Question 37 evidence tables

Question 37: Is remotely-delivered therapy as effective as face-to-face therapy after a stroke? Are patients as satisfied with remote therapy as with face-to-face?

NB Any discrepancies between reviewers in evidence quality and comment were discussed at the corresponding evidence review meeting

LLFDI = Late-Life Function and Disability Instrument, ABC = Activities-Specific Balance (ABC) scale, FMA-UE = Fugl-Meyer assessment of upper extremity, BRS = Brunnstrom recovery stages, BI = barthel index, FAC = Functional Ambulation Category Test, F2F = face to face, VR = virtual reality, SR = systematic review, MA = meta-analysis, RCT = randomised controlled trial, IPDMA = individual patient data meta-analysis, MDT = multidisciplinary team, PICO = patient/population, intervention, comparison and outcomes, OR = odds ratio, CI = confidence interval, QoL = quality of life, ADL = activities of daily living, OR = odds ratio, RR = relative risk, aOR = adjusted odds ratio, cOR = crude odds ratio, CI = confidence interval, RoB = risk of bias, I2 = heterogeneity statistic.

REF ID	Source	Setting, design & subjects	Intervention	Outcomes	Results	Evidence quality (SIGN checklist score) and comment
876	M. Asano et al (2021). Home-based tele-rehabilitation presents comparable positive impact on self-reported functional outcomes as usual care: The Singapore Tele-technology Aided Rehabilitation in Stroke (STARS) randomised controlled trial. Journal of telemedicine and telecare.	Setting: Community Design: A parallel, two-arm, evaluator-blinded, randomised controlled trial. Subjects: Adults aged >40 years who had suffered a stroke within four weeks of the start of the study were recruited from the general community.	Intervention: A home based tele-rehabilitation system* and standard rehab programme Control: usual care * Consists of lightweight wireless wearable sensors strapped onto patients to allow real-time biofeedback and collection data from the sensors for patient's rehabilitation team wirelessly via the internet. The sensor data is summarized in chart form for review by therapist to allow them to prescribe further rehabilitation exercises remotely. The system also allows the patient to self-record videos of them exercising, which is transmitted to the therapist (termed 'tele-therapist') for	Primary Outcome: Late-Life Function and Disability Instrument (LLFDI) and @ baseline, 3 months and 6 months Secondary outcomes: (a) the timed five-metre walk test (b) two-minute walking distance (c) the modified Barthel Index (BI), (d) the Activities-Specific Balance (ABC) scale and (e) the EuroQoL (EQ-5D).	124 individuals were recruited – 61 intervention group; 63 control group. 98 individuals I total (50 tele-rehab and 48 control) who completed both the baseline and three-month assessments were included in the modified intention-to-treat analysis. No significant difference in the median time spent on rehabilitation and exercise between the two groups.	**+/-** Poor description of intervention. Statistical power not reported; relatively small sample size Acceptable/ low quality

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	27: 4. 231-238.		review. Where needed, patients and therapists can communicate using videoconferencing. Accessed from: https://bmcneurol.biomedcentral.com/articles/10.1186/s12883-015-0420-3		The intervention and control groups self-reported similar improvements in functional outcomes. At three months post rehabilitation, both the tele-rehab and control groups showed improvements in all secondary outcome measures from baseline.	
877	B. Brouns et al (2021). Effect of a comprehensive eRehabilitation intervention alongside conventional stroke rehabilitation on disability and health-related quality of life: A pre-post comparison. Journal of rehabilitation medicine. 53: 3.	Design: Pre-post test design, controlled clinical trial (control group studied first followed by intervention group, not in parallel). Setting: 2 rehabilitation centres in the Netherlands. Participants: N=318 (N=153 control; N=165 intervention) 306 people completed 3 month follow up (159 in intervention, 147 in control; 96.2% completion ratel) 281 completed 6 month follow up (150 in intervention, 131 in control; 88.3% completion rate)	Intervention: Fast@Home, an e-rehabilitation package accessed via laptops, tablets or PC, with several different applications for cognitive and physical exercises, activity tracking and stroke related psychoeducation. People could access the eRehabilitation intervention for 16 weeks and were encouraged to use it multiple times per week. Dose of therapy depended on the nature of the intervention. Cognitive exercise programme (300s, 5 mins of use every day), physical exercise intensity and frequency depended on individuals' situation and nature of exercises (2-3 days of exercise per week). Reminders to use the intervention were sent. HCPs sent reports on the number/repetitions of exercises	Outcomes assessed at admission (T0), 3 months (T3) and 6 months after admission (T6) Primary outcome: Disability (measured by Stroke Impact Scale) Secondary outcomes: health related quality of life (measured by EuroQol-5D-3L (EQ5D) & SF 12), fatigue (Fatigue Severity Scale), self-management (Patient Activation Measure). Physical activity also noted (measured by Physical Activity Questionnaire Short Form)	Primary outcome: Regarding group differences, no significant differences between the IG and CG were seen between T0 and T3. However, between T3 and T6, the improvements were significantly greater in the IG than the CG for the SIS subscales Communication and Physical strength. Taking into account all time-points, no significant differences were seen between CG and IG. Secondary outcomes:	**+** Acceptable The assessors were not blinded. Quasi experimental study with a control comparison group but not randomised nor was the intervention delivered simultaneously alongside a control group. Only 82 people were offered the intervention, and only 54 actually used it. Doesn't explain why this was – 165 in intervention group so why a reduced number offered the intervention?)

