite care (per hour)	$45	$14	$26	$15	$2
Individual allied health visit					
Physiotherapy	N/A	N/A	$243	$239	$8
Occupational therapy	N/A	N/A	$243	$36	$7
Speech and language therapy	N/A	N/A	$69	$36	$4
Ambulance transfer	$508	$646	$575	$265	$52
Non-healthcare					
Community services	*Not listed here due to the number of items*				
Home modifications	*Cost was provided by individual patients*				
Special aids and equipment	*Not listed here due to the substantial number of items*				
Accommodation changes	*Not listed here due to the number of items*				
Professional carer (per hour)	$24	$14	$14	$10	$2
Living-in maid (per month)	N/A	N/A	N/A	$571	$103
Average weekly earnings					
Male	$1137	$621	$1152	$973	$137
Female			$957¶		

Unit cost for intervention[#]					
Hospital physiotherapist (per hour)	$33	$32	$30	$21	$5
Hospital nurse (per hour)	$30	$25	$29	$21	$5

AU: Australia; NZ: New Zealand; UK: United Kingdom; SG: Singapore; MA: Malaysia;
Sources of CPI:
Australian Bureau of Statistics. Consumer price index inflation calculator. Accessed from:Http://www.Abs.Gov.Au/websitedbs/d3310114.Nsf/home/consumer+price+index+inflation+calculator. 2017
Office for National Statistics. Inflation and price indices. Accessed from: Https://www.Ons.Gov.Uk/economy/inflationandpriceindices. 2017
Department of Statistics Singapore. Consumer price index. Accessed from: Https://data.Gov.Sg/dataset/consumer-price-index-annual. 2017
Statistics New Zealand. Consumer price index, accessed from: Http://www.Stats.Govt.Nz/browse_for_stats/economic_indicators/cpi_inflation/info-releases.Aspx. 2017
Department of Statistics Malaysia OP. Consumer price index malaysia. Accessed from: Https://www.Dosm.Gov.My/v1/index.Php?R=column/cthemebycat&cat=106&bul_id=zi9pmutpvzixb042mlptt1buellazz09&menu_id=bthzthqxn1zqmvf6a2i4rkzondfkqt09. 2017

[*] severity was determined by baseline NIHSS score; [†]severity was classified by baseline mRS score; [‡]it is the per day cost; [§]cost was assigned according to the baseline mRS score (mild 0-2; moderate 3-5; severe 6); [‖] the National Survey of Household Income was provided on gender basis, so the weekly earnings for UK patients were assigned corresponding to this; [#] hourly wage of hospital physiotherapist and nurse were assigned; N/A: not applicable.
Main sources of unit cost: AU: Independent Hospital Pricing Authority (IHPA), Australia, National Efficient Price Data (2015-16); National Hospital Cost Data collection (https://www.ihpa.gov.au/publications/australian-public-hospitals-cost-report-2013-2014-round-18); Department of Health, Revised residential care subsidies (https://agedcare.health.gov.au/aged-care-funding/aged-care-subsidies-and-supplements); Australian Bureau of Statistics (http://www.abs.gov.au/AUSSTATS/abs@.nsf/allprimarymainfeatures/E9FF9F13B417A488CA257F630014DF30?opendocument
NZ: Ministry of Health (http://www.health.govt.nz/nz-health-statistics/data-references/weighted-inlier-equivalent-separations); World Health Organisation (http://www.who.int/choice/country/nzl/cost/en/); Cost Resource Manual Version 2.2 (https://www.pharmac.govt.nz/assets/pfpa-v2-2-cost-resource-manual.pdf); study by Te Ao et al 2011 (Te Ao BJ et al. Are stroke units cost effective? Evidence from a New Zealand stroke incidence and population-based study. Int. J. Stroke. 2012;7:623-630); Statistics New Zealand (http://www.stats.govt.nz/browse_for_stats/income-and-work/employment_and_unemployment/LabourMarketStatistics_HOTPJun15qtr.aspx); District Health Board, Multi Employer Agreement, New Zealand Nurses Organisation(http://www.bopdhb.govt.nz/media/58613/psa-ronz-allied-meca-2015-2017.pdf);
UK: National Health Service (NHS) reference costs 2014 to 2015, United Kingdom (https://www.gov.uk/government/publications/nhs-reference-costs-2014-to-2015) ; NICE Technology Appraisal (Davis,S., Holmes,M., Simpson,E., Sutton,A. Alteplase for the treatment of acute ischaemic stroke [review of technology appraisal 122]: A Single Technology Appraisal. ScHARR, The University of Sheffield 2012, https://www.nice.org.uk/guidance/ta264/documents/stroke-acute-ischaemic-alteplase-review-of-ta122-evidence-review-group-report2); Personal Social Services Research Unit (PSSRU)(http://www.pssru.ac.uk/); Information Services Division, Scotland (http://www.isdscotland.org/); Annual Survey of Hours and Earnings 2015, Office for National Statistics (https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/earningsandworkinghours/bulletins/annualsurveyofhoursandearnings/2015provisionalresults); Payscale UK (http://www.payscale.com/research/UK/Job=Care_Worker/Hourly_Rate); NHS pay and benefits (https://www.healthcareers.nhs.uk/about/careers-nhs/nhs-pay-and-benefits/agenda-change-pay-rates);
SG: Ministry of Health , Hospital Bill Sizes, Singapore (https://www.moh.gov.sg/content/moh_web/home/costs_and_financing/HospitalBillSize/stroke.html.) ; Outpatient Charges, Singapore General Hospital (https://www.sgh.com.sg/patient-services/charges-payment/pages/outpatient-charges.aspx); Charges, Ren Ci Hospital (http://www.renci.org.sg/patients-guide/charges-2/); Hospital rates and charges, Bright Vision Hospital (http://www.bvh.org.sg/hospital-rate-charge.html); Ministry of Manpower (http://stats.mom.gov.sg/Pages/Occupational-Wages-Tables2014.aspx);
MA: study by Mohd Nordin et al 2012 (Mohd Nordin et al.: Estimating cost of in-patientmedical care for stroke using Casemix data. BMC Health Services Research 2012 12(Suppl 1):P10.); Ministry of Health Malaysia (http://www.moh.gov.my/english.php/pages/view/160); Study by Akhavan Hejazi et al 2015(Akhavan Hejazi SM, et al. Cost of post-stroke outpatient care in malaysia. Singapore Med. J. 2015;56:116-119); Department of Statistics Malaysia (https://www.dosm.gov.my/v1/index.php?r=column/pdfPrev&id=czRyNkJIbDFyYXJFbU5YTVJ1V1BHZz09).

Valuation of costs

For the ICER from a societal perspective, all the costs from health and non-health sector were summed together, including the productivity cost; for ICER of a health sector perspective, all the costs borne by healthcare system were counted (i.e. excluding non- healthcare costs and productivity cost).

Supplementary document 4. Missing cost data analyses

Table I. Number of missing data for each cost item

Cost variable	Missing										
	Total	AU		NZ		UK		SG		MA	
	N=2104	VEM N=522	UC N=532	VEM N=94	UC N=95	VEM N=311	UC N=299	VEM N=64	UC N=64	VEM N=62	UC N=61
Acute hospitalisation	1(0.05%)	1(0.2%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)
Stroke-related rehospitalisation	51(2.4%)	8(1.5%)	7(1.3%)	0(0%)	0(0%)	17(5.5%)	8(2.7%)	0(0%)	3(4.7%)	7(11.3%)	1(1.6%)
Ambulance transfer	53(2.5%)	8(1.5%)	10(1.9%)	0(0%)	0(0%)	16(5.1%)	7(2.3%)	1(1.6%)	3(4.7%)	7(11.3%)	1(1.6%)
Rehabilitation hospital admission	55(2.6%)	9(1.7%)	9(1.7%)	0(0%)	0(0%)	18(5.8%)	8(2.7%)	0(0%)	3(4.7%)	7(11.3%)	1(1.6%)
Outpatient rehabilitation program	47(2.2%)	0(0%)	0(0%)	0(0%)	0(0%)	23(7.4%)	10(3.3%)	0(0%)	3(4.7%)	9(14.5%)	2(3.3%)
Rehabilitation provided at home/nursing facility	67(3.2%)	11(2.1%)	10(1.9%)	0(0%)	0(0%)	23(7.4%)	1(3.7%)	0(0%)	3(4.7%)	7(11.3%)	1(1.6%)
Individual allied health visit[§]	0(0%)	-	-	-	-	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)
Private physiotherapy	76(3.6%)	12(2.3%)	11(2.1%)	0(0%)	1(1.1%)	27(8.7%)	13(4.4%)	1(1.6%)	3(4.7%)	7(11.3%)	1(1.6%)
Respite care	77(3.7%)	12(2.3%)	11(2.1%)	1(1.1%)	1(1.1%)	27(8.7%)	13(4.4%)	1(1.6%)	3(4.7%)	7(11.3%)	1(1.6%)
Subtotal (medical cost)	**94(10.7%)**	**14(2.7%)**	**13(2.4%)**	**1(1%)**	**1(1.1%)**	**36(11.6%)**	**14(4.7%)**	**1(1.6%)**	**3(4.7%)**	**9(14.5%)**	**2(3.3%)**
Accommodation moves	60(2.9%)	15(2.9%)	11(2.1%)	1(1.1%)	1(1.1%)	15(4.8%)	10(3.3%)	0(0%)	2(3.1%)	5(8.1%)	0(0%)
Community services	230(10.9%)	63(12.1%)	87(16.4%)	4(4.3%)	5(5.3%)	32(10.3%)	27(9.0%)	1(1.6%)	3(4.7%)	7(11.3%)	1(1.6%)
Home modifications	13(0.6%)	3(2.6%)	6(1.1%)	0(0%)	1(1.1%)	0(0%)	2(0.7%)	0(0%)	1(1.6%)	0(0%)	0(0%)
Special aids and equipment	48(2.3%)	7(1.3%)	8(1.5%)	1(1.1%)	1(1.1%)	16(5.1%)	14(4.7%)	1(1.6%)	0(0%)	0(0%)	0(0%)
Informal care	72(3.4%)	11(2.1%)	12(2.3%)	0(0%)	1(1.1%)	26(8.4%)	10(3.3%)	1(1.6%)	3(4.7%)	7(11.3%)	1(1.6%)
Living-in maids[ǂ]	-	-	-	-	-	-	-	1(1.6%)	3(4.7%)	7(11.3%)	2(3.3%)
Subtotal (non-medical cost)	**304(14.5%)**	**77(14.8)%**	**97(18.2%)**	**6(6.4%)**	**7(7.4%)**	**54(17.4%)**	**46(15.4%)**	**2(3.1%)**	**5(7.8%)**	**8(12.9%)**	**2(3.3%)**
Productivity cost	225(10.7%)	50(9.6%)	46(8.7%)	14(14.9%)	10(10.5%)	27(8.7%)	23(7.7%)	17(25.6%)	13(20.3%)	14(22.6%)	11(18.0%)
Total cost (exc. productivity cost)	319(15.2%)	80(15.3%)	97(18.2%)	6(6.4%)	7(7.4%)	61(19.6%)	48(16.1%)	2(3.1%)	5(7.8%)	10(16.1%)	3(4.9%)
Total cost	512(24.3%)	124(23.8%)	136(25.6%)	20(21.3%)	16(16.8%)	80(25.7%)	68(22.7%)	17(26.6%)	16(25.0%)	22(35.5%)	13(21.3%)

[§]only applicable to UK, Singapore and Malaysia patients; [ǂ]only applicable to Singapore and Malaysia patients

Table II. Missing pattern analysis based on logit regression

Resource use items with missing data	Predictor of missingness
Stroke-related rehospitalisation	Age (p=0.001)
Rehabilitation hospital admission	Age (p=0.009), NIHSCORE (p=0.037)
Outpatient rehabilitation program	Age (p=-0.003)
Rehabilitation service provided at home/nursing facility	Age (p=0.014),
Community services used prior to stroke	NIHSCORE (p=0.001)
Community services used at 3 months	Age (p=0.003)
Community services used at 12 months	NIHSCORE (p=0.008)
Aids or special equipment uses at 3 months	Age (p=0.012)
Aids or special equipment uses at 12 months	Age (p=0.035), NIHSCORE (p=0.013)
Private physiotherapy uses at 3 months	Age (p<0.0001)
Private physiotherapy uses at 12 months	Age (p=0.006), NIHSCORE (p=0.034)
Respite care use at 3 months	Age (p<0.0001)
Respite care use at 12 months	Age (p=0.017), NIHSCORE (P=0.018)
Informal care use at 3 months	Age (p=0.003)
Informal care use at 12 months	Age (p<0.0001)

If any of the other variables were able to predict the missingness of a given variable representing resource use, the MAR assumption was deemed to be held true. More specifically, multiple imputations were used to replace the missing values (missing mRS, AQoL-4D data or cost categories) with plausible estimates, and generated 30 datasets. Results were provided as pooled estimates of these sets. Identical analyses were carried out to estimate the incremental costs and benefits between groups on the basis of imputed data following the methods outlined in the statistical analysis section above. As the probability of all the resource use items being missing could be predicted by one or more of the other variables, it is likely that the Missing-at-Random (MAR) assumption could be held true. (https://www.ssc.wisc.edu/sscc/pubs/stata_mi_decide.htm).

Supplementary document 5. Outcomes

Table I. Results of mRS score at 3 and 12 months follow-up

Modified Rankin Scale Score	UC group n=1050		VEM group n=1054	
	3M	**12M**	**3M**	**12M**
0	96	132	90	137
1	204	231	200	219
2	225	175	190	166
3	218	199	238	186
4	127	95	140	113
5	103	83	92	59
6	72	118	88	139
Total	**1045**	**1033**	**1038**	**1019**
Missing data	**5**	**17**	**16**	**35**

Number of patients falling into each category

Since there was no significant intervention effect together with no accepted willingness-to- pay (WTP) per unit increase in probability of achieving a better mRS outcome, further estimation of the ICER was considered not meaningful (i.e. no cost-effectiveness plane or cost-effectiveness acceptability curve could be generated).

Table II. Time and cost associated with delivering VEM and UC (mean, 95%CI)

	VEM		UC		Between group difference	
	Total time (min)	Cost (AUD)	Total time (min)	Cost (AUD)	Total time (min)	Cost (AUD)
Physiotherapist	243 (232, 254)	$117 ($111, $123)	95 (90, 101)	$48 ($45, $51)	147 (135, 159)*	$69 ($63, $75)*
Nurse†	494 (456, 532)	$225 ($207, $244)	439 (404, 474)	$202 ($185, $219)	55 (4, 106)*	$23 (-$2, $48)
Total cost	-	$342 ($320, $364)	-	$250 ($231, $269)	-	$92 ($63, $121)*

VEM: very early mobilisation; UC: usual care; CI: confidence interval

*p<0.0001 (adjusted for age, baseline NIHSS and mRS); † nurse's time devoted to delivery of VEM/UC was not recorded in the process of data collection, so the physiotherapist time was used as a proxy

Because VEM and UC were supplied by the same group of physiotherapists and nurses, the key difference was that a patient randomised to VEM received early rehabilitation within 24 hours of stroke onset and more out-of-bed mobilisation sessions of early mobilisation.

The total health practitioner (physiotherapist and nurses) time devoted to the delivery of the VEM and UC differed significantly, with the VEM group receiving substantially longer mean service time from both the physiotherapist (VEM: 243 mins, 95%CI: 232 to 254 vs UC: 95 mins, 95%CI: 90 to 101, p<0.0001) and nurse (VEM: 494 mins, 95%CI: 456 to 532 vs UC: 439 mins, 95%CI: 404 to 474, p<0.0001). The resultant difference in costs between groups was significant ($92, 95%CI: $63 to $121, p<0.0001).

Supplementary document 6. Sensitivity analyses

Generally, the difference in QALY gains between VEM and UC groups were fairly consistent across different methods.

Table I. Between-group differences based on the Generalised Linear Model_ base case analysis vs. multiple imputation analysis

	ITT (not imputed)			ITT (imputed)		
	mRS score	**QALYs**	**Cost (AUD)**	**mRS**	**QALYs**	**Cost (AUD)**
Health Sector Perspective						
Total medical costs	0.030 (-0.022, 0.082)	-0.013 (-0.041, 0.016)	$1082 (-$2399, $4563)	0.042 (-0.008, 0.092)	-0.019 (-0.046, 0.007)	$940 (-$2584, $4465)
Societal Perspective						
Total cost (excl. productivity cost)	0.030 (-0.022, 0.082)	-0.013 (-0.041, 0.016)	-$6 (-$5703, $5690)	0.042 (-0.008, 0.092)	-0.019 (-0.046, 0.007)	$1704 (-$5423, $8832)
Total cost (incl. productivity cost)	0.030 (-0.022, 0.082)	-0.013 (-0.041, 0.016)	$102 (-$6945, $7149)	0.042 (-0.008, 0.092)	-0.019 (-0.046, 0.007)	$1413 (-$5940, $8766)

ITT: intention to treatment; mRS: modified Rankin Scale; AUD: Australian dollars
*the p-value was >0.05 for the between-group difference in mRS score, QALYs and cost

Table II. Between-group differences based on the Generalised Linear Model

	Adding country dummies		
	mRS	**QALYs**	**Cost**
Total medical costs	0.031(-0.021, 0.083)	-0.013(-0.042, 0.015)	$704 (-$1968, $3376)
Total cost (excl. productivity cost)	0.031(-0.021, 0.083)	-0.013(-0.042, 0.015)	-$335 (-$4953, $4283)
Total cost (incl. productivity cost)	0.031(-0.021, 0.083)	-0.013(-0.042, 0.015)	-$238 (-$6012, $5537)

mRS: modified Rankin Scale; QALYs: Quality-adjusted Life Years

*the p-value was >0.05 for the between-group difference in mRS score, QALYs and cost

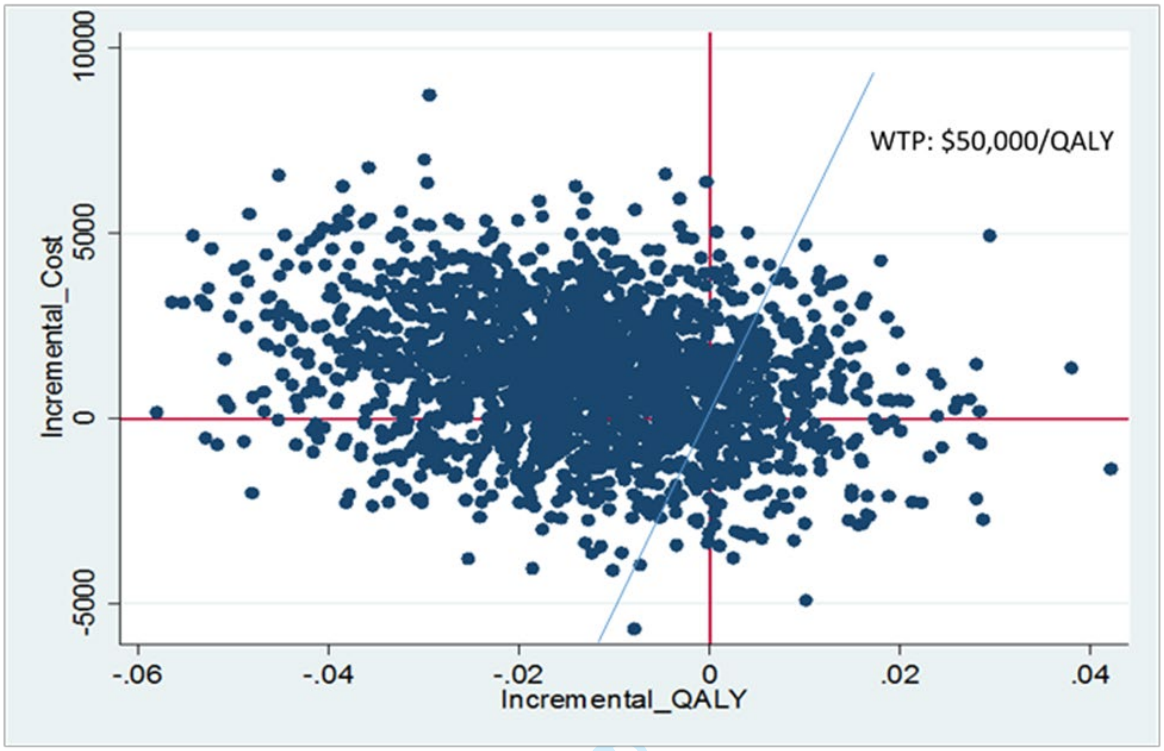
Table III. Cost-utility analysis based on multiple imputation analysis

	Efficacy (QALYs)	Cost (AUD)	Probability of being cost-effective
Health Sector Perspective			
Total medical costs	-0.019 (-0.044, 0.005)	$940 (-$4622, $4682)	25%
Societal Perspective			
Total cost (excl. productivity cost)	-0.019 (-0.044, 0.005)	$1704 (-$3817, $7226)	20%
Total cost (incl. productivity cost)	-0.019 (-0.044, 0.005)	$1413 (-$4044, $6871)	23%

QALYs: Quality-adjusted Life Years; AUD: Australian dollar.

