

Effectiveness of Patient-Centered Intervention in Post-Stroke Patients in the Family and Community Practice Setting: A Meta-Analysis*

Fritz Gerard F. Buenafior, MD; Daisy M Medina, MD, FPAFP and Liz Engeljakob-Cabrera, MD, DFM

Background: According to the American Heart Association, post-stroke patients often have neurologic deficits which can lead to a variety of complications. Patient-centered approach to care promotes shared decision-making between physicians and patients regarding treatment plan and may lead to better health outcomes for these post-stroke patients.

Objective: The effectiveness of patient-centered intervention in improving physical functioning among adult post-stroke patients with residual neurologic deficit was determined. Secondary outcomes such as improvement in social functioning, activities of daily living, quality of life and prevention of negative events such as death, re-hospitalization and depression were also evaluated.

Method: This systematic review included comparative randomized clinical trials involving humans as the clinical subjects, diagnosed to have had a stroke and appropriately evaluated to be in recovery with residual neurologic deficit, with the intervention described labeled as 'patient-centered care', and reporting an outcome on the improvement of physical functioning. Online search was done in Pubmed, CENTRAL, NICE, and the grey literature. Three reviewers independently conducted the search, appraisal and data extraction.

Results: Results varied depending on the outcome measurement tool utilized by the included studies. There was no difference between groups in terms of overall physical functioning and ADL as measured by SIS 16 and SIS 3.0. However, significant improvement was noted in the following subscales of SIS 3.0: hand movement (0.45, 3.18, $p=0.009$, $I^2=0\%$), communication (0.86, 2.16, $p\leq 0.00001$, $I^2=0\%$), and memory and thinking (0.13, 1.74, $p=.02$, $I^2=33\%$). Physical function, ADL and social functioning using RNLI as an outcome (1.44-3.70] $p\leq 0.00001$, $I^2=0\%$), and physical functioning, social functioning, ADL and QOL as measured by participation (1.48, 3.74, $p\leq 0.00001$, $I^2=0\%$) and perception of recovery (2.22, 4.00, $p\leq 0.00001$, $I^2=0\%$) also showed significant improvement.

Conclusion. Patient-centered approaches have potential benefit in improving specific components of physical and social functioning, ADL and quality of life. However, differences in the type of patient-centered intervention and outcome measurement tools warrant further investigation into the specific interventions which will provide the most benefit to post-stroke patients.

Key words: Post-stroke patients, patient-centered intervention, meta-analysis

INTRODUCTION

Stroke was defined by the World Health Organization (WHO) more than 40 years ago as "rapidly developing clinical signs of focal (or global) disturbance of cerebral function, lasting more than 24

hours or leading to death, with no apparent cause other than that of vascular origin."¹ According to the 2016 data by the Philippine Statistics Authority, cerebrovascular disease is the 4th leading cause of all death accounting for 9.8% of the total death for that year. It is also the 2nd leading cause of death for males, and the 4th leading cause of death for females.² According to the American Heart Association, post-stroke patients often have neurologic deficits which can lead to a variety of conditions and complications such as pneumonia, a result of not being able to move as a result of the stroke, swallowing problems after stroke

*Department of Family and Community Medicine, Batangas Medical Center

resulting in things 'going down the wrong pipe', leading to aspiration pneumonia, urinary tract infection (UTI) and/or bladder control as a result of having a foley catheter placed to collect urine when the stroke survivor cannot control bladder function, seizures, clinical depression, bedsores from decreased ability to move and pressure on areas of the body because of immobility, limb contractures reduced ability to move the affected limb or lack of exercise and other conditions that can result from immobility or any neurologic deficit.³

Approximately 70% of stroke survivors require assistance with activities of daily living. This assistance is usually provided by family members who are often unprepared and ill-equipped to assume caregiving responsibilities such as providing direct care (e.g., bathing, toileting, mobility assistance, transfers), managing medications, assisting with instrumental activities of daily living, managing stroke survivor emotions and behaviors, communicating with providers, and identifying and accessing community resources. These new responsibilities often lead to overwhelming physical and emotional strain, depressive symptoms, decline in physical and mental health, reduced quality of life, and isolation in the family caregiver.⁴ Aphasic stroke survivors had great difficulties conveying their feelings and thoughts about their disabilities. It is known that insufficient communication increases the family's burden. Family dysfunction may arise when there is a discrepancy between the stroke survivor's abilities and family expectations. Post-stroke motor recovery, which is a complex and dynamic process, is affected by several factors. Such factors can be categorized into socio-demographic and clinical factors. Among the socio-demographic factors, older age, female sex, and lower educational level are associated with poorer outcomes. Clinical factors that have been shown to influence recovery are extent of injury, post-stroke depression, diabetes, and stroke subtype. Patients with severe motor impairment at baseline have higher odds of poorer outcomes at 3 months post-stroke. Post-stroke depression and diabetes have been identified to also impact recovery negatively after stroke. Patients who had hemorrhagic stroke are more likely to recover faster when compared to those with ischemic stroke of comparable severity of impairment.⁵ The Patient Centered Clinical Method identifies that patient-centeredness is achieved in part by understanding patients experiences with illness and disease as well as understanding patients holistically. Developing a partnership with patients occurs when clinicians and patients find common ground upon which a health care plan can be developed mutually. Finally, effective health promotion, defined as tailoring health care plans based on reflections on the patient's past health history and current health context, helps ensure that health care plans are developed from an understanding of previous health care experiences. This approach reduces the risk of failed treatments and ensures optimal use of resources.⁶