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			performed in order to support the patient or adapt the prog if necessary. Control: conventional rehabilitation according to national guideline, treatment provided by MDT, inpatient and outpatient rehab, focussing on improving cognitive/motor or psychological function, speech or participation		None of the between-group differences reached significance between T0 and T3, or T3 and T6 or T0 and T6.	Intention to treat analysis conducted as well as per protocol analysis
834	L. Cacciante et al (2021). Telerehabilitation for people with aphasia: A systematic review and meta-analysis. Journal of Communication Disorders. 92.	Systematic review and MA. Participants with post-stroke aphasia and mixed impairments in linguistic functions and remotely provided treatments of linguistic functions and communication abilities. 5 studies were included (3 RCTs and 2 non-randomised RCTs) with 132 participant	Telerehabilitation versus face-face-therapy.	Auditory comprehension, naming accuracy, Western Aphasia Battery Aphasia Quotient WAB AQ, generalization post-intervention, functional communication post-intervention.	TR seemed to be non-inferior to conventional treatment, suggesting speech and language treatment provided via videoconference could bring similar benefits as those obtained from the conventional face-to-face treatment.	**++** High quality
879	J. Chen et al (2020). Effects of home-based telerehabilitation in patients with stroke: A randomized controlled trial. Neurology. 95: 17. e2318-e2330.	PROBE design RCT of stroke survivors with hemiplegia from subcortical stroke. Arbitrary age based exclusions. 52 participants included, mostly young with minor stroke.	12-week home-based motor training telerehabilitation program versus conventional clinic based rehabilitation. (10 sessions per week with 60 minutes of occupational therapy and physical therapy and 20 minutes neuromuscular stimulation each session)	Fugl-Meyer and Barthel index at end of 12 week intervention. Neuroimaging surrogate outcomes.	No evidence of non-inferiority of tele-rehab approach for motor gains	**+** Concerns over randomisation, masking. Note baseline imbalances and differences in treatment duration between groups.
901	S. C. Chen et al (2021).	Prospective case-control pilot study	Experimental group (n=15): Telerehabilitation using Kinect camera-based interactive	Primary outcome: Berg Balance Scale (BBS)	No significant differences between groups at baseline or post	-

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	Feasibility and effect of interactive telerehabilitation on balance in individuals with chronic stroke: a pilot study. Journal of NeuroEngineering and Rehabilitation. 18: 1. 71.	n=30 Taiwanese individuals with chronic stroke screened in outpatient clinic. First stroke, motor deficits, stroke onset over 6 months ago, no obvious psychological or emotional problems. Bruunstrom stage between ii and V. Exclusions: Modified Ashworth Scale >3, language difficulties or aphasia. Randomly allocated to experimental or control group.	rehabilitation system. In an independent room (in the hospital) to simulate home environment. Control group (n=15): Conventional one-to-one physiotherapy in a dedicated rehabilitation area. All participants received intervention 3 times per week for 4 weeks in the study hospital.	Secondary outcomes: Timed Up and Go (TUG) test, Modified Falls Efficacy Scale, Motricity Index, Functional Ambulation Category	intervention for all outcome measures. BBS score improved significantly in both groups. Completion time of TUG improved significantly in experimental group.	Limited information on randomisation and blinding details so unable to assess some aspects of study quality. Note the title refers to it as a pilot study.
881	L. R. Cherney (2021). Web-based Oral Reading for Language in Aphasia (Web ORLA): A pilot randomized control trial. Clinical rehabilitation. 35: 7. 976-987.	Urban residential hospital. Participants recruited from across the United States. Single-blind, randomised placebo-controlled trial. Pilot RCT. Participants: n=35 randomised. n=32 (19 Web ORLA, 13 Control) completed intervention and post-treatment assessment. n=27 (16 Web ORLA, 11 Control) completed follow up assessment 6 weeks after end of treatment. Adults with chronic aphasia (at least six months post-	Randomised in 3:2 ratio to one of two conditions. Experimental group: Web-based ORLA (Oral Reading for Language in Aphasia). Laptop with audio headset, presented audio stimuli and captured recordings of participants' verbal output. Repeated choral and independent reading of sentences with a virtual therapist. Research SLP able to remotely monitor practice synchronously and asynchronously and provide real-time adjustments to the program.	Primary outcome: Western Aphasia Battery-Revised Language Quotient (WAB-R LQ). Change in WAB-R LQ from pre-treatment to post-treatment and pre-treatment to six weeks following end of treatment.	Groups comparable at baseline on demographic characteristics and WAB scores. Web ORLA treatment resulted in significant improvement in WAB-R LQ pre-treatment to immediately post-treatment and from pre-treatment to six weeks following end of treatment. No significant difference in gain on WAB-R-LQ from pre-treatment to 6 week follow up in Web ORLA vs control group.	+ Pilot study, n=35 randomised