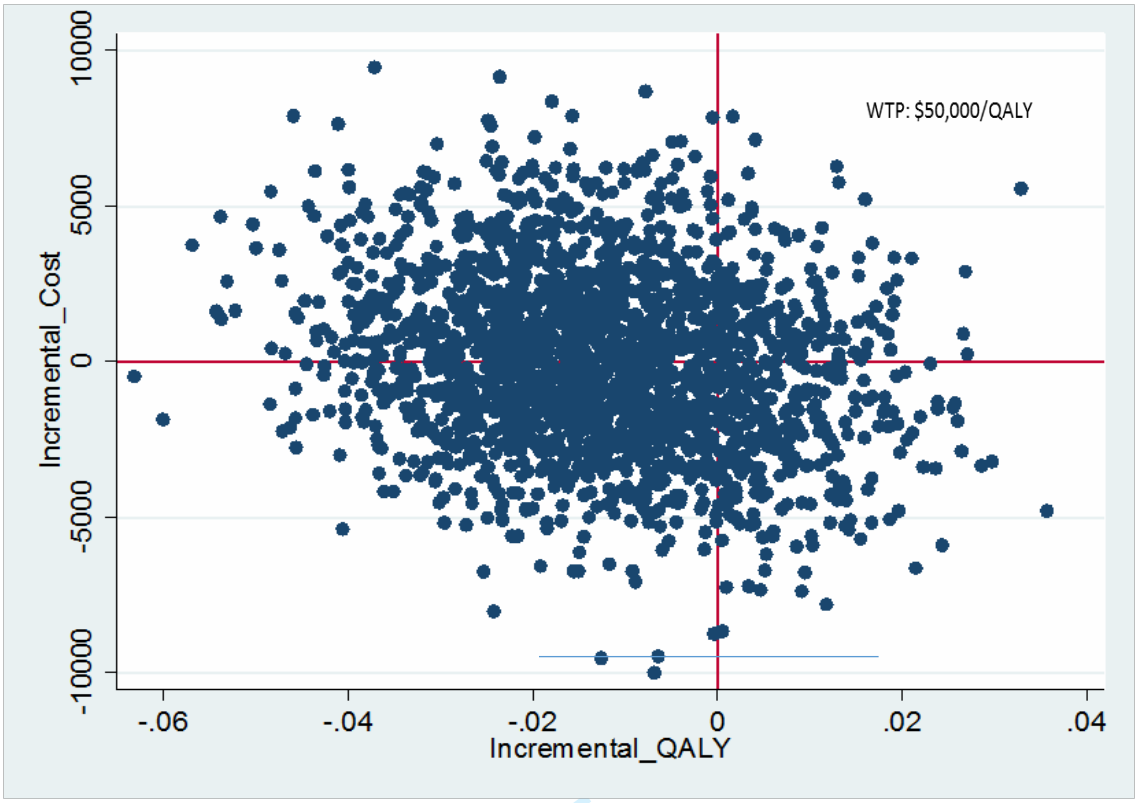
*the p-value was >0.05 for the between-group difference in QALYs and cost

Supplementary document 7: Figures



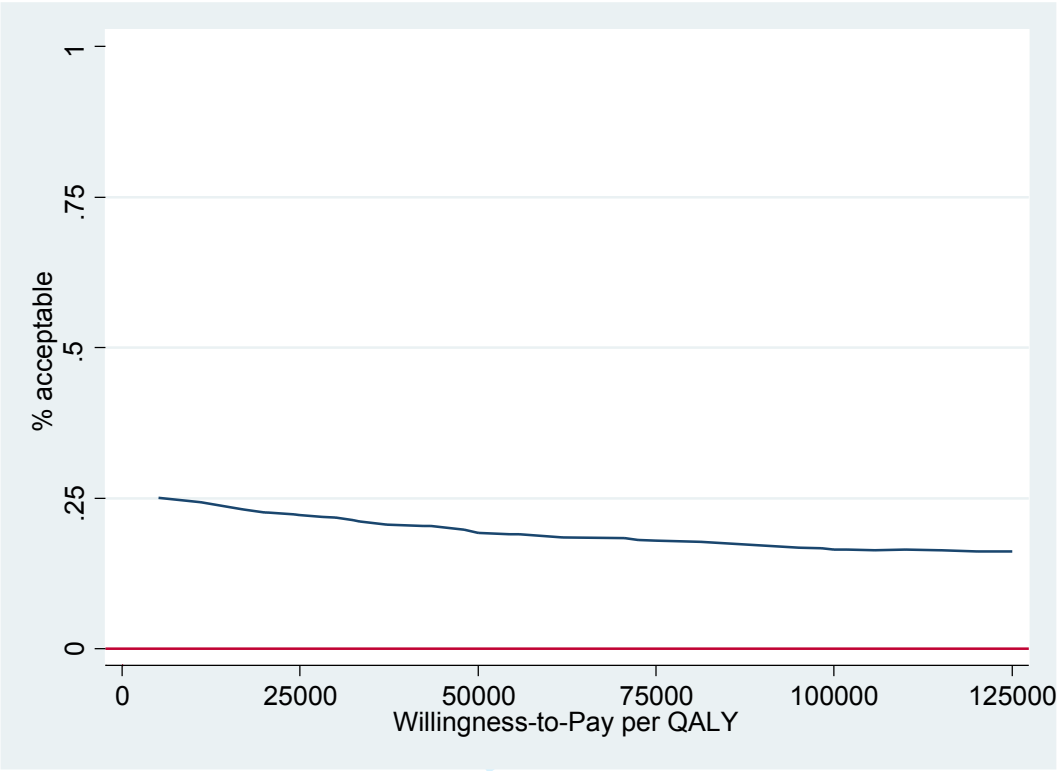
*Probability of VEM being cost-effective is 19%; WTP: willingness-to-pay; QALY: quality adjusted life year

Figure I Cost-effectiveness plane_ health sector perspective



*Probability of VEM being cost-effective is 42%; WTP: willingness-to-pay; QALY: quality-adjusted life year

Figure II Cost-effectiveness plane_ societal perspective (excl. productivity cost)



Note: The probability of VEM being cost-effective decreases with the increasing WTP/QALY threshold because the VEM is associated with less costs

Figure III Cost-effectiveness acceptability curve for medical cost

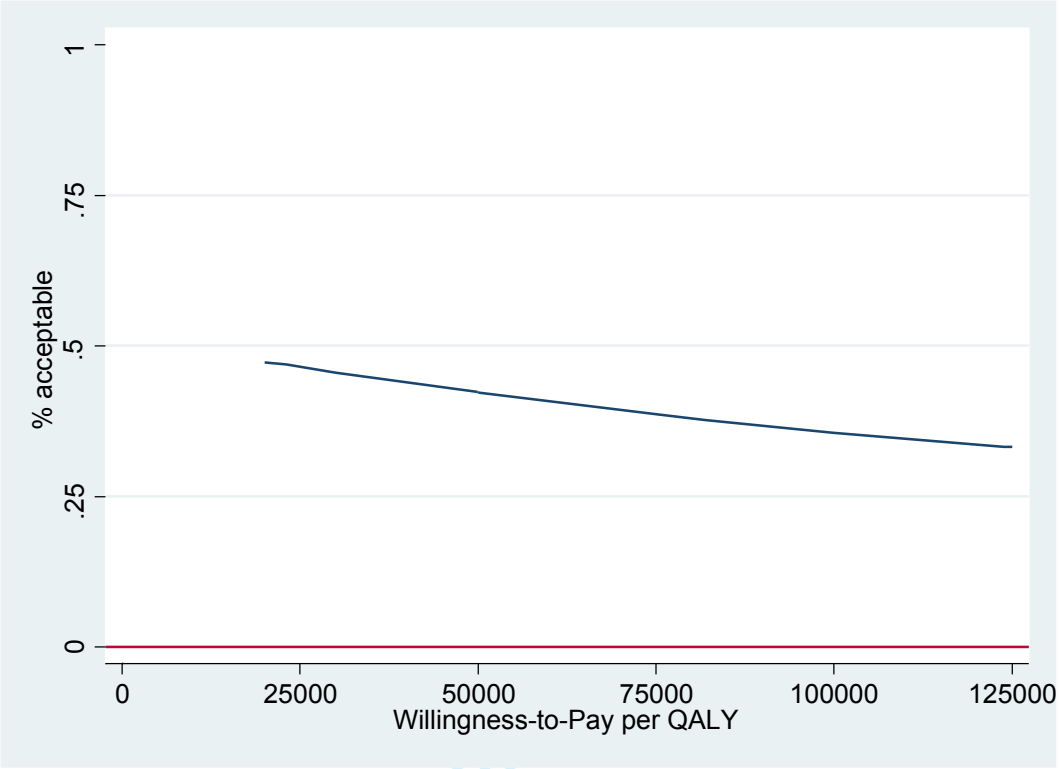


Figure IV Cost-effectiveness acceptability curve for total cost excluding productivity cost

Note: The probability of VEM being cost-effective decreases with the increasing WTP/QALY threshold because the VEM is associated with less costs

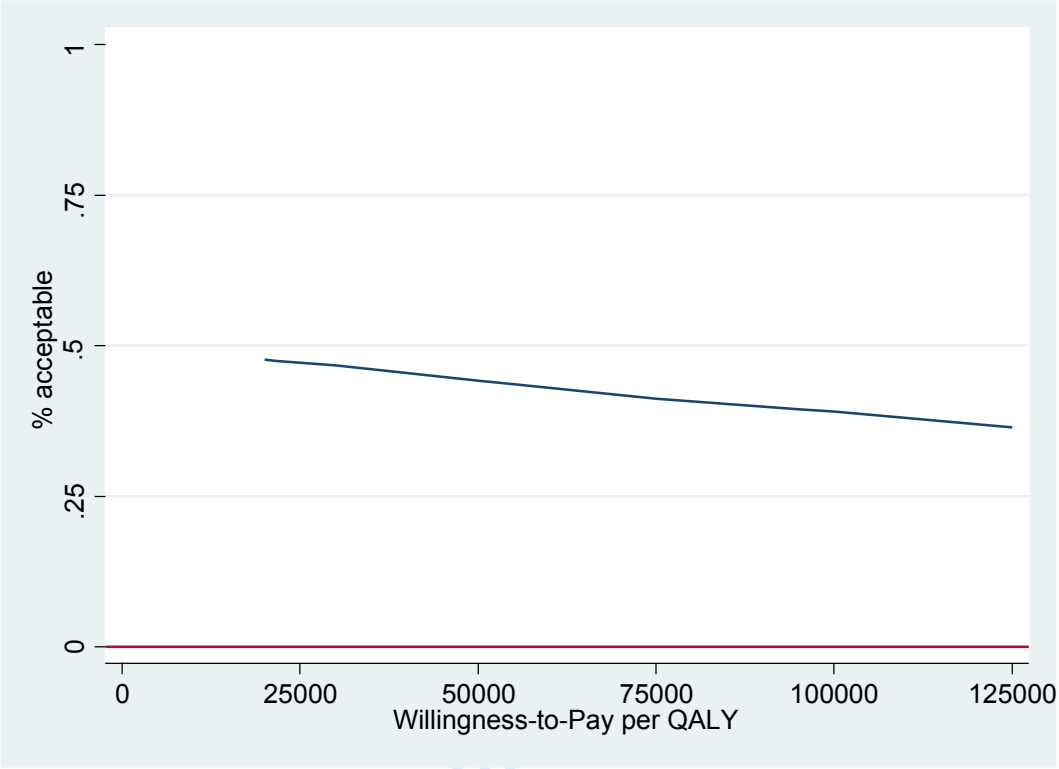


Figure V Cost-effectiveness acceptability curve for total cost including productivity cost

Note: The probability of VEM being cost-effective decreases with the increasing WTP/QALY threshold because the VEM is associated with less costs

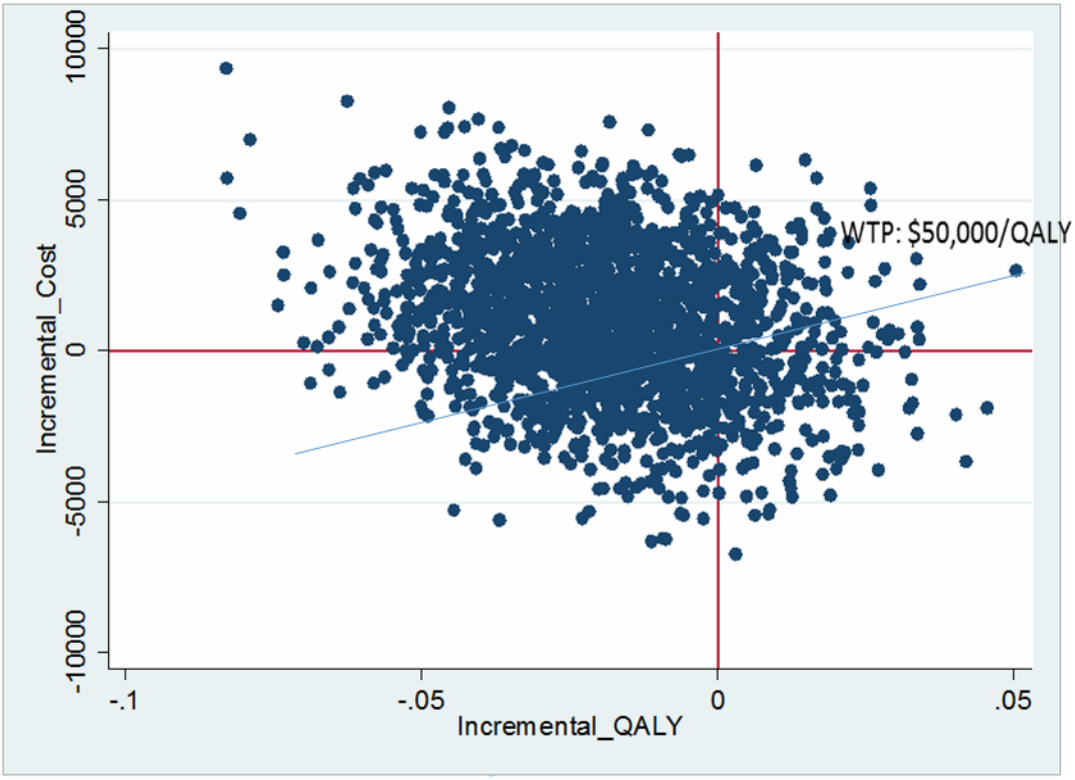


Figure VI Cost-effectiveness plane_ health sector perspective (multiple imputation analysis)

WTP: willingness-to-pay; QALY: quality-adjusted life year

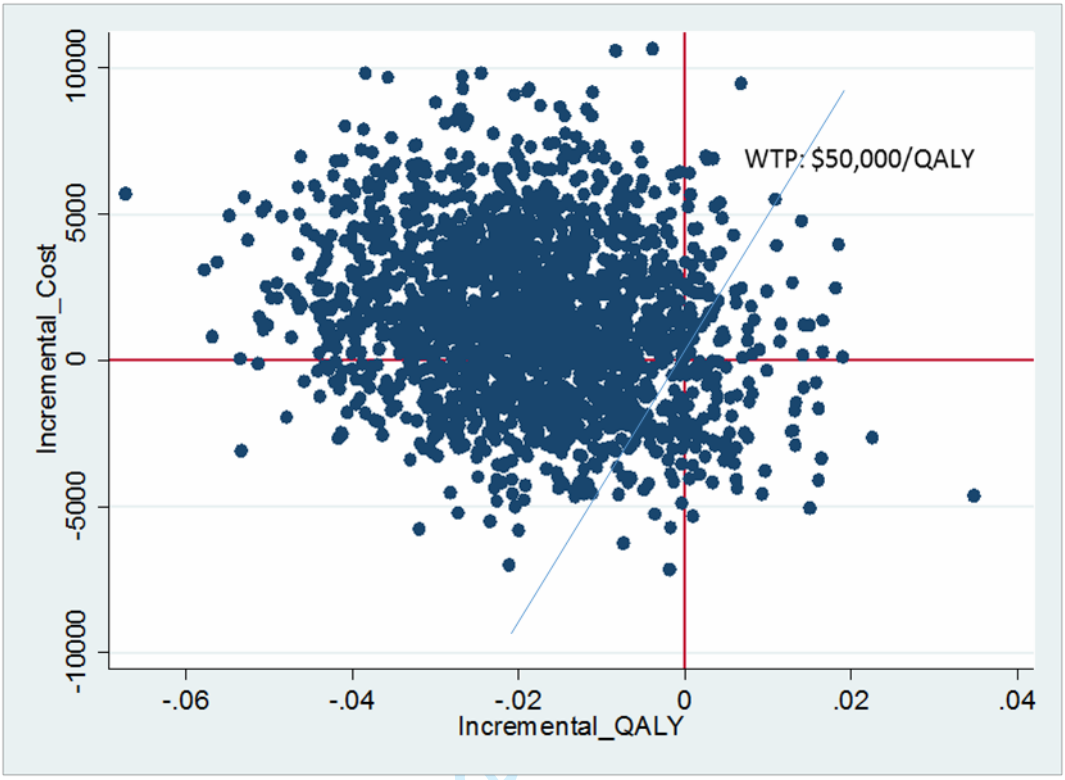


Figure VII Cost-effectiveness plane_ societal perspective including productivity cost (multiple imputation analysis)

WTP: willingness-to-pay; QALY: quality-adjusted life year

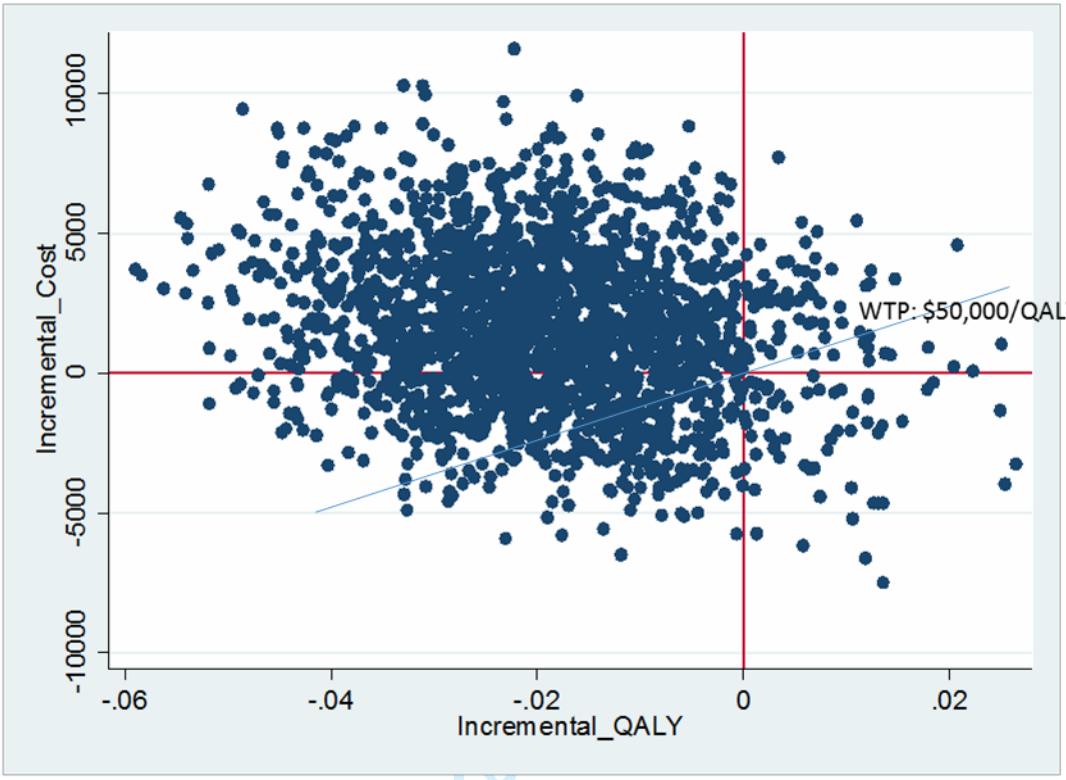


Figure VIII Cost-effectiveness plane_ societal perspective excluding productivity cost (multiple imputation analysis)

WTP: willingness-to-pay; QALY: quality-adjusted life year

References

1. Claesson L, Gosman-Hedstrom G, Johannesson M, Fagerberg B, Blomstrand C. Resource utilization and costs of stroke unit care integrated in a care continuum: A 1-year controlled, prospective, randomized study in elderly patients: the Goteborg 70+ Stroke Study. Stroke 2000;31(11):2569-77.
2. Bernhardt J, Dewey H, Thrift A, Collier J, Donnan G. A very early rehabilitation trial for stroke (AVERT) phase II safety and feasibility. Stroke 2008;39(2):390-6.

Section/item	Item No	Recommendation	Reported on page No/ line No
Title and abstract			
Title	1	Identify the study as an economic evaluation or use more specific terms such as "cost-effectiveness analysis", and describe the interventions compared.	1
Abstract	2	Provide a structured summary of objectives, perspective, setting, methods (including study design and inputs), results (including base case and uncertainty analyses), and conclusions.	4-5
Introduction			
Background and objectives	3	Provide an explicit statement of the broader context for the study.	7
		Present the study question and its relevance for health policy or practice decisions.	8
Methods			
Target population and subgroups	4	Describe characteristics of the base case population and subgroups analysed, including why they were chosen.	12
Setting and location	5	State relevant aspects of the system(s) in which the decision(s) need(s) to be made.	9
Study perspective	6	Describe the perspective of the study and relate this to the costs being evaluated.	9
Comparators	7	Describe the interventions or strategies being compared and state why they were chosen.	8
Time horizon	8	State the time horizon(s) over which costs and consequences are being evaluated and say why appropriate.	11
Discount rate	9	Report the choice of discount rate(s) used for costs and outcomes and say why appropriate.	11
Choice of health outcomes	10	Describe what outcomes were used as the measure(s) of benefit in the evaluation and their relevance for the type of analysis performed.	8-9
Measurement of effectiveness	11a	*Single study-based estimates:* Describe fully the design features of the single effectiveness study and why the single study was a sufficient source of clinical effectiveness data.	12
	11b	*Synthesis-based estimates:* Describe fully the methods used for identification of included studies and synthesis of clinical effectiveness data.	
Measurement and valuation of preference based outcomes	12	If applicable, describe the population and methods used to elicit preferences for outcomes.	9
Estimating resources and costs	13a	*Single study-based economic evaluation:* Describe approaches used to estimate resource use associated with the alternative interventions. Describe primary or secondary research methods for valuing each resource item in terms of its unit cost. Describe any adjustments made to approximate to opportunity costs.	9-10
	13b	*Model-based economic evaluation:* Describe approaches and data sources used to estimate resource use associated with model health states. Describe primary or secondary research methods for valuing each resource item in terms of its unit cost. Describe any adjustments made to approximate to opportunity costs.	
Currency, price date, and conversion	14	Report the dates of the estimated resource quantities and unit costs. Describe methods for adjusting estimated unit costs to the year of reported costs if necessary. Describe methods for converting costs into a common currency base and the exchange rate.	10
Choice of model	15	Describe and give reasons for the specific type of decision-analytical model used. Providing a figure to show model structure is strongly recommended.	
Assumptions	16	Describe all structural or other assumptions underpinning the decision-analytical model.	
Analytical methods	17	Describe all analytical methods supporting the evaluation. This could include methods for dealing with skewed, missing, or censored data; extrapolation methods; methods for pooling data; approaches to validate or make adjustments (such as half cycle corrections) to a model; and methods for handling population heterogeneity and uncertainty.	11-12
Results			
Study parameters	18	Report the values, ranges, references, and, if used, probability distributions for all parameters. Report reasons or sources for distributions used to represent uncertainty where appropriate. Providing a table to show the input values is strongly recommended.	N/A
Incremental costs and outcomes	19	For each intervention, report mean values for the main categories of estimated costs and outcomes of interest, as well as mean differences between the comparator groups. If applicable, report incremental cost-effectiveness ratios.	14-15
Characterising uncertainty	20a	*Single study-based economic evaluation:* Describe the effects of sampling uncertainty for the estimated incremental cost and incremental effectiveness parameters, together with the impact of methodological assumptions (such as discount rate, study perspective).	14
	20b	*Model-based economic evaluation:* Describe the effects on the results of uncertainty for all input parameters, and uncertainty related to the structure of the model and assumptions.	
Characterising heterogeneity	21	If applicable, report differences in costs, outcomes, or cost-effectiveness that can be explained by variations between subgroups of patients with different baseline characteristics or other observed variability in effects that are not reducible by more information.	
Discussion			
Study findings, limitations, generalisability, and current	22	Summarise key study findings and describe how they support the conclusions reached. Discuss limitations and the generalisability of the findings and how the findings fit with current knowledge.	16-21

knowledge

Other			
Source of funding	23	Describe how the study was funded and the role of the funder in the identification, design, conduct, and reporting of the analysis. Describe other non-monetary sources of support.	22
Conflicts of interest	24	Describe any potential for conflict of interest of study contributors in accordance with journal policy. In the absence of a journal policy, we recommend authors comply with International Committee of Medical Journal Editors recommendations.	22

For consistency, the CHEERS statement checklist format is based on the format of the CONSORT statement checklist

BMJ Open

Economic evaluation of a phase III international randomised controlled trial of very early mobilisation after stroke (AVERT)

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2018-026230.R2
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Title Page

Title

Economic evaluation of a phase III international randomised controlled trial of very early mobilisation after stroke (AVERT)

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Abstract

Objectives While Very Early Mobilisation (VEM) intervention for stroke patients was shown not to be effective at 3 months, 12 -month clinical and economic outcomes remain unknown. The aim was to assess cost-effectiveness of a VEM intervention within a Phase III randomised controlled trial (RCT).