According to the study of Kristensen, et al., to develop a high-quality health care for stroke survivors, it is important to have a common understanding of the needs, experiences, and priorities of those patients with residual deficits. Involvement of patients in decisions on care and treatment was found to be associated with having health services needs met in six problem areas: falls, fatigue, emotion, memory, speaking, and reading.⁷ A holistic assessment of individual's needs and priorities should be conducted to ensure that

these are identified and addressed, relevant rehabilitation goals are set, and interventions are implemented that are perceived to be appropriate and meaningful to post-stroke patients, irrespective of age.⁸ Goal formulation with the patient can ensure that personally relevant goals are set, and can result in greater satisfaction with the rehabilitation experience, along with improved recovery of stroke deficits. In a retrospective chart review by Rice⁹, et al. of 286 patients recovering, patient goals concentrated on themes of improving hand function, mobility, and cognition. Goals were also sorted into International Classification of Functioning (ICF) categories in which impairment-based and activity limitation-based goals were predominant. Compared to activity-based and participation-based goals, patients with impairment-based goals perceived greater satisfaction with meeting their goals at admission and discharge ($p < .001$). Patient satisfaction in meeting their first-, second-, and third-listed goals each significantly improved by discharge from the rehabilitation program ($p < .001$). Their results suggest that within an outpatient stroke rehabilitation setting, patients set heterogeneous goals that were predominantly impairment based. Satisfaction in achieving goals significantly improved after receiving therapy.

Patient readiness is a composite of patient self-efficacy and education. Stroke patients may not understand care plans, receive medication education too late, and were less satisfied with the quality of medication education.¹⁰ In one study, investigators developed a patient-centered communication intervention (PCCI) which focused on patients with communication impairments post-stroke. In order to enhance quality of life and reduce agitation in patients, they established an individualized patient communication care plans based on the initial assessments such as: a) how to communicate with the patient; b) how the patient communicates; c) what the patient's behavior mean, and d) patient's habits to know to avoid communication problems including topics of interest for discussion. This created more cooperative and less stressful caregiving situations. Patient-centered care in the study involves educating the people giving care to aphasic patients on how to communicate effectively to understand the patients' need, thus enhancing their wellbeing and maintain autonomy.¹¹

Studies suggest that post stroke patients who are treated with patient centered approaches led to better quality of life, significantly improved physical functioning and greater satisfaction in both the patients and care givers, albeit most involved small numbers of participants. This review is, thus, deemed necessary to firmly establish the effectiveness of the patient-centered approach in improving health outcomes among post-stroke patients, specifically in their physical functioning which can lead to better social functioning, activities of daily living, quality of life and decrease in re-hospitalization. Establishing the effectiveness of the patient-centered approach, Family Medicine practitioners will be more confident in utilizing this approach in providing care to their post-stroke patients. Patients, in turn, will benefit from actively participating in their treatment in partnership with their physician and this may ensure proper compliance to the proposed treatment.

The objective of the study was to determine the effectiveness of patient-centered intervention in improving physical functioning among adult post-stroke patients with residual neurologic deficit.

METHODS

Protocol Review and Registration

This systematic review protocol was registered with the Research Committee of the Philippine Academy of Family Physicians. It was also registered with Batangas Medical Center where the investigators are affiliated. It was conducted following the guidelines of Cochrane Handbook for Systematic Reviews of Interventions and reported following the Preferred Reporting Items for Systematic Reviews and Meta-analysis (PRISMA).

Inclusion Criteria of Studies

Study Design

This systematic review only included comparative randomized clinical trials involving humans as the clinical subjects from peer reviewed journals of PubMed, clinical trials registered Cochrane Central Register of Controlled Trials and the grey literature. Non-comparative clinical trials, outcomes research or real-world data, animal experiments, reviews, and case reports were excluded.

Participants

Studies were included if the participants were diagnosed to have stroke and have been appropriately evaluated to be on recovery with residual neurologic deficit which can be any of the following: 1) paralysis or problems controlling movement (motor control); 2) sensory disturbances, including pain; 3) problems using or understanding language (aphasia); 4) problems with thinking and memory; 5) emotional disturbances and eligible to receive the interventions. Studies with participants who have other co-morbidities were included.

Interventions

Clinical trials where one of the interventions tested was labelled as 'patient centered care' were included. The main categories of patient centered approaches considered were: 1) enhanced patient education; 2) partnership in decision making, 3) behavioral interventions; and 4) other approaches like self-commitment or contract. Currently, accepted standard treatment was considered for control. This was usually described in the literature as standard care or usual treatment or pharmacologic interventions.

Outcomes

The primary outcomes considered were positive outcomes reported by the study, specifically the improvement of physical functioning among post-stroke patients. Secondary outcomes like the improvement in social functioning, activities of daily living and quality of life were also looked into. Negative events were also considered as secondary outcomes such as death, re-hospitalization and depression.

Search Methods

For the electronic search, the combination of terms ("patient centered care" OR "patient-centered care" OR "patient centered" OR "patient-centered") AND (stroke OR post-stroke OR "post-cerebrovascular disease" OR "post-cerebrovascular accidents") was utilized. Search was limited to the following study types: "clinical trials" OR "randomized controlled trials". Other limits were not used to maximize the yield of our initial search.

The following databases for primary studies were used for the search:

- PubMed (<https://pubmed.ncbi.nlm.nih.gov/>)
- Cochrane Central Register of Controlled Trials (CENTRAL) in the Cochrane Library (<https://www.cochranelibrary.com/central/about-central>)

A grey literature search was conducted to identify studies not indexed in the databases listed above. The following grey literature databases were:

- Open Grey (www.opengrey.eu)
- Grey Literature Report of the New York Academy of Medicine (www.greylit.org)
- National Institute for Health and Clinical Excellence (www.nice.org.uk)

Cross-reference search was also conducted and the references listed in the included articles were reviewed to determine if there were available citation that might be included.