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		onset) resulting from single left hemisphere stroke; native speakers of English; sufficient auditory and visual acuity to interact with a laptop; not receiving speech/language treatment for at least one month prior to or during study.	Control group: Commercially available computer game (Bejeweled 2). Both groups instructed to practice 90 minutes a day, 6 days a week for 6 weeks.		Sig. greater gains in 6 week follow up in Web ORLA vs control.	
882	S. C. Cramer (2019). Efficacy of Home-Based Telerehabilitation vs In-Clinic Therapy for Adults after Stroke: A Randomized Clinical Trial. JAMA Neurology. 76: 9. 1079-1087.	Home based tele-rehab US based, multisite, PROBE RCT. 124 stroke survivors at 4-36 weeks posts stroke, with residual arm impairment. Participants were young (mean age 61 years) and predominantly male (73%).	36 sessions of 70 mins upper limb rehabilitation delivered via tele-rehab (intervention) or at an outpatient clinic (control)	Primary outcome: change in Fugl-Meyer from baseline to 4 weeks after therapy Other outcomes: Stroke knowledge, adherence	No evidence of non-inferiority of tele-rehab approach for motor gains or improved stroke knowledge Good adherence to therapy in both arms	**++** Note long time in recruitment and unrepresentative population. Need to be careful of extrapolating these data to an unselected stroke population.
883	C. English et al (2022). Telehealth for rehabilitation and recovery after stroke: State of the evidence and future directions. International Journal of Stroke. 17: 5. 487-493.	Rapid review new research published since the Cochrane review, Medline searched using key terms related to stroke rehabilitation and telehealth or virtual care with limits on publication from 2019 to 2020	case management or advice (seven trials), motor retraining for arm, and/or hand function (seven trials). Other interventions included motor retraining for leg and/or balance and walking training (four trials), speech and language therapy (one trial), a package of rehabilitation (two trials), or interventions to address low mood (one trial).		Overall, there is moderate-quality evidence that providing discharge support via telehealth is no different to usual care for measures of depression and quality of life; low-quality evidence of no difference between telehealth-delivered upper limb therapy; rehabilitation of activities of daily living or balance	**0** Unacceptable – reject 0 No detail of methodology – consort flow diagram etc Only 2 trials monitored adverse events. Most trials were not adequately powered, the risk of Type II error, or false acceptance of no between group difference, could not be ruled out.

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					training compared with in-person therapy; and insufficient evidence about the effectiveness of mobility training delivered via telehealth	
884	M. Grau-Pellicer et al (2020). Impact of mHealth technology on adherence to healthy PA after stroke: a randomized study. Topics in Stroke Rehabilitation. 27: 5. 354-368.	Design: pilot randomised unblinded study design Setting: Rehabilitation Unit of Hospital Consorci Sanitari de Terrassa, Barcelona Spain. Participants: n=41 IG (n=24), CG (n=17) At E2, IG n=21, CG n=13 In IG, 10 people used the intervention.	Intervention: 8-week intervention of two alternate days a week, in sessions of 1 h (16 sessions in total). The intervention was performed in groups of 4–6 participants with a physical therapist who guided on: 1) Implementation of the system 2) A pedometer 3) A Whatsapp group 4) An 8-week exercise program (2 days/wk, 1 h/session) that consisted of: aerobic, task-oriented training, balance, and stretching exercises 5) A progressive daily ambulation program at home with the aim to reach PA levels recommended by the World Health Organization (WHO)9 of 150 m/wk of moderate PA (monitored with the app and pedometer). Control group: a daily conventional rehabilitation	Participants assessed at baseline (E1) and three months later (E2) Primary outcome: Adherence to physical activity. Measured by self reported outdoor walking time and outside visits e.g. to the supermarket) and self-reported sedentary behaviour e.g. amount of time sitting watching TV. Secondary outcomes/outcome measures: Walking speed (measured by 10m walking test (10MWT), repeated twice and average of two distances calculated. Walking endurance (measured by six minute walking test (SMWT). Functional mobility and risk of falling (measured by the Timed Up and Go Test (TUG)), as assessment of	Self reported adherence to community ambulation and sitting time, walking time and waling endurance, functional mobility and risk of falls were significantly improved by the intervention. Self-reported community ambulation increased by 38.95 (+20.37) minutes/day in IG ($p<0.05$) (a 105% increase) and by 9.47 (+12.11) mins/day in CG (a 38% increase). Sitting time decreased by 2.96 (+2.0) hours/day in IG ($p<0.05$) (a 30% decrease) and by 0.53 (+0.24) hours in control group (a 7% decrease). Effect size of adherence to PA moderate. Effect size in reduction of sitting time was negative. Results indicate a positive	- Low quality (-) Only 50% of the IG were able to use the app. Technical reasons were the main cause of low rate of use: too challenging, problems with the internet connection or not appropriate mobile device. These results were maintained during three months, but there were no long-term assessments Authors acknowledged difficulties in recruitment & compliance. Although sample randomised, it was a convenience sample recruited.

