

# Stroke

## Current Awareness Bulletin

October 2018

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**Title: Adding electrical stimulation during standard rehabilitation after stroke to improve motor function. A systematic review and meta-analysis.**

**Citation:** Annals of physical and rehabilitation medicine; Sep 2018; vol. 61 (no. 5); p. 339-344

**Author(s):** Sharififar, Sharareh; Shuster, Jonathan J; Bishop, Mark D

**Background:** Clinical studies have shown that sensory input improves motor function when added to active training after neurological injuries in the spinal cord.

**Objective:** We aimed to determine the effect on motor function of extremities of adding an electrical sensory modality without motor recruitment before or with routine rehabilitation for hemiparesis after stroke by a comprehensive systematic review and meta-analysis.

**Methods:** We searched databases including MEDLINE via PubMed and the Cochrane Central Register of Controlled Trials from 1978 to the end of November 2017 for reports of randomized controlled trials or controlled studies of patients with a clinical diagnosis of stroke who underwent 1) transcutaneous electrical nerve stimulation (TENS) or peripheral electromyography-triggered sensory stimulation over a peripheral nerve and associated muscles or 2) acupuncture to areas that produced sensory effects, without motor recruitment, along with routine rehabilitation. Outcome measures were motor impairment, activity, and participation outcomes defined by the International Classification of Functioning, Disability and Health.

**Results:** The search yielded 11 studies with data that could be included in a meta-analysis. Electrical sensory inputs, when paired with routine therapy, improved peak torque dorsiflexion (mean difference [MD] 2.44 Nm, 95% confidence interval [CI] 0.26-4.63). On subgroup analysis, the combined therapy yielded a significant difference in terms of sensory stimulation without motor recruitment only on the Timed Up and Go test in the chronic phase of stroke (MD 3.51sec, 95% CI 3.05-3.98). The spasticity score was reduced but not significantly (MD-0.83 points, 95% CI -1.77-0.10).

**Conclusion:** Electrical sensory input can contribute to routine rehabilitation to improve early post-stroke lower-extremity impairment and late motor function, with no change in spasticity. Prolonged periods of sensory stimulation such as TENS combined with activity can have beneficial effects on impairment and function after stroke.

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**Title: Anxiety after stroke: A systematic review and meta-analysis.**

**Citation:** Journal of rehabilitation medicine; Sep 2018; vol. 50 (no. 9); p. 769-778

**Author(s):** Rafsten, Lena; Danielsson, Anna; Sunnerhagen, Katharina S

**Objective:** To update the evidence surrounding the presence of anxiety after stroke.

**Data Sources:** A search was conducted in EMBASE, MEDLINE, PsycINFO, Cochrane Library, AMED and CINAHL in May 2015 and repeated in April 2017.

**Study Selection:** Clinical diagnosis of stroke and assessed for anxiety symptoms on a rating scale in the first year after stroke. **DATA EXTRACTION** One reviewer screened and identified studies against the inclusion criteria. A second reviewer conducted a random check of approximately 10% of titles and abstracts. Two authors independently performed the final full-text review. **DATA SYNTHESIS** Overall pooled prevalence of anxiety disorders was 29.3% ((95% confidence interval 24.8-33.8%), (I<sup>2</sup> = 97%, p < 0.00001)) during the first year. Frequency 0-2 weeks post-stroke was 36.7%, 2 weeks to 3 months 24.1%, and 3-12 months 23.8%. There was a statistically high heterogeneity in this estimate (I<sup>2</sup> = 97%, p < 0.00001). **CONCLUSION** Anxiety is common during the first year post-stroke. Since anxiety significantly influences quality of life and is a predictor for depression, it may be worth considering further routine screening post-stroke.

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**Title: Comparison of Treatment Rates of Depression After Stroke Versus Myocardial Infarction: A Systematic Review and Meta-Analysis of Observational Data.**

**Citation:** Psychosomatic medicine; Oct 2018; vol. 80 (no. 8); p. 754-763

**Author(s):** Ladwig, Simon; Zhou, Zien; Xu, Ying; Wang, Xia; Chow, Clara K; Werheid, Katja; Hackett, Maree L

**Objective:** Depression after stroke and myocardial infarction (MI) is common but often assumed to be undertreated without reliable evidence being available. Thus, we aimed to determine treatment rates and investigate the application of guidelines in these conditions.

**Methods:** Databases MEDLINE, EMBASE, PsycInfo, Web of Science, CINAHL, and Scopus were systematically searched without language restriction from inception to June 30, 2017. Prospective

observational studies with consecutive recruitment reporting any antidepressant treatment in adults with depression after stroke or MI were included. Random-effects models were used to calculate pooled estimates of treatment rates.

**Results:** Fifty-five studies reported 32 stroke cohorts (n = 8938; pooled frequency of depression = 34%, 95% confidence interval [CI] = 29%-38%) and 17 MI cohorts (n = 10,767; pooled frequency of depression = 24%, 95% CI = 20%-28%). In 29 stroke cohorts, 24% (95% CI = 20%-27%) of 2280 depressed people used antidepressant medication. In 15 MI cohorts, 14% (95% CI = 8%-19%) of 2381 depressed people used antidepressant medication indicating a lower treatment rate than in stroke. Two studies reported use of psychosocial interventions, indicating that less than 10% of participants were treated.

**Conclusions:** Despite the high frequency of depression after stroke and MI and the existence of efficacious treatment strategies, people often remain untreated. Innovative strategies are needed to increase the use of effective antidepressive interventions in patients with cardiovascular disease.

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**Title: Cost-effectiveness of mechanical thrombectomy for acute ischemic stroke: an Australian payer perspective.**

**Citation:** Journal of medical economics; Aug 2018; vol. 21 (no. 8); p. 799-809

**Author(s):** Arora, Nimita; Makino, Koji; Tilden, Dominic; Lobotesis, Kyriakos; Mitchell, Peter; Gillespie, John

**Aims:** The goal of this study was to assess the cost-effectiveness of mechanical thrombectomy (MT) for acute ischemic stroke (AIS) from an Australian payer perspective.

**Methods:** This study used a Markov model that employed a life-time time horizon, modeling patients from symptom onset of stroke until end of life. Clinical efficacy and safety data were taken from an individual patient level data (IPD) meta-analysis of clinical studies. The treatment effect of MT compared to usual care was measured by changes in modified Rankin Score (mRS). Post-treatment mRS scores were used to determine short- and long-term stroke care costs. Treatment costs were modeled, with health state utility values determined by literature review. All analyses were conducted using Microsoft Excel.

**Results:** In comparison to usual care, MT is associated with higher costs (\$10,666 per patient) and additional quality-adjusted life years (QALYs) (0.8281 per patient), resulting in an incremental cost per QALY of \$12,880. Sensitivity analyses demonstrated the reliability of the base case results across a range of assumptions. The higher cost associated with MT is, to an extent, offset by the cost savings resulting from lower stroke care costs due to improved patient outcomes. The life-time cost savings in terms of stroke care costs are estimated to be more than \$8,000 per patient for patients who had received MT in combination with usual care.

**Limitations:** Stroke care costs based on patient disability/functional level were not available and were derived. As a consequence, long-term care costs for patients with poorer outcomes may be underestimated. Patient outcomes at 90 days were extrapolated to a lifetime horizon, but this approach was supported by long-term evidence on stroke survival.

**Conclusions:** Mechanical thrombectomy is a cost-effective treatment option for AIS, with clinical benefits translating to short- and long-term cost benefits. This analysis supports rapid update of stroke care pathways to incorporate this therapy as a treatment option.

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**Title: Direct endovascular thrombectomy and bridging strategies for acute ischemic stroke: a network meta-analysis.**

**Citation:** Journal of neurointerventional surgery; Oct 2018

**Author(s):** Phan, Kevin; Dmytriw, Adam A; Lloyd, Declan; Maingard, Julian M; Kok, Hong Kuan; Chandra, Ronil V; Brooks, Mark; Thijs, Vincent; Moore, Justin M; Chiu, Albert Ho Yuen; Selim, Magdy; Goyal, Mayank; Pereira, Vitor Mendes; Thomas, Ajith J; Hirsch, Joshua A; Asadi, Hamed; Wang, Nelson

**Objectives:** The present Bayesian network meta-analysis aimed to compare the various strategies for acute ischemic stroke: (1) direct endovascular thrombectomy within the thrombolysis window in patients with no contraindications to thrombolysis (DEVT); (2) direct endovascular thrombectomy secondary to contraindications to thrombolysis (DEVTc); (3) endovascular thrombectomy in addition to thrombolysis (IVEVT); and (4) thrombolysis without thrombectomy (IVT).