Design An economic evaluation alongside a RCT, and detailed resource use and cost analysis over 12-months post-acute stroke.

Setting Multi-country RCT involved 58 stroke centres.

Participants 2104 patients with acute stroke who were admitted to a stroke unit.

Intervention A very early rehabilitation intervention within 24 hours of stroke onset

Methods Cost-utility analyses were undertaken according to pre-specified protocol measuring VEM against usual care (UC) based on 12 -month outcomes. The analysis was conducted using both health sector and societal perspectives. Unit costs were sourced from participating countries. Details on resource use (both health and non-health) were sourced from Cost Case Report Form. Dichotomised Modified Rankin Scale (mRS) scores (0-2 vs 3-6) and Quality Adjusted Life Years (QALYs) were used to compare the treatment effect of VEM and UC. The base case analysis was performed on an Intention-To-Treat (ITT) basis and 95% confidence intervals (CI) for cost and QALYs were estimated by bootstrapping. Sensitivity analysis were conducted to examine the robustness of base case results.

Results VEM and UC groups were comparable in the quantity of resource use and cost of each component. There were no differences in the probability of achieving a favourable mRS outcome (0.030, 95%CI: -0.022 to 0.082), QALYs (0.013, 95%CI: -0.041 to 0.016) and cost (AUD1082, 95%CI: -$2520 to $4685) from a health sector perspective; or AUD$102, 95%CI:

-$6907 to $7111, from a societal perspective including productivity cost). Sensitivity analysis achieved results with mostly overlapped CIs.

Conclusions VEM and UC were associated with comparable costs, mRS outcome and QALY gains at 12 months. Compared with to UC, VEM is unlikely to be cost-effective. The long-term data collection during the trial also informed resource use and cost of care post-acute stroke across five participating countries.

Trial registration Australian New Zealand ClinicalTrials Registry, number ACTRN12606000185561.

Strength and limitations

- This is the first economic evaluation assessing the cost-effectiveness of a very early rehabilitation intervention within the largest Phase III randomised controlled trial in patients with stroke;
- The study assessed the long-term cost and cost-effectiveness of this very early rehabilitation intervention at 12-month;
- The difficulty posed by the multi-country design of the trial and the percentage of missing data may undermine the confidence in the results.

Introduction

Stroke is one of the biggest killers and a leading cause of disability worldwide.[1 2] 65% of stroke survivors live with some degree of disability that impedes their ability to carry out daily living activities unassisted.[3] Therefore, ways of improving the outcomes of patients after stroke is an important focus of research.[4 5] Early mobilisation after stroke is believed to contribute to better patient outcomes and clinical trials have been conducted globally.[6-9]

The short-term efficacy and safety of a very early rehabilitation trial after stroke (AVERT) has been evaluated in a phase III randomised controlled trial (RCT) with 2,104 patients enrolled from Australia, New Zealand, United Kingdom, Singapore and Malaysia.[10] The evidence from this trial indicated that at three months after stroke, very early mobilisation (VEM) of patients was associated with a reduction in the probability of a favourable outcome as defined by a modified Rankin Scale (mRS) score of 0-2 compared to that in the usual care (UC) group.[10] In the research field of stroke, primary endpoint is usually assessed at month 3 after stroke[11-14], which means there is a paucity of data in terms of long-term resource use and cost of care for patients with stroke. Given AVERT provided a longer-term (i.e. 12 months) comprehensive measurement of costs relating to stroke care (i.e. direct medical, direct non-medical, and indirect costs), and the broader representativeness of patients across countries and regions (>2000 patients were recruited from both developing and developed world), together with the implications of stroke economic burden sustained beyond the acute phase (i.e., 3 months), holistically examining the cost of stroke care that falls within health and non-health sectors could potentially advance understanding of pattern of resource use post stroke and identify any gaps to improve care for stroke and chances to curb the increasing economic burden of disease.

This examination also benefits healthcare funders (i.e. governments, insurance companies) and the public with addition of substantial knowledge of long-term rehabilitation cost for stroke.

This economic evaluation, which was part of the registered trial protocol (Australian New Zealand Clinical Trials Registry, ACTRN12606000185561) and planned prior to knowledge of outcomes, was conducted alongside the Phase III RCT,[10] The aim of this paper is to assess the cost-effectiveness of very early mobilisation within 24 hours after stroke in terms of improving patient outcomes at 12-months, in comparison to usual care (UC), with a particular focus on examining the resource use and cost of care after stroke.

Methods

The economic analysis was undertaken following the previously published plan.[15] It also conforms to the Consolidated Health Economic Evaluation Reporting Standards (CHEERS) checklist.[16] Ethics approval was granted by relevant institutions.

Intervention and comparator

The trial design has been reported in detail elsewhere.[10] In brief, patients with confirmed stroke who were admitted to a stroke unit within 24 hours of stroke onset were randomised to receive usual stroke-unit care (UC) alone or VEM in addition to UC in a multinational Phase III trial.

Outcomes

The mRS at 12-months, a secondary outcome of the trial, and Quality-Adjusted life years (QALYs) derived from the Assessment of Quality of Life-4D (AQoL-4D)[17] were used as the effectiveness measures in the economic evaluation. The AQoL-4D instrument is a multi-

attribute utility scale used to assess the health-related quality of life (HRQoL)[18]; it was administered at 3 and 12 months.

Outcome of mRS was dichotomised into "favourable" (mRS 0-2) and "poor" (mRS 3-6) based on patients outcomes at 12-month follow up.[10] The difference in the probability of patients achieving a favourable mRS outcome (mRS 0-2) was used to estimate the incremental benefits between treatment groups for the primary efficacy outcome.

Due to the inherent difficulties of administering the AQoL instrument to acute stroke patients (i.e. most of patients were not able to respond to these questions at baseline), the mRS score at baseline[10] was used as a surrogate measure of patient utility during the acute phase. The detailed methods of this work are reported elsewhere[19] and a brief description is supplied in the online Supplementary document 1.

Costs

A societal perspective with a key focus on the health sector was adopted.

Intervention delivery

Intervention delivery costs consisted of the time costs of physiotherapists (PT) and nurses delivering VEM (or UC) to patients. The mean of the total physiotherapist time (recorded by a log documented by each participating PT across whole hospital stay) per patient was calculated. Given insufficient data, physiotherapist's mean time per session was used as a proxy for nurse time spent on delivering either VEM or UC.

Resource use

All resource use during the study period was electronically collated using a validated Cost Case Report Form (Cost CRF) administered and recorded by trained staff at 3- and 12-months using face to face assessments with patients and carers, and medical records. Cost CRF used in Australia is supplied as an example (Supplementary document 2). Cost CRF from other participating countries could be requested from corresponding author.

Healthcare resource use

The quantity of resources used for the following health care resource items was recorded: number of ambulance transfers (emergency and non-emergency), acute hospitalisation (including length of stay, LoS), rehospitalisation (number of occasions and LoS for each occasion), rehabilitation hospital admission (number of occasions and LoS for each occasion), outpatient rehabilitation program (number of occasions and number of days for each occasion), rehabilitation provided at home/nursing facility (number of occasions and number of sessions for each occasion), private physiotherapy (number of sessions), respite care (number of sessions) and individual outpatient (including physiotherapy, occupational therapy, and speech and language therapy) visits (service type and number of sessions) for patients from United Kingdom, Singapore and Malaysia only.

Non-healthcare resource use

The quantity of resources used was recorded for the following non-heath care resource items: accommodation move due to stroke (location moved to and date of move), community service (type of service use and number of service used both for prior to and post-stroke), home modification (type of modification, supplier and cost), special equipment and aids (type of equipment/aids and quantity consumed), informal care (purpose of the care and hours used), live-in maids (number of maids prior to and post stroke) (for Singapore and Malaysia only),

changes to employment (employment status and weekly hours of working both prior to and post-stroke).

Resource use reported at 3 (i.e. resources used between 0 and 3 months) and 12 (i.e. resources used between 4 and 12 months) months was used to calculate the total annual resource use for each participant. Generally, where patients were still using a particular resource at the time of 12-month data collection, the last day of 12 months' follow-up (calculated from the day of index stroke) was used to estimate the duration of that resource utilisation. In the event of a patient dying, resource use data for the period prior to death was ascertained from their carer and medical records, wherever possible.

Unit costing

Costs were computed by applying country-specific unit costs to each resource item utilised. Therefore, five sets of unit costs (one for each of the participating countries) were compiled from the most up-to-date and reliable source (Supplementary document 3). Unit costs from a country with a similar economic status and healthcare system were used where local country-specific unit costs were unavailable.

All costs are expressed in Australian dollars (AUD) for the 2015 reference year value and can be converted to United States dollar (USD) using the Purchasing Power Parity rate 1 USD=1.463 AUD[20] (December 2015). The currency of other countries was converted to AUD using the corresponding exchange rate. The country-specific Consumer Price Index (CPI) from the health sector was employed to adjust costs not valued in the year of 2015.

The details of unit cost for acute stroke hospitalisation, rehospitalisation, rehabilitation (inpatient and outpatient), non-health sector costs (home modifications, community services, aids etc.) and productivity cost are provided in Supplementary document 3.

Statistical analysis

All the costs that were attributable to stroke including healthcare costs, non-healthcare costs and productivity costs were accounted for in the economic analysis. Since a 12 month economic evaluation was undertaken, no discounting was applied to either costs or benefits.

Quantity of resource use and costs were summarised using medians and interquartile ranges (IQRs) due the skewness of the raw data. Means and standard deviations (SDs) were also reported. Base case analysis of the economic evaluation was performed based on the Intention-to-Treat (ITT) population[21] with an assumption for the main analysis that data were Missing At Random (MAR). The difference in costs was analysed using Generalised Linear regression Model (GLM) with gamma family and a log link, with treatment groups as an independent variable, including baseline National Institutes of Health Stroke Scale (NIHSS), baseline mRS[15] and age as treatment covariates.

For the primary outcome, the mRS score at 12 months was compared following the method detailed in the Statistical Analysis Plan.[22] While for the secondary effectiveness outcome (i.e. the QALY gains at 12 months), a linear regression model with treatment group as the factor variable and 12 months AQoL-4D utility value as the dependent variable, adjusted for age, baseline mRS was utilised to estimate the difference in QALY gains over 12 months. Non-parametric bootstrap simulations with 2000 replications were used to calculate 95% confidence intervals (CIs) around mean difference in costs and effects for cost-effectiveness analysis. To

examine the cost-effectiveness of VEM measured against UC, Incremental Cost-Effectiveness Ratios (ICERs) were calculated where applicable. For the ICER from a societal perspective, all the costs from health and non-health sector were summed together, including the productivity cost; for ICER of a health sector perspective, all the costs borne by healthcare system were counted (i.e. excluding non-healthcare costs and productivity cost). The differences between groups in terms of costs and benefits (i.e. QALYs) were compared regardless of the statistical significance of the difference.[23] Cost-effectiveness acceptability curves were plotted to show the probability of VEM being the optimal choice. The ICERs were compared with a common benchmark in Australia of ≤AUD50,000 per QALY.[24] All the analyses were performed using the STATA 14.0 statistical package (StataCorp. 2015. Release 14. StataCorp LP.)

Sensitivity analyses

To investigate the impact of using country-specific costs, a country dummy variable was added to the GLM analysis to adjust for country effect.[25] Subgroup analysis on the basis of individual countries were also conducted to explore the difference in costs and benefits across countries.

Multiple imputation was performed to test the sensitivity of results to the missing data assumption. The missing patterns were explored with the use of logit regression to investigate if any of the other variables predicted whether a given variable was missing[26] (Supplementary document 4).

Secondary analyses were undertaken to assess the robustness of the base case results. Subgroup analyses were performed at the country-specific level to test for differences in efficacy and costs.

Patient and Public involvement

No patient and public were involved.

Results

Between July 2006 and October 2014, 2,104 patients (VEM 1,054; UC 1,050) were recruited across 58 sites from Australia (N=1,054, 24 sites), New Zealand (N=189, 1 site), United Kingdom (N=610, 29 sites), Singapore (N=128, 1 site) and Malaysia (N=123, 1 site). At recruitment, over 80% of patients had no prior history of stroke; NIHSS was greater than 7 points (indicating a moderate to severe stroke) for around 45% of patients; 26% aged over 80 years and 24% had received recombinant tissue plasminogen activator prior to randomisation[10]. Baseline characteristics were similar between the two treatment groups[10].

Outcomes

There was no difference between VEM and UC groups in terms of favourable mRS outcome and quality of life (as measured by AQoL-4D) at month 12. Specifically, a comparable percentage of patients from both treatment groups achieved a favourable outcome at 12 months after stroke (between-group difference in probability: 0.030, 95%CI:-0.021 to 0.082, adjusted for baseline age and NIHSS). Likewise, for the outcome of AQoL-4D at 12 months, no between-group difference was observed (-0.013, 95%CI:-0.043 to 0.017). The detailed mRS outcomes are presented in Supplementary document 5: Table I.

Resource use and costs

The proportion of patients reporting use of a specific resource varied from item to item (Table 1). In relation to the healthcare resource items, nearly half of patients experienced rehabilitation hospital admission and more than a quarter of patients had a stroke-related rehospitalisation, rehabilitation service use (outpatient/provided at home or nursing facility) and ambulant transfers whereas only a small proportion of patients (less than 10%) recorded the use of private physiotherapy and/or respite care. Regarding non-health-related resource use, the majority of patients (>50%) used some form of special aids or equipment during the 12 months after their index stroke, whilst nearly 40% of patients received informal care, and around 27% reported the use of community services and home modifications. Only 16% (VEM) and 17% (UC) of patients respectively, experienced accommodation changes due to the index stroke. For maid's service use in the home in Singapore and Malaysia, a small proportion (less than 10%) of patients hired a maid both before and after the index stroke.

With respect to productivity, nearly one in four patients were employed prior to their stroke; this proportion fell to only one in eight patients at 12 months follow up. Generally, resource use was comparable between VEM and UC groups ($p > 0.05$) across all items (Table 1).

The median total medical cost was marginally higher in the UC group ($20,411, IQR: $7,238 to $63,835) than in the VEM group ($19,271, IQR: $6,294 to $52,637), primarily due to the higher rehabilitation admission cost in UC. In both groups, the major cost component was acute hospitalisation which accounted for around 30% of medical costs. The median non-medical cost was also marginally higher in the UC group ($438, IQR: $0 to $4,561) than in the VEM group ($358, IQR: $0 to $3,334). The median productivity cost was zero for both treatment groups given that less than one quarter of patients were in paid employment before the index stroke. Overall, the median total cost (including productivity cost and non-medical costs) were nominally higher in the UC group ($27,042, IQR: $7,257 to $63,824) compared to the VEM group ($25,675, IQR: $6,766 to $63,617). The detailed costs of each resource item and

summary costs are presented in Table 2. The costs for VEM and UC interventions are summarised in Supplementary document 5: Table II.

Generally, the cost from VEM and UC groups were comparable: the differences between VEM and UC groups was $1082 (95%CI: -$2399, $4563) for the total medical cost (Supplementary document 6: Table I) and $3 (95%CI: -$5, $12) for the productivity cost per person at 12 months; the between-group difference in the total non-health care cost was -$1300 (95%CI: -$3361, $760) over the same period of time.

Cost-effectiveness analysis

The between group difference in both efficacy and cost outcomes generated from the GLM model are presented in Supplementary document 6: Table I.

In the base case health sector perspective analysis, the VEM yielded comparable total medical costs ($1082, 95%CI: -$2520 to $4685, p=0.544) and QALY gains (-0.013, 95%CI: -0.041 to 0.016) at 12 months. When a societal perspective was adopted, the VEM entailed, again, similar costs with the UC group ($102, 95%CI: -$6907 to $7111, p=0.982, including productivity costs) or (-$6, 95%CI: -$5476 to $5463, p=0.933, excluding productivity costs) (Table 3).

The cost-effectiveness planes and cost-effectiveness acceptability curves from the two perspectives are shown in Supplementary document 7: Figures I to V.

Sensitivity analyses

Inclusion of a country dummy variable in the analysis produced similar results to the base case (Supplementary document 6: Table II).

The analysis from imputed data including all randomised participants produced consistent results with regard to the incremental cost and effectiveness between treatment groups. For example, from a health sector perspective, VEM was associated with similar costs ($940, 95%CI: $-4622 to $4682) and QALY gains (-0.019, 95%CI:-0.044 to 0.005) over 12 months. (Supplementary document 6: Table III and Supplementary document 7: Figures VI-VIII)

The country-specific analysis showed similar results in the between-group differences for both costs and QALYs, indicating that VEM and UC yielded comparable results within each participating countries (Table 4).

When a societal perspective was assumed, again, the point estimate of difference in costs between groups across countries varied substantially, with the 95% confidence intervals mostly overlapping (Table 4).

Discussion

The 12 months within-trial cost-effectiveness analysis showed that VEM was unlikely to be cost-effective than UC in patients with stroke. Between-group differences in costs and benefits (probability of achieving a favourable outcome of mRS and differences in QALYs) over the one year study period were comparable from a health sector perspective. The findings from this economic evaluation is also underpinning an adapted version of trial underway to investigate the effectiveness of optimal rehabilitation in patients with mild to moderate stroke

(i.e. AVERT-DOSE, National Health and Medical Research Council Australia, project grant #1139712).

Our earlier economic evaluation of the phase II AVERT trial which consisted of only 71 patients (38 VEM and 33 UC) from two Australian centres reported that VEM was likely to be a cost-effective intervention with both less cost and more benefit when compared to UC.[27] Since it was a national pilot study with a limited sample, the direct comparison between the results from this and our current economic evaluation is problematic. In addition, inconsistent with the pilot study, no service shifting was observed in the current study. Across all resource use components, the proportion of patients consuming specific types of resources were comparable between the two groups in this study. On the contrary, in the Phase II AVERT trial, patients from VEM group were more likely to be discharged earlier from hospital than their UC counterparts; those discharged early tended to use more care provided in the outpatient setting, which incurred lower costs; and informal care was not costed. In the current study, the LoS for acute hospitalisation and rehabilitation were similar between treatment groups (median: VEM 16 vs UC 17 days). These differences between the two studies highlight the importance of large, adequately powered studies to inform health care policy.

In this study, resources used were valued on the basis of country-specific unit costs sourced for each participating country. To counteract any concern arising from the adoption of this approach, extensive sensitivity analyses were performed to test the robustness of the results. The conduct of incorporation of a country dummy variable into the model or country-specific analysis did not alter the outcomes substantially, with the resultant 95% confidence intervals overlapping to a great extent. Ramsey et al. 2015 suggest that a country-specific costing approach is likely to yield few qualitative differences in summary measures of cost-effectiveness among countries with similar levels of economic development.[25] Therefore, it was believed that any differences in economic status of the participating countries (as reflected

by the unit costs applied in our study) are unlikely to bear a major influence on the results of the cost-effective analysis.

This multinational trial also revealed that in managing patients post-stroke, practice of stroke care varied from country to country. Although 100% of patients with stroke were hospitalised for the initial acute care, the LoS differs significantly greatly, ranging from 4 days (Malaysia) to 25 days (New Zealand), which might be attributable to the different severity of stroke and/or differences in clinical practice care processes. Moreover, in Malaysia, patients tended to receive rehabilitation services in an outpatient (i.e. up to 52% of patients received the outpatients rehabilitation program services) rather than inpatient (i.e. only up to 2% patients were admitted to rehabilitation hospital) setting; and patients were less likely to utilise ambulant transfer and apply home modifications, as compared to participants from other countries. This might be a signal for future study around stroke care in Malaysia, research potentially could be helpful to improve the service delivery for outpatient rehabilitation program. Patients from western countries consumed more community services and rehabilitation services that provided at home/nursing home than their Asian counterparts, which reflects the difference in social welfare and healthcare systems.

Economic evaluations have been conducted for other types of stroke rehabilitation interventions including early-supported discharge service, community- or home-based rehabilitation. [28-36] Generally, these interventions trended towards being cost-saving measured against usual practice. In regards to health-related quality of life (HRQoL) outcomes measured by a series of quality of life instruments (including SF-36, WHOQoL-Bref, Nottingham Health Profile, Sickness Impact Profile and EQ-5D), most studies did not detect an overall significant effect.[28-32 34 35 37] Only one study reported a significant difference improvement in the overall

HRQoL score.[36] The conclusions drawn from these economic evaluations of stroke rehabilitation interventions were fairly consistent; the interventions were likely to cost less,[33 34 37-42] although the difference in costs was statistically significant in only one study.[41] None of these studies evaluated the costs and benefits, particularly benefits measured in terms of QALYs, in an aggregated manner, and all were limited by small sample sizes. Another study using a Markov model explored the increased intensity of physiotherapy for stroke patients from a health system perspective, concluding that increased physiotherapy could be cost-effective by improving health outcomes and reducing costs due to the resultant shorter stay in rehabilitation facilities.[43]

Given that it is not practical to obtain a baseline utility value from patients with stroke, in this study, the baseline AQoL value was mapped from mRS score at baseline.[15] Whilst the mapping exercise was carried out using the baseline mRS score and AQoL values at 3 and 12 months, the significant variation in the mapped baseline utility values for patients falling within the same category of mRS hampered its application to the current economic evaluation. Instead, only the 12-month utility values were compared to approximate the difference in QALY gains over one year between the two treatment groups. Comprehensive sensitivity analyses were undertaken surrounding this assumption. It was observed that there was no noticeable difference among approaches examining the annual QALY gain difference between VEM and UC.

Whilst the results from the clinical study showed that there were no significant differences in either costs or effects between treatment groups, the cost-effectiveness analysis was still performed to investigate the possible ICER of the VEM intervention. It is possible to have greater confidence in the joint outcome of costs and QALYs than looking at them individually.[44]

To the best of our knowledge, this study evaluated the cost-effectiveness of the largest international acute stroke rehabilitation trial ever conducted. The cost-effectiveness analysis was performed alongside the randomised controlled trial, where the costs and benefits data were collected prospectively. Moreover, the Cost CRF was completed by trained and blinded assessors via interviews with individual patients/carers and accessing medical records, which provides for greater accuracy than resource use questionnaires or diaries completed by participants themselves. Since the trial was designed in a pragmatic manner, with close resemblance to real clinical practice, it is believed that the assessment of its cost and cost-effectiveness under this setting reflects the real-life resource use (health and non-health).

This study provides some insights for future economic evaluation alongside multi-country, multi-centre clinical trials. It is important to note that given the large number of centres involved (56 stroke units across five geographical jurisdictions), it was not practical or reasonable to collect centre-specific unit costs which probably leads to huge variations even within a single country. Country-level unit costs were therefore applied to the valuation of resource uses across the trial sites. However, the heterogeneity in the resource utilisation and unit cost among the included countries undermines confidence in the conclusion. A country-specific economic evaluation might be more appropriate in this regard but the lacking of statistical power poses another concern. The current study made a trade-off between them both approaches by presenting both the aggregated (i.e. base case of pooling all countries) and disaggregated (i.e. sensitivity analysis of individual countries) form of results. The resource utilisation, costs and benefits were also tabulated across all sites and individually to allow close scrutiny from various perspectives. [28] It is believed that this practice can be recommended to other multi-country studies.