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			program for 3 months that included: trunk exercises, muscle strengthening, occupational therapy, and gait training	the time taken when standing up from an armchair and walking for 3 mins). Independence in basic ADLs (measured by the Barthel Index) Self perceived QoL (measured by the EuroQol (EQ-5D-%L) Participant satisfaction (measured by a bespoke questionnaire)	effect from the intervention. Of the people in IG who used the app (n=10 compared with n=13 from CG). Increase in community ambulation was of 56.85 (+52.81) mins/day (p<0.05) and sitting time decreased by 2.96 (+2.07) hours/day (p<o.o5). Effect size was higher than expected. Comfortable and fast walking speed (10MWT) increased 0.21 (+0.7) and 0.27 (+1.3) meters/second in IC (p<0.05). the CG increased 0.12 (+0.4) (p<0.05) and 0.06 (+0.03) meters/second (ns). Walking endurance (6MST) increased by 47.62m (+12.37) in IG (p<0.05) and by 19.79m (+9.19) in GC (ns). Functional mobility and risk of falling (TUG, cut off 14s, all participants considered fallers in the study) decreased by 3.46 (p<0.05) in IG (considered	

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					non fallers now) and increased in the CG by 4.67 (sig not reported) and remained as fallers. ADLs (Barthel) changed from mildly dependent to independent in IG and no change in CG ($p<0.05$) QoL (EQ-5D-5L) improved in the IG and unchanged in the CG (<0.05) Effect sizes commented on throughout.	
885	J. Huang et al (2022). Internet+Continuing Nursing (ICN) Program Promotes Motor Function Rehabilitation of Patients with Ischemic Stroke. Neurologist. 27: 2. 56-60.	Setting: Community Design: RCT? Patients were randomly divided into 2 groups: control group (n= 40) and ICN-treated group (n= 40) Subjects: Patients with (1) first time stroke (2) muscle strength grade <3; (3) conscious; (4) familiar with using smartphones and WeChat software; (5) aged above 18 years; (6) returned home after being discharged from the hospital	Intervention: The ICN platform is composed of the WeChat group of "Neurology Continued Nursing Patients" and the Lantern Follow-up Management System. All members of the rehabilitation team and the intervention group included in the WeChat group. Doctors, nurses, rehabilitation therapists and patients provided online lectures through the WeChat group "Communicate online." Lantern Follow-up Management System functions included file management,	Self-efficacy Scale for Chronic Disease, Questionnaire of Exercise Adherence, Motor Assessment Scale, Activities of Daily Living, and Stroke-specific Quality of Life	after the ICN intervention for 6 weeks and 3 months, the scores of Self-efficacy Scale for Chronic Disease, Questionnaire of Exercise Adherence, Motor Assessment Scale, Activities of Daily Living, and Stroke-specific Quality of Life in the ICN-treated group were significantly higher compared with those in the control group.	- Poorly reported study. Outcome measures used poorly describes/ referenced. Randomisation process not fully described. Not clear if intervention group also received 'usual care'. No power calculation. Poorly reported results. Low quality (-)

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			reminders, data collection and tracking, health education videos, pictures, text, animation, etc. All health education documents, videos and pictures related to stroke and physical rehabilitation were imported into the system database to be accessed by the patient through the system link. Control: Patients provided with discharge guidance & handbook of health knowledge, which included a physical exercise rehabilitation plan, information about stroke and educational materials. Following discharge from the hospital, the traditional follow-up method was adopted: (1) Telephone follow-up: (2) outpatient follow-up: 1 month after discharge and 3 months after discharge, the patient and family members brought the discharge summary to the Neurology Clinic for follow-up; (3) family follow-up: on 6 and 12 weeks after discharge, 2 expert team members visited the patients' homes for 1 to 2 hours to communicate face-to-face with the patients and their family members.			