**Methods:** Six electronic databases were searched from their dates of inception to May 2017 to identify randomized controlled trials (RCTs) comparing IVT versus IVEVT, and prospective registry studies comparing IVEVT versus DEVT or IVEVT versus DEVTc. Network meta-analyses were performed using ORs and 95% CIs as the summary statistic.

**Results:** We identified 12 studies (5 RCTs, 7 prospective cohort) with a total of 3161 patients for analysis. There was no significant difference in good functional outcome at 90 days (modified Rankin Scale score  $\leq 2$ ) between DEVT and IVEVT. There was no significant difference in mortality between all treatment groups. DEVT was associated with a 49% reduction in intracranial hemorrhage (ICH) compared with IVEVT (OR 0.51; 95% CI 0.33 to 0.79), due to reduction in rates of asymptomatic ICH (OR 0.47; 95% CI 0.29 to 0.76). Patients treated with DEVT had higher rates of reperfusion compared with IVEVT (OR 1.73; 95% CI 1.04 to 2.94).

**Conclusions:** To our knowledge, this is the first network meta-analysis to be performed in the era of contemporary mechanical thrombectomy comparing DEVT and DEVTc. Our analysis suggests the addition of thrombolysis prior to thrombectomy for large vessel occlusions may not be associated with improved outcomes.

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**Title: Does Tai Chi improve balance and reduce falls incidence in neurological disorders? A systematic review and meta-analysis.**

**Citation:** Clinical rehabilitation; Sep 2018; vol. 32 (no. 9); p. 1157-1168

**Author(s):** Winsler, Stanley John; Tsang, William Wn; Krishnamurthy, Karthikeyan; Kannan, Priya

**Objective:** To evaluate the effect of Tai Chi on balance and reducing falls incidence in neurological disorders.

**Data Sources:** AMED, Embase, Web of Science, SCOPUS, EBSCO and Medline from inception until February 2018. REVIEW METHOD Randomized controlled trials of Tai Chi compared with active or no treatment control, measuring balance with the Berg Balance Scale or the Timed Up and Go Test and number of falls in neurological disorders were included. Methodological quality was assessed using PEDro and quality of evidence using the Grading of Recommendations, Assessment, Development, and Evaluation (GRADE) system.

**Results:** A total of 10 studies involving 720 participants were reviewed. Seven studies were in Parkinson's disease and three in stroke. Seven studies were of high methodological quality and three were low. Meta-analyses of balance measured with the Timed Up and Go Test in Parkinson's disease revealed a statistically significant effect of Tai Chi compared to no treatment (weighted mean difference (WMD), -2.13; 95% confidence interval (CI), -3.26 to -1.00;  $P < 0.001$ ) and was insignificant (WMD, -0.19; 95% CI, -1.74 to 1.35;  $P = 0.81$ ) when compared with active treatment. Tai Chi significantly reduced falls incidence in Parkinson's disease (odds ratio (OR), 0.47; 95% CI, 0.29 to 0.77;  $P = 0.003$ ) and stroke (OR, 0.21; 95% CI, 0.09 to 0.48;  $P < 0.001$ ). Balance measured with the Timed Up and Go Test comparing Tai Chi and active treatment was insignificant (WMD, 0.45; 95% CI, -3.43 to 2.54;  $P = 0.77$ ) in stroke.

**Conclusion:** Tai Chi is effective in reducing falls incidence in Parkinson's disease and stroke. This systematic review did not find high-quality studies among other neurological disorders.

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**Title: Effect of Mirror Therapy on Recovery of Stroke Survivors: A Systematic Review and Network Meta-analysis.**

**Citation:** Neuroscience; Oct 2018; vol. 390 ; p. 318-336

**Author(s):** Yang, Yue; Zhao, Qingchun; Zhang, Yingshi; Wu, Qiong; Jiang, Xiaowen; Cheng, Gang

**Abstract:** Mirror therapy (MT) as a relatively new rehabilitation technique has been widely applied in stroke patients. A number of randomized controlled trials (RCTs) have investigated the effects of MT for stroke survivors. The main purpose of this network meta-analysis was to investigate the effects of MT on motor function, activities of daily living (ADL), and pain perception in stroke survivors. Several databases were searched to identify RCTs evaluating the effects of MT in stroke patients to perform this network meta-analysis. Thirty-seven RCTs (42 analyses, 1685 subjects) were eligible for inclusion in the meta-analysis. Standard meta-analysis showed that MT significantly improved motor function according to the increased Fugl-Meyer Assessment (FMA), Functional Independence Measure (FIM), and decreased Modified Ashworth Scale (MAS) score. In addition, ADL was promoted by MT as the elevated Modified Barthel Index (MBI) and Motor Activity Log (MAL) score. Moreover, MT effectively relieved the pain of stroke patients as the Visual Analog Scale (VAS) score was reduced. Subgroup analyses and meta-regressions identified that the sources of heterogeneity might be different intervention arms and duration of interventions. Network meta-analysis showed that MT combined with electrical stimulation (ES) for less than 4 weeks along with conventional rehabilitation therapy (CT), and MT accompanied with CT for less than 4 weeks might be the most suitable interventions for improvement of motor function and ADL, respectively. Overall, MT could

effectively improve motor function and ADL, as well as relieve pain for stroke survivors. The study was registered at PROSPERO (CRD42017081742).

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**Title: Effectiveness and Safety of Antibiotics for Preventing Pneumonia and Improving Outcome after Acute Stroke: Systematic Review and Meta-analysis.**

**Citation:** Journal of stroke and cerebrovascular diseases : the official journal of National Stroke Association; Aug 2018

**Author(s):** Badve, Monica S; Zhou, Zien; Anderson, Craig S; Hackett, Maree L

**Background:** Pneumonia is a common complication after stroke which increases morbidity and mortality. This systematic review was conducted to evaluate the efficacy and safety of antibiotics for the prevention of pneumonia after acute stroke.

**Methods:** Medline, EMBASE, and Cochrane databases were searched for randomized controlled trials comparing preventive antibiotics to placebo or no antibiotics after acute stroke. The primary outcome was poststroke pneumonia. Secondary outcomes were all infections, urinary tract infections, death, dependency, length of hospital stay, and adverse events. Treatment effects were summarized using random effects metaanalysis.

**Results:** Six trials (4111 patients) were eligible for inclusion. The median National Institute of Health Stroke Scale score in included trials ranged from 5 to 16.5. The proportion of dysphagia ranged from 26% to 100%. Preventive antibiotics were commenced within 48 hours after acute stroke. Compared to control, preventive antibiotics reduced the risk of poststroke pneumonia (RR .75, 95%CI .57-.99), and all infections (RR .58, 95%CI .48-.69). There was no significant difference in the risks of dependency (RR 0.99, 95%CI 0.80-1.11), or mortality (RR .96, 95%CI .78-1.19) between the preventive antibiotics and control groups. Preventive antibiotics did not increase the risk of elevated liver enzymes (RR 1.20, 95% CI .97-1.49). Preventive antibiotics had uncertain effects on the risks of other adverse events.

**Conclusion:** Preventive antibiotics reduced the risk of post-stroke pneumonia. However, there is insufficient evidence to currently recommend routine use of preventive antibiotics after acute stroke.

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**Title: Effectiveness of Cognitive Behavioral Therapy for Depression and Anxiety in Patients with Cardiovascular Disease: A Systematic Review and Meta-Analysis.**

**Citation:** Psychosomatic medicine; Oct 2018; vol. 80 (no. 8); p. 742-753

**Author(s):** Reavell, James; Hopkinson, Michael; Clarkesmith, Danielle; Lane, Deirdre A

**Objective:** Depression and anxiety are highly prevalent in patients with cardiovascular disease (CVD) and influence their mental well-being and CVD prognosis. The primary objective was to assess the effectiveness of cognitive behavioral therapy (CBT) for depression and anxiety in patients with CVD. Secondary objectives were to assess the impact of CBT on cardiovascular mortality, cardiovascular events, patient satisfaction, and quality of life.

**Methods:** MEDLINE, PsycINFO, CINAHL, CENTRAL, and alternative sources were searched for randomized controlled trials and observational studies with a control. Studies were required to assess CBT in coronary heart disease, acute coronary syndrome, atrial fibrillation, or postmyocardial infarction patients, with anxiety and/or depression. Studies were independently screened by two reviewers and critically appraised using the Cochrane Risk of Bias tool. The random-effects model was used to pool standardized mean differences (SMD).