A couple of limitations of the study are acknowledged. Firstly, the missing data on total costs from a societal perspective was around 24%, and related mainly to the missing information on

community services (10.9%) and productivity loss (10.7%). The base case analysis was based on the ITT population with an assumption of missing pattern being MAR. To account for this, the sensitivity analysis using multiple imputation was undertaken and yielded the identical conclusion (i.e. comparable results in costs and benefits between treatment groups). Secondly, unit costs originating from individual countries were assigned to value resource use. The differences in health care systems and cost structures among the five participating countries may potentially confound the cost comparisons between groups. However, analysis by country produced results consistent with the base case, which overcomes any concern that the latter were heavily weighted towards Australia, the largest sample country.

Conclusions

This economic evaluation alongside a phase III RCT evidenced that based on the ITT population, the VEM intervention for patients with stroke was unlikely to be cost-effective compared to UC. The sensitivity analyses based on the multiple imputation and subgroup analyses by each country separately yielded fairly consistent results. Despite substantial differences observed, in resource use and unit costs across the countries, the marginal differences between VEM and UC were consistent. Overall, the VEM intervention was demonstrated to be comparable with UC in terms of both benefits and costs at one-year, however given its poorer outcomes at 3 months, VEM cannot be recommended to clinicians, patients or policymakers.

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Authors' Contribution

Conception/design, revising and final approval: LG, LS, LC, OW, MM, JC, FE, JB, HD, MMoodie. Methodology: LG, MM, LS, LC, MMoodie, OW. Data analysis: LG, LS, MM, LC. Drafting: LG, MMoodie.

Competing Interests Statement

All authors confirm that there is nothing to declare.

Data Availability Statement

No additional data available

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Tables

Table 1. Quantity of resource use over 12 months (ITT) (median, IQR)

	AU (N=1054)		NZ (N=189)		UK (N=610)		SG (N=128)		MA (N=123)		All Countries	
	VEM	UC	VEM	UC	VEM	UC	VEM	UC	VEM	UC	VEM	UC
Acute hospitalisation												
% of patients using	100	100	100	100	100	100	100	100	100	100	100	100
LoS (days)	21(6-42)	22(7-46)	23(6-57)	25(8-48)	12(4-45)	13(5-4)	16(4-25)	18(4-25)	5(3-8)	4(2-8)	16(4-41)	17(5-41)
Stroke-related rehospitalisation												
% of patients using	30	29	28	33	28	23	20	20	18	23	28	27
No. readmission/s	1(1-2)	1(1-2)	1(1-2)	1(1-2)	1(1-2)	1(1-2)	1(1-2)	2(1-2)	1(1-2)	1(1-2)	1(1-2)	1(1-2)
Admission to rehabilitation hospital[‡]												
% of patients using	62	56	60	65	35	34	45	56	0	2	50	47
No. of admission/s	1(0-1)	1(0-1)	1(0-1)	1(0-1)	0(0-1)	0(0-1)	0(0-1)	1(0-1)	0(0-0)	0(0-0)	0(0-1)	1(1-1)
Outpatient rehabilitation program												
% of patients using	40	39	23	19	12	10	19	25	52	48	30	28
No. of services	15(6-29)	12(6-28)	16(7-28)	17(12-34)	12(6-21)	7(4-14)	32(20-77)	29(3-116)	15(7-24)	16(4-22)	15(6-28)	12(6-27)
Rehabilitation provided at home/nursing facility												
% of patients using	30	33	57	52	50	46	3	2	2	2	35	34
No. of services	9(4-22)	10(4-25)	18(8-29)	16(9-30)	12(6-28)	12(6-30)	81(63-99)	9(9-9)	104(104-104)	8(8-8)	12(5-27)	12(5-28)
Ambulance transfer												
% of pts using	51	53	34	48	41	38	36	28	5	8	43	44
No. of trips	2(1-3)	2(1-3)	2(1-3)	1(1-3)	2(1-3)	2(1-3)	1(1-2)	1(1-2)	2(2-3)	2(1-3)	2(1-3)	2(1-3)
Individual allied health therapy												
% of pts using	N/A	N/A	N/A	N/A	19	15	-	2	20	25	-	-
No. of services	N/A	N/A	N/A	N/A	8(2-12)	8(4-15)	-	2(2-2)	8(3-10)	16(8-31)	-	-
Private physiotherapy												

% of pts using	9	8	11	1	5	5	8	8	3	2	8	6
No. of services	5(3-19)	6(4-19)	13(6-18)	3(3-3)	12(6-33)	7(1-14)	18(16-24)	14(7-24)	12(11-13)	8(8-8)	15(4-20)	24(3-19)
Respite care												
% of pts using	3	2	3	2	2	3	-	-	-	2	2	2
No. of services	21(10-43)	15(11-35)	12(10-20)	7(5-8)	24(9-40)	21(12-80)	-	-	-	30(N/A)	18(9-39)	18(9-41)
Accommodation moves												
% of pts using	18	17	19	28	13	14	11	20	23	10	16	17
No. of moves	1(1-1)	1(1-1)	1(1-1)	1(1-1)	1(1-1)	1(1-1)	1(1-1)	1(1-1)	1(1-2)	2(1-2)	1(1-1)	1(1-1)
Community Services used prior to having a stroke over the past year												
% of pts using	13	17	6	7	5	5	-	-	-	-	9	11
No. of services	26(26-52)	26(26-52)	52(39-88)	46(14-52)	52(25-104)	40(15-131)	-	-	-	-	27(26-52)	26(26-52)
Community services used over 12 months after stroke												
% of pts using	30	35	32	28	31	28	-	3	6	-	27	28
No. of services	28(18-72)	32(12-78)	130(47-233)	48(17-256)	42(12-185)	90(12-310)	-	3(3-3)	6(3-73)	-	39(14-119)	39(12-124)
Home modifications undertaken over 12 months												
% of pts using	27	30	20	17	36	33	16	19	3	10	27	28
No. of mods	2(1-2)	2(1-2)	1(1-2)	2(1-2)	1(1-2)	2(1-2)	1(1-2)	1(1-2)	1(1-1)	1(1-1)	1(1-2)	2(1-2)
Aids and appliances used over 12 months												
% of pts using	46	47	55	63	58	51	44	45	58	59	51	50
No. of aids/appliance used	2(1-5)	2(1-4)	3(2-6)	2(1-4)	4(2-6)	4(2-6)	2(2-3)	2(1-3)	2(1-3)	2(1-3)	3(1-5)	3(1-5)
Working prior to stroke												
% of patients	24	23	38	34	19	21	52	52	45	33	27	26
Hrs worked/week	40(27-50)	40(30-50)	40(37-40)	40(37-40)	40(25-48)	37(25-40)	48(40-56)	45(36-50)	42(40-56)	45(32-50)	40(30-50)	40(30-50)
Proportion working at 12 months												
% of patients	15	12	20	16	7	9	25	22	24	15	14	12
Hrs worked/week	38(18-40)	25(12-40)	40(20-40)	40(38-40)	35(26-40)	30(24-37)	39(16-46)	35(23-44)	40(32-47)	45(30-50)	38(20-41)	30(16-40)

Patients from Malaysia and Singapore who had a maid prior to stroke												
% of patients	-	-	-	-	-	-	19	16	5	10	-	-
No. of maids	-	-	-	-	-	-	1(1-1)	1(1-1)	1(1-1)	1(1-1)	-	-
Patients from Singapore and Malaysia who had a maid at 12 months following stroke												
% of patients	-	-	-	-	-	-	23	22	5	7	-	-
No. of maids	-	-	-	-	-	-	1(1-1)	1(1-1)	1(1-1)	1(1-1)	-	-
Receipt of informal care at 12 months												
% of patients	35	39	37	33	41	40	30	36	42	44	37	39
No. of hrs/week	15(6-34)	12(4-31)	8(3-21)	14(6-30)	21(9-34)	17(7-35)	35(13-46)	16(4-30)	22(10-38)	16(5-26)	18(7-35)	14(5-32)

ITT: Intention-to-treat; AU: Australia; NZ: New Zealand; UK: United Kingdom; SG: Singapore; MA: Malaysia; LoS: length of stay; pts: patients; No.: number; hrs: hours; mod: modification; -: no such resource use; all numbers were expressed as median and interquartile range (IQR); [‡] includes any admissions to rehabilitation hospital following the indexed stroke;

Table 2 Cost of all the resources used over 12 months (AUD)

	AU (N=1054)		NZ (N=189)		UK (N=610)		SG (N=128)		MA (N=123)		All Countries	
	VEM	UC	VEM	UC	VEM	UC	VEM	UC	VEM	UC	VEM	UC
Health care cost (AUD)												
Acute hospitalisation												
Median, IQR	$6294 (6294, 9553)	$6294 (6294, 9553)	$6104 (4370, 6104)	$6104 (4370, 6104)	$2763 (1382, 6563)	$3109 (1727, 6563)	$1493 (1493, 1809)	$1493 (1493, 1493)	$1363 (1363, 1572)	$1363 (1363, 1572)	$6294 (2279, 9535)	$6294 (2418, 9553)
Mean, SD	$9883 (9484)	$10010(10508)	$6635 (3244)	$6549 (3555)	$5714(7876)	$5885 (7101)	$1721 (547)	$1676 (432)	$1482 (212)	$1472 (200)	$7369 (8469)	$7521 (8916)
Stroke-related rehospitalisation												
Median, IQR	$0 (0, 3850)	$0 (0, 3850)	$0 (0, 325)	$0 (0, 2243)	$227 (227, 1401)	$227 (227, 227)	$111 (111, 111)	$111 (111, 111)	$68 (68, 68)	$68 (68, 68)	$111 (0, 1401)	$111 (0, 610)
Mean, SD	$6030 (17114)	$6473 (21590)	$651 (1371)	$1507 (2828)	$4524 (13968)	$3494(11349)	$2756 (7565)	$1679 (3465)	$714 (1608)	$603 (1479)	$4610 (14518)	$4551 (16707)
Admission to rehab hospital												
Median, IQR	$13134 (0, 36371)	$13134 (0, 38391)	$11262 (0, 30983)	$11262 (0, 26486)	$0 (0, 29788)	$0 (0, 29788)	$0 (0, 2921)	$1298 (0, 3570)	$0 (0, 0)	$0 (0, 0)	$0 (0, 29788)	$1136 (0, 29788)
Mean, SD	$25667 (38892)	$26648(38315)	$16871(18536)	$15573(16848)	$12539(19682)	$11758 (18390)	$1815 (2759)	$2798 (5082)	$0 (0)	$43 (234)	$18197 (31241)	$18458 (30811)
Outpatient rehab program												
Median, IQR	$0 (0, 2451)	$0 (0, 1913)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 36)	$33 (0, 265)	$0 (0, 249)	$0 (0, 478)	$0 (0, 239)
Mean, SD	$2081 (4183)	$1934 (5316)	$821 (2236)	$721 (1991)	$266 (1026)	$155 (676)	$364 (1090)	$562 (1478)	$174 (286)	$126 (206)	$1246 (3244)	$1142 (3976)
Rehab provided at home/nursing facility												
Median, IQR	$0 (0, 717)	$0 (0, 956)	$1168 (0, 4299)	$212 (0, 3821)	$922 (0, 11064)	$0 (0, 11064)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 1913)	$0 (0, 1913)
Mean, SD	$1382 (4069)	$1551 (4252)	$3171 (4960)	$3111 (5754)	$12085 (28516)	$11051 (26723)	$93 (570)	$5 (42)	$97 (719)	$7 (53)	$4447 (16294)	$4180 (15203)
Individual allied health visit												
Median, IQR	N/A	N/A	N/A	N/A	$0 (0,0)	$0 (0,0)	$0 (0,0)	$0 (0,179)	$0 (0,0)	$0 (0,0)	N/A	N/A
Mean, SD	N/A	N/A	N/A	N/A	$375 (1144)	$329 (1291)	$432 (1521)	$1126 (3150)	$0 (0)	$0.2 (2)	N/A	N/A
Ambulance transfers												
Median, IQR	$508 (0, 1015)	$508 (0, 1015)	$0 (0, 646)	$0 (0, 646)	$0 (0, 1150)	$0 (0, 575)	$0 (0, 265)	$0 (0, 265)	$0 (0, 0)	$0 (0, 0)	$0 (0, 611)	$0 (0, 610)
Mean, SD	$671 (1057)	$623 (946)	$543 (1082)	$605 (928)	$790 (3209)	$701 (3150)	$164 (348)	$113 (208)	$6 (26)	$14 (64)	$627 (1920)	$578 (1838)
Private physiotherapy												
Median, IQR	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)
Mean, SD	$70 (375)	$124 (797)	$245 (1308)	$4 (36)	$128 (780)	$174 (2102)	$238 (1096)	$333 (1938)	$4 (19)	$1 (9)	$109 (693)	$132 (1336)
Respite care												
Median, IQR	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)
Mean, SD	$48 (355)	$20 (182)	$7 (46)	$2 (15)	$9 (95)	$58 (686)	$0 (0)	$0 (0)	$0 (0)	$1 (8)	$27 (259)	$27 (386)
	AU (N=1054)		NZ (N=189)		UK (N=610)		SG (N=128)		MA (N=123)		All Countries	
	VEM	UC	VEM	UC	VEM	UC	VEM	UC	VEM	UC	VEM	UC

Sub-total												
Median (IQR)	$29278 (8218, 63622)	$29441 (9811, 62489)	$20621 (6068, 46909)	$23722 (7316, 40162)	$18896 (4030, 48999)	$20843 (3682, 47908)	$4525 (1604, 8668)	$4687 (2724, 10926)	$1713 (1431, 2532)	$1746 (1431, 2348)	$19271 (6294, 52637)	$20411 (7238, 63835)
Mean (SD)	$45620 (51458)	$47453(53715)	$28898 (25011)	$27986(22676)	$34863 (42509)	$32842 (39517)	$7681 (8828)	$8358 (8787)	$2385(1587)	$2269(1574)	$36351 (45620)	$36604 (46309)
Non-health care cost												
Accommodation moves												
Median, IQR	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)
Mean, SD	$2089 (8518)	$2482 (9323)	$5975 (19614)	$9135 (26918)	$2901 (12958)	$2532 (11125)	$72 (578)	$108 (507)	$425 (1893)	$104 (501)	$2460 (11036)	$2821 (12212)
Community services												
Median, IQR	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 430)	$0 (0, 174)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)
Mean, SD	$570 (2681)	$1091 (8556)	$238 (950)	$1022 (4113)	$22275(294988)	$10738 (57306)	$0 (0)	$244 (1902)	$21 (110)	$0 (0)	$6870 (160318)	$3786 (31893)
Home modifications												
Median, IQR	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)
Mean, SD	$805 (6338)	$751 (7715)	$833 (4862)	$565 (3204)	$352 (2133)	$834 (7091)	$234 (1079)	$62 (299)	$49 (369)	$64 (237)	594 (4840)	$676 (6734)
Special aids and equipment												
Median, IQR	$0 (0, 332)	$0 (0, 318)	$70 (0, 549)	$103 (0, 357)	$27 (0, 786)	$0 (0, 846)	$0 (0, 240)	$0 (0, 210)	$15 (0, 218)	$36 (0, 186)	$0 (0, 414)	$0 (0, 414)
Mean, SD	$1986 (7668)	$2787 (10396)	$2198 (7993)	$1798 (7229)	$1354(3649)	$1720 (5083)	$1117 (5843)	$1079 (5483)	$153 (252)	$193 (658)	$1660 (6426)	$2141 (8328)
Informal care												
Median, IQR	$24 (0, 503)	$48 (0, 455)	$14 (0, 283)	$0 (0, 149)	$29 (0, 471)	$29 (0, 375)	$0 (0, 114)	$0 (0, 238)	$24 (0, 60)	$9 (0, 50)	$24 (0, 407)	$24 (0, 407)
Mean, SD	$414 (747)	$405 (758)	$236 (536)	$152 (311)	$324 (516)	$324 (645)	$144 (285)	$159 (300)	$43 (57)	$27 (34)	$335 (633)	$322 (660)
Living-in maids												
Median, IQR	N/A	N/A	N/A	N/A	N/A	N/A	$0 (0,0)	$0 (0,0)	$0 (0,0)	$0 (0,0)	N/A	N/A
Mean, SD	N/A	N/A	N/A	N/A	N/A	N/A	$3154 (8146)	$4268(11338)	$179 (930)	$83 (504)	N/A	N/A
Sub-total												
Median (IGR)	$459 (0, 3334)	$673 (0, 5209)	$381 (0, 3674)	$638 (103, 14551)	$758 (0, 5097)	$471 (0, 4725)	$25 (0, 1293)	$194 (0, 6999)	$74 (0, 285)	$57 (0, 318)	$358 (0, 3334)	$438 (0, 4561)
Mean (SD)	$6104 (15582)	$6985 (17554)	$7752 (17751)	$11981(27676)	$27892(306917)	$15345(61750)	$4802 (10366)	$6177 (13942)	$861 (2272)	$484 (1113)	$12043 (164026)	$9360 (36504)
Productivity cost												
Median, IQR	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)	$0 (0, 0)
Mean, SD	$75 (317)	$84 (391)	$29 (130)	$14 (54)	$17 (152)	$44 (245)	$6 (29)	$8 (35)	$1 (4)	$0.4 (3)	$46 (246)	$58 (312)
Total cost												
Median (IGR)	$33203 (9687, 71902)	$35143 (12696, 74070)	$29934 (8528, 65781)	$32216 (15710, 68292)	$25374 (4712, 64285)	$30537 (4629, 67012)	$6960 (1674, 26187)	$8810 (3426, 19493)	$2016 (1561, 3994)	$1816 (1537, 3301)	$25675 (6766, 63617)	$27042 (7257, 63824)
Mean (SD)	$52456(57264)	$56408(62536)	$40381(37242)	$43901(43170)	$65530(332044)	$49627(78644)	$15036(16921)	$16340(19650)	$3609(3985)	$2938(2350)	$50448(184931)	$47627(64249)

Where only a low proportion (i.e. less than 50%) of patient reported certain types of resource utilisation, zero median and/or IQR are reported. *In Malaysia, the length of stay for acute stroke hospitalisation includes a patient's immediate admission to rehabilitation hospital on discharge from hospital as the rehabilitation service immediately following the acute stroke hospitalisation is not routinely provided.

Table 3. Baseline cost-utility analysis_ ITT

	QALYs	Per capita mean cost (AUD)
Health care perspective		
Total medical costs	-0.013 (-0.041, 0.016)	$1082 (-$2520, $4685)
Societal perspective		
Total medical and non-medical costs (excl. productivity cost)	-0.013 (-0.041, 0.016)	-$6 (-$5476, $5463)
Total medical and non-medical costs (incl. productivity cost)	-0.013 (-0.041, 0.016)	$102 (-$6907, $7111)

ITT: Intention-to-treat; QALYs: Quality-adjusted Life Years; AUD: Australian dollar; excl: excluding; incl: including

Table 4 Results of country-specific analysis of costs and benefits

	AU (N=1054)	NZ (N=189)	UK (N=610)	SG (N=128)	MA (N=123)
Total medical costs	$948 (-$4352, $6248)	-$2836 (-$8403, $2730)	$2937 (-$3635, $9509)	-$81 (-$2789, $2627)	$137 (-$324, $599)
Total non-medical costs	-$1318 (-$3038, $403)	-$3959 (-$7769, -$150)	-$1387 (-$7331, $4557)	-$3164 (-$6834, $505)	$200 (-$232, $631)
Total cost (incl. productivity)	-$1735 (-$8482, 5013)	-$8981 (-$18380, $418)	$1870 (-$13955, $17694)	-$2636 (-$9233, $3961)	$479 (-$487, $1446)
Total cost (excl. productivity)	-$1185 (-$7184, $4815)	-$7610 (-$15302, $82)	$2552 (-$11377, $16481)	-$1534 (-$6464, $3395)	$416 (-$364, $1196)
QALY gains	-0.036 (-0.076, 0.003)	0.086 (-0.003, 0.176)	-0.010 (-0.064, 0.044)	0.008 (-0.106, 0.123)	0.003 (-0.126, 0.132)

AU: Australia; NZ: New Zealand; UK: United Kingdom; SG: Singapore; MA: Malaysia; QALY: Quality-adjusted Life Year.
*the p-value was >0.05 for the between-group difference in QALYs and cost

Supplementary document 1: Mapping baseline mRS score to utility of AQoL-4D

Methods

Generalized additive model (GAM) with spline smother was used to map AQoL from pre-morbid mRS, stroke severity, and/ or age group. The performance of the models was evaluated using mean absolute, mean squared errors (MAE and MSE) and R2. 10-fold cross- validation was implemented for model validation. The mapped baseline utility of AQoL-4D was used in the following models.

The analyses are structured as follows:

Model 1:

a) A complete case model with the utility value at 12 months as an output, group as an input, and pre- morbid mRS as a covariate;

b) A complete case model with the utility value at 12 months as an output, group as an input, and pre- morbid mRS + stroke severity as covariates;

c) A complete case model with the utility value at 12 months as an output, group as an input, and pre- morbid mRS + stroke severity + age group as covariates;

d) Sensitivity analyses for the unadjusted model using pattern-mixture models that confirm that there is no statistically significant difference between the groups for the plausible range of changes of a parameter that describes the departure from the assumed "missing-at-random" pattern.

Model 2:

a) A complete case model with the difference between utility value at 12 months and baseline mapped utility value as an output and group as an input;

b) A complete case model with the difference between utility value at 12 months and baseline mapped utility value as an output and group as an input + stroke severity as a covariate;

c) A complete case model with the difference between utility value at 12 months and baseline mapped utility value as an output and group as an input + stroke severity and age group as covariates;

d) Sensitivity analyses for the unadjusted model using pattern-mixture models that confirm that there is no statistically significant difference between the groups for the plausible range of changes of a parameter that describes the departure from the assumed "missing-at-random" pattern.

Model 3:

a) A complete case model with the difference between utility value at 12 months and baseline mapped utility value as an output, group as an input, and baseline mapped utility value as a covariate;

b) A complete case model with the difference between utility value at 12 months and baseline mapped utility value as an output, group as an input, and baseline mapped utility value + stroke severity as covariates;

c) A complete case model with the difference between utility value at 12 months and baseline mapped utility value as an output, group as an input, and baseline mapped utility value + stroke severity + age group as covariates;

d) Sensitivity analyses for the unadjusted model using pattern-mixture models that confirm that there is no statistically significant difference between the groups for the plausible range of changes of a parameter that describes the departure from the assumed "missing-at-random" pattern.

Model 4:

a) A complete case model with the utility value at 12 months as an output, group as an input, and baseline mapped utility value as a covariate;

b) A complete case model with the utility value at 12 months as an output, group as an input, and baseline mapped utility value + stroke severity as covariates;

c) A complete case model with the utility value at 12 months as an output, group as an input, and baseline mapped utility value + stroke severity + age group as covariates;

d) Sensitivity analyses for the unadjusted model using pattern-mixture models that confirm that there is no statistically significant difference between the groups for the plausible range of changes of a parameter that describes the departure from the assumed "missing-at-random" pattern.