Data Collection and Analysis

Three review authors independently carried out all aspects of study selection, 'risk of bias' assessment and data extraction. Any disagreements were resolved through discussion.

Selection of Studies

All titles and abstracts were retrieved by electronic searching and duplicates removed. Three independent reviewers initially screened the title and abstract that met the criteria. Full text copy of all the articles that met the criteria were then retrieved. The reviewers read the full text article and decided if the study should be included or not. The decision to include or exclude was cross-checked by each reviewer. Reasons for exclusion of the ineligible studies were identified and recorded. Studies that initially appeared to meet the inclusion criteria but later excluded were listed in the 'Characteristics of excluded studies' table. PRISMA flow diagram was used to show the screening process of the study inclusion and exclusion.

Risk of Bias Assessment

Risk of bias for each study was assessed using the criteria outlined in the Cochrane Handbook for Systematic Reviews of Interventions. Risk of bias was assessed according to at least the following domains:

- Bias arising from the randomization process and allocation concealment
- Bias arising from blinding of participants and personnel
- Bias due to missing outcome data
- Bias in measurement of the outcome
- Bias in the selection of the reported result
- Any other source of bias

Each potential source of bias was judged as “high”, “low”, or “unclear risk. Overall Risk of bias’ judgements across different studies for each of the domains listed were summarized. ‘Risk of bias’ assessment (low risk of bias, unclear risk or high risk of bias) was assigned for each domain for each of the included studies.

Studies with low risk of bias for all key domains, or where it seems unlikely for bias to seriously alter the results, were considered to have a low risk of bias. Studies were considered to have some concerns where the studies were judged to raise some concerns in at least one domain, but not to be at a high risk of bias for any domain. Studies were considered to have high risk of bias when at least one domain was judged to have serious concerns for multiple domains in a way that substantially lowers confidence in the result. Studies were not excluded on the grounds of their risk of bias.

Data Extraction and Management

For the included studies, the following information were extracted using a data collection form:

- Methods: study design, number of study centers and location, study setting, withdrawals, date of study, follow-up
- Participants: number, mean age, age range, sex, severity of condition, diagnostic criteria, inclusion criteria, exclusion criteria, other relevant characteristics
- Interventions: intervention components, comparison, fidelity assessment
- Outcomes: main and other outcomes specified and collected, time points reported, costs, benefits

These data were extracted by three reviewers. Any disagreement with extracted data was resolved through discussion. If there was something unclear on the study, the authors were contacted for clarification. All the extracted data were cross-checked by the three reviewers.

Analysis

RevMan 5 software was used in the analysis of data. Different evaluation methods were used according to the different effectiveness indicators. The effect of the intervention were estimated using mean difference in scores together with the 95% appropriate associated confidence interval.

Assessment of Heterogeneity

Heterogeneity was assessed by Chi-squared test and I^2 test. If $I^2 < 50\%$, $p > 0.1$, no statistical heterogeneity between each study was considered

and the fixed effect model (FEM) was chosen to synthesize the data. If $I^2 \geq 50\%$, $p < 0.1$, indicating that there is a statistical heterogeneity, the data was analyzed using random effect model (REM).

Grading the Quality of Evidence

In this systematic review, the quality of evidence for the entire study was assessed using the “Grades of Recommendations Assessment, Development and Evaluation (GRADE)” standard established by the World Health Organization and international organizations. The certainty of the evidence (high, moderate, low, and very low) was assessed using the five GRADE considerations (risk of bias, consistency of effect, imprecision, indirectness, and publication bias) for each outcome.

RESULTS

Study Selection

Initial search of the 5 aforementioned databases yielded a total of 80 studies from PUBMED and NICE. After removing the duplicates (6 studies) and those deemed ineligible for screening for various reasons (50 studies), 24 studies remained and needed to be further evaluated. 8 were removed after reading the abstracts and titles. The full text of the remaining 16 studies were retrieved, and upon examination only 8 were eligible for the systematic review. We excluded 8 studies for the following reasons: 5 studies did not report the relevant population (post-stroke patients); 2 were unfinished studies, and 1 is a meta-analysis. For the final systematic review, 8 studies met the inclusion criteria and were included (Figure 1).

Characteristics of the Selected Studies

A total of 8 studies including 4412 participants met the inclusion criteria, and 3550 stroke events were identified in the included studies. All 8 studies were randomized control trials. The publication years of the included studies were between 2007 and 2020. The sample sizes of the selected studies ranged from 40 to 2079 participants. The follow-up period ranged from 3 months to 15 months. All study populations included both men and women post-stroke patients needing rehabilitation. The interventions varied between trials, although all are considered as patient centered interventions. All control groups consisted of usual care for post stroke patients, though again, slightly different from study to study. All the 8 studies have physical functioning as a primary outcome, though measured differently. Additionally, 7 of the 8 (Chen being the exception, which only have physical functioning and ADL as a primary outcome) studies include social functioning, ADL, and QOL as a secondary outcome. Only 2 studies include negative events such as depression and rehospitalization as a secondary outcome (Desrosiers, Chen) (Table 1).