**Results:** Twelve randomized controlled trials were included. At follow-up, depression (SMD = -0.35, 95% confidence interval [CI] = -0.52 to -0.17,  $p < .001$ ,  $I = 59\%$ ) and anxiety (SMD = -0.34, 95% CI = -0.65 to -0.03,  $p = .03$ ,  $I = 71\%$ ) scores were significantly lower in CBT patients compared with controls. Change in mental health quality of life (SF-12) was also significantly greater for CBT patients, compared with controls (mean difference = 3.62, 95% CI = 0.22 to 7.02,  $p = .04$ ,  $I = 0\%$ ). No differences in patient satisfaction or cardiovascular events were evident between CBT and control groups. Among the study reports included in this meta-analysis, data specific to cardiovascular mortality were not reported. **Conclusions:** Cognitive behavioral therapy seems to be an effective treatment for reducing depression and anxiety in patients with CVD and should be considered in standard clinical care.

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**Title: Effectiveness of robo-assisted lower limb rehabilitation for spastic patients: A systematic review.**

**Citation:** Biosensors & bioelectronics; Oct 2018; vol. 117 ; p. 403-415

**Author(s):** Shakti, Divya; Mathew, Lini; Kumar, Neelesh; Kataria, Chitra

**Background:** Though many rehabilitative treatments are available for treatment of spasticity, thus the effectiveness of different robo-rehabilitative devices needs to be evaluated through a systematic review.

**Objective:** The objective of this study is to focus on the efficacy of Robot assistive rehabilitation device for the removal of spasticity from the lower limb of Spastic patients.

**Data Sources:** PubMed, Web of Sciences, EMBASE (Excerpta Medical database), CDSR (Cochrane database of systematic reviews), Scopus, IEEE Xplore, Wiley online library, MEDLINE (OvidSP), Science Direct, Springer Link were from January 1980 to September 2017

**Data Extraction:** Seventy-one publications from eleven databases published were selected using keywords Ankle foot, spasticity, robotic rehabilitation, efficacy of robotics and Ankle foot rehabilitation. The review is narrowed down to twenty-six articles which were selected for they focused on effects of Robot assistive rehabilitation device quantitatively.

**Result:** A quantitative study from analyzing 26 studies comprising of 786 subjects is carried out. The major outcome of the effectiveness of the robot assistive therapy for the movement of ankle and functioning of gait is deduced. As the used protocols and treatment procedures vary, made comparative study complex or impracticable.

**Conclusion:** Robo-rehabilitation possesses an ability to provide unified therapy protocols with greater ease in comparison to conventional therapies. They continuously prove to be irreplaceable assistant devices when it comes to providing excellent treatment in terms of improvement from this study. Though many mechatronic devices are available but the devices for treatment of early stage rehabilitation of stroke patients is very limited.

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**Title: Effects of extracorporeal shock wave therapy on spasticity in post-stroke patients: a systematic review and meta-analysis of randomized controlled trials.**

**Citation:** Journal of rehabilitation medicine; Sep 2018

**Author(s):** Xiang, Jie; Wang, Wei; Jiang, Weifeng; Qian, Qiuchen

**Objective:** To evaluate whether extracorporeal shock wave therapy significantly improves spasticity in post-stroke patients.

**Design:** Systematic review and meta-analysis.

**Data Sources:** PubMed, EMBASE, EBSCO, Web of Science, Cochrane CENTRAL electronic databases.

**Study Selection:** Randomized controlled trials assessing the effect of extracorporeal shock wave therapy on post-stroke patients with spasticity were selected for inclusion. DATA EXTRACTION Two authors independently screened the literature, extracted data, and assessed the quality of included studies. Primary outcome was modified Ashworth scale (MAS). Secondary outcomes were Modified Tardieu Scale (MTS), H/M ratio and range of motion.

**Data Synthesis:** Eight randomized controlled trial studies (n = 385 patients) were included in the meta-analysis. There was a high level of evidence that extracorporeal shock wave therapy significantly ameliorates spasticity in post-stroke patients according to the 4 parameters: MAS (standard mean difference (SMD) -1.22; 95% confidence interval (95% CI): -1.77 to -0.66); MTS (SMD 0.70; 95% CI 0.42-0.99.); H/M ratio (weighted mean difference (WMD) -0.76; 95% CI -1.19 to -0.33); range of motion (SMD 0.69; 95% CI 0.06-1.32). However, there was no statically significant difference on the MAS at 4 weeks (SMD -1.73; 95% CI -3.99 to 0.54).

**Conclusion:** Extracorporeal shock wave therapy has a significant effect on spasticity in post-stroke patients.

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**Title: Effects of mirror therapy on walking ability, balance and lower limb motor recovery after stroke: a systematic review and meta-analysis of randomized controlled trials.**

**Citation:** Clinical rehabilitation; Aug 2018; vol. 32 (no. 8); p. 1007-1021

**Author(s):** Li, Yi; Wei, Qingchuan; Gou, Wei; He, Chengqi

**Objective:** To investigate the effects of mirror therapy on walking ability, balance and lower limb motor recovery in patients with stroke.

**Method:** MEDLINE, EMBASE, Web of Science, CENTRAL, PEDro Database, CNKI, VIP, Wan Fang, ClinicalTrials.gov, Current controlled trials and Open Grey were searched for randomized controlled trials that investigated the effects of mirror therapy on lower limb function through January 2018. The primary outcomes included were walking speed, mobility and balance function. Secondary outcomes included lower

limb motor recovery, spasticity and range of motion. Quality assessments were performed with the PEDro scale.

**Results:** A total of 13 studies ( n = 572) met the inclusion criteria. A meta-analysis demonstrated a significant effect of mirror therapy on walking speed (mean difference (MD) 0.1 m/s, 95% confidence interval (CI): 0.08 to 0.12, P < 0.00001), balance function (standard mean difference (SMD) 0.66, 95% CI: 0.43 to 0.88, P < 0.00001), lower limb motor recovery (SMD 0.83, 95% CI: 0.62 to 1.05, P < 0.00001) and passive range of motion of ankle dorsiflexion (MD 2.07°, 95% CI: 0.82 to 3.32, P = 0.001), without improving mobility (SMD 0.43, 95% CI: -0.12 to 0.98, P = 0.12) or spasticity of ankle muscles (MD -0.14, 95% CI: -0.43 to 0.15, P = 0.35). **CONCLUSION** The systematic review demonstrates that the use of mirror therapy in addition to some form of rehabilitation appears promising for some areas of lower limb function, but there is not enough evidence yet to suggest when and how to approach this therapy.

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**Title: Effects of MOTomed movement therapy on the mobility and activities of daily living of stroke patients with hemiplegia: a systematic review and meta-analysis.**

**Citation:** Clinical rehabilitation; Aug 2018 ; p. 269215518790782

**Author(s):** Shen, Cuiling; Liu, Fang; Yao, Liqun; Li, Zhongyuan; Qiu, Li; Fang, Suzhu

**Objective:** To estimate the effectiveness of MOTomed® movement therapy in increasing mobility and activities of daily living in stroke patients with hemiplegia.

**Design:** Systematic review. **DATA SOURCES** English- and Chinese-language articles published from the start of database coverage through 20 June 2018 were retrieved from the Embase, Web of Science, PubMed, OVID, Cochrane Central Register of Controlled Trials, Cochrane Systematic Reviews, Wanfang, Chinese National Knowledge Infrastructure, VIP, and Chinese Biomedicine databases. Articles were also retrieved by manual searches of Rehabilitation Medicine and Chinese journals. **METHODS** Randomized control trials examining MOTomed movement therapy interventions for patients with post-stroke hemiplegia were included in this review. The risk of bias assessment tool was utilized in accordance with Cochrane Handbook 5.1.0. All included studies reported mobility effects as primary outcomes. Standardized mean differences or mean differences with the corresponding 95% confidence intervals (CIs) were calculated. Review Manager 5.3 was utilized for meta-analysis. **RESULTS** In total, 19 trials involving a total of 1099 patients were included in the analysis. All studies were of moderate quality, based on the Cochrane Handbook for Systematic Reviews of Intervention: Part 2:8.5. MOTomed movement therapy resulted in a merged mean difference in the Fugl-Meyer Assessment score of 5.51 (95% CI: 4.03 to 6.98). Comparison of groups treated with and without MOTomed movement therapy yielded the following mean differences: Modified Ashworth Scale, - 1.13 (95% CI: -1.37 to -0.89); Berg Balance Scale, 13.66 (95% CI: 10.47-16.85); Functional Ambulation Category Scale, 0.85 (95% CI: 0.68-1.03); 10-m walk test, 10.15 (95% CI: 5.72-14.58); Barthel Index, 14.82 (95% CI: 12.96-16.68); and Modified Barthel Index, 11.49 (95% CI: 8.96-14.03). **Conclusion:** MOTomed movement therapy combined with standard rehabilitation improves mobility and activities of daily living in stroke patients with hemiplegia.