Results

Table I. Difference in utility values between treatment groups by different models

	a	**b**	**c**	**d**	
				1	**2**
Model 1	-0.011 (-0.042, 0.020)	-0.015 (-0.042, 0.011)	-0.016 (-0.042,0.010)	-0.026 (-0.062, 0.009)	0.006 (-0.030, 0.041)
Model 2*	-0.001 (-0.046, 0.044)	-0.007 (-0.047, 0.034)	-0.008 (-0.048, 0.031)	-0.007 (-0.062, 0.048)	0.005 (-0.050, 0.060)
Model 3*	-0.008 (-0.043, 0.026)	-0.014 (-0.043, 0.016)	-0.015 (-0.043, 0.014)	-0.014 (-0.052, 0.033)	0.002 (-0.050, 0.045)
Model 4	-0.008 (-0.043, 0.026)	-0.014 (-0.043, 0.016)	-0.015 (-0.043, 0.014)	-0.026 (-0.062, 0.010)	0.006 (-0.030, 0.042)

*models 2 and 3 used the mapped baseline AQol utility to estimate the QALY gains over 12 month for each patient.

As shown in Table 1, using the mapped baseline AQoL utility value and the 12 month AQoL

utility value to calculate the difference in QALYs between treatment groups (results from models 2 and 3) yielded similar results to the primary analysis (-0.013 , 95%CI [-0.043, 0.018]), and the 95% confidence

Supplementary document 2: Cost Case Report Form (CRF)

The Cost CRF was originally developed via pathway analysis during Phase II of AVERT to identify resource items associated with the trial11. Since the Phase II of AVERT trial was a national project and resource utilisation tools were tailored to the Australian setting, the form was further modified to accommodate international differences in the acute service delivery, rehabilitation and post-acute care. An extensive review of country-specific literature and consultation with international AVERT project team members based in each country were undertaken to tailor the Cost CRF tool to each participating country.

Case Report Form - Cost

National Stroke Research Institute

PATIENT STUDY NUMBER ☐☐☐☐☐

PATIENT INITIALS ☐☐☐

NOTE: this one form is to be completed AND faxed following BOTH the 3 and 12 month interviews.
When CRF Cost complete at 3 months AND at 12 months, fax all pages 25-36 to the Data Fax.

Instructions to the person responding: These questions are about health care provided as a consequence of the stroke which occurred on (give date of stroke) or as a result of any further stroke. I will be asking about health care such as visits to hospital, rehabilitation, therapy at home, equipment and work. To help us work out the cost of stroke to the community, and to you and your family, I will be asking about how often services were provided and their cost.

Subject's stroke date
Obtain from CRF - Screening Day 0 ☐☐ / ☐☐ / ☐☐☐☐

---

3 MONTH DATE OF ASSESSMENT ☐☐ / ☐☐ / ☐☐☐☐ **Assessor initials** ☐☐☐

PERSON RESPONDING

- Index case ☐
- Spouse/partner ☐
- Sibling ☐
- Son/Daughter ☐
- Parent ☐
- Other relative ☐
- Friend/Associate/Neighbour ☐
- Carer, e.g. nurse ☐
- Other, unspecified ☐

ASSISTANCE FOR INTERVIEW OBTAINED FROM

- Index case ☐
- Spouse/partner ☐
- Sibling ☐
- Son/Daughter ☐
- Parent ☐
- Other relative ☐
- Friend/Associate/Neighbour ☐
- Carer, e.g. nurse ☐
- Other, unspecified ☐

LIVING ARRANGEMENT OF RESPONDENT*

- Living with index ☐
- Not living with index ☐
- Professional carer in nursing home or hostel ☐

---

12 MONTH DATE OF ASSESSMENT ☐☐ / ☐☐ / ☐☐☐☐ **Assessor initials** ☐☐☐

PERSON RESPONDING

- Index case ☐
- Spouse/partner ☐
- Sibling ☐
- Son/Daughter ☐
- Parent ☐
- Other relative ☐
- Friend/Associate/Neighbour ☐
- Carer, e.g. nurse ☐
- Other, unspecified ☐

ASSISTANCE FOR INTERVIEW OBTAINED FROM

- Index case ☐
- Spouse/partner ☐
- Sibling ☐
- Son/Daughter ☐
- Parent ☐
- Other relative ☐
- Friend/Associate/Neighbour ☐
- Carer, e.g. nurse ☐
- Other, unspecified ☐

LIVING ARRANGEMENT OF RESPONDENT*

- Living with index ☐
- Not living with index ☐
- Professional carer in nursing home or hostel ☐

*** Please note:** this is the 'normal' living arrangement of the respondent with respect to the subject, even if the subject is currently in hospital

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Case Report Form - Cost

National Stroke Research Institute

PATIENT STUDY NUMBER ☐☐☐☐☐

PATIENT INITIALS ☐☐☐

1) DISCHARGE

Date of discharge from acute care

☐☐ / ☐☐ / ☐☐☐☐

Acute discharge destination

- Home ☐
- Rehabilitation ward/hospital ☐
- Supported residential service (SRS) ☐
- Hostel ☐
- Nursing home ☐
- Other ☐
- Unknown ☐

Date of admission to inpatient rehabilitation

☐☐ / ☐☐ / ☐☐☐☐

Date of discharge from inpatient rehabilitation

☐☐ / ☐☐ / ☐☐☐☐

Leave dates BLANK if not applicable
Please note: inpatient rehabilitation is inclusive of geriatric evaluation and transitional care.

Discharge destination after inpatient rehab

- Home ☐
- Rehabilitation hospital ☐
- Supported residential service (SRS) ☐
- Hostel ☐
- Nursing home ☐
- Other ☐
- Unknown ☐

Leave BLANK if not applicable

2) LIVING ARRANGEMENT

Pre-stroke residential address

- Own house, flat – alone ☐
- Own house, flat – with family/relative/friend ☐
- Home of relative/friend ☐
- Supported residential service (SRS) ☐
- Hostel ☐
- Nursing home ☐
- Other ☐
- Unknown ☐

Residential address at 3 months*

- Own house, flat – alone ☐
- Own house, flat – with family/relative/friend ☐
- Home of relative/friend ☐
- Supported residential service (SRS) ☐
- Hostel ☐
- Nursing home ☐
- Other ☐
- Unknown ☐

Residential address at 12 months*

- Own house, flat – alone ☐
- Own house, flat – family/relative/friend ☐
- Home of relative/friend ☐
- Supported residential service (SRS) ☐
- Hostel ☐
- Nursing home ☐
- Other ☐
- Unknown ☐

*** Please note if the subject is currently a hospital inpatient (acute or subacute), record their current residential address, NOT the hospital address**

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Case Report Form - Cost

National Stroke Research Institute

PATIENT STUDY NUMBER

PATIENT INITIALS

3) CHANGE IN LIVING ARRANGEMENTS

As a consequence of your stroke, have you needed to change your place of residence?

If NO, proceed to question 4.

*** Please note: if subject has been a hospital inpatient this is NOT a change of residence**

3 months	Yes ☐	No ☐	Unknown ☐
3-12 months	Yes ☐	No ☐	Unknown ☐

	DATE OF MOVE	LOCATION
1)	/ /	Own home or unit ☐ Home of relative/friend ☐ SRS ☐ Hostel ☐ Nursing home ☐ Other ☐
2)	/ /	Own home or unit ☐ Home of relative/friend ☐ SRS ☐ Hostel ☐ Nursing home ☐ Other ☐
3)	/ /	Own home or unit ☐ Home of relative/friend ☐ SRS ☐ Hostel ☐ Nursing home ☐ Other ☐
4)	/ /	Own home or unit ☐ Home of relative/friend ☐ SRS ☐ Hostel ☐ Nursing home ☐ Other ☐

4) AMBULANCE TRANSFERS: EMERGENCY AND NON-EMERGENCY

As a consequence of your stroke, have you required ambulance transport after your acute admission to hospital?*

If NO, please proceed to question 5

3 months	Yes ☐	No ☐	Unknown ☐
3-12 months	Yes ☐	No ☐	Unknown ☐

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Count number of ambulance trips (recruitment to 3 months) ☐☐

Count number of ambulance trips (from 3 to 12 months) ☐☐

*** Include post-acute transfers (eg - acute to rehab)**

Case Report Form - Cost

National Stroke Research Institute

PATIENT STUDY NUMBER

PATIENT INITIALS

5) HOSPITALISATION OR EMERGENCY DEPARTMENT ATTENDANCES

5a) Have you been readmitted to hospital or attended the emergency department as a consequence of another stroke or for any stroke related problems?

3 months	Yes ☐	No ☐	Unknown ☐
3-12 months	Yes ☐	No ☐	Unknown ☐

(ONLY include information for admissions and attendances for stroke-related problems (see below for summary list of stroke-related problems and CRF completion manual for further clarification)

If NO, proceed to question 6

5b) If YES, Start with the earliest admission or attendance. If patient NOT discharged at 3 month assessment, leave discharge dates BLANK (complete dates at 12 month assessment)

	Hospital code	Date admitted	Date discharged	If patient not discharged at 12 month assessment, cross box.
Admission or Attendance 1 - Hospital name		/ /	/ /	☐
Admission or Attendance 2 - Hospital name		/ /	/ /	☐
Admission or Attendance 3 - Hospital name		/ /	/ /	☐
Admission or Attendance 4 - Hospital name		/ /	/ /	☐
Admission or Attendance 5 - Hospital name		/ /	/ /	☐

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Stroke related problems include: 1. Recurrent stroke, 2. TIA or suspected TIA, 3. Seizure, 4. Pneumonia/chest infection, 5. UTI, 6. Urinary catheter-related problem, 7. Mood disorder, 8. Falls, 9. Fractures, 10. DVT, 11. Pulmonary Embolism, 12. Complications of stroke treatment or stroke prevention, 13. Haemorrhage, 14. Nutritional problem, 15. Gastroscopy/colonoscopy/barium enema or other procedure to investigate GI haemorrhage, 16. Cerebral angiography, 17. Carotid endarectomy, 18. Carotid (or other cerebral vessel) angioplasty and/or stenting 19. Surgery or procedural management of of an atrial septal defect or patent foramen ovale, 20. Surgical or electrophysiological procedure to treat AF, 21. Inability to manage at home, 22. Increased confusion or cognitive impairment, 23. Constipation - investigation or treatment, 24. Urinary incontinence, 25. Post-stroke pain (incl. headache), 26. Pressure sores.

Case Report Form - Cost

National Stroke Research Institute

PATIENT STUDY NUMBER

PATIENT INITIALS

6) INPATIENT REHABILITATION ADMISSION

After your stroke on (give date of stroke), were you admitted to a Rehabilitation Hospital or other hospital where you received rehabilitation treatment? Please include admissions with the care type 'rehabilitation', 'geriatric evaluation' and 'transitional care'

3 months	Yes ☐	No ☐	Unknown ☐
3-12 months	Yes ☐	No ☐	Unknown ☐

If NO, proceed to question 7.
If YES, complete inpatient rehabilitation admission details, starting from your first inpatient rehabilitation admission.
If patient NOT discharged at 3 month assessment, leave discharge dates BLANK (complete dates at 12 month assessment)

	Rehab hospital code	Date admitted	Date discharged	If patient not discharged at 12 month assessment, cross box.
Admission 1- Rehabilitation hospital name		/ /	/ /	☐
Admission 2- Rehabilitation hospital name		/ /	/ /	☐
Admission 3- Rehabilitation hospital name		/ /	/ /	☐

7) OUTPATIENT REHABILITATION PROGRAM

Did you attend or are you attending an outpatient rehabilitation program as a consequence of your stroke?
e.g. with physiotherapy, occupational therapy, speech therapy, etc
An outpatient rehabilitation program is any rehabilitation program where the patient attends a facility. The program can be located at a hospital or community facility.

3 months	Yes ☐	No ☐	Unknown ☐
3-12 months	Yes ☐	No ☐	Unknown ☐

If NO, proceed to question 8.
If YES, complete outpatient rehabilitation details, starting from your first outpatient rehabilitation visit.
If patient NOT discharged at 3 month assessment, leave discharge dates and number of days attended BLANK (complete dates at 12 month assessment)

	Rehab facility code	Date admitted	Date discharged	Total number of DAYS attended	If patient not discharged at 12 month assessment, cross box.
Admission 1 - Outpatient rehabilitation name		/ /	/ /		☐
Admission 2 - Outpatient rehabilitation name		/ /	/ /		☐
Admission 3 - Outpatient rehabilitation name		/ /	/ /		☐

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Case Report Form - Cost

National Stroke Research Institute

PATIENT STUDY NUMBER

PATIENT INITIALS

8) REHABILITATION SERVICES PROVIDED AT HOME OR IN A NURSING HOME

Have you had a rehabilitation program provided to you at home or a nursing home as a consequence of your stroke? e.g. with physiotherapy, occupational therapy, speech

3 months	Yes ☐	No ☐	Unknown ☐
3-12 months	Yes ☐	No ☐	Unknown ☐

If NO, proceed to question 9.
If YES, complete rehabilitation details, starting from the first visit since your stroke. Count number of sessions.
If patient NOT discharged at 3 month assessment, leave discharge dates and number of sessions BLANK (complete dates at 12 month assessment)

	Rehab service code	Start date	Cease date	Total number of SESSIONS	If patient not discharged at 12 month assessment, cross box.
Time 1 - Rehabilitation service name		/ /	/ /		☐
Time 2 - Rehabilitation service name		/ /	/ /		☐
Time 3 - Rehabilitation service name		/ /	/ /		☐
Time 4 - Rehabilitation service name		/ /	/ /		☐

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Case Report Form - Cost

National Stroke Research Institute

PATIENT STUDY NUMBER

PATIENT INITIALS

9) COMMUNITY SERVICES

9a) Did you receive any community services in the year PRIOR to your stroke? Yes ☐ No ☐ Unknown ☐

Community services are individual care services provided at home and do NOT include rehabilitation therapy.
If NO, proceed to question 9b.
If YES, which service/s did you receive in the year PRIOR to your stroke?

Community service codes
1 = Nursing Service
2 = Delivered Meals
3 = Personal Care (Bath/Shower)
4 = Housework help
5 = Gardening/home maintenance
6 = Home respite
7 = Other service, specify

Which service did you receive? (One service code per line)	How many times in the past year did you receive the service?
☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7	
☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7	
☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7	
☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7	

If "other" (code 7), please specify

9b) Have you received community services SINCE the stroke?

3 months	Yes ☐	No ☐	Unknown ☐
3-12 months	Yes ☐	No ☐	Unknown ☐

Community services are individual care services provided at home and do NOT include rehabilitation therapy.
If NO, proceed to question 10.
If YES, which service/s did you receive AFTER your stroke?
For each service, complete a seperate line. If a service is ongoing at 3 month interview, enter data for 3 months, and then add service data for 3-12 months on a separate line.

Note: hours per service NOT applicable to delivered meals

Community service codes
1 = Nursing Service
2 = Delivered Meals
3 = Personal Care (Bath/Shower)
4 = Housework help
5 = Gardening/home maintenance
6 = Home respite
7 = Other service, specify

Which service did you receive? (One service code per line)	How many times did you receive the service?	How many hours per service?
☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7		
☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7		
☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7		
☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7		
☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7		
☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7		

If "other" (code 7), please specify

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Case Report Form - Cost

National Stroke Research Institute

PATIENT STUDY NUMBER

PATIENT INITIALS

10) HOME MODIFICATIONS

Has your home been modified as a consequence of your stroke?
e.g. installation of rails, bathroom modifications, installation of ramp(s), kitchen modifications etc
If NO, proceed to question 11
If YES, please indicate the type of modifications, who supplied the modifications and estimate any personal cost to you.

3 months	Yes ☐	No ☐	Unknown ☐
3-12 months	Yes ☐	No ☐	Unknown ☐

SUPPLIERS
1 = Hospital/rehabilitation centre **3 = Veteran's Affairs** **5 = Housing commision** **7 = Other (specify)**
2 = Patient/family **4 = Local Council** **6 = Charity**

Type of modification (check box for each type supplied)	Who supplied the modification?	If supplier is "other", please specify	
☐ Rail(s) for steps/stairs	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7		Cost to you/family* - $
☐ Ramp(s)	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7		Cost to you/family* - $
☐ Platform step(s)	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7		Cost to you/family* - $
☐ Shower, bath and toilet rail(s)	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7		Cost to you/family* - $
☐ Shower(s) modification	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7		Cost to you/family* - $
☐ Toilet(s) modification	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7		Cost to you/family* - $
☐ Remove/modify door(s) from shower/toilet/bath	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7		Cost to you/family* - $
☐ Kitchen modifications	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7		Cost to you/family* - $
☐ Other modification (specify below)			
Other home modification - 1	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7		Cost to you/family* - $
Other home modification - 2	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7		Cost to you/family* - $

If total costs includes any aids, describe in brief below (see also list of aids on page 33):

*** If an overall cost is provided, please indicate type of modifications above, and provide the total cost here, INCLUSIVE of any known itemised costs listed above:**

Overall Cost $

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Case Report Form - Cost

National Stroke Research Institute

PATIENT STUDY NUMBER

PATIENT INITIALS

11) SPECIAL EQUIPMENT AND AIDS

Have you been given, hired or purchased any special equipment, aids or special food as a consequence of stroke?

3 months	Yes ☐	No ☐	Unknown ☐
3-12 months	Yes ☐	No ☐	Unknown ☐

Prompt: These may have been provided by an Occupational Therapist or Physiotherapist. What about a....?
If NO, proceed to question 12

Walking aids
- ☐ Single point stick
- ☐ Three or four point stick
- ☐ Walking frame - pick up
- ☐ Walking frame - wheelie
- ☐ Walking frame - gutter (forearm suppt)
- ☐ Crutch(es)

Mobility aids
- ☐ Manual wheelchair
- ☐ Electric wheelchair/scooter
- ☐ Car steering wheel knob

Eating aids
- ☐ Built-up cutlery
- ☐ Plate guard
- ☐ Non-slip mat
- ☐ Special food e.g. NG/PEG

If yes, number of days used:
3 months
3-12 months

Kitchen aids
- ☐ Tap handles
- ☐ Chopping board
- ☐ Modified knife
- ☐ Vitamiser/blender
- ☐ Non-slip mat

Lounge and bedroom equipment
- ☐ Chair platform/blocks raise
- ☐ Cushion to relieve pressure
- ☐ Special chair (NOT wheelchair)
- ☐ Table - bedside/wheelie
- ☐ Bed platform/block raise
- ☐ Bedstick
- ☐ Hospital bed (eg - height/tilt adjust)
- ☐ Mobile hoist/lifter

Bathroom equipment
- ☐ Over-toilet seat
- ☐ Toilet surround
- ☐ Bathroom and grooming aids
- ☐ Shower chair/stool
- ☐ Over bath seat
- ☐ Hand held shower
- ☐ Non-slip mat

Continence aids
- ☐ Urine bottle
- ☐ Bedpan
- ☐ Commode
- ☐ Incontinence sheet (bed protector)
- ☐ Incontinence sheet (kylie/bluey)

If yes, number of days used - 3 months
- ☐ Incontinence pads — 3-12 months

If yes, number of days used - 3 months
- ☐ Catheter — 3-12 months

If yes, number of days used - 3 months
3-12 months

General aids
- ☐ Long handled aid
- ☐ Blood pressure machine
- ☐ Treadmill
- ☐ Stationary bike
- ☐ Intercom (portable)
- ☐ Modified tap handles

If yes, number supplied

- ☐ Personal alarm

If yes, number of days supplied:
3 months
3-12 months

Any other aids/equipment, specify

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PATIENT STUDY NUMBER ☐☐☐☐☐

PATIENT INITIALS ☐☐☐

NOTE: this one form is to be completed AND faxed following BOTH the 3 and 12 month interviews.
When CRF Cost complete at 3 months AND at 12 months, fax all pages 25-36 to the Data Fax.

Instructions to the person responding: These questions are about health care provided as a consequence of the stroke which occurred on (give date of stroke) or as a result of any further stroke. I will be asking about health care such as visits to hospital, rehabilitation, therapy at home, equipment and work. To help us work out the cost of stroke to the community, and to you and your family, I will be asking about how often services were provided and their cost.

Subject's stroke date ☐☐ / ☐☐ / ☐☐☐☐
Obtain from CRF - Screening Day 0

---

3 MONTH DATE OF ASSESSMENT ☐☐ / ☐☐ / ☐☐☐☐ **Assessor initials** ☐☐☐

PERSON RESPONDING

Index case ☐ Other relative ☐
Spouse/partner ☐ Friend/Associate/Neighbour ☐
Sibling ☐ Carer, e.g. nurse ☐
Son/Daughter ☐ Other, unspecified ☐
Parent ☐

ASSISTANCE FOR INTERVIEW OBTAINED FROM

Index case ☐ Other relative ☐
Spouse/partner ☐ Friend/Associate/Neighbour ☐
Sibling ☐ Carer, e.g. nurse ☐
Son/Daughter ☐ Other, unspecified ☐
Parent ☐

LIVING ARRANGEMENT OF RESPONDENT*

Living with index ☐
Not living with index ☐
Professional carer in nursing home or hostel ☐

---

12 MONTH DATE OF ASSESSMENT ☐☐ / ☐☐ / ☐☐☐☐ **Assessor initials** ☐☐☐

PERSON RESPONDING

Index case ☐ Other relative ☐
Spouse/partner ☐ Friend/Associate/Neighbour ☐
Sibling ☐ Carer, e.g. nurse ☐
Son/Daughter ☐ Other, unspecified ☐
Parent ☐

ASSISTANCE FOR INTERVIEW OBTAINED FROM

Index case ☐ Other relative ☐
Spouse/partner ☐ Friend/Associate/Neighbour ☐
Sibling ☐ Carer, e.g. nurse ☐
Son/Daughter ☐ Other, unspecified ☐
Parent ☐

LIVING ARRANGEMENT OF RESPONDENT*

Living with index ☐
Not living with index ☐
Professional carer in nursing home or hostel ☐

*** Please note:** this is the 'normal' living arrangement of the respondent with respect to the subject, even if the subject is currently in hospital

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National Stroke Research Institute

PATIENT STUDY NUMBER ☐☐☐☐☐

PATIENT INITIALS ☐☐☐

1) DISCHARGE

Date of discharge from acute care

☐☐ / ☐☐ / ☐☐☐☐

Acute discharge destination

- Home ☐
- Rehabilitation ward/hospital ☐
- Supported residential service (SRS) ☐
- Hostel ☐
- Nursing home ☐
- Other ☐
- Unknown ☐

Date of admission to inpatient rehabilitation

☐☐ / ☐☐ / ☐☐☐☐

Date of discharge from inpatient rehabilitation

☐☐ / ☐☐ / ☐☐☐☐

Leave dates BLANK if not applicable

Please note: inpatient rehabilitation is inclusive of geriatric evaluation and transitional care.