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886	Y. Keskin et al (2020). Efficacy of a video-based physical therapy and rehabilitation system in patients with post-stroke hemiplegia: A randomized, controlled, pilot study. Turk Geriatri Dergisi. 23: 1. 118-128.	Design: Randomised controlled single-blind study Setting: Physical Medicine and Rehabilitation Clinic, Istanbul, Turkey Participants: n=24; IG n=12, CG n=12	Intervention group: Conventional rehabilitation programme (as described below) + virtual therapy programme. VR programme comprising Virtual Reality exercises and implemented using LeapMotion, a motion detection device that captures motion without the use of a mouse or keyboards. Participants instructed how to play a game (either LeapBall, a multi level game designed for hand grasp movements OR the Pong game, a multi-level game developed for wrist/elbow movements). IG participants had routine rehab programme and were asked to perform VR exercises twice a week for 6 weeks under supervision of a therapist. Control group: Conventional rehabilitation programme comprising physical therapy modalities and combination of neurophysiological and conventional exercise programme implemented 1 hour/day for 5 days a week for 6 weeks.	Outcomes assessed at beginning of treatment and 6 weeks after start of treatment. Sensorimotor recover post stroke/Motor function of upper extremity, measured by the upper extremity subscale of the Fugl-Meyer assessment of upper extremity (FMA-UE) scale. Neurophysiological recovery/hemiplegic upper extremity and hand assessed by Brunnstrom recovery stages (BRS) ADLs measured by Barthel Index (BI) Ambulation status measured using the Functional Ambulation Category Test (FAC) Range of motion results of all joints retrieved from the LeapMotion system (not outcome data?)	Both groups improved in each of the outcomes but no significant differences between the groups, except for range of motion in the intervention group. Intragroup evaluation revealed that the improvements in the clinical scales resulted in statistically significant improvement in all clinical tests in both groups before treatment and at 6th week after treatment Range of results presented for group comparisons of elbow and wrist range of motion before and after treatment. No significant differences reported between groups.	Results reported no significant changes between groups. Study was underpowered with a low sample size, various sources of bias including lack of blinding (other than at randomisation) and lack of description of randomisation procedure. Not possible to tell if the within group effects seen in the IG are because of the intervention or not. Technology still at trial stage and so protocol for how it should be implemented (including frequency of sessions etc) not been established. The VR technology is still under trial under hospital conditions and only administered twice a week. Might be more effective if frequency increased to five times per week.
887	K. D. Knepley et al (2021). Impact of Telerehabilitation	Literature Review Articles were scored for methodological quality using the PEDro scale.	Types of TR included speech therapy, virtual reality (VR), robotic, community-based, goal setting, and motor	Frequently measured outcomes included motor function, speech, disability, and satisfaction	All 34 studies reported improvement from baseline after TR therapy.	+ Acceptable

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	for Stroke-Related Deficits. Telemedicine journal and e-health : the official journal of the American Telemedicine Association. 27: 3. 239-246.	34 articles with 1,025 patients were included.	training exercises.		All 15 studies that compared TR with traditional therapy showed equivalent or better functional outcomes. Home-based robotic therapy and VR were less costly than in-person therapy. Patient satisfaction with TR and in-person clinical therapy was similar. Although the majority of articles that reported satisfaction used non-standardized questionnaires or patient interviews.	Inconsistent outcome measurement scales makes meta-analysis of TR efficacy difficult. Research is limited by sample size, power, and study design.
888	K. E. Laver et al (2020). Telerehabilitation services for stroke. Cochrane Database of Systematic Reviews. 2020: 1. CD010255.	Systematic review of RCTS	Telerehabilitation interventions in stroke. Trials were categorised based on comparator – in-person rehab or no rehab.	Primary outcome was improvement in ADL, other impairment based and safety based outcomes were also reported.	22 RCTS (1937 participants). Substantial heterogeneity and risk of bias in included studies. Variable quality evidence suggesting no difference between telerehabilitation and conventional rehabilitation. Limited data on safety and economic analyses.	++ High quality systematic review
888	D. W. Lawson et al (2020). Telehealth Delivery of Memory Rehabilitation Following Stroke.	Study aim: investigation of feasibility and effectiveness of individual (1:1) telehealth (internet video-based) versus F2F memory rehab programme;	6-week memory rehabilitation including psychoeducation and compensatory memory training; Booster session condition: group with and without booster.	Participants in both conditions telehealth vs F2F) improved their personal goal attainment, improved their subjective	Telehealth 1:1 method had similar outcomes as F2F-group intervention outcomes.	- Research methods unclear: E.G. comparison of F2F to 1:1 telehealth and to existing group.

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	Journal of the International Neuropsychological Society : JINS. 26: 1. 58-71.	Comparison of outcomes with existing memory groups; Non-randomised trial. Outcome measure: patients' goal attainment; patient feedback about memory lapses and use of compensatory methods; objective memory tests. Participants: 46 stroke patients, allocated to either telehealth or F2F memory rehab program; age 18 plus; recent confirmed stroke. F2F: 18 participants; Telehealth: 28		everyday memory and prospective memory. Overall, subjective improvements. Objective memory test outcomes: mixed results.	F2F method had better outcomes than group. Booster sessions increased maintenance of improvements in those who received it and not in those who didn't have a booster.	However, this was pilot/preliminary evidence. Quality score: low.
891	G. Maresca et al (2019). Toward Improving Poststroke Aphasia: A Pilot Study on the Growing Use of Telerehabilitation for the Continuity of Care. Journal of Stroke and Cerebrovascular Diseases. 28: 10. 104303.	Pilot study. n=30 patients with aphasia (ischaemic or haemorrhagic stroke) admitted to rehab centre in Italy. Randomised to experimental (n=15) or control (n=15).	Two phases lasting 12 weeks each. Both groups performed the training 5 days a week, each session about 50 minutes. Experimental group: Phase 1 – experimental linguistic treatment performed using virtual reality rehabilitation system (VRRS) tablet. Phase 2 – provided with the VRRS tablet. Control group: Phase 1- trained with traditional linguistic treatment. Phase 2 – delivered to territorial services.	Participants assessed at baseline (T0), after 12 weeks (T1) and at the end of the protocol, 12 weeks later (T2). Token Test (TT) Esamae Neurologico Per L'Afasia (ENPA) Aphasic Depression Rating Scale Euro-Qol-5D (EQ-5D0 Psychosocial Impact of Assistive Devices (experimental group only)	No differences between groups at baseline. Significant difference between the two groups at the end of the study in all test scores. Experimental group improved in all areas except writing. Control group improved in comprehension, depression and QoL only.	**+/-** Limited information on randomisation and blinding details so unable to assess some aspects of study quality.