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**Title: Efficacy and safety of dual antiplatelet therapy in the elderly for stroke prevention: a systematic review and meta-analysis.**

**Citation:** European journal of neurology; Oct 2018; vol. 25 (no. 10); p. 1276-1284

**Author(s):** Ding, L; Peng, B

**Background and Purpose:** There is a lack of age-specific evidence regarding the efficacy and safety of dual antiplatelet therapy (DAPT). A systematic review and meta-analysis was conducted for dual versus mono antiplatelet therapy in elderly patients with ischaemic stroke (IS) or transient ischaemic attack (TIA). **Methods:** PubMed, Embase and the Cochrane Central Register of Controlled Trials were searched for relevant studies. Risk ratios (RRs) for the outcomes of stroke recurrence, major bleeding and intracranial bleeding were calculated based on the DerSimonian and Laird random effects model. Subgroup analyses were conducted. **RESULTS** In seven multicentre, randomized controlled trials comprising 24 873 patients with IS or TIA, aged 65 years or older, a significant reduction in the risk of recurrent stroke was observed using DAPT in comparison with aspirin monotherapy [RR 0.79, 95% confidence interval (95% CI) 0.69-0.91; P = 0.001]. DAPT was not associated with a significant reduction in recurrent stroke compared with clopidogrel monotherapy (RR 1.01, 95% CI 0.93-1.10; P = 0.800). In addition, the results from two studies showed that DAPT significantly increased the risk of major bleeding and intracranial bleeding in elderly patients over younger patients (RR 2.18, 95% CI 1.02-4.69; and RR 2.13, 95% CI 1.18-3.86, respectively). **CONCLUSIONS** For stroke prevention in elderly patients with IS or TIA, DAPT is superior to aspirin

monotherapy but appears to be equivalent to clopidogrel monotherapy, and is accompanied by an increased risk of bleeding. The balance between the benefits and risks of DAPT is important to consider when choosing antiplatelet strategy.

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**Title: Factors Associated With Post-Stroke Physical Activity: A Systematic Review and Meta-Analysis.**

**Citation:** Archives of physical medicine and rehabilitation; Sep 2018; vol. 99 (no. 9); p. 1876-1889

**Author(s):** Thilarajah, Shamala; Mentiplay, Benjamin F; Bower, Kelly J; Tan, Dawn; Pua, Yong Hao; Williams, Gavin; Koh, Gerald; Clark, Ross A

**Objective:** To integrate the literature investigating factors associated with post-stroke physical activity.

**Data Sources:** A search was conducted from database inception to June 2016 across 9 databases: Cochrane, MEDLINE, ProQuest, Web of Science, PsycINFO, Scopus, Embase, CINAHL, and Allied and Complementary Medicine Database. The reference lists of included articles were screened for secondary literature.

**Study Selection:** Cohort and cross-sectional studies were included if they recruited community-dwelling stroke survivors and measured factors associated with physical activity.

**Data Extraction:** Risk of bias was evaluated using the Quality in Prognosis Studies checklist. A meta-analysis was conducted for correlates where there were at least 2 studies that reported a correlation value. Correlation values were used in an effect size measure and converted to a standardized unit with Fisher  $r$  to  $z$  transformation and conversion back to  $r$  method. Results were described qualitatively for studies that could not be pooled.

**Data Synthesis:** There were 2161 studies screened and 26 studies included. Age (meta  $r=-.17$ ;  $P\leq.001$ ) and sex (meta  $r=-.01$ ;  $P=.02$ ) were the nonmodifiable factors that were found to be associated with post-stroke physical activity. The modifiable factors were physical function (meta  $r=.68-.73$ ;  $P<.001$ ), cardiorespiratory fitness (meta  $r=.35$ ;  $P\leq.001$ ), fatigue (meta  $r=-.22$ ;  $P=.01$ ), falls self-efficacy (meta  $r=-.33$ ;  $P<.001$ ), balance self-efficacy (meta  $r=.37$ ;  $P<.001$ ), depression (meta  $r=-.58$  to  $.48$ ;  $P<.001$ ), and health-related quality of life (meta  $r=.38-.43$ ;  $P<.001$ ). The effect of side of infarct, neglect, and cognition on post-stroke physical activity was inconclusive. **CONCLUSIONS** Age, sex, physical function, depression, fatigue, self-efficacy, and quality of life were factors associated with post-stroke physical activity. The cause and effect of these relations are unclear, and the possibility of reverse causality needs to be addressed.

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**Title: #Fake news: a systematic review of mechanical thrombectomy results among neurointerventional stroke surgeons on Twitter.**

**Citation:** Journal of neurointerventional surgery; Sep 2018

**Author(s):** Dmytriw, Adam Andrew; Sorenson, Thomas Joseph; Morris, Jonathan M; Nicholson, Patrick J; Hilditch, Christopher Alan; Graffeo, Christopher S; Brinjikji, Waleed

**Objective:** Twitter is a popular social media platform among physicians. Neurointerventionalists frequently document their lifesaving mechanical thrombectomy cases on Twitter with very favorable results. We fear that there may be some social media publication bias to tweeted mechanical thrombectomy cases with neurointerventionalists being more likely to tweet cases with favorable outcomes. We used these publicly documented cases to analyze post-intervention Twitter-reported outcomes and compared these outcomes with the data provided in the gold standard literature.

**Methods:** Two reviewers performed a search of Twitter for tweeted cases of acute ischemic strokes treated with mechanical thrombectomy. Data were abstracted from each tweet regarding baseline characteristics and outcomes. Twitter-reported outcomes were compared with the Highly Effective Reperfusion Evaluated in Multiple Endovascular Stroke (HERMES) trial individual patient meta-analysis.

**Results:** When comparing the tweeted results to HERMES, tweeted cases had a higher post-intervention rate of modified Thrombolysis In Cerebral Infarction (mTICI) scale score of 2c/3 (94% vs 71%, respectively;  $p<0.0001$ ) and rate of National Institutes of Health Stroke Scale (NIHSS) score  $\leq 2$  (81% vs 21%, respectively;  $p<0.0001$ ). There were no reported complications; thus, tweeted cases also had significantly lower rates of complications, including symptomatic intracerebral hemorrhage (0% vs 4.4%, respectively;  $p<0.0001$ ), type 2 parenchymal hemorrhage (0% vs 5.1%, respectively;  $p<0.0001$ ), and mortality (0% vs 15.3%, respectively;  $p<0.0001$ ).

**Conclusions:** There is a significant difference between social media and reality even within the 'MedTwitter' sphere, which is likely due to a strong publication bias in Twitter-reported cases. Content on 'MedTwitter', as with most social media, should be accepted cautiously.

**Title: How is sexuality after stroke experienced by stroke survivors and partners of stroke survivors? A systematic review of qualitative studies.**

**Citation:** Clinical rehabilitation; Sep 2018 ; p. 269215518793483

**Author(s):** McGrath, Margaret; Lever, Sandra; McCluskey, Annie; Power, Emma

**Objective:** To synthesise how post-stroke sexuality is experienced by stroke survivors and partners of stroke survivors.

**Methods:** MEDLINE, PubMed, SCOPUS, CINAHL and PsycINFO were searched from inception to May 2018 using a combination of relevant Medical Subject Headings and Free Text Terms. Only papers published in English reporting original qualitative research were included. Methodological quality was assessed using the Critical Appraisal Skills Programme Qualitative Research Checklist. All text presented as 'results' or 'findings' in the included studies was extracted and subjected to a thematic analysis and synthesis which was discussed and agreed by the research team.

**Results:** The initial search yielded 136 unique papers with a further 8 papers identified through reference checking. Following full-text review, 43 papers were included in the final synthesis. Two analytical themes were identified: sexuality is silenced and sexuality is muted and sometimes changed, but not forgotten. These themes were made up of six descriptive themes: struggle to communicate within relationships, health professionals don't talk about sexuality, sexuality and disability is a taboo topic, changes to pre-stroke relationships, changed relationship with the stroke survivor's own body and resuming sexual intimacy - adaptation and loss.