Discharge destination after inpatient rehab

- Home ☐
- Rehabilitation hospital ☐
- Supported residential service (SRS) ☐
- Hostel ☐
- Nursing home ☐
- Other ☐
- Unknown ☐

Leave BLANK if not applicable

2) LIVING ARRANGEMENT

Pre-stroke residential address

- Own house, flat – alone ☐
- Own house, flat – with family/relative/friend ☐
- Home of relative/friend ☐
- Supported residential service (SRS) ☐
- Hostel ☐
- Nursing home ☐
- Other ☐
- Unknown ☐

Residential address at 3 months*

- Own house, flat – alone ☐
- Own house, flat – with family/relative/friend ☐
- Home of relative/friend ☐
- Supported residential service (SRS) ☐
- Hostel ☐
- Nursing home ☐
- Other ☐
- Unknown ☐

Residential address at 12 months*

- Own house, flat – alone ☐
- Own house, flat – family/relative/friend ☐
- Home of relative/friend ☐
- Supported residential service (SRS) ☐
- Hostel ☐
- Nursing home ☐
- Other ☐
- Unknown ☐

*** Please note if the subject is currently a hospital inpatient (acute or subacute), record their current residential address, NOT the hospital address**

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PATIENT STUDY NUMBER

PATIENT INITIALS

3) CHANGE IN LIVING ARRANGEMENTS

As a consequence of your stroke, have you needed to change your place of residence?

If NO, proceed to question 4.

*** Please note: if subject has been a hospital inpatient this is NOT a change of residence**

3 months	Yes ☐	No ☐	Unknown ☐
3-12 months	Yes ☐	No ☐	Unknown ☐

	DATE OF MOVE	LOCATION
1)	/ /	Own home or unit ☐ Home of relative/friend ☐ SRS ☐ Hostel ☐ Nursing home ☐ Other ☐
2)	/ /	Own home or unit ☐ Home of relative/friend ☐ SRS ☐ Hostel ☐ Nursing home ☐ Other ☐
3)	/ /	Own home or unit ☐ Home of relative/friend ☐ SRS ☐ Hostel ☐ Nursing home ☐ Other ☐
4)	/ /	Own home or unit ☐ Home of relative/friend ☐ SRS ☐ Hostel ☐ Nursing home ☐ Other ☐

4) AMBULANCE TRANSFERS: EMERGENCY AND NON-EMERGENCY

As a consequence of your stroke, have you required ambulance transport after your acute admission to hospital?*

If NO, please proceed to question 5

3 months	Yes ☐	No ☐	Unknown ☐
3-12 months	Yes ☐	No ☐	Unknown ☐

Count number of ambulance trips (recruitment to 3 months) ☐☐

Count number of ambulance trips (from 3 to 12 months) ☐☐

*** Include post-acute transfers (eg - acute to rehab)**

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PATIENT STUDY NUMBER

PATIENT INITIALS

5) HOSPITALISATION OR EMERGENCY DEPARTMENT ATTENDANCES

5a) Have you been readmitted to hospital or attended the emergency department as a consequence of another stroke or for any stroke related problems?

(ONLY include information for admissions and attendances for stroke-related problems (see below for summary list of stroke-related problems and CRF completion manual for further clarification)

If NO, proceed to question 6

3 months	Yes ☐	No ☐	Unknown ☐
3-12 months	Yes ☐	No ☐	Unknown ☐

5b) If YES, Start with the earliest admission or attendance. If patient NOT discharged at 3 month assessment, leave discharge dates BLANK (complete dates at 12 month assessment)

	Hospital code	Date admitted	Date discharged	If patient not discharged at 12 month assessment, cross box.
Admission or Attendance 1 - Hospital name		/ /	/ /	☐
Admission or Attendance 2 - Hospital name		/ /	/ /	☐
Admission or Attendance 3 - Hospital name		/ /	/ /	☐
Admission or Attendance 4 - Hospital name		/ /	/ /	☐
Admission or Attendance 5 - Hospital name		/ /	/ /	☐

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Stroke related problems include: 1. Recurrent stroke, 2. TIA or suspected TIA, 3. Seizure, 4. Pneumonia/chest infection, 5. UTI, 6. Urinary catheter-related problem, 7. Mood disorder, 8. Falls, 9. Fractures, 10. DVT, 11. Pulmonary Embolism, 12. Complications of stroke treatment or stroke prevention, 13. Haemorrhage, 14. Nutritional problem, 15. Gastroscopy/colonoscopy/barium enema or other procedure to investigate GI haemorrhage, 16. Cerebral angiography, 17. Carotid endarectomy, 18. Carotid (or other cerebral vessel) angioplasty and/or stenting 19. Surgery or procedural management of of an atrial septal defect or patent foramen ovale, 20. Surgical or electrophysiological procedure to treat AF, 21. Inability to manage at home, 22. Increased confusion or cognitive impairment, 23. Constipation - investigation or treatment, 24. Urinary incontinence, 25. Post-stroke pain (incl. headache), 26. Pressure sores.

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PATIENT STUDY NUMBER

PATIENT INITIALS

6) INPATIENT REHABILITATION ADMISSION

After your stroke on (give date of stroke), were you admitted to a Rehabilitation Hospital or other hospital where you received rehabilitation treatment? Please include admissions with the care type 'rehabilitation', 'geriatric evaluation' and 'transitional care'

3 months	Yes ☐	No ☐	Unknown ☐
3-12 months	Yes ☐	No ☐	Unknown ☐

If NO, proceed to question 7.
If YES, complete inpatient rehabilitation admission details, starting from your first inpatient rehabilitation admission.
If patient NOT discharged at 3 month assessment, leave discharge dates BLANK (complete dates at 12 month assessment)

	Rehab hospital code	Date admitted	Date discharged	If patient not discharged at 12 month assessment, cross box.
Admission 1- Rehabilitation hospital name		/ /	/ /	☐
Admission 2- Rehabilitation hospital name		/ /	/ /	☐
Admission 3- Rehabilitation hospital name		/ /	/ /	☐

7) OUTPATIENT REHABILITATION PROGRAM

Did you attend or are you attending an outpatient rehabilitation program as a consequence of your stroke? e.g. with physiotherapy, occupational therapy, speech therapy, etc
An outpatient rehabilitation program is any rehabilitation program where the patient attends a facility. The program can be located at a hospital or community facility.

3 months	Yes ☐	No ☐	Unknown ☐
3-12 months	Yes ☐	No ☐	Unknown ☐

If NO, proceed to question 8.
If YES, complete outpatient rehabilitation details, starting from your first outpatient rehabilitation visit.
If patient NOT discharged at 3 month assessment, leave discharge dates and number of days attended BLANK (complete dates at 12 month assessment)

	Rehab facility code	Date admitted	Date discharged	Total number of DAYS attended	If patient not discharged at 12 month assessment, cross box.
Admission 1 - Outpatient rehabilitation name		/ /	/ /		☐
Admission 2 - Outpatient rehabilitation name		/ /	/ /		☐
Admission 3 - Outpatient rehabilitation name		/ /	/ /		☐

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PATIENT STUDY NUMBER

PATIENT INITIALS

8) REHABILITATION SERVICES PROVIDED AT HOME OR IN A NURSING HOME

Have you had a rehabilitation program provided to you at home or a nursing home as a consequence of your stroke? e.g. with physiotherapy, occupational therapy, speech

3 months	Yes ☐	No ☐	Unknown ☐
3-12 months	Yes ☐	No ☐	Unknown ☐

If NO, proceed to question 9.
If YES, complete rehabilitation details, starting from the first visit since your stroke. Count number of sessions.
If patient NOT discharged at 3 month assessment, leave discharge dates and number of sessions BLANK (complete dates at 12 month assessment)

	Rehab service code	Start date	Cease date	Total number of SESSIONS	If patient not discharged at 12 month assessment, cross box.
Time 1 - Rehabilitation service name		/ /	/ /		☐
Time 2 - Rehabilitation service name		/ /	/ /		☐
Time 3 - Rehabilitation service name		/ /	/ /		☐
Time 4 - Rehabilitation service name		/ /	/ /		☐

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PATIENT STUDY NUMBER

PATIENT INITIALS

9) COMMUNITY SERVICES

9a) Did you receive any community services in the year PRIOR to your stroke? Yes ☐ No ☐ Unknown ☐

Community services are individual care services provided at home and do NOT include rehabilitation therapy.
If NO, proceed to question 9b.
If YES, which service/s did you receive in the year PRIOR to your stroke?

Community service codes
1 = Nursing Service
2 = Delivered Meals
3 = Personal Care (Bath/Shower)
4 = Housework help
5 = Gardening/home maintenance
6 = Home respite
7 = Other service, specify

Which service did you receive? (One service code per line)	How many times in the past year did you receive the service?
☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7	
☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7	
☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7	
☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7	

If "other" (code 7), please specify

9b) Have you received community services SINCE the stroke?
Community services are individual care services provided at home and do NOT include rehabilitation therapy.
If NO, proceed to question 10.
If YES, which service/s did you receive AFTER your stroke?
For each service, complete a seperate line. If a service is ongoing at 3 month interview, enter data for 3 months, and then add service data for 3-12 months on a separate line.

3 months	Yes ☐	No ☐	Unknown ☐
3-12 months	Yes ☐	No ☐	Unknown ☐

Community service codes
1 = Nursing Service
2 = Delivered Meals
3 = Personal Care (Bath/Shower)
4 = Housework help
5 = Gardening/home maintenance
6 = Home respite
7 = Other service, specify

Note: hours per service NOT applicable to delivered meals

Which service did you receive? (One service code per line)	How many times did you receive the service?	How many hours per service?
☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7		
☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7		
☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7		
☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7		
☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7		
☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7		

If "other" (code 7), please specify

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PATIENT STUDY NUMBER

PATIENT INITIALS

10) HOME MODIFICATIONS

Has your home been modified as a consequence of your stroke?
e.g. installation of rails, bathroom modifications, installation of ramp(s), kitchen modifications etc
If NO, proceed to question 11
If YES, please indicate the type of modifications, who supplied the modifications and estimate any personal cost to you.

3 months	Yes ☐	No ☐	Unknown ☐
3-12 months	Yes ☐	No ☐	Unknown ☐

SUPPLIERS
1 = Hospital/rehabilitation centre **3 = Veteran's Affairs** **5 = Housing commision** **7 = Other (specify)**
2 = Patient/family **4 = Local Council** **6 = Charity**

Type of modification (check box for each type supplied)	Who supplied the modification?	If supplier is "other", please specify	
☐ Rail(s) for steps/stairs	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7		Cost to you/family* - $
☐ Ramp(s)	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7		Cost to you/family* - $
☐ Platform step(s)	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7		Cost to you/family* - $
☐ Shower, bath and toilet rail(s)	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7		Cost to you/family* - $
☐ Shower(s) modification	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7		Cost to you/family* - $
☐ Toilet(s) modification	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7		Cost to you/family* - $
☐ Remove/modify door(s) from shower/toilet/bath	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7		Cost to you/family* - $
☐ Kitchen modifications	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7		Cost to you/family* - $
☐ Other modification (specify below)			
Other home modification - 1	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7		Cost to you/family* - $
Other home modification - 2	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7		Cost to you/family* - $

If total costs includes any aids, describe in brief below (see also list of aids on page 33):

*** If an overall cost is provided, please indicate type of modifications above, and provide the total cost here, INCLUSIVE of any known itemised costs listed above:**

Overall Cost $

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PATIENT STUDY NUMBER

PATIENT INITIALS

11) SPECIAL EQUIPMENT AND AIDS

Have you been given, hired or purchased any special equipment, aids or special food as a consequence of stroke?

3 months	Yes ☐	No ☐	Unknown ☐
3-12 months	Yes ☐	No ☐	Unknown ☐

Prompt: These may have been provided by an Occupational Therapist or Physiotherapist. What about a....?
If NO, proceed to question 12

Walking aids
- ☐ Single point stick
- ☐ Three or four point stick
- ☐ Walking frame - pick up
- ☐ Walking frame - wheelie
- ☐ Walking frame - gutter (forearm suppt)
- ☐ Crutch(es)

Mobility aids
- ☐ Manual wheelchair
- ☐ Electric wheelchair/scooter
- ☐ Car steering wheel knob

Eating aids
- ☐ Built-up cutlery
- ☐ Plate guard
- ☐ Non-slip mat
- ☐ Special food e.g. NG/PEG

If yes, number of days used:
3 months ☐☐☐
3-12 months ☐☐☐

Kitchen aids
- ☐ Tap handles
- ☐ Chopping board
- ☐ Modified knife
- ☐ Vitamiser/blender
- ☐ Non-slip mat

Lounge and bedroom equipment
- ☐ Chair platform/blocks raise
- ☐ Cushion to relieve pressure
- ☐ Special chair (NOT wheelchair)
- ☐ Table - bedside/wheelie
- ☐ Bed platform/block raise
- ☐ Bedstick
- ☐ Hospital bed (eg - height/tilt adjust)
- ☐ Mobile hoist/lifter

Bathroom equipment
- ☐ Over-toilet seat
- ☐ Toilet surround
- ☐ Bathroom and grooming aids
- ☐ Shower chair/stool
- ☐ Over bath seat
- ☐ Hand held shower
- ☐ Non-slip mat

Continence aids
- ☐ Urine bottle
- ☐ Bedpan
- ☐ Commode
- ☐ Incontinence sheet (bed protector)
- ☐ Incontinence sheet (kylie/bluey)

If yes, number of days used - 3 months ☐☐☐
- ☐ Incontinence pads — 3-12 months ☐☐☐

If yes, number of days used - 3 months ☐☐☐
- ☐ Catheter — 3-12 months ☐☐☐

If yes, number of days used - 3 months ☐☐☐
3-12 months ☐☐☐

General aids
- ☐ Long handled aid
- ☐ Blood pressure machine
- ☐ Treadmill
- ☐ Stationary bike
- ☐ Intercom (portable)
- ☐ Modified tap handles
  If yes, number supplied ☐☐
- ☐ Personal alarm
  If yes, number of days supplied:
  3 months ☐☐☐
  3-12 months ☐☐☐

Any other aids/equipment, specify

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PATIENT STUDY NUMBER

PATIENT INITIALS

12) PRIVATE PHYSIOTHERAPY

Have you paid for private physiotherapy sessions after your stroke? (NOT while a hospital inpatient)

If no, proceed to question 13

3 months	Yes ☐	No ☐	Unknown ☐
3-12 months	Yes ☐	No ☐	Unknown ☐

If yes, number of sessions - 3 months ☐☐☐

3-12 months ☐☐☐

13) RESPITE CARE

As a consequence of your stroke, have you been admitted to a respite bed in a nursing home or hospital?

If NO, proceed to question 14

3 months	Yes ☐	No ☐	Unknown ☐
3-12 months	Yes ☐	No ☐	Unknown ☐

If yes, how many days of respite have you received since your stroke? **3 months** ☐☐☐

3-12 months ☐☐☐

14) EMPLOYMENT STATUS/ PAID WORK

Were you working up to the time of your stroke? Yes ☐ No ☐ Unknown ☐

If YES, what was the nature of this work? Full time ☐ Part time ☐

How many hours did you work each week? ☐☐

Since the stroke, have you returned to this work?

3 months	Yes ☐	No ☐	Unknown ☐
3-12 months	Yes ☐	No ☐	Unknown ☐

Have you returned to normal hours or decreased hours?

3 months	Normal ☐	Decreased ☐
3-12 months	Normal ☐	Decreased ☐

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How many hours per week of work have you performed since the last assessment?

Record average amount per week over the 3 month period ☐☐ **If more than 0 but less than 1hr, record as 1**

Record average amount per week over the period 3 to 12 months ☐☐

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PATIENT INITIALS

15) INFORMAL CARE - 3 MONTHS

NOTE: This question only applies to patients living at home (ie - excludes subjects in residential care and/or current hospital inpatients)

Definition of Informal Carer: That person who is most closely involved in helping the person with stroke to live independently at home. Any assistance provided by an informal carer is **over and above the assistance provided by any formal support service**. A carer is usually a spouse or other member of the family but may be a friend or neighbour.

If the person with stroke needs help with any activities of daily living, the carer is the person who provides most of this help beyond that provided by any formal support services. Assistance that a carer may provide includes: help with community tasks (e.g. shopping, errands, appointments, transport); help with domestic tasks (e.g. house cleaning, garden maintenance, laundry, meal preparation, washing up); help with personal care tasks (e.g. bathing, toileting, transferring, walking indoors, feeding). Supervision of daily activities to ensure safety should also be included as care.

15a) OVER THE LAST WEEK, have you received any assistance with your daily activities from a carer as a result of the stroke? Yes ☐ No ☐

This might include assistance with community tasks (such as help with your banking, paying your bills, shopping or transportation), assistance with domestic tasks (such as cooking and cleaning) or assistance with personal care tasks (such as bathing, toileting and feeding)

If the answer is NO, no further questions are required in this section

15b) If the answer is YES, OVER THE LAST WEEK did you receive any assistance with COMMUNITY tasks? Yes ☐ No ☐

Examples of assistance with community tasks include: banking and paying bills; errands such as posting letters or making appointments; transport to appointments or social occasions; shopping; your carer might also 'check up' on you by visiting or phoning.

If NO, go to question 15c)

If YES, can you estimate how many hours your carer spent helping you with these tasks during the last week? **Hours** ☐☐☐

15c) OVER THE LAST WEEK did you receive any assistance with DOMESTIC tasks? Yes ☐ No ☐

Examples of assistance with domestic tasks include: gardening; handyman tasks; grounds and home maintenance; housework such as laundry, cleaning, washing up; supervision of medication; supervision or assistance to walk outside.

If NO, go to question 15d)

If YES, can you estimate how many hours your carer spent helping you with these tasks during the last week? **Hours** ☐☐☐

15d) OVER THE LAST WEEK did you receive any assistance with PERSONAL CARE tasks? Yes ☐ No ☐

Examples of assistance with personal care tasks include: eating; grooming; bathing; dressing; toilet use; help with incontinence pads; moving from bed to chair or chair to chair; walking inside the house including stairs.

If NO, you have finished the questions.

If YES, can you estimate how many hours your carer spent helping you with these tasks during the last week? **Hours** ☐☐☐

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PATIENT STUDY NUMBER

PATIENT INITIALS

16) INFORMAL CARE - 12 MONTHS

NOTE: This question only applies to patients living at home (ie - excludes subjects in residential care and/or current hospital inpatients)

Definition of Informal Carer: That person who is most closely involved in helping the person with stroke to live independently at home. Any assistance provided by an informal carer is **over and above the assistance provided by any formal support service**. A carer is usually a spouse or other member of the family but may be a friend or neighbour.

If the person with stroke needs help with any activities of daily living, the carer is the person who provides most of this help beyond that provided by any formal support services. Assistance that a carer may provide includes: help with community tasks (e.g. shopping, errands, appointments, transport); help with domestic tasks (e.g. house cleaning, garden maintenance, laundry, meal preparation, washing up); help with personal care tasks (e.g. bathing, toileting, transferring, walking indoors, feeding). Supervision of daily activities to ensure safety should also be included as care.

16a) OVER THE LAST WEEK, have you received any assistance with your daily activities from a carer as a result of the stroke? Yes ☐ No ☐

This might include assistance with community tasks (such as help with your banking, paying your bills, shopping or transportation), assistance with domestic tasks (such as cooking and cleaning) or assistance with personal care tasks (such as bathing, toileting and feeding)

If the answer is NO, no further questions are required in this section

16b) If the answer is YES, OVER THE LAST WEEK did you receive any assistance with COMMUNITY tasks? Yes ☐ No ☐

Examples of assistance with community tasks include: banking and paying bills; errands such as posting letters or making appointments; transport to appointments or social occasions; shopping; your carer might also 'check up' on you by visiting or phoning.

If NO, go to question 16c)

If YES, can you estimate how many hours your carer spent helping you with these tasks during the last week? **Hours** ☐☐☐

16c) OVER THE LAST WEEK did you receive any assistance with DOMESTIC tasks? Yes ☐ No ☐

Examples of assistance with domestic tasks include: gardening; handyman tasks; grounds and home maintenance; housework such as laundry, cleaning, washing up; supervision of medication; supervision or assistance to walk outside.

If NO, go to question 16d)

If YES, can you estimate how many hours your carer spent helping you with these tasks during the last week? **Hours** ☐☐☐

16d) OVER THE LAST WEEK did you receive any assistance with PERSONAL CARE tasks? Yes ☐ No ☐

Examples of assistance with personal care tasks include: eating; grooming; bathing; dressing; toilet use; help with incontinence pads; moving from bed to chair or chair to chair; walking inside the house including stairs.

If NO, you have finished the questions.

If YES, can you estimate how many hours your carer spent helping you with these tasks during the last week? **Hours** ☐☐☐

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End Case Report Form - Cost

Supplementary document 3: Unit costs and valuation of costs

Unit costs for hospitalisation, rehabilitation, non-health sector costs and productivity costs

Acute stroke hospitalisation costing: Unit costs for acute stroke hospitalisation for all countries at baseline were categorised by stroke severity, using the National Institute of Health Stroke Scale (NIHSS) to group patients into three severity levels: mild (0-7), moderate (8-16) and severe (>16). (1)·(2) It was assumed that severity as classified by the NIHSS was consistent with the stroke severity that corresponded to three levels of unit cost for acute hospitalisation. Length of Stay (LoS) together with stroke severity were used to estimate the cost of acute hospitalisation for Australia and New Zealand patients (i.e. the cost of acute hospitalisation was weighted by the LoS). LoS was taken as the difference between the date of hospital discharge and date of hospital admission (plus one day or not) in accordance with country-specific practice. For the other countries, only stroke severity was considered in the assignment of a unit cost to acute stroke hospitalisation due to insufficient health sector data.

Re-hospitalisation and rehabilitation costing: Due to the diversity of causes for patients being readmitted to hospital after the index stroke, the average daily cost of hospitalisation for all disease conditions from individual countries in combination with LoS was used to gauge the cost of readmission for stroke-related causes, while the average cost for an emergency department visit was assigned whenever a patient was hospitalised for one day only. Similarly, the unit cost of rehabilitation hospital admission was taken from the national average cost for all disease conditions. The median cost was used where there was more than one unit cost identified for the same resource item.

Non-health sector costs: Unit costs of non-health sector resource items (e.g. community service, accommodation changes, special aids and equipment) were sourced on a country- specific basis from official websites or published literature where applicable. No unit cost was retrieved for home modification items since the cost of home modifications was generally reported in the Cost CRF.

Productivity cost: Lost productivity was valued based on a human capital approach using average earnings across all occupations up to normal retirement age. The average wage of a

professional carer was adopted to estimate the cost of informal care.

The currency of other countries was converted to AUD using the corresponding exchange rate. The country-specific Consumer Price Index (CPI) from the health sector was employed to adjust costs not valued in the year of 2015.

All the unit costs from participating countries are summarised in Table I.