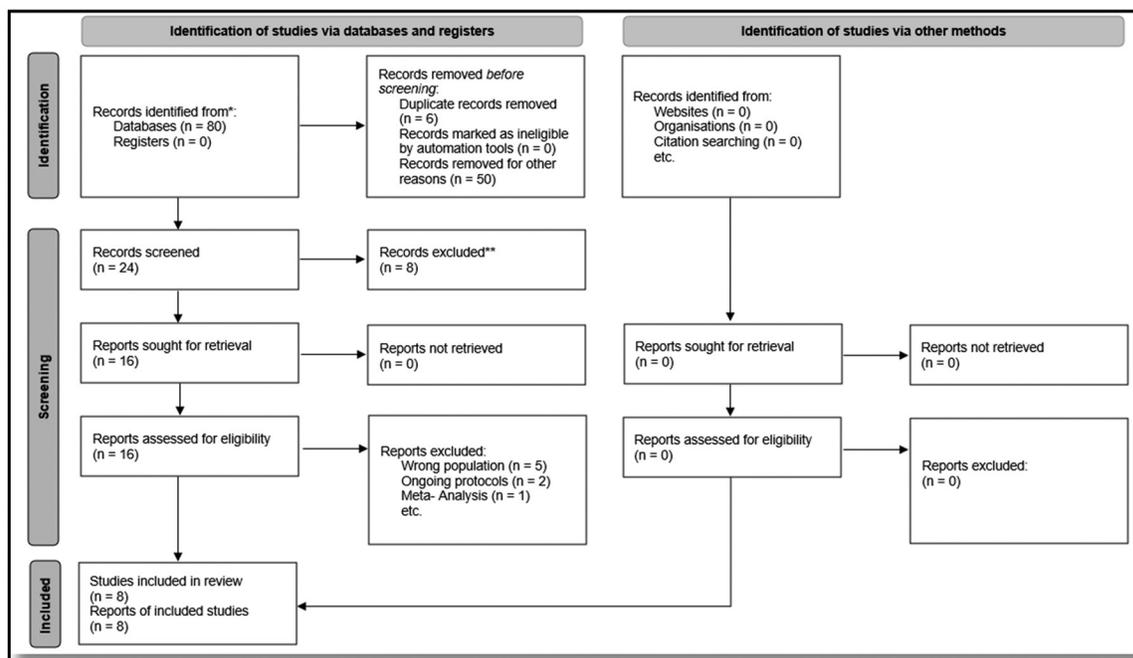


Figure 1. PRISMA diagram for selection of studies.

Table 1. Characteristics of the included studies.

Study	Study setting	Study design	Sample size	Mean age, yr	Sex	Intervention	Outcome measured	Results
Brouwer ²²	Canada	RCT	103	IG: 62.7 CG: 62.1	M: 54 F: 49	"Tune-up", a 1- hour therapy sessions in their home 3times per week for 2 weeks at 6 months post discharge focusing on identified mobility-related goals.	Primary outcome: Community reintegration measured by the Subjective Index of Physical and Social Outcome at 12 months Secondary outcomes: Berg Balance Scale Measures of mobility and health-related quality of life up to 15 months.	At 12 months, both groups showed significant improvement in community reintegration ($P < 0.05$) with no difference between groups (mean difference - 0.5; confidence interval- 1.8 to 2.7; $P = 0.68$). Main effect of time reflected improvement in mobility-related and quality of life outcomes for both groups ($P \leq 0.5$) but no group differences ($P \geq 0.30$).
Chen ²³	China	RCT	144	IG: 65.92 CG: 64.78	M: 106 F: 38	PCSMEI (patient-centered self-management empowerment intervention)	Self-efficacy Improvement in Activities of daily living (ADL) using the Barthel Index (BI) tool	Stroke self-efficacy: patients in the IG had significant improvements in self-efficacy compared with those in the CG at T1, T2, and T3.

							Negative event: rehospitalization	<p>Activities of daily living: Differences on BI between the IG and CG at T1 ($\beta = 2.493$; 95% CI [-1.162, 6.148]; $p = .181$) and T2 ($\beta = 3.503$; 95% CI [-0.563, 7.569]; $p = .091$) were not significant. However, there was significant difference in the change of BI between the IG and CG at T3 ($\beta = 5.175$; 95% CI [0.131, 10.219]; $p = .044$). It indicated that patients in the IG had significant improvement in ADL compared with those in the CG at 3 months postintervention.</p> <p>Rehospitalization: There are no significant differences between the two groups at 3 months telephone follow-up period ($\beta = -0.094$; 95% CI [-0.192, 0.004]; $p = .061$).</p>
Desrosiers ²⁴	Canada	RCT	62	IG: 70 CG: 70	M: 32 F:30	Experimental group received the leisure education program at home once a week for 8 to 12 weeks	<p>General Well-Being Schedule (GWBS)</p> <p>Center for Epidemiological Studies Depression Scale</p>	<p>The well-being of the experimental group increased during the program but the differences between groups was not significant.</p> <p>Both groups statistically improved their HRQOL but no difference was found between them. However, only the experimental group significantly reduced their depressive symptoms after the program and statistical testing between groups was significant (95% CI, -12.5 to -1.9; $p = .01$).</p>
Egan ²⁵	Canada	RCT	14	IG: 75.7 CG: 65.6	M:11 F:3	8 visits from occupational therapist to work on issues related to participation in valued activities identified by the patient	<p>PRIMARY</p> <p>* Canadian Occupational Performance Measure (COPM)</p> <p>SECONDARY</p> <p>* SF-36 for well-being</p> <p>* RNLI or Reintegration to Normal Living</p>	<p>Intervention and control participants did not differ on perceived changes to performance in the occupational performance issues they identified, but there was a clinically and statistically significant difference in satisfaction with performance among intervention patients</p>