**Conclusion:** Stroke has a profound impact on how sexuality is experienced by both stroke survivors and partners of stroke survivors. Despite this, post-stroke sexuality is rarely discussed openly. Stroke survivors and partners value sexuality and may benefit from strategies to support adjustment to post-stroke sexuality.

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**Title: Imaging features and safety and efficacy of endovascular stroke treatment: a meta-analysis of individual patient-level data.**

**Citation:** The Lancet. Neurology; Oct 2018; vol. 17 (no. 10); p. 895-904

**Author(s):** Román, Luis San; Menon, Bijoy K; Blasco, Jordi; Hernández-Pérez, María; Dávalos, Antoni; Majoie, Charles B L M; Campbell, Bruce C V; Guillemin, Francis; Lingsma, Hester; Anxionnat, René; Epstein, Jonathan; Saver, Jeffrey L; Marquering, Henk; Wong, John H; Lopes, Demetrius; Reimann, Gernot; Desal, Hubert; Dippel, Diederik W J; Coutts, Shelagh; du Mesnil de Rochemont, Richard; Yavagal, Dileep; Ferre, Jean Christophe; Roos, Yvo B W E M; Liebeskind, David S; Lenthall, Robert; Molina, Carlos; Al Ajlan, Fahad S; Reddy, Vivek; Dowlatshahi, Dar; Nader-Antoine, Sourour; Oppenheim, Catherine; Mitha, Alim P; Davis, Stephen M; Weimar, Christian; van Oostenbrugge, Robert J; Cobo, Erik; Kleinig, Timothy J; Donnan, Geoffrey A; van der Lugt, Aad; Demchuk, Andrew M; Berkhemer, Olvert A; Boers, Anna M M; Ford, Gary A; Muir, Keith W; Brown, B Scott; Jovin, Tudor; van Zwam, Wim H; Mitchell, Peter J; Hill, Michael D; White, Phil; Bracard, Serge; Goyal, Mayank; HERMES collaborators

**Background:** Evidence regarding whether imaging can be used effectively to select patients for endovascular thrombectomy (EVT) is scarce. We aimed to investigate the association between baseline imaging features and safety and efficacy of EVT in acute ischaemic stroke caused by anterior large-vessel occlusion.

**Methods:** In this meta-analysis of individual patient-level data, the HERMES collaboration identified in PubMed seven randomised trials in endovascular stroke that compared EVT with standard medical therapy, published between Jan 1, 2010, and Oct 31, 2017. Only trials that required vessel imaging to identify patients with proximal anterior circulation ischaemic stroke and that used predominantly stent retrievers or second-generation neurothrombectomy devices in the EVT group were included. Risk of bias was assessed with the Cochrane handbook methodology. Central investigators, masked to clinical information other than stroke side, categorised baseline imaging features of ischaemic change with the Alberta Stroke Program Early CT Score (ASPECTS) or according to involvement of more than 33% of middle cerebral artery territory, and by thrombus volume, hyperdensity, and collateral status. The primary endpoint was neurological functional disability scored on the modified Rankin Scale (mRS) score at 90 days after randomisation. Safety outcomes included symptomatic intracranial haemorrhage, parenchymal haematoma type 2 within 5 days of randomisation, and mortality within 90 days. For the primary analysis, we used mixed-methods ordinal logistic regression adjusted for age, sex, National Institutes of Health Stroke Scale score at admission, intravenous alteplase, and time from onset to randomisation, and we used interaction terms to test whether imaging categorisation at baseline modifies the association between treatment and

outcome. This meta-analysis was prospectively designed by the HERMES executive committee but has not been registered.

**Findings:** Among 1764 pooled patients, 871 were allocated to the EVT group and 893 to the control group. Risk of bias was low except in the THRACE study, which used unblinded assessment of outcomes 90 days after randomisation and MRI predominantly as the primary baseline imaging tool. The overall treatment effect favoured EVT (adjusted common odds ratio [cOR] for a shift towards better outcome on the mRS 2.00, 95% CI 1.69-2.38;  $p < 0.0001$ ). EVT achieved better outcomes at 90 days than standard medical therapy alone across a broad range of baseline imaging categories. Mortality at 90 days (14.7% vs 17.3%,  $p = 0.15$ ), symptomatic intracranial haemorrhage (3.8% vs 3.5%,  $p = 0.90$ ), and parenchymal haematoma type 2 (5.6% vs 4.8%,  $p = 0.52$ ) did not differ between the EVT and control groups. No treatment effect modification by baseline imaging features was noted for mortality at 90 days and parenchymal haematoma type 2. Among patients with ASPECTS 0-4, symptomatic intracranial haemorrhage was seen in ten (19%) of 52 patients in the EVT group versus three (5%) of 66 patients in the control group (adjusted cOR 3.94, 95% CI 0.94-16.49;  $p_{\text{interaction}} = 0.025$ ), and among patients with more than 33% involvement of middle cerebral artery territory, symptomatic intracranial haemorrhage was observed in 15 (14%) of 108 patients in the EVT group versus four (4%) of 113 patients in the control group (4.17, 1.30-13.44,  $p_{\text{interaction}} = 0.012$ ). INTERPRETATION EVT achieves better outcomes at 90 days than standard medical therapy across a broad range of baseline imaging categories, including infarcts affecting more than 33% of middle cerebral artery territory or ASPECTS less than 6, although in these patients the risk of symptomatic intracranial haemorrhage was higher in the EVT group than the control group. This analysis provides preliminary evidence for potential use of EVT in patients with large infarcts at baseline. FUNDING Medtronic.

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**Title: Impact of Dysphagia Assessment and Management on Risk of Stroke-Associated Pneumonia: A Systematic Review.**

**Citation:** Cerebrovascular diseases (Basel, Switzerland); Sep 2018; vol. 46 (no. 3-4); p. 97-105

**Author(s):** Eltringham, Sabrina A; Kilner, Karen; Gee, Melanie; Sage, Karen; Bray, Benjamin D; Pownall, Sue; Smith, Craig J

**Background:** Patients with dysphagia are at an increased risk of stroke-associated pneumonia. There is wide variation in the way patients are screened and assessed during the acute phase. The aim of this review was to identify the methods of assessment and management in acute stroke that influence the risk of stroke-associated pneumonia. Studies of stroke patients that reported dysphagia screening, assessment or management and occurrence of pneumonia during acute phase stroke were screened for inclusion after electronic searches of multiple databases from inception to November 2016. The primary outcome was association with stroke-associated pneumonia.

**Summary:** Twelve studies of 87,824 patients were included. The type of dysphagia screening protocol varied widely across and within studies. There was limited information on what comprised a specialist swallow assessment and alternative feeding was the only management strategy, which was reported for association with stroke-associated pneumonia. Use of a formal screening protocol and early dysphagia screening (EDS) and assessment by a speech and language pathologist (SLP) were associated with a reduced risk of stroke-associated pneumonia. There was marked heterogeneity between the included studies, which precluded meta-analysis.

**Key Messages:** There is variation in the assessment and management of dysphagia in acute stroke. There is increasing evidence that EDS and specialist swallow assessment by an SLP may reduce the odds of stroke-associated pneumonia. There is the potential for other factors to influence the incidence of stroke-associated pneumonia during the acute phase.

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**Title: Interventions involving repetitive practice improve strength after stroke: a systematic review.**

**Citation:** Journal of physiotherapy; Oct 2018; vol. 64 (no. 4); p. 210-221

**Author(s):** de Sousa, Davide G; Harvey, Lisa A; Dorsch, Simone; Glinsky, Joanne V

**Questions:** Do interventions involving repetitive practice improve strength after stroke? Are any improvements in strength accompanied by improvements in activity? DESIGN Systematic review of randomised trials with meta-analysis.

**Participants:** Adults who have had a stroke.

**Intervention:** Any intervention involving repetitive practice compared with no intervention or a sham intervention.

**Outcome Measures:** The primary outcome was voluntary strength in muscles trained as part of the intervention. The secondary outcomes were measures of lower limb and upper limb activity.