Table I. Unit cost (in Australian dollars) across five countries, 2015 reference year

Resource items	Unit cost (AUD)				
	AU	NZ	UK	SG	MA
Healthcare					
Acute hospitalisation*					
Severe (per episode)	$19157	$10867	$15327	$4371	$2066
Moderate (per episode)	$9553	$6104	$8115	$2126	$1572
Mild (per episode)	$6279	$4370	$4272	$1493	$1363
Stroke-related rehospitalisation (per day)	$1925	$320	$701	$789	$230
Emergency department attendance (per attendance)	$610	$325	$227	$111	$68
Rehabilitation hospital admission†					
Severe (per episode)	$1010‡	$8032	$19136§	$157‡	$1293
Moderate (per episode)		$5727	$29788§		
Mild (per episode)		$5727	$13920§		
Same day (per episode)		$758	N/A		
Outpatient rehab visit (per/session)	$239	$164	$213	$36	$17
Rehab services at home/nursing facility (per/session)	$239	$212	$922	$36	$51
Private physiotherapy (per session)	$64	$153	$162	$116	$8
Respite care (per hour)	$45	$14	$26	$15	$2
Individual allied health visit					
Physiotherapy	N/A	N/A	$243	$239	$8
Occupational therapy	N/A	N/A	$243	$36	$7
Speech and language therapy	N/A	N/A	$69	$36	$4
Ambulance transfer	$508	$646	$575	$265	$52
Non-healthcare					
Community services	*Not listed here due to the number of items*				
Home modifications	*Cost was provided by individual patients*				
Special aids and equipment	*Not listed here due to the substantial number of items*				
Accommodation changes	*Not listed here due to the number of items*				
Professional carer (per hour)	$24	$14	$14	$10	$2
Living-in maid (per month)	N/A	N/A	N/A	$571	$103
Average weekly earnings					
Male	$1137	$621	$1152	$973	$137
Female			$957¶		

Unit cost for intervention[#]					
Hospital physiotherapist (per hour)	$33	$32	$30	$21	$5
Hospital nurse (per hour)	$30	$25	$29	$21	$5

AU: Australia; NZ: New Zealand; UK: United Kingdom; SG: Singapore; MA: Malaysia;
Sources of CPI:
Australian Bureau of Statistics. Consumer price index inflation calculator. Accessed from:Http://www.Abs.Gov.Au/websitedbs/d3310114.Nsf/home/consumer+price+index+inflation+calculator. 2017
Office for National Statistics. Inflation and price indices. Accessed from: Https://www.Ons.Gov.Uk/economy/inflationandpriceindices. 2017
Department of Statistics Singapore. Consumer price index. Accessed from: Https://data.Gov.Sg/dataset/consumer-price-index-annual. 2017
Statistics New Zealand. Consumer price index, accessed from: Http://www.Stats.Govt.Nz/browse_for_stats/economic_indicators/cpi_inflation/info-releases.Aspx. 2017
Department of Statistics Malaysia OP. Consumer price index malaysia. Accessed from: Https://www.Dosm.Gov.My/v1/index.Php?R=column/cthemebycat&cat=106&bul_id=zi9pmutpvzixb042mlptt1buellazz09&menu_id=bthzthqxn1zqmvf6a2i4rkzondfkqt09. 2017

[*] severity was determined by baseline NIHSS score; [†]severity was classified by baseline mRS score; [‡]it is the per day cost; [§]cost was assigned according to the baseline mRS score (mild 0-2; moderate 3-5; severe 6); [‖] the National Survey of Household Income was provided on gender basis, so the weekly earnings for UK patients were assigned corresponding to this; [#] hourly wage of hospital physiotherapist and nurse were assigned; N/A: not applicable.
Main sources of unit cost: AU: Independent Hospital Pricing Authority (IHPA), Australia, National Efficient Price Data (2015-16); National Hospital Cost Data collection (https://www.ihpa.gov.au/publications/australian-public-hospitals-cost-report-2013-2014-round-18); Department of Health, Revised residential care subsidies (https://agedcare.health.gov.au/aged-care-funding/aged-care-subsidies-and-supplements); Australian Bureau of Statistics (http://www.abs.gov.au/AUSSTATS/abs@.nsf/allprimarymainfeatures/E9FF9F13B417A488CA257F630014DF30?opendocument
NZ: Ministry of Health (http://www.health.govt.nz/nz-health-statistics/data-references/weighted-inlier-equivalent-separations); World Health Organisation (http://www.who.int/choice/country/nzl/cost/en/); Cost Resource Manual Version 2.2 (https://www.pharmac.govt.nz/assets/pfpa-v2-2-cost-resource-manual.pdf); study by Te Ao et al 2011 (Te Ao BJ et al. Are stroke units cost effective? Evidence from a New Zealand stroke incidence and population-based study. Int. J. Stroke. 2012;7:623-630); Statistics New Zealand (http://www.stats.govt.nz/browse_for_stats/income-and-work/employment_and_unemployment/LabourMarketStatistics_HOTPJun15qtr.aspx); District Health Board, Multi Employer Agreement, New Zealand Nurses Organisation(http://www.bopdhb.govt.nz/media/58613/psa-ronz-allied-meca-2015-2017.pdf);
UK: National Health Service (NHS) reference costs 2014 to 2015, United Kingdom (https://www.gov.uk/government/publications/nhs-reference-costs-2014-to-2015) ; NICE Technology Appraisal (Davis,S., Holmes,M., Simpson,E., Sutton,A. Alteplase for the treatment of acute ischaemic stroke [review of technology appraisal 122]: A Single Technology Appraisal. ScHARR, The University of Sheffield 2012, https://www.nice.org.uk/guidance/ta264/documents/stroke-acute-ischaemic-alteplase-review-of-ta122-evidence-review-group-report2); Personal Social Services Research Unit (PSSRU)(http://www.pssru.ac.uk/); Information Services Division, Scotland (http://www.isdscotland.org/); Annual Survey of Hours and Earnings 2015, Office for National Statistics (https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/earningsandworkinghours/bulletins/annualsurveyofhoursandearnings/2015provisionalresults); Payscale UK (http://www.payscale.com/research/UK/Job=Care_Worker/Hourly_Rate); NHS pay and benefits (https://www.healthcareers.nhs.uk/about/careers-nhs/nhs-pay-and-benefits/agenda-change-pay-rates);
SG: Ministry of Health , Hospital Bill Sizes, Singapore (https://www.moh.gov.sg/content/moh_web/home/costs_and_financing/HospitalBillSize/stroke.html.) ; Outpatient Charges, Singapore General Hospital (https://www.sgh.com.sg/patient-services/charges-payment/pages/outpatient-charges.aspx); Charges, Ren Ci Hospital (http://www.renci.org.sg/patients-guide/charges-2/); Hospital rates and charges, Bright Vision Hospital (http://www.bvh.org.sg/hospital-rate-charge.html); Ministry of Manpower (http://stats.mom.gov.sg/Pages/Occupational-Wages-Tables2014.aspx);
MA: study by Mohd Nordin et al 2012 (Mohd Nordin et al.: Estimating cost of in-patientmedical care for stroke using Casemix data. BMC Health Services Research 2012 12(Suppl 1):P10.); Ministry of Health Malaysia (http://www.moh.gov.my/english.php/pages/view/160); Study by Akhavan Hejazi et al 2015(Akhavan Hejazi SM, et al. Cost of post-stroke outpatient care in malaysia. Singapore Med. J. 2015;56:116-119); Department of Statistics Malaysia (https://www.dosm.gov.my/v1/index.php?r=column/pdfPrev&id=czRyNkJIbDFyYXJFbU5YTVJ1V1BHZz09).

Valuation of costs

For the ICER from a societal perspective, all the costs from health and non-health sector were summed together, including the productivity cost; for ICER of a health sector perspective, all the costs borne by healthcare system were counted (i.e. excluding non- healthcare costs and productivity cost).

Supplementary document 4. Missing cost data analyses

Table I. Number of missing data for each cost item

Cost variable	Missing										
	Total	AU		NZ		UK		SG		MA	
	N=2104	VEM N=522	UC N=532	VEM N=94	UC N=95	VEM N=311	UC N=299	VEM N=64	UC N=64	VEM N=62	UC N=61
Acute hospitalisation	1(0.05%)	1(0.2%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)
Stroke-related rehospitalisation	51(2.4%)	8(1.5%)	7(1.3%)	0(0%)	0(0%)	17(5.5%)	8(2.7%)	0(0%)	3(4.7%)	7(11.3%)	1(1.6%)
Ambulance transfer	53(2.5%)	8(1.5%)	10(1.9%)	0(0%)	0(0%)	16(5.1%)	7(2.3%)	1(1.6%)	3(4.7%)	7(11.3%)	1(1.6%)
Rehabilitation hospital admission	55(2.6%)	9(1.7%)	9(1.7%)	0(0%)	0(0%)	18(5.8%)	8(2.7%)	0(0%)	3(4.7%)	7(11.3%)	1(1.6%)
Outpatient rehabilitation program	47(2.2%)	0(0%)	0(0%)	0(0%)	0(0%)	23(7.4%)	10(3.3%)	0(0%)	3(4.7%)	9(14.5%)	2(3.3%)
Rehabilitation provided at home/nursing facility	67(3.2%)	11(2.1%)	10(1.9%)	0(0%)	0(0%)	23(7.4%)	1(3.7%)	0(0%)	3(4.7%)	7(11.3%)	1(1.6%)
Individual allied health visit[§]	0(0%)	-	-	-	-	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)
Private physiotherapy	76(3.6%)	12(2.3%)	11(2.1%)	0(0%)	1(1.1%)	27(8.7%)	13(4.4%)	1(1.6%)	3(4.7%)	7(11.3%)	1(1.6%)
Respite care	77(3.7%)	12(2.3%)	11(2.1%)	1(1.1%)	1(1.1%)	27(8.7%)	13(4.4%)	1(1.6%)	3(4.7%)	7(11.3%)	1(1.6%)
Subtotal (medical cost)	**94(10.7%)**	**14(2.7%)**	**13(2.4%)**	**1(1%)**	**1(1.1%)**	**36(11.6%)**	**14(4.7%)**	**1(1.6%)**	**3(4.7%)**	**9(14.5%)**	**2(3.3%)**
Accommodation moves	60(2.9%)	15(2.9%)	11(2.1%)	1(1.1%)	1(1.1%)	15(4.8%)	10(3.3%)	0(0%)	2(3.1%)	5(8.1%)	0(0%)
Community services	230(10.9%)	63(12.1%)	87(16.4%)	4(4.3%)	5(5.3%)	32(10.3%)	27(9.0%)	1(1.6%)	3(4.7%)	7(11.3%)	1(1.6%)
Home modifications	13(0.6%)	3(2.6%)	6(1.1%)	0(0%)	1(1.1%)	0(0%)	2(0.7%)	0(0%)	1(1.6%)	0(0%)	0(0%)
Special aids and equipment	48(2.3%)	7(1.3%)	8(1.5%)	1(1.1%)	1(1.1%)	16(5.1%)	14(4.7%)	1(1.6%)	0(0%)	0(0%)	0(0%)
Informal care	72(3.4%)	11(2.1%)	12(2.3%)	0(0%)	1(1.1%)	26(8.4%)	10(3.3%)	1(1.6%)	3(4.7%)	7(11.3%)	1(1.6%)
Living-in maids[ǂ]	-	-	-	-	-	-	-	1(1.6%)	3(4.7%)	7(11.3%)	2(3.3%)
Subtotal (non-medical cost)	**304(14.5%)**	**77(14.8)%**	**97(18.2%)**	**6(6.4%)**	**7(7.4%)**	**54(17.4%)**	**46(15.4%)**	**2(3.1%)**	**5(7.8%)**	**8(12.9%)**	**2(3.3%)**
Productivity cost	225(10.7%)	50(9.6%)	46(8.7%)	14(14.9%)	10(10.5%)	27(8.7%)	23(7.7%)	17(25.6%)	13(20.3%)	14(22.6%)	11(18.0%)
Total cost (exc. productivity cost)	319(15.2%)	80(15.3%)	97(18.2%)	6(6.4%)	7(7.4%)	61(19.6%)	48(16.1%)	2(3.1%)	5(7.8%)	10(16.1%)	3(4.9%)
Total cost	512(24.3%)	124(23.8%)	136(25.6%)	20(21.3%)	16(16.8%)	80(25.7%)	68(22.7%)	17(26.6%)	16(25.0%)	22(35.5%)	13(21.3%)

[§]only applicable to UK, Singapore and Malaysia patients; [ǂ]only applicable to Singapore and Malaysia patients

Table II. Missing pattern analysis based on logit regression

Resource use items with missing data	Predictor of missingness
Stroke-related rehospitalisation	Age (p=0.001)
Rehabilitation hospital admission	Age (p=0.009), NIHSCORE (p=0.037)
Outpatient rehabilitation program	Age (p=-0.003)
Rehabilitation service provided at home/nursing facility	Age (p=0.014),
Community services used prior to stroke	NIHSCORE (p=0.001)
Community services used at 3 months	Age (p=0.003)
Community services used at 12 months	NIHSCORE (p=0.008)
Aids or special equipment uses at 3 months	Age (p=0.012)
Aids or special equipment uses at 12 months	Age (p=0.035), NIHSCORE (p=0.013)
Private physiotherapy uses at 3 months	Age (p<0.0001)
Private physiotherapy uses at 12 months	Age (p=0.006), NIHSCORE (p=0.034)
Respite care use at 3 months	Age (p<0.0001)
Respite care use at 12 months	Age (p=0.017), NIHSCORE (P=0.018)
Informal care use at 3 months	Age (p=0.003)
Informal care use at 12 months	Age (p<0.0001)

If any of the other variables were able to predict the missingness of a given variable representing resource use, the MAR assumption was deemed to be held true. More specifically, multiple imputations were used to replace the missing values (missing mRS, AQoL-4D data or cost categories) with plausible estimates, and generated 30 datasets. Results were provided as pooled estimates of these sets. Identical analyses were carried out to estimate the incremental costs and benefits between groups on the basis of imputed data following the methods outlined in the statistical analysis section above. As the probability of all the resource use items being missing could be predicted by one or more of the other variables, it is likely that the Missing-at-Random (MAR) assumption could be held true. (https://www.ssc.wisc.edu/sscc/pubs/stata_mi_decide.htm).

Supplementary document 5. Outcomes

Table I. Results of mRS score at 3 and 12 months follow-up

Modified Rankin Scale Score	UC group n=1050		VEM group n=1054	
	3M	**12M**	**3M**	**12M**
0	96	132	90	137
1	204	231	200	219
2	225	175	190	166
3	218	199	238	186
4	127	95	140	113
5	103	83	92	59
6	72	118	88	139
Total	**1045**	**1033**	**1038**	**1019**
Missing data	**5**	**17**	**16**	**35**

Number of patients falling into each category

Since there was no significant intervention effect together with no accepted willingness-to- pay (WTP) per unit increase in probability of achieving a better mRS outcome, further estimation of the ICER was considered not meaningful (i.e. no cost-effectiveness plane or cost-effectiveness acceptability curve could be generated).

Table II. Time and cost associated with delivering VEM and UC (mean, 95%CI)

	VEM		UC		Between group difference	
	Total time (min)	Cost (AUD)	Total time (min)	Cost (AUD)	Total time (min)	Cost (AUD)
Physiotherapist	243 (232, 254)	$117 ($111, $123)	95 (90, 101)	$48 ($45, $51)	147 (135, 159)*	$69 ($63, $75)*
Nurse†	494 (456, 532)	$225 ($207, $244)	439 (404, 474)	$202 ($185, $219)	55 (4, 106)*	$23 (-$2, $48)
Total cost	-	$342 ($320, $364)	-	$250 ($231, $269)	-	$92 ($63, $121)*

VEM: very early mobilisation; UC: usual care; CI: confidence interval

*p<0.0001 (adjusted for age, baseline NIHSS and mRS); † nurse's time devoted to delivery of VEM/UC was not recorded in the process of data collection, so the physiotherapist time was used as a proxy

Because VEM and UC were supplied by the same group of physiotherapists and nurses, the key difference was that a patient randomised to VEM received early rehabilitation within 24 hours of stroke onset and more out-of-bed mobilisation sessions of early mobilisation.

The total health practitioner (physiotherapist and nurses) time devoted to the delivery of the VEM and UC differed significantly, with the VEM group receiving substantially longer mean service time from both the physiotherapist (VEM: 243 mins, 95%CI: 232 to 254 vs UC: 95 mins, 95%CI: 90 to 101, p<0.0001) and nurse (VEM: 494 mins, 95%CI: 456 to 532 vs UC: 439 mins, 95%CI: 404 to 474, p<0.0001). The resultant difference in costs between groups was significant ($92, 95%CI: $63 to $121, p<0.0001).

Supplementary document 6. Sensitivity analyses

Generally, the difference in QALY gains between VEM and UC groups were fairly consistent across different methods.

Table I. Between-group differences based on the Generalised Linear Model_ base case analysis vs. multiple imputation analysis

	ITT (not imputed)			ITT (imputed)		
	mRS score	**QALYs**	**Cost (AUD)**	**mRS**	**QALYs**	**Cost (AUD)**
Health Sector Perspective						
Total medical costs	0.030 (-0.022, 0.082)	-0.013 (-0.041, 0.016)	$1082 (-$2399, $4563)	0.042 (-0.008, 0.092)	-0.019 (-0.046, 0.007)	$940 (-$2584, $4465)
Societal Perspective						
Total cost (excl. productivity cost)	0.030 (-0.022, 0.082)	-0.013 (-0.041, 0.016)	-$6 (-$5703, $5690)	0.042 (-0.008, 0.092)	-0.019 (-0.046, 0.007)	$1704 (-$5423, $8832)
Total cost (incl. productivity cost)	0.030 (-0.022, 0.082)	-0.013 (-0.041, 0.016)	$102 (-$6945, $7149)	0.042 (-0.008, 0.092)	-0.019 (-0.046, 0.007)	$1413 (-$5940, $8766)

ITT: intention to treatment; mRS: modified Rankin Scale; AUD: Australian dollars
*the p-value was >0.05 for the between-group difference in mRS score, QALYs and cost

Table II. Between-group differences based on the Generalised Linear Model

	Adding country dummies		
	mRS	**QALYs**	**Cost**
Total medical costs	0.031(-0.021, 0.083)	-0.013(-0.042, 0.015)	$704 (-$1968, $3376)
Total cost (excl. productivity cost)	0.031(-0.021, 0.083)	-0.013(-0.042, 0.015)	-$335 (-$4953, $4283)
Total cost (incl. productivity cost)	0.031(-0.021, 0.083)	-0.013(-0.042, 0.015)	-$238 (-$6012, $5537)

mRS: modified Rankin Scale; QALYs: Quality-adjusted Life Years

*the p-value was >0.05 for the between-group difference in mRS score, QALYs and cost

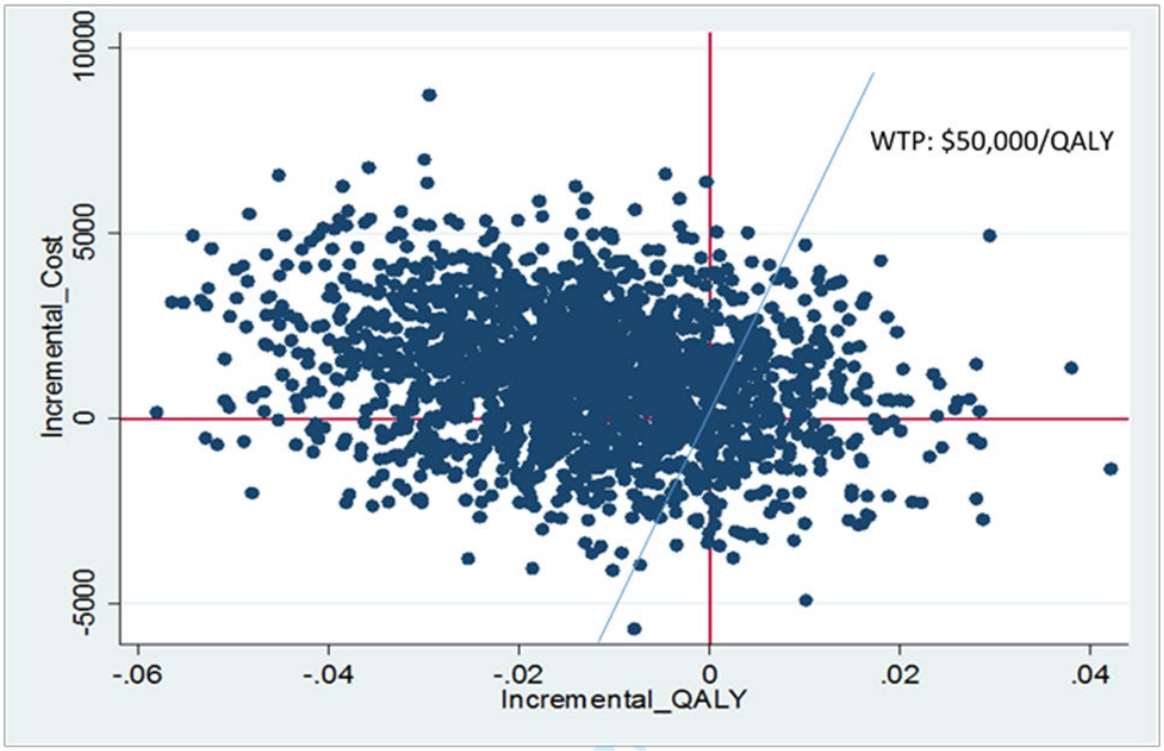
Table III. Cost-utility analysis based on multiple imputation analysis

	Efficacy (QALYs)	Cost (AUD)	Probability of being cost-effective
Health Sector Perspective			
Total medical costs	-0.019 (-0.044, 0.005)	$940 (-$4622, $4682)	25%
Societal Perspective			
Total cost (excl. productivity cost)	-0.019 (-0.044, 0.005)	$1704 (-$3817, $7226)	20%
Total cost (incl. productivity cost)	-0.019 (-0.044, 0.005)	$1413 (-$4044, $6871)	23%

QALYs: Quality-adjusted Life Years; AUD: Australian dollar.