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892	A. Rintala et al (2019). Effectiveness of Technology-Based Distance Physical Rehabilitation Interventions for Improving Physical Functioning in Stroke: A Systematic Review and Meta-analysis of Randomized Controlled Trials. Archives of Physical Medicine and Rehabilitation. 100: 7. 1339-1358.	Aim: To study the effectiveness of technology-based distance physical rehabilitation interventions on physical functioning in stroke Design: A Systematic Review and Meta-analysis of Randomized Controlled Trials Subjects: stroke patients	Interventions: Technology-based distance physical rehabilitation interventions Comparison: any comparison without the use of technology;	Outcomes: Physical functioning: Activities of daily living (ADL), upper extremity functioning, lower extremity functioning, balance, walking, physical activity, and participation	13 studies included · Technologies and the content of the interventions in the experimental group were heterogeneous. · Online video monitoring was the most used technology. The second most common technology used for providing distance physical rehabilitation interventions was telephone calls conducted by a therapist or a nurse. The remaining 5 studies used technologies such as exercise videos through an electronic tablet, virtual training program for upper extremity functioning, exercises from a digital video disc or combination of physical exercise programs through the Internet along with gamification. · A meta-analysis of 6 RCTs indicated that technology-based distance physical rehabilitation had a similar effect on ADL (standard mean	**++** High quality

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					difference 0.06; 95% confidence interval: 0.22 to 0.35, PZ.67) compared to the combination of traditional treatments (usual care, similar and other treatment). · Similar results were obtained for other outcomes, except inconsistent findings were noted for walking. · Interventions heterogeneous & methodological quality of the studies and quality of evidence were considered low. · No data on resource utilization and cost-effectiveness People with cognitive problems often excluded from studies	
893	C. Salgueiro et al (2022). Telerehabilitation for balance rehabilitation in the subacute stage of stroke: A pilot controlled trial. NeuroRehabilitation.	Aim: To assess the effectiveness and feasibility of core stability exercises guided by a telerehabilitation App after hospital discharge. Setting: Design: A pilot controlled trial Subjects: Stroke patients d/c home from hospital. Subjects were invited to participate if they	Intervention: telerehabilitation App – AppG. All exercises produced by an experienced neurologic physiotherapist, who was also available for video calls using the App Control: Usual care	The Spanish-version of the >Trunk Impairment Scale > Function in Sitting Test (S-FIST) > Berg Balance Scale (BBS), > Spanish-version of Postural Assessment for Stroke Patients (S-PASS) > number of falls > Brunel Balance Assessment (BBA) > Gait	> 49 participants > AppG showed greater improvement in balance in both sitting and standing position and gait compared with CG, although no statistically significant differences were obtained. >Of the 13 subjects from the AppG who completed the study, only 4	Small pilot study >Only 13 participants in intervention group @ 3 month follow up

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		or the caregiver were regular users of a smartphone		Assessed before and after 3 months intervention.	participants (30.77%) regularly used the App.	
894	I. D. Saragih et al (2021). Effects of telehealth interventions on performing activities of daily living and maintaining balance in stroke survivors: A systematic review and meta-analysis of randomised controlled studies. Journal of clinical nursing.	A systematic literature review and meta-analysis. The intervention settings were: the community (n = 5 studies), home (n = 2), hospital (n = 4), long-term care (n = 1), neurological rehabilitation centre (n = 1) and national stroke association (n = 1). 14 studies with 1,367 participants were included in the analysis.	Telehealth interventions covered a range of educational topics, including physical exercise and the promotion of healthy behaviours. The total intervention time ranged from 1 to 12 months. The follow-up periods after the interventions were 3, 6 and 24 months. The intervention providers were therapists (n = 5), nurses (n = 2), physicians (n = 5) and a researcher (n = 1); one study did not identify the intervention provider	Activities of daily living (ADLs) and balance	Majority of participants were male (64%), although four studies did not report the gender of their participants. The ages of the participants ranged from 41 to 75 years Overall, telehealth interventions were effective in improving stroke survivors' abilities to carry out their ADLs (standardised mean difference: .45; 95% confidence interval: .12 to .78); however, no significant effects were found on balance Variance in the quality of the included studies was found. However, the examination of the funnel plots showed considerable symmetry for all of our outcome analyses, both of the outcomes; independency to perform activities of daily living and balance did not show an	+ Acceptable Only included studies published in English