**Results:** Fifty-two studies were included. The overall SMD of repetitive practice on strength was examined by pooling post-intervention scores from 46 studies involving 1928 participants. The SMD of repetitive practice on strength when the upper and lower limb studies were combined was 0.25 (95% CI 0.16 to 0.34, I<sup>2</sup>=44%) in favour of repetitive practice. Twenty-four studies with a total of 912 participants investigated the effects of repetitive practice on upper limb activity after stroke. The SMD was 0.15 (95% CI 0.02 to 0.29, I<sup>2</sup>=50%) in favour of repetitive practice on upper limb activity. Twenty studies with a total of 952 participants investigated the effects of repetitive practice on lower limb activity after stroke. The SMD was 0.25 (95% CI 0.12 to 0.38, I<sup>2</sup>=36%) in favour of repetitive practice on lower limb activity.

**Conclusion:** Interventions involving repetitive practice improve strength after stroke, and these improvements are accompanied by improvements in activity. REVIEW REGISTRATION PROSPERO CRD42017068658. [de Sousa DG, Harvey LA, Dorsch S, Glinsky JV (2018) Interventions involving repetitive practice improve strength after stroke: a systematic review. Journal of Physiotherapy 64: 210-221].

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**Title: Patent foramen ovale closure for patients with cryptogenic stroke: A systematic review and comprehensive meta-analysis of 5 randomized controlled trials and 14 observational studies.**

**Citation:** CNS neuroscience & therapeutics; Oct 2018; vol. 24 (no. 10); p. 853-862

**Author(s):** Chen, Xi; Chen, Shi-Dong; Dong, Yi; Dong, Qiang

**Background:** Previous review from randomized controlled trials (RCT) showed that patients with cryptogenic stroke may benefit from patent foramen ovale (PFO) closure. However, the findings from the systematic review were not clear when observational studies were also included.

**Methods:** We searched MEDLINE, Embase, and Cochrane databases. The primary endpoints were recurrent stroke or transient ischemic attack (TIA). The secondary outcomes were all-cause death, atrial fibrillation (AF), and hemorrhagic events.

**Results:** Five randomized trials and fourteen observational studies (6301 participants) were eligible. PFO closure was superior to medical therapy for stroke prevention risk ratios ([RR], 0.38; 95% CI, 0.24-0.60), but showed increased risk of AF (RR, 4.96; 95% CI, 2.31-10.7). There was no significant difference in TIA recurrence, death, and hemorrhagic events. Subgroup analyses showed that patients with factors such as substantial residual shunt, the presence of atrial septal aneurysm (ASA), male, and age <45 years had a lower risk of recurrent stroke when PFOs were closed. CONCLUSIONS In patients with cryptogenic stroke, PFO closure does appear to be superior to medical therapy in stroke prevention, with an increased incidence of AF. Male, age <45 years, substantial residual shunt, and the history of ASA are the factors that will predict the benefit when PFO is closed.

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**Title: Percutaneous closure of patent foramen ovale in patients with cryptogenic stroke - An updated comprehensive meta-analysis.**

**Citation:** Cardiovascular revascularization medicine : including molecular interventions; Sep 2018

**Author(s):** Sitwala, Puja; Khalid, Muhammad Faisal; Khattak, Furqan; Bagai, Jayant; Bhogal, Sukhdeep; Ladia, Vatsal; Mukherjee, Debabrata; Daggubati, Ramesh; Paul, Timir K

**Background:** The ideal treatment strategy for patients with cryptogenic stroke and patent foramen ovale (PFO) is not yet clear. Previous randomized controlled trials (RCTs) comparing transcatheter PFO closure with medical therapy in patients with cryptogenic stroke to prevent recurrent ischemic stroke showed mixed results. This meta-analysis aims to compare rates of recurrent stroke, transient ischemic attack (TIA) and all-cause mortality with PFO closure and medical therapy vs. medical therapy alone.

**Methods:** PubMed and the Cochrane Center Register of Controlled Trials were searched for studies published through June 2018, comparing PFO closure plus medical therapy versus medical therapy alone. Six RCTs (n = 3750) comparing PFO closure with medical therapy were included in the analysis. End points were recurrent stroke, TIA and all-cause mortality. The odds ratios (OR) with 95% confidence interval (CI) were computed and p < 0.05 was considered as a level of significance.

**Results:** A total of 1889 patients were assigned to PFO closure plus medical therapy and 1861 patients were assigned to medical therapy only. Risk of recurrent stroke was significantly lower in the PFO closure plus medical therapy group compared to medical therapy alone. (OR 0.47, 95% CI 0.33-0.67, p < 0.0001). Rate of TIA was similar between the two groups (OR 0.76, 95% CI 0.52-1.14), p = 0.18). There was no

difference in all-cause mortality between two groups (OR 0.73, CI 0.33-1.58,  $p=0.42$ ). Patients undergoing PFO closure were more likely to develop transient atrial fibrillation than medical therapy alone (OR: 5.85; CI: 3.06-11.18,  $p \leq 0.0001$ ) whereas the risk of bleeding was similar between the groups (OR: 0.93; CI: 0.55-1.57,  $p = 0.78$ ).

**Conclusions:** The results of this meta-analysis suggest that transcatheter closure of PFO plus medical therapy is superior to medical therapy alone for the prevention of recurrent cryptogenic stroke. However, PFO closure in these patients has not been shown to reduce the risk of recurrent TIA or all-cause mortality. There is a higher rate of transient atrial fibrillation post PFO closure device placement, the long-term effects of which have yet to be studied.

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**Title: Prevalence of pre-stroke depression and its association with post-stroke depression: a systematic review and meta-analysis.**

**Citation:** Psychological medicine; Aug 2018 ; p. 1-12

**Author(s):** Taylor-Rowan, Martin; Momoh, Oyiza; Ayerbe, Luis; Evans, Jonathan J; Stott, David J; Quinn, Terence J

**Background:** Depression is a common post-stroke complication. Pre-stroke depression may be an important contributor, however the epidemiology of pre-stroke depression is poorly understood. Using systematic review and meta-analysis, we described the prevalence of pre-stroke depression and its association with post-stroke depression.

**Methods:** We searched multiple cross-disciplinary databases from inception to July 2017 and extracted data on the prevalence of pre-stroke depression and its association with post-stroke depression. We assessed the risk of bias (RoB) using validated tools. We described summary estimates of prevalence and summary odds ratio (OR) for association with post-stroke depression, using random-effects models. We performed subgroup analysis describing the effect of depression assessment method. We used a funnel plot to describe potential publication bias. The strength of evidence presented in this review was summarised via 'GRADE'.

**Results:** Of 11 884 studies identified, 29 were included (total participants  $n = 164\ 993$ ). Pre-stroke depression pooled prevalence was 11.6% [95% confidence interval (CI) 9.2-14.7]; range: 0.4-24% (I2 95.8). Prevalence of pre-stroke depression varied by assessment method ( $p = 0.02$ ) with clinical interview suggesting greater pre-stroke depression prevalence (~17%) than case-note review (9%) or self-report (11%). Pre-stroke depression was associated with increased odds of post-stroke depression; summary OR 3.0 (95% CI 2.3-4.0). All studies were judged to be at RoB: 59% of included studies had an uncertain RoB in stroke assessment; 83% had high or uncertain RoB for pre-stroke depression assessment. Funnel plot indicated no risk of publication bias. The strength of evidence based on GRADE was 'very low'.

**Conclusions:** One in six stroke patients have had pre-stroke depression. Reported rates may be routinely underestimated due to limitations around assessment. Pre-stroke depression significantly increases odds of post-stroke depression. Protocol identifier PROSPERO identifier: CRD42017065544.

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**Title: Real-World Outcomes of Acute Ischemic Stroke Treatment with Intravenous Thrombolysis: A Systematic Review and Meta-Analysis.**

**Citation:** Journal of stroke and cerebrovascular diseases : the official journal of National Stroke Association; Sep 2018

**Author(s):** Qin, Bin; Zhao, Ming-Jun; Chen, Hong; Qin, Huixun; Zhao, Libo; Fu, Lin; Qin, Cheng; Yang, Mingxiu; Gao, Wen

**Background:** Evidence from outside the typical clinical research setting, such as the real-world setting, complements evidence coming from randomized controlled trials. The purpose of this study was to evaluate all available evidence from the real-world observational trials about long-term outcomes of treatment with intravenous (IV) recombinant tissue-type plasminogen activator (rt-PA) compared with not treated with IV rt-PA (non-rt-PA) in patients with acute ischemic stroke.