							Index for participation	compared with control patients. There were no differences at posttest between the intervention and control groups on the secondary measures.
Geselle ²⁶	USA	RCT	2,079		Male Female	COMPASS-TC (COMprehensive Post-Acute Stroke Services)	Primary outcome: physical function measured with Stroke Impact Scale-16 (SIS-16).	Physical function was better among patients who attended a 14- day visit versus those who did not (adjusted mean difference: 3.84, 95% CI 1.42–6.27, p = 0.002).
Guidett ²⁷		RCT	40	IG: 66 CG: 69	M: 17 F: 23	CCSCI (Client-centered Self-care Intervention)	Barthel Index (BI) – for independence/dependence in ADL Functional Independent Measure (FIM) A- M scale – dependence in self-care, sphincter control, mobility, and locomotion Frenchay Activities Index	There were no statistically significant differences in outcomes for BI, FIM, SIS, FAI, LiSat-11, and Caregiver Burden Scale between the groups. At three months, the proportion of those satisfied with life as a whole was 38% in the IG (5/13) and 35% in the CG (6/17). Within-group comparisons showed
							(FAI) – frequency of social activities Stroke Impact Scale (SIS) – participants' perceived impact of stroke Life Satisfaction Scale 11 (LiSat-11) – to assess participants' perceived satisfaction with life 3 months after stroke	that there were statistically significant improvements in self-care between baseline and three months in both groups. Comparing clinical improvements in ADL, 12 out of 14 (86%) participants in the IG and 12 of 19 participants (63%) in the CG improved.
Lewthwaite ²⁸	USA	RCT	361	61	M: 202 F: 159	ASAP (Accelerated Skill Acquisition Program)	Primary outcome measure: Wolf Motor Function Test (WMFT) – motor performance of affected upper extremity Secondary outcome measures: Direct performance – Fugl-Meyer Assessment of upper extremity motor ability	Most improvement occurred during the treatment phase, followed by change more slowly during follow-up. Compared with DEUCC and UCC, ASAP group gains were greater during treatment for Stroke Impact Scale Hand, Strength, Mobility, Physical Function, and Participation scores, self-efficacy, perceived health, reintegration, patient-centeredness, and quality of life outcomes.

							Stroke impact scale (SIS)	ASAP participants reported higher Motor Activity Log–28 Quality of Movement than UCC posttreatment and perceived greater study related improvements in quality of life.
							Motor Activity Log-28	By end of study, all groups reached similar levels with only limited group difference.
							Quality of Movement (MAL-28 QOM)	
							Health Care Climate Questionnaire (HCCQ)	
Swank ²⁹	USA	RCT	21	IG: 61.2 CG: 61.3	M: 6 F: 15	Usual care + PDAP (Patient-Directed Activity Program)	Stroke Rehabilitation Assessment of Movement Measure	No differences were observed between groups at discharge in functional measures. PDAP completed significantly more steps/day (PDAP=657.70±655.82, control=396.17±419.65; p=0.022).
							Functional Independence Measure	The Stroke Impact Scale showed
							Balance	significantly better memory and thinking (PDAP=86.2±11.4, control=80.8±16.7; p=0.049), communication (PDAP=93.6±8.3, control=89.6±12.4; p=0.042), mobility (PDAP=62.2±22.5, control=53.8±21.8; p=0.038), and overall recovery from stroke (PDAP=62.1±19.1, control=52.2±18.7; p=0.038) for PDAP compared to control.
							Physical activity	
							Stroke Impact Scale	At three months post discharge, PDAP (n=11) completed significantly greater physical activity (p=0.014; 3586.5±3468.5 steps/day) compared to control (n=10; 1760.9±2346.3 steps/day).

In the study by Brouwer, et al. using SIPSO as a measure of outcome, both groups showed significant improvement in community reintegration ($p < 0.05$) with no difference between groups (mean difference -0.5; confidence interval -1.8 to 2.7; $p = 0.68$). Similarly, using SF 36 as an outcome measure, a main effect of time reflected improvement in mobility-related and quality of life outcomes for both groups ($p < 0.5$) but no between-group differences ($p > 0.30$).

The study by Chen, et al. shows that patients in the intervention group (IG) had significant improvements in self-efficacy compared with those in the control group, as measured by SSEQ. Activities of daily living as measured by the Barthel Index (BI) showed no significant results at 1 month and 2 months post discharge. However, there was significant difference in the change of BI between the IG and CG (Control Group) at 3 months post discharge (mean = 5.175; 95% CI [0.131, 10.219]; $p = .044$). It indicated that patients in the IG had significant improvement in ADL compared with those in the CG at 3 months postintervention. In rehospitalization rate, there are no significant differences between the two groups at 3 months telephone follow-up period (mean = 0.094; 95% CI [-0.192, 0.004]; $p = .061$).

The study by Desrosiers, et al. showed that the well-being of the experimental group increased during the program but the differences between groups was not significant. Both groups statistically improved their HRQOL, but no difference was found between groups. Only the experimental group showed statistically significant reduction in depressive symptoms after the program (95% CI, -12.5 to -1.9; $p = .01$).

In the study by Guedetti, et al. there were no statistically significant differences in outcomes for improvement in physical functioning, social functioning, ADL and QOL as measured by Barthel index, Functional Independence Measure, Stroke Impact Scale, Frechay Activities Index, Life Satisfaction 11. Caregiver Burden Scale was also used between the groups but is not significant in this study.

These initial four studies were included in the systematic review, however, since they have no comparable outcomes (or reported in a different manner, i.e., median, instead of mean in the case of the study

by Guidetti, et al.) to the other studies, they were not included in the meta-analysis.

Improvement of Physical Functioning (Stroke Impact Scale 16)

In the random effect model (Figure 2), there was no significant difference between the intervention group and control group in two (2) studies which reported on improvement of physical functioning measured by SIS 16 (mean difference: 1.97 95% CI [-2.44, 6.38], $p = 0.38$, $I^2 = 95\%$).