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					asymmetrical outlier on the funnel plot	
895	F. S. Sarfo et al (2018). Tele-Rehabilitation after Stroke: An Updated Systematic Review of the Literature. Journal of Stroke and Cerebrovascular Diseases 27: 9. 2306-2318.	Systematic review of RCTS	Telerehabilitation interventions for motor impairment, higher cortical dysfunction and depression. Telerehabilitation included telephone, video and robot based interventions.	Various outcomes.	22 RCTs included, 18 with a motor function focus. Across heterogenous outcomes, a mix of interventions were reported as offering similar or improved outcomes compared to various comparators.	**0** Poor quality systematic review with inadequate search strategy, no registered protocol, methods that deviate from stated aims, no attempt at assessing risk of bias.
896	N. L. Saywell et al (2021). Telerehabilitation After Stroke Using Readily Available Technology: A Randomized Controlled Trial. Neurorehabilitation and Neural Repair. 35: 1. 88-97.	Design: multi centre 2 arm, parallel randomised controlled trial, Setting: 4 sites in New Zealand Participants: n=95 IG n= 47, control n=48 IG at 6 months n= 39 IG at 12 months n=35 CG at 6 months n=44 CG at 12 months n=40 (numbers & reasons on CONSORT diagram confusing; 21% drop out rate)	Intervention group: Augmented Community Telerehabilitation Intervention (ACTIV) is a structured 6-month programme comprising face to face sessions, telephone contact and text message reminders to support ongoing physical activity. Underpinned by Self Efficacy Theory. The intervention focussed on exercises for two functional categories: staying upright and using your arm. Programme was delivered by physical therapists. Each participant received 4 face to face visits, 5 structured phone calls, and personalised text messages. Phone calls focussed on helping participants formulate a strategy to stay engaged in the programme and they could	Assessments carried out at baseline, end of intervention (6 months) and 12 months (6 months post end of intervention) Primary outcome: Physical function measured by Stroke Impact Scale. Secondary outcomes: Hand grip strength and balance measured by JAMAR hand-held dynamometer (hand grip strength) and the Step Test (balance) Self-efficacy measured by the Stroke Self-Efficacy Questionnaire.	CTIV was not effective in improving physical function in the ACTIV group compared with the usual care group. The per-protocol analysis raises the possibility that for those who receive more than 50% of the intervention, ACTIV may be effective in preventing deterioration or even improving physical function in people with stroke, in the period immediately following discharge from hospital. No evidence of longer-term effectiveness (i.e. at 12 months).	**+** Acceptable Participants in the intervention group did not show significant changes in physical function at the end of the intervention period compared with the usual-care control group. Well-designed study that addresses many items of the quality appraisal checklist here but a few concerns: all participants had already completed usual rehabilitation, meaning it was not clear at the outset of the trial whether a small addition of input would affect physical function.

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			clarify exercise instructions or alter exercise parameters with the therapist. Text messages used to encourage continuation of the exercises and acknowledge progress. Control group: Standard rehab care from services in New Zealand (not described)	Health outcomes/impact of stroke measured by the Stroke Impact Scale (overall stroke recovery rating and each of the 8 domains) and the Visual Analogue Scale of the EuroQol 5D (EQ-5D)	In the intention-to-treat analysis, the effect of ACTIV on the primary outcome measure at 6 months did not reach significance (4.51; 95% CI = −0.46, 9.48; P = .07). The effect of ACTIV on the primary outcome based on the per-protocol analysis was significant (4.98; 95% CI = 0.003, 9.95; P = .0499) and indicated that ACTIV improved physical function after stroke for those who received at least 50% of the intervention. At the 12-month follow-up, the effect of ACTIV on the SIS3.0 physical function subscale was nonsignificant (1.72; 95% CI = −4.04, 7.48; P = .55), suggesting that there was no retention of gains made during the intervention. At the end of the intervention (6-month assessment), the effect for the participation	CONSORT diagram shown but numbers excluded and reasons for this don't add up with the final figures provided for 6- and 12-month analyses. Authors state that Many people required rehabilitation but were either unable to be contacted or did not wish to receive ACTIV. This means that only a small number of potential participants received ACTIV, which limited the generalizability of ACTIV to the whole stroke population. Recruitment is a challenge in these studies (recurring issue).

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					subscale of the SIS showed a significant beneficial effect in favor of ACTIV (11.34; 95% CI = 2.54, 20.14; P = .012). However, this was not sustained at the 12-month assessment because there were no between group differences in any SIS3.0 domains. In addition, ACTIV showed no significant effects on grip strength, balance, or self-efficacy (SSEQ). The ACTIV group showed a significant improvement on the EQ-5D VAS at 6 months (10.09; 95% CI = 0.53, 19.65; P = .04). The effect of ACTIV on the EQ-5D VAS at 12 months was also significant, but participants in the intervention group had significantly lower EQ-5D VAS scores than those in the control group (−10.76; 95% CI =−19.86, −1.67; P = .02). The results of the sensitivity analyses showed that the best and	