**Methods:** We searched PubMed and Embase until March 1, 2018 for observational studies reporting matched or adjusted results comparing IV rt-PA versus non-rt-PA in patients with acute ischemic stroke. Outcomes assessed included all-cause mortality, hospital readmission rates, and independence rates. Hazard ratios with 95% confidence intervals were used as a measure of comparing between patients treated with IV rt-PA and non-rt-PA.

**Results:** Six observational trials with 16,399 participants were identified. The use of IV rt-PA in acute ischemic stroke patients was associated with a lower risk of mortality (hazard ratio .61; 95% confidence

interval, .52-.70;  $P < .00001$ ), and there was no heterogeneity across trials. There was no evidence of an effect on hospital readmission rates and independence rates.

**Conclusions:** IV rt-PA is associated with reduced long-term mortality in acute ischemic stroke patients.

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**Title: Reduced Stroke After Transcatheter Patent Foramen Ovale Closure: A Systematic Review and Meta-analysis.**

**Citation:** The American journal of the medical sciences; Aug 2018; vol. 356 (no. 2); p. 103-113

**Author(s):** Alvarez, Chikezie; Siddiqui, Waqas Javed; Aggarwal, Sandeep; Hasni, Syed Farhan; Hankins, Shelly; Eisen, Howard

**Background:** Recent randomized control trials (RCTs) have suggested benefit with transcatheter patent foramen ovale (PFO) closure plus antiplatelet therapy over medical treatment alone for secondary stroke prevention.

**Material and Methods:** Data sources: we searched PubMed and Ovid MEDLINE from the inception until November 10, 2017 for RCTs comparing TPFO closure to medical therapy in patients with a PFO and a history of cryptogenic stroke.

**Results:** Five RCTs with 3,627 patients (TPFO closure = 1,829 versus medical therapy =1,798) were included. There was a decreased number of post-TPFO closure strokes compared to the medical therapy arm; 53 versus 80 strokes (odds ratio [OR] = 0.61, CI: 0.39-0.94,  $P = 0.03$ ,  $I^2 = 17\%$ ). Transient ischemic attacks occurred in 43 patients after TPFO closure versus 60 patients in the medical therapy group (OR = 0.80, CI: 0.53-1.19,  $P = 0.26$ ,  $I^2 = 0\%$ ). There was a higher incidence of atrial fibrillation in the TPFO closure group, which occurred in 75 patients, compared to 12 patients in the medical therapy group (OR = 5.23, CI: 2.17-12.59,  $P = 0.0002$ ,  $I^2 = 43\%$ ). There was a trend toward a decreased number of neuropsychiatric events in the TPFO closure group compared to the medical therapy group; 42 versus 67 neuropsychiatric events (OR = 0.71, CI: 0.48-1.06,  $P = 0.09$ ,  $I^2 = 0\%$ ).

**Conclusions:** TPFO closure plus antiplatelet therapy is superior to medical therapy in patients with a PFO and cryptogenic stroke. PFO closure is associated with new-onset atrial fibrillation and a trend toward reduced neuropsychiatric events.

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**Title: Repetitive Peripheral Sensory Stimulation and Upper Limb Performance in Stroke: A Systematic Review and Meta-analysis.**

**Citation:** Neurorehabilitation and neural repair; Sep 2018 ; p. 1545968318798943

**Author(s):** Conforto, Adriana Bastos; Dos Anjos, Sarah Monteiro; Bernardo, Wanderley Marques; Silva, Arnaldo Alves da; Conti, Juliana; Machado, André G; Cohen, Leonardo G

**Background:** Enhancement of sensory input in the form of repetitive peripheral sensory stimulation (RPSS) can enhance excitability of the motor cortex and upper limb performance.

**Objective:** To perform a systematic review and meta-analysis of effects of RPSS compared with control stimulation on improvement of motor outcomes in the upper limb of subjects with stroke.

**Methods:** We searched studies published between 1948 and December 2017 and selected 5 studies that provided individual data and applied a specific paradigm of stimulation (trains of 1-ms pulses at 10 Hz, delivered at 1 Hz). Continuous data were analyzed with means and standard deviations of differences in performance before and after active or control interventions. Adverse events were also assessed.

**Results:** There was a statistically significant beneficial effect of RPSS on motor performance (standard mean difference between active and control RPSS, 0.67; 95% CI, 0.09-1.24;  $I^2 = 65\%$ ). Only 1 study included subjects in the subacute phase after stroke. Subgroup analysis of studies that only included subjects in the chronic phase showed a significant effect (1.04; 95% CI, 0.66-1.42) with no heterogeneity. Significant results were obtained for outcomes of body structure and function as well as for outcomes of activity limitation according to the International Classification of Function, Disability and Health, when only studies that included subjects in the chronic phase were analyzed. No serious adverse events were reported.

**Conclusions:** RPSS is a safe intervention with potential to become an adjuvant tool for upper extremity paresis rehabilitation in subjects with stroke in the chronic phase.

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**Title: Self-directed therapy programmes for arm rehabilitation after stroke: a systematic review.**

**Citation:** Clinical rehabilitation; Aug 2018; vol. 32 (no. 8); p. 1022-1036

**Author(s):** Da-Silva, Ruth H; Moore, Sarah A; Price, Christopher I

**Aim:** To investigate the effectiveness of self-directed arm interventions in adult stroke survivors.

**Methods:** A systematic review of Medline, EMBASE, CINAHL, SCOPUS and IEEE Xplore up to February 2018 was carried out. Studies of stroke arm interventions were included where more than 50% of the time spent in therapy was initiated and carried out by the participant. Quality of the evidence was assessed using the Cochrane risk of bias tool.

**Results:** A total of 40 studies ( n = 1172 participants) were included (19 randomized controlled trials (RCTs) and 21 before-after studies). Studies were grouped according to no technology or the main additional technology used (no technology n = 5; interactive gaming n = 6; electrical stimulation n = 11; constraint-induced movement therapy n = 6; robotic and dynamic orthotic devices n = 8; mirror therapy n = 1; telerehabilitation n = 2; wearable devices n = 1). A beneficial effect on arm function was found for self-directed interventions using constraint-induced movement therapy ( n = 105; standardized mean difference (SMD) 0.39, 95% confidence interval (CI) -0.00 to 0.78) and electrical stimulation ( n = 94; SMD 0.50, 95% CI 0.08-0.91). Constraint-induced movement therapy and therapy programmes without technology improved independence in activities of daily living. Sensitivity analysis demonstrated arm function benefit for patients >12 months poststroke ( n = 145; SMD 0.52, 95% CI 0.21-0.82) but not at 0-3, 3-6 or 6-12 months.

**Conclusion:** Self-directed interventions can enhance arm recovery after stroke but the effect varies according to the approach used and timing. There were benefits identified from self-directed delivery of constraint-induced movement therapy, electrical stimulation and therapy programmes that increase practice without using additional technology.

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**Title: Sex differences in stroke and major adverse clinical events in patients with atrial fibrillation: A systematic review and meta-analysis of 993,600 patients.**

**Citation:** International journal of cardiology; Oct 2018; vol. 269 ; p. 182-191

**Author(s):** Marzona, Irene; Proietti, Marco; Farcomeni, Alessio; Romiti, Giulio Francesco; Romanazzi, Imma; Raparelli, Valeria; Basili, Stefania; Lip, Gregory Y H; Nobili, Alessandro; Roncaglioni, Maria Carla

**Background:** Atrial fibrillation (AF) is the most commonly diagnosed arrhythmia, which is associated with an increased risk of stroke. Several studies have suggested that female AF patients could have a greater risk for stroke and thromboembolic events (TE).

**Methods:** A systematic literature review update and meta-analysis was conducted using Pubmed. The search used the terms "atrial fibrillation", "gender", "sex", "female", "women", "stroke", "thromboembolism". Main aim of the study was to compare and male AF patients for occurrence of stroke and TE. Secondary outcomes were: major bleeding, cardiovascular (CV) death and all-cause death.

**Results:** Forty-four studies were included in the analysis including 993,603 patients (48.9% women). After pooling the data, there was a higher risk of stroke for women vs. male AF patients (hazard ratio [HR]: 1.24; 95% confidence intervals [CIs]: 1.14-1.36). Overall, TE risk was not different between female and male patients, despite sensitivity analysis left some uncertainties. No sex differences were found for major bleeding, CV death and all-cause death. A significant relationship between increasing age and the difference in stroke risk between female and male AF patients was found (Delta HR: 1.01; 95% CI: 1.00-1.03 for each year of age increase).