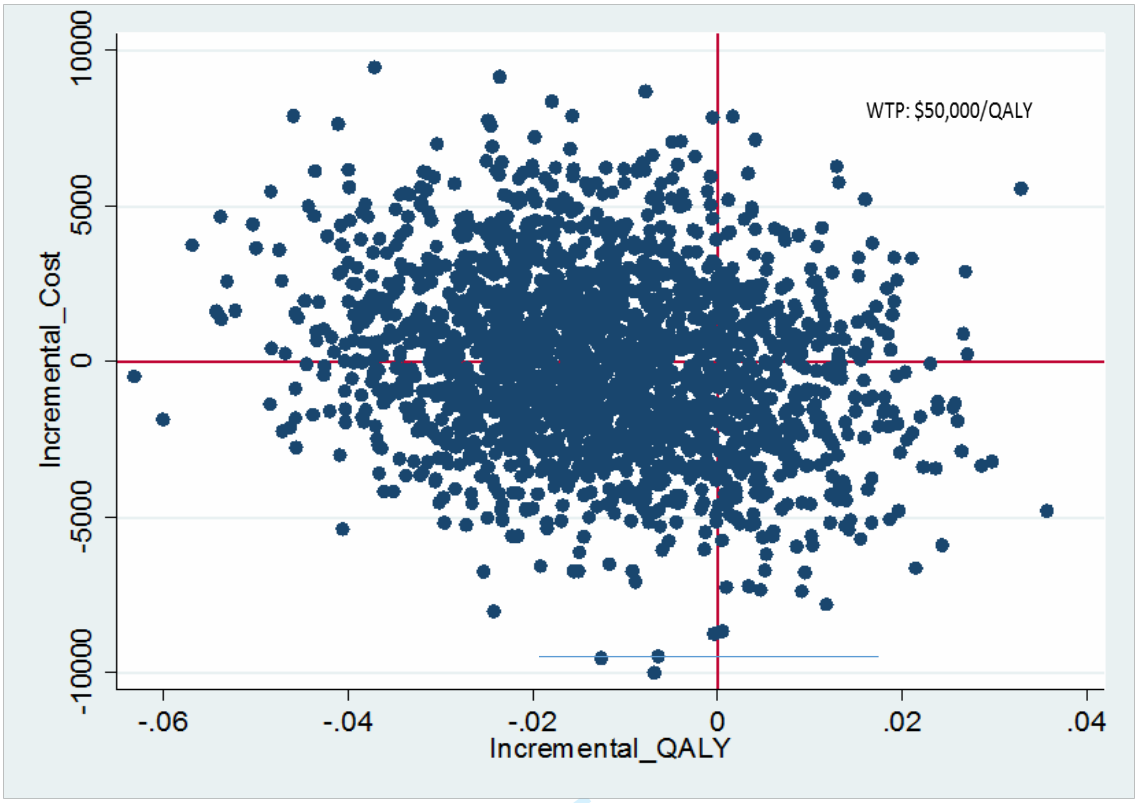
*the p-value was >0.05 for the between-group difference in QALYs and cost

Supplementary document 7: Figures



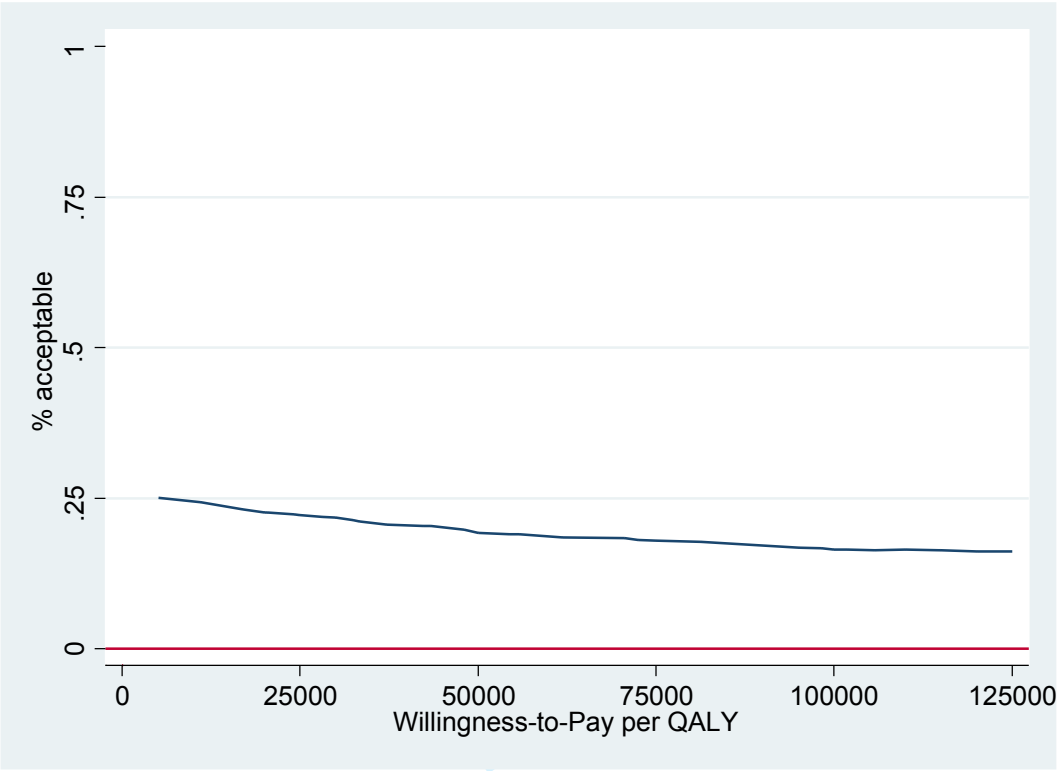
*Probability of VEM being cost-effective is 19%; WTP: willingness-to-pay; QALY: quality adjusted life year

Figure I Cost-effectiveness plane_ health sector perspective



*Probability of VEM being cost-effective is 42%; WTP: willingness-to-pay; QALY: quality-adjusted life year

Figure II Cost-effectiveness plane_ societal perspective (excl. productivity cost)



Note: The probability of VEM being cost-effective decreases with the increasing WTP/QALY threshold because the VEM is associated with less costs

Figure III Cost-effectiveness acceptability curve for medical cost

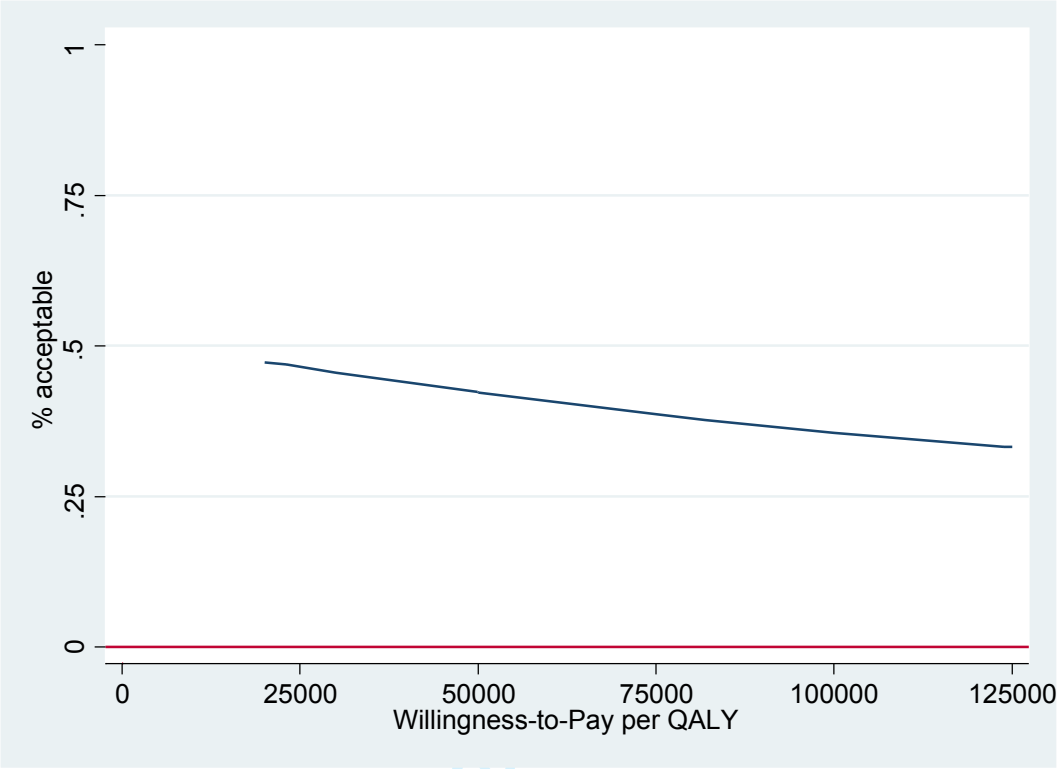


Figure IV Cost-effectiveness acceptability curve for total cost excluding productivity cost

Note: The probability of VEM being cost-effective decreases with the increasing WTP/QALY threshold because the VEM is associated with less costs

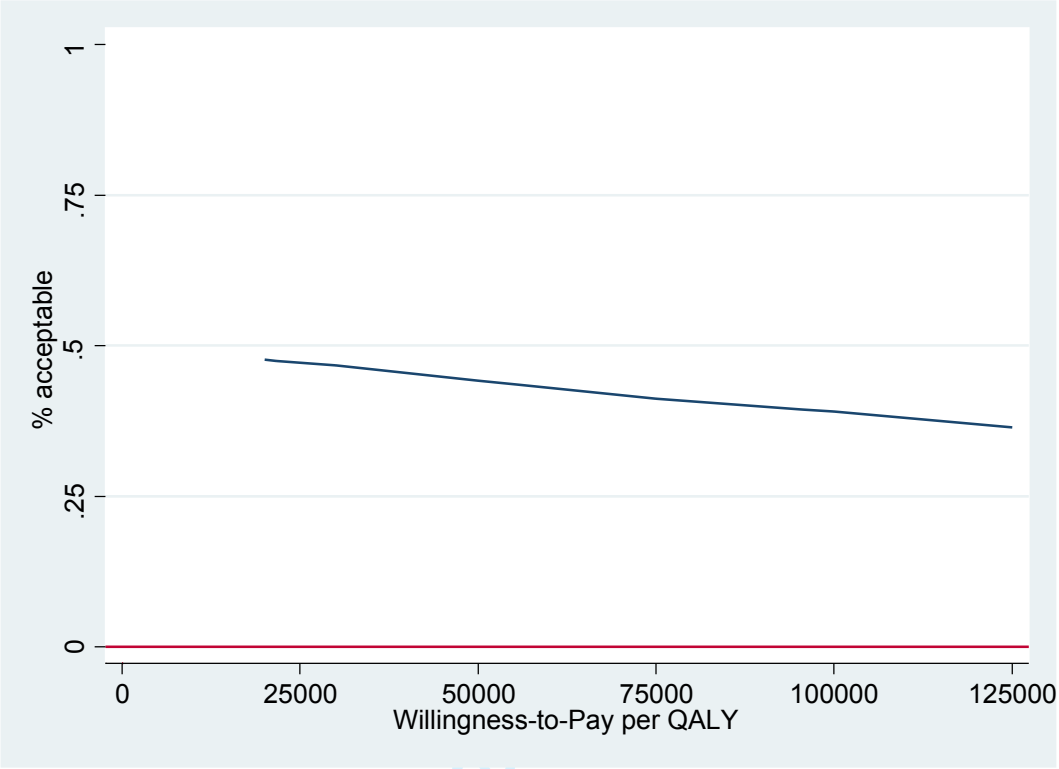


Figure V Cost-effectiveness acceptability curve for total cost including productivity cost

Note: The probability of VEM being cost-effective decreases with the increasing WTP/QALY threshold because the VEM is associated with less costs

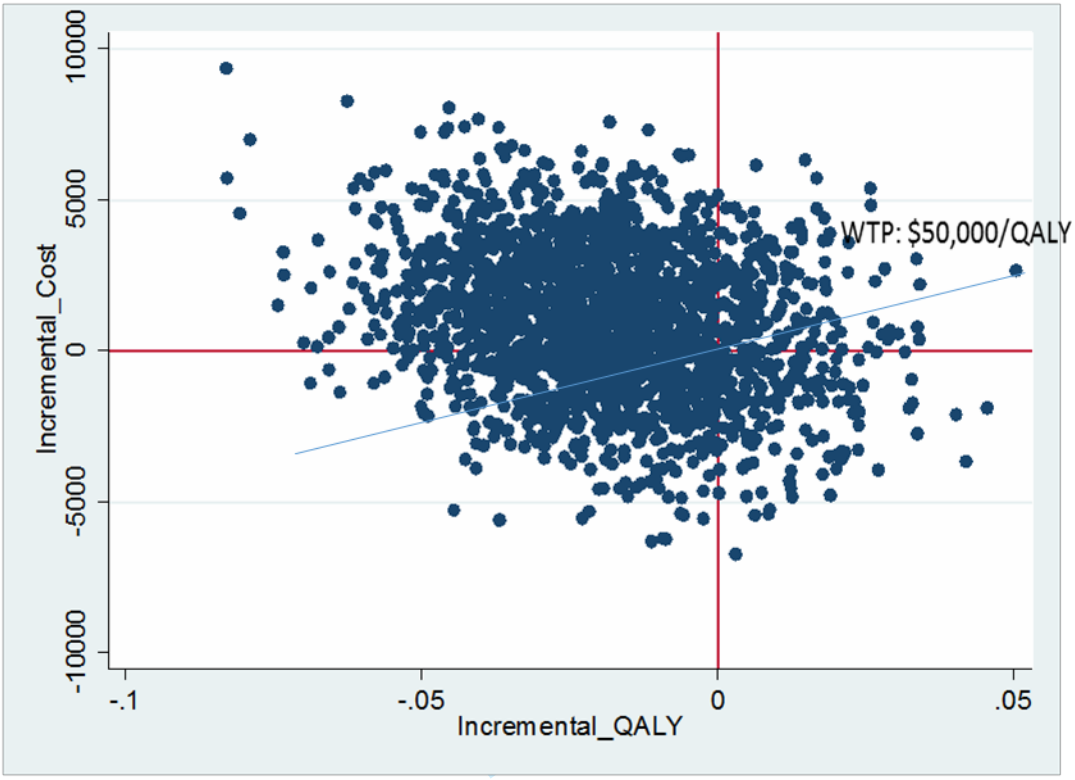


Figure VI Cost-effectiveness plane_ health sector perspective (multiple imputation analysis)

WTP: willingness-to-pay; QALY: quality-adjusted life year

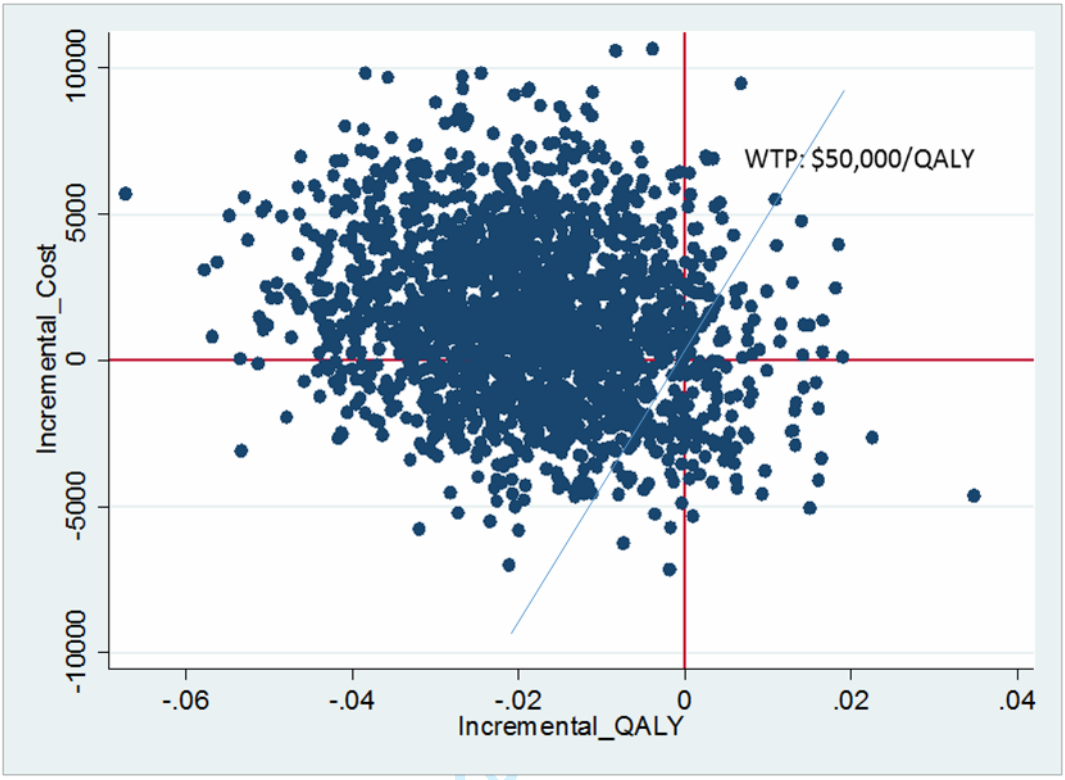


Figure VII Cost-effectiveness plane_ societal perspective including productivity cost (multiple imputation analysis)

WTP: willingness-to-pay; QALY: quality-adjusted life year

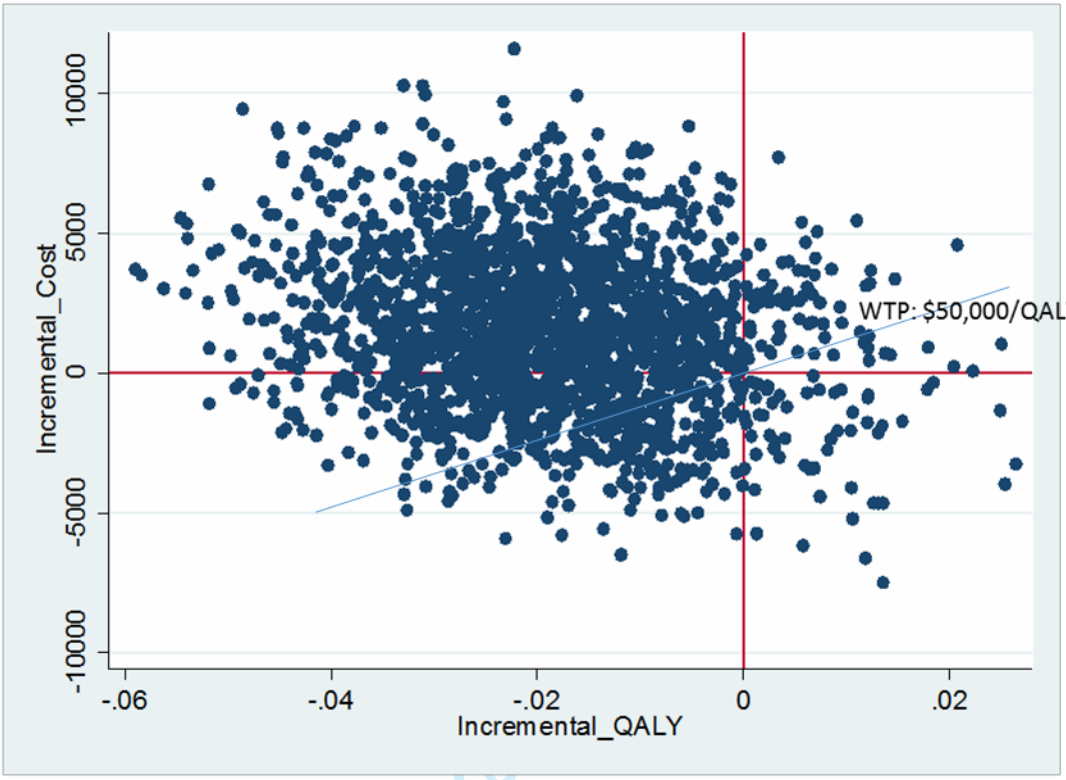


Figure VIII Cost-effectiveness plane_ societal perspective excluding productivity cost (multiple imputation analysis)

WTP: willingness-to-pay; QALY: quality-adjusted life year

References

1. Claesson L, Gosman-Hedstrom G, Johannesson M, Fagerberg B, Blomstrand C. Resource utilization and costs of stroke unit care integrated in a care continuum: A 1-year controlled, prospective, randomized study in elderly patients: the Goteborg 70+ Stroke Study. Stroke 2000;31(11):2569-77.
2. Bernhardt J, Dewey H, Thrift A, Collier J, Donnan G. A very early rehabilitation trial for stroke (AVERT) phase II safety and feasibility. Stroke 2008;39(2):390-6.

Section/item	Item No	Recommendation	Reported on page No/ line No
Title and abstract			
Title	1	Identify the study as an economic evaluation or use more specific terms such as "cost-effectiveness analysis", and describe the interventions compared.	1
Abstract	2	Provide a structured summary of objectives, perspective, setting, methods (including study design and inputs), results (including base case and uncertainty analyses), and conclusions.	4-5
Introduction			
Background and objectives	3	Provide an explicit statement of the broader context for the study.	7
		Present the study question and its relevance for health policy or practice decisions.	8
Methods			
Target population and subgroups	4	Describe characteristics of the base case population and subgroups analysed, including why they were chosen.	12
Setting and location	5	State relevant aspects of the system(s) in which the decision(s) need(s) to be made.	9
Study perspective	6	Describe the perspective of the study and relate this to the costs being evaluated.	9
Comparators	7	Describe the interventions or strategies being compared and state why they were chosen.	8
Time horizon	8	State the time horizon(s) over which costs and consequences are being evaluated and say why appropriate.	11
Discount rate	9	Report the choice of discount rate(s) used for costs and outcomes and say why appropriate.	11
Choice of health outcomes	10	Describe what outcomes were used as the measure(s) of benefit in the evaluation and their relevance for the type of analysis performed.	8-9
Measurement of effectiveness	11a	*Single study-based estimates:* Describe fully the design features of the single effectiveness study and why the single study was a sufficient source of clinical effectiveness data.	12
	11b	*Synthesis-based estimates:* Describe fully the methods used for identification of included studies and synthesis of clinical effectiveness data.	
Measurement and valuation of preference based outcomes	12	If applicable, describe the population and methods used to elicit preferences for outcomes.	9
Estimating resources and costs	13a	*Single study-based economic evaluation:* Describe approaches used to estimate resource use associated with the alternative interventions. Describe primary or secondary research methods for valuing each resource item in terms of its unit cost. Describe any adjustments made to approximate to opportunity costs.	9-10
	13b	*Model-based economic evaluation:* Describe approaches and data sources used to estimate resource use associated with model health states. Describe primary or secondary research methods for valuing each resource item in terms of its unit cost. Describe any adjustments made to approximate to opportunity costs.	
Currency, price date, and conversion	14	Report the dates of the estimated resource quantities and unit costs. Describe methods for adjusting estimated unit costs to the year of reported costs if necessary. Describe methods for converting costs into a common currency base and the exchange rate.	10
Choice of model	15	Describe and give reasons for the specific type of decision-analytical model used. Providing a figure to show model structure is strongly recommended.	
Assumptions	16	Describe all structural or other assumptions underpinning the decision-analytical model.	
Analytical methods	17	Describe all analytical methods supporting the evaluation. This could include methods for dealing with skewed, missing, or censored data; extrapolation methods; methods for pooling data; approaches to validate or make adjustments (such as half cycle corrections) to a model; and methods for handling population heterogeneity and uncertainty.	11-12
Results			
Study parameters	18	Report the values, ranges, references, and, if used, probability distributions for all parameters. Report reasons or sources for distributions used to represent uncertainty where appropriate. Providing a table to show the input values is strongly recommended.	N/A
Incremental costs and outcomes	19	For each intervention, report mean values for the main categories of estimated costs and outcomes of interest, as well as mean differences between the comparator groups. If applicable, report incremental cost-effectiveness ratios.	14-15
Characterising uncertainty	20a	*Single study-based economic evaluation:* Describe the effects of sampling uncertainty for the estimated incremental cost and incremental effectiveness parameters, together with the impact of methodological assumptions (such as discount rate, study perspective).	14
	20b	*Model-based economic evaluation:* Describe the effects on the results of uncertainty for all input parameters, and uncertainty related to the structure of the model and assumptions.	
Characterising heterogeneity	21	If applicable, report differences in costs, outcomes, or cost-effectiveness that can be explained by variations between subgroups of patients with different baseline characteristics or other observed variability in effects that are not reducible by more information.	
Discussion			
Study findings, limitations, generalisability, and current	22	Summarise key study findings and describe how they support the conclusions reached. Discuss limitations and the generalisability of the findings and how the findings fit with current knowledge.	16-21

knowledge

Other			
Source of funding	23	Describe how the study was funded and the role of the funder in the identification, design, conduct, and reporting of the analysis. Describe other non-monetary sources of support.	22
Conflicts of interest	24	Describe any potential for conflict of interest of study contributors in accordance with journal policy. In the absence of a journal policy, we recommend authors comply with International Committee of Medical Journal Editors recommendations.	22

For consistency, the CHEERS statement checklist format is based on the format of the CONSORT statement checklist