Improvement of Physical Functioning and ADL (Stroke Impact Scale 3.0)

In the random effect model, there was no significant difference between the intervention group and control group in the two studies measured by the ADL component of the SIS 3.0 (Figure 3) with ADL mean difference, 4.38, 95% CI [-5.65, 14.42], $p = 0.39$, $I^2 = 68\%$. In the fixed effect model, there was however a noted significant difference between the two groups when measured by the hand movement component of the SIS 3.0 (Figure 4), hand movement mean difference 1.82, CI 95% [0.45-3.18], $p = 0.009$, $I^2 = 0\%$.

Improvement of Social Functioning (Stroke Impact Scale 3.0)

Using the Fixed effect model, significant improvement was found in the intervention group in social functioning in two studies measured by the communication and memory and thinking component of SIS 3.0, communication mean difference 1.51, CI 95% [0.86-2.16], $p \leq 0.00001$, $I^2 = 0\%$, memory and thinking; mean difference 0.94, CI 95%, $p = 0.02$, $I^2 = 33\%$ (Figures 5 & 6 respectively). However, when using the mood and emotion component of the SIS 3.0, there was no significant difference found between the intervention group and control group, mean difference 1.18, CI 95%, [-0.81-3.18], $p = 0.24$, $I^2 = 0\%$ (Figure 7).

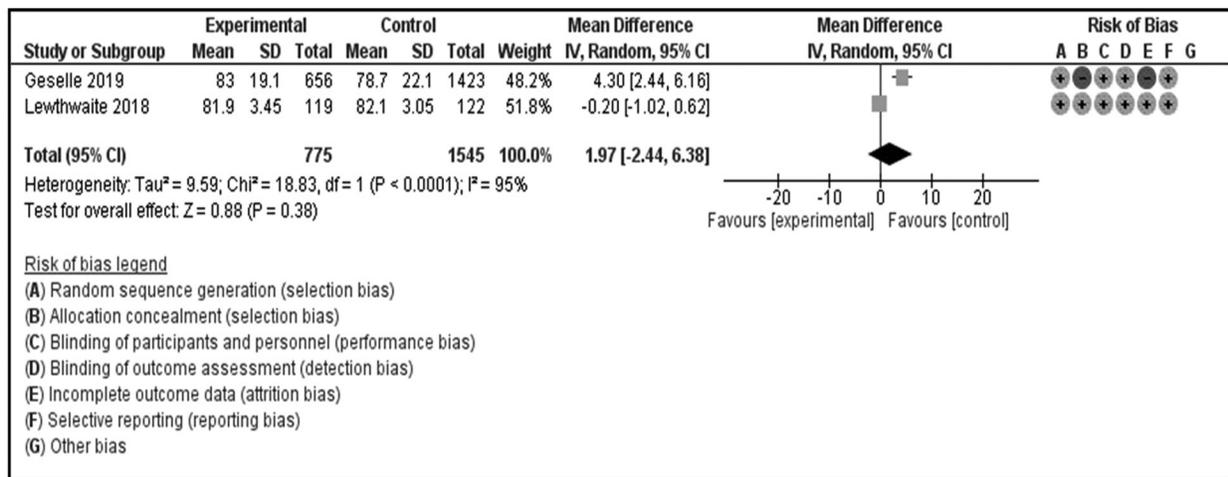


Figure 2. Analysis of effectiveness (SIS 16)