**Conclusions:** Female patients with AF are at increased risk of stroke compared to men. A significant relationship between increasing age and stroke risk in women compared to men was found, most evident at age > 65 years. Female sex may act as a stroke risk modifier, particularly in elderly and very elderly AF subjects, conferring a significant increase in stroke risk.

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**Title: Tele-Rehabilitation after Stroke: An Updated Systematic Review of the Literature.**

**Citation:** Journal of stroke and cerebrovascular diseases : the official journal of National Stroke Association; Sep 2018; vol. 27 (no. 9); p. 2306-2318

**Author(s):** Sarfo, Fred S; Ulasavets, Uladzislau; Opare-Sem, Ohene K; Ovbiagele, Bruce

**Background:** Tele-rehabilitation for stroke survivors has emerged as a promising intervention for remotely supervised administration of physical, occupational, speech, and other forms of therapies aimed at improving motor, cognitive, and neuropsychiatric deficits from stroke.

**Objective:** We aimed to provide an updated systematic review on the efficacy of tele-rehabilitation interventions for recovery from motor, higher cortical dysfunction, and poststroke depression among stroke survivors.

**Methods:** We searched PubMed and Cochrane library from January 1, 1980 to July 15, 2017 using the following keywords: "Telerehabilitation stroke," "Mobile health rehabilitation," "Telemedicine stroke rehabilitation," and "Telerehabilitation." Our inclusion criteria were randomized controlled trials, pilot trials, or feasibility trials that included an intervention group that received any tele-rehabilitation therapy for stroke survivors compared with a control group on usual or standard of care.

**Results:** This search yielded 49 abstracts. By consensus between 2 investigators, 22 publications met the criteria for inclusion and further review. Tele-rehabilitation interventions focused on motor recovery (n = 18), depression, or caregiver strain (n = 2) and higher cortical dysfunction (n = 2). Overall, tele-rehabilitation interventions were associated with significant improvements in recovery from motor deficits, higher cortical dysfunction, and depression in the intervention groups in all studies assessed, but significant differences between intervention versus control groups were reported in 8 of 22 studies in favor of tele-rehabilitation group while the remaining studies reported nonsignificant differences.

**Conclusion:** This updated systematic review provides evidence to suggest that tele-rehabilitation interventions have either better or equal salutary effects on motor, higher cortical, and mood disorders compared with conventional face-to-face therapy.

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**Title: Tenecteplase versus alteplase for management of acute ischemic stroke: a pairwise and network meta-analysis of randomized clinical trials.**

**Citation** Journal of thrombosis and thrombolysis; Nov 2018; vol. 46 (no. 4); p. 440-450

**Author(s):** Kheiri, Babikir; Osman, Mohammed; Abdalla, Ahmed; Haykal, Tarek; Ahmed, Sahar; Hassan, Mustafa; Bachuwa, Ghassan; Al Qasmi, Mohammed; Bhatt, Deepak L

**Abstract:** Tenecteplase is a genetically mutated variant of alteplase with superior pharmacodynamic and pharmacokinetic properties. However, its efficacy and safety in acute ischemic strokes are limited. Hence, we conducted a study to evaluate the efficacy and safety of tenecteplase compared with alteplase in acute ischemic stroke. Electronic databases were searched for randomized clinical trials (RCTs) comparing tenecteplase with alteplase in acute ischemic stroke patients eligible for thrombolysis. We evaluated various efficacy and safety outcomes using random-effects models for both pairwise and Bayesian network meta-analyses along with meta-regression. We included 5 RCTs with a total of 1585 patients. Compared with alteplase, tenecteplase treatment was associated with significantly greater complete recanalization (odds ratio [OR] 2.01; 95% confidence interval [CI] 1.04-3.87; p = 0.04) and early neurological improvement (OR 1.43; 95% CI 1.01-2.03; p = 0.05). There were no differences between the two thrombolytics in terms of excellent recovery (modified Rankin Scale [mRS] 0-1; OR 1.17; 95% CI 0.95-1.44; p = 0.13), functional independence (mRS 0-2; OR 1.24; 95% CI 0.78-1.98), poor recovery (mRS 4-6; OR 0.78; 95% CI 0.49-1.25; p = 0.31), complete/partial recanalization (OR 1.51; 95% CI 0.70-3.26; p = 0.30), any intracerebral hemorrhage (OR 0.81; 95% CI 0.56-1.17; p = 0.26), symptomatic intracerebral hemorrhage (OR 0.98; 95% CI 0.52-1.83; p = 0.94), or mortality (OR 0.83; 95% CI 0.54-1.26; p = 0.38). In network meta-analysis, there were better efficacy and imaging-based outcomes with tenecteplase 0.25 mg/kg without increased risk of safety outcomes. Our results demonstrate that in acute ischemic stroke, thrombolysis with tenecteplase is at least as effective and safe as alteplase.

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**Title: The prevalence of Diabetes and its effects on Stroke Outcomes; a meta-analysis and literature review.**

**Citation:** Journal of diabetes investigation; Sep 2018

**Author(s):** Lau, L H; Lew, J; Borschmann, K; Thijs, V; Ekinici, E I

**Background:** Diabetes Mellitus is an established risk factor for stroke and maybe associated with poorer outcomes following stroke.

**Objective:** The aims of this literature review were to determine (i) the prevalence of diabetes in acute stroke patients through a meta-analysis, (ii) the association between diabetes and outcomes after ischemic and hemorrhagic stroke and (iii) to review the value of HbA1c and admission glucose based tests in predicting stroke outcomes.

**Methods:** Ovid MEDLINE and EMBASE searches were conducted to find studies relating diabetes and inpatient stroke populations published between January 2004 and April 2017. A meta-analysis of the

prevalence of diabetes from included studies was conducted. A narrative review on the associations of diabetes and different diagnostic methods on stroke outcomes was performed.

**Results:** Sixty-six eligible articles met inclusion criteria. A meta-analysis of 39 studies (n=359,783) estimated the prevalence of diabetes to be 28% (95%CI [26, 31]). The rate was higher in ischemic (33%, 95%CI [28, 38]) compared to hemorrhagic stroke (26%, 95%CI [19, 33]) inpatients. Most, but not all studies found that acute hyperglycemia and diabetes were associated with poorer outcomes after ischemic or hemorrhagic strokes: including higher mortality, poorer neurological and functional outcomes, longer hospital stay, higher readmission rates and stroke recurrence. Diagnostic methods for establishing diagnosis were heterogeneous between the reviewed studies.

**Conclusion:** Approximately one-third of all stroke patients have diabetes. Uniform methods to screen for diabetes after stroke are required to identify individuals with diabetes to design interventions aimed at reducing poor outcomes in this high risk population. This article is protected by copyright. All rights reserved.

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**Title: Transcutaneous electrical nerve stimulation improves walking capacity and reduces spasticity in stroke survivors: a systematic review and meta-analysis.**

**Citation:** Clinical rehabilitation; Sep 2018; vol. 32 (no. 9); p. 1203-1219

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**Objective:** To evaluate (1) the effectiveness of transcutaneous electrical nerve stimulation (TENS) at improving lower extremity motor recovery in stroke survivors and (2) the optimal stimulation parameters for TENS.

**Review Methods:** A systematic search was conducted for studies published up to October 2017 using eight electronic databases (CINAHL, ClinicalTrials.gov, the Cochrane Central Register of Controlled Trials, EMBASE, MEDLINE, PEDro, PubMed and Web of Science). Randomized controlled trials that evaluated the effectiveness of the application of TENS at improving lower extremity motor recovery in stroke survivors were assessed for inclusion. Outcomes of interest included plantar flexor spasticity, muscle strength, walking capacity and balance.

**Results:** In all, 11 studies met the inclusion criteria which involved 439 stroke survivors. The meta-analysis showed that TENS improved walking capacity, as measured by either gait speed or the Timed Up and Go Test (Hedges' g = 0.392; 95% confidence interval (CI) = 0.178 to 0.606) compared to the placebo or no-treatment control groups. TENS also reduced paretic plantar flexor spasticity, as measured using the Modified Ashworth Scale and Composite Spasticity Scale (Hedges' g = -0.884; 95% CI = -1.140 to -0.625). The effect of TENS on walking capacity in studies involving 60 minutes per sessions was significant (Hedges' g = 0.468; 95% CI = 0.201-0.734) but not in study with shorter sessions (20 or 30 minutes) (Hedges' g = 0.254; 95% CI = -0.106-0.614).

**Conclusion:** The results support the use of repeated applications of TENS as an adjunct therapy for improving walking capacity and reducing spasticity in stroke survivors.

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