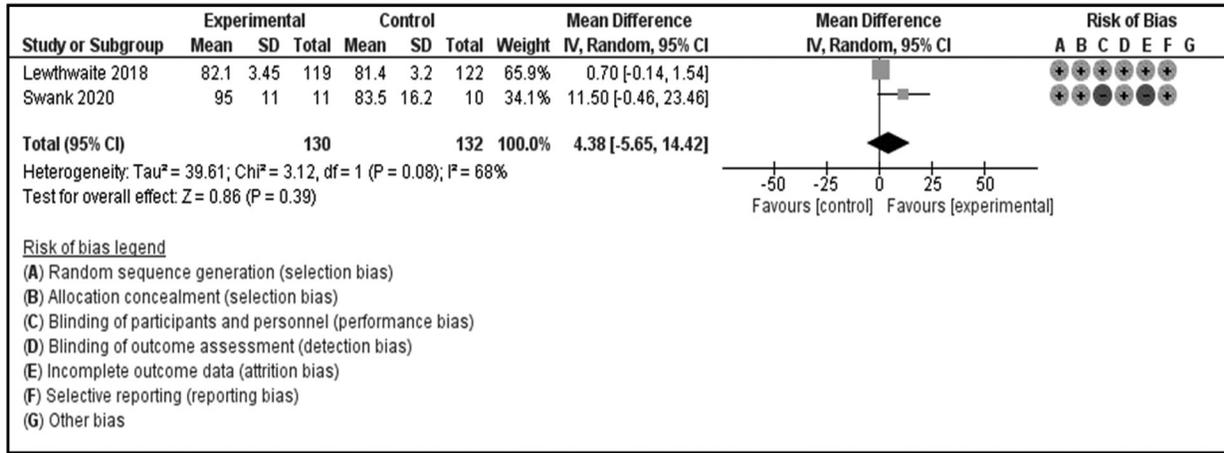


Figure 3. Analysis of effectiveness in Activities of Daily Living (ADL), SIS 3.0

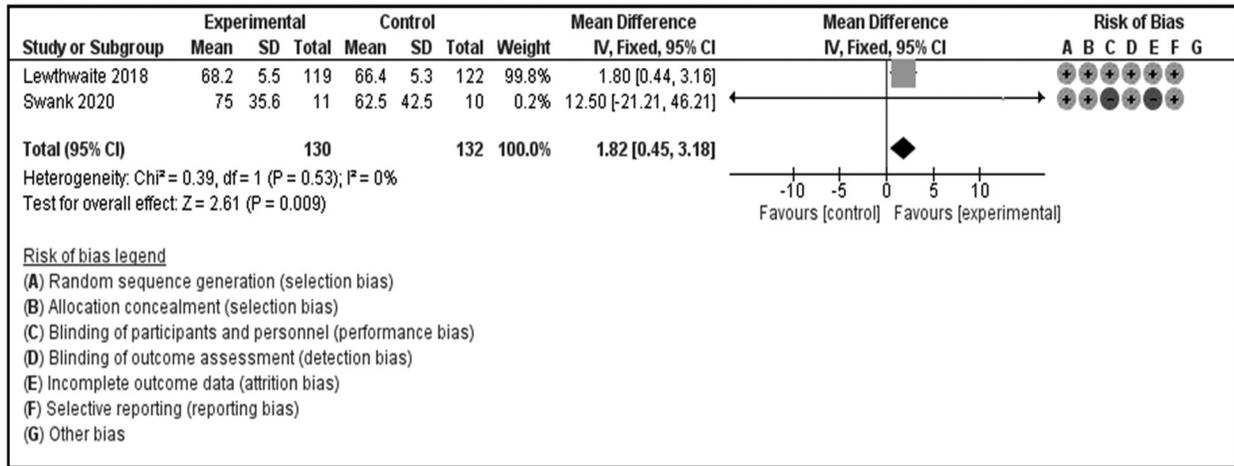


Figure 4. Analysis of effectiveness in hand movement (SIS 3.0)

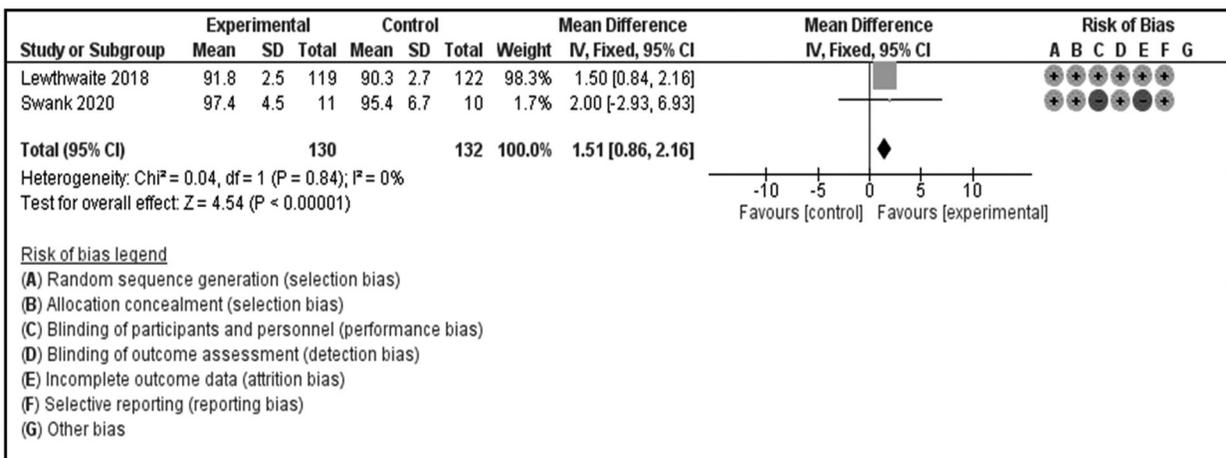


Figure 5. Analysis of effectiveness communication (SIS 3.0)

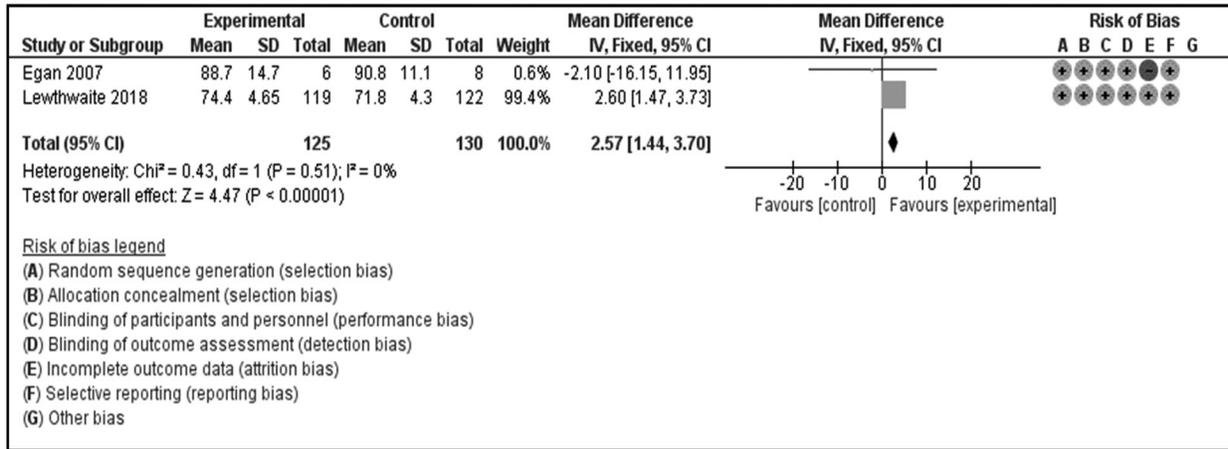


Figure 8. Analysis of effectiveness (RNLI)

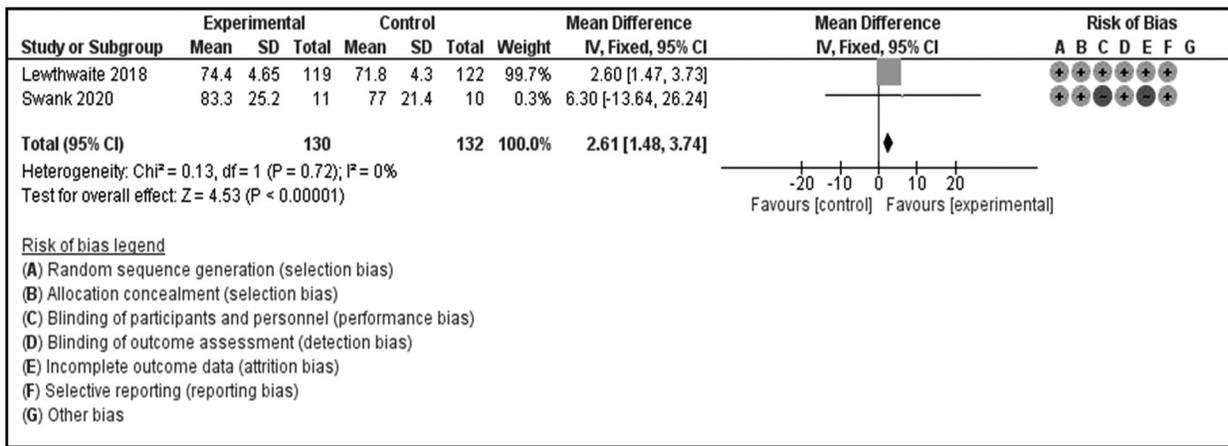


Figure 9. Analysis of effectiveness participation (SIS 3.0)

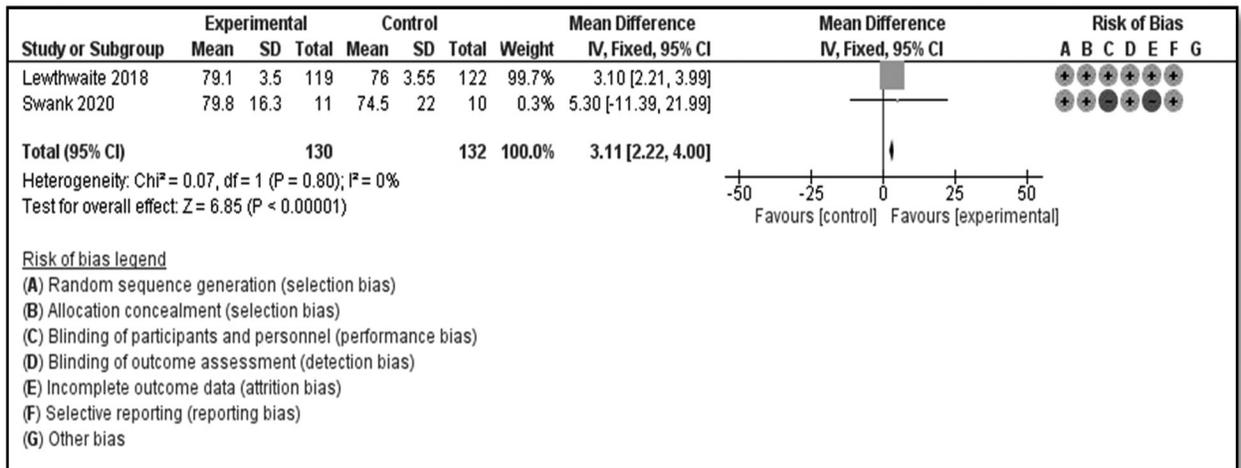


Figure 10. Analysis of effectiveness perception of recovery (SIS 3.0)

	Random sequence generation (selection bias)	Allocation concealment (selection bias)	Blinding of participants and personnel (performance bias)	Blinding of outcome assessment (detection bias)	Incomplete outcome data (attrition bias)	Selective reporting (reporting bias)	Other bias
Brouwer 2018	+	+	+	+	-	+	
Chen 2018	+	+	+	+	+	+	
Desrosiers 2007	+	+	+	+	-	+	
Egan 2007	+	+	+	+	-	+	
Geselle 2019	+	-	+	+	-	+	
Guidetti 2010	+	+	+	+	-	+	
Lewthwaite 2018	+	+	+	+	+	+	
Swank 2020	+	+	-	+	-	+	

Figure 13. Individual study risk of bias assessment.

CONCLUSION

Based on the complete and multi-faceted review and analysis of the determined appropriate studies or text, various patient-centered approaches have been shown to yield effective results with regards to improvement of physical function, social function, ADL, and QOL. Post-stroke therapies reveal evidence that show improved recoveries, lessened complications, and overall reduced neurological deficit. However, the study is strictly limited by various factors. The magnitude of the available or qualified data is far too little to create a conclusive statement regarding the actual effects of patient-centered treatment. Missing available data is a powerful limiting factor of the study. Additionally, various intervention methods present different results and rates with unknown factors possibly affecting the variation.

ACKNOWLEDGEMENT

This protocol was developed under the guidance and approval of the PAFP Research Committee. In the implementation, the reviewers

and the affiliated institution were in constant communication and collaboration for assistance from the committee for the conduct of the study.

The researchers would like to thank their parents, family and friends who are fully supportive all throughout. Special thanks to the consultants of their institution, the Batangas Medical Center Department of Family and Community Medicine, especially to Dr. Merlita G. Publico, chair for giving the author a chance to continue his service in the Institution, Dr. Daisy M. Medina for her comments, suggestions, and overall support in the making of this research, and Dr. Juvelle A. Umali, for her help in the editing process. This research would not be completed without their help and unending support.

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