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					worst cases for the intervention lay considerably outside the confidence bounds for grip strength outcomes and, to a lesser extent, the SIS physical subcomponent, SSEQ, and SIS3.0 stroke recovery rating scores.	
897	J. Schroder et al (2019). Combining the benefits of tele-rehabilitation and virtual reality-based balance training: a systematic review on feasibility and effectiveness. Disability and rehabilitation. Assistive technology 14: 1.	Literature review Seven studies (n =120) were included, of which four are RCTs. Literature searches were conducted in 5 databases. Randomized controlled trial (RCT) and non-RCT investigating feasibility and effectiveness of VR based tele-rehabilitation were included. Based on the risk of bias and study design, methodological quality is ranked according to the GRADE guidance	3 included studies used a commercially available gaming device to provide VR. All systems investigated in this review displayed the VR on a screen	Perceived enjoyment, cost benefit, Outcome of effectiveness	Insufficient data for a meta-analysis VR can increase motivation allowing longer and more training sessions in community-dwelling stroke survivors. Therefore, combining the benefits of both approaches seems convenient. Although evidence is still sparse, functional improvements seem to be equal compared to a similar intervention with therapist- supervision in the clinic, suggesting that for cost-efficient rehabilitation parts of therapy can be transferred to the homes	+ Acceptable Of the RCTs, one is of good quality, one of fair quality and two present a high risk of bias). Both case studies and the case control study are according to design (small sample size) and modest to high risk of bias ranked as 2– quality
898	H. Tchero et al (2018). Telerehabilitation for Stroke	SR & MA; 15 studies included, 1339 patents (12 studies in MA, 1246 patients)	Telerehabilitation, any type, in poststroke patients in comparison to usual rehabilitation methods; follow-	(i) Motor performance (ii) ADLs (iii) HRQoL (patient & carer) (iv) Satisfaction with care	Patients on telerehabilitation show comparable improvement to those	+ Less than optimal scientific quality of included studies,

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	Survivors: Systematic Review and Meta-Analysis. Journal of Medical Internet Research. 20: 10. e10867.		up period ranged between 4-24 weeks	(v) Cost-effectiveness	receiving usual care for (i), (ii), and (iii) Only three studies reported on satisfaction with care. One study shows reduced costs for telerehabilitation (by US $654) with similar efficacy.	alternative method of examining publication bias not described
900	B. Vahlberg et al (2021). Effects on walking performance and lower body strength by short message service guided training after stroke or transient ischemic attack (The STROKEWALK Study): a randomized controlled trial. Clinical rehabilitation. 35: 2. 276-287.	Aim: Do distant (via mobile phone message) prompts for 3-months increase mobility and physical activity? Randomised controlled trial Data collection 2016-2018, 79 patients (mean age 63.9, 29 women) Randomly assigned to control and intervention; Intervention group: standard care plus daily phone instructions to walk outdoors and to do leg exercises; Control group: standard care	Measures: six minutes walking test, lower body strength, physical performance battery, 10 metres walk; Patients tested at baseline and after three months.	No statistical difference between groups. Intervention group was a bit better (p=0.037) on the walking test and the lower-body strength test (p=0.034); No difference re physical performance and 10-metres walking	After three month: both groups had improved walking performance and lower body strength; Mobile phone prompts did not significantly improve mobility performance. That means that mobility training is effective, but the extra mobile phone prompts didn't seem to improve this even more.	High quality re all research components

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		Primary care follow-up.				
878	K. T. Abel et al (2019). Home-based technologies for stroke rehabilitation: A systematic review. International Journal of Medical Informatics. 123.	SR, 31 included studies, n = not reported, looking at 25 projects (US, Europe, New Zealand, China), Each project included one or more types of technologies; mix of quantitative (12), qualitative (2) and mixed (11) design. Objective is stated as an attempt to synthesize the current knowledge of technologies and human factors in home-based technologies for stroke rehabilitation, no research question or attempt to compare outcomes across different conditions	Studies describing technological means to help stroke patients conduct rehabilitation at home, all types (telerehabilitation, virtual reality, games, robotic devices, wearable sensors, tablets)	Main therapy outcome(s) not described. Reference made to quantitative and qualitative findings without specifying measures or domains under evaluation.	No pooled analysis attempted. Findings reported descriptively, mostly commenting on results from individual studies (e.g. improved motor skills). Qualitative findings show patients demonstrated observable improvement in physical performance and ADLs; examples given from individual studies (self-reported comments by study participants).	**0** Reject
880	Y. Chen et al (2020). A qualitative study on user acceptance of a home-based stroke telerehabilitation system. Topics in stroke rehabilitation. 27: 2. 81-92.	Qualitative design Semi-structured interviews n=13 participants in subacute phase of stroke who had completed a six week intervention using the home-based telerehabilitation system. Participants were enrolled in a clinical trial of arm motor rehab therapy and	Telerehabilitation system provides daily guided rehabilitation games, exercises and stroke education in the patients' home	Aims to investigate patients' perceived benefits of and barriers to using the telerehab system at home. Analysed using thematic analysis.	Mostly reported positive experiences of using the telerehab system. Benefits include: perceived improvements in physical abilities, cognitive abilities and emotional wellbeing. Perceived the system was easy to use because of the engaging experience	**N/A** No SIGN checklist. Authors completed COREQ checklist. Not clear how participants were sampled.

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		were randomised to receive 6 weeks of novel home based telerehab system designed to improve motor recovery and patient education following stroke.			and convenience of completing at home.	
889	D. W. Lawson et al (2022). Acceptability of telehealth in post-stroke memory rehabilitation: A qualitative analysis. Neuropsychological rehabilitation. 32: 1.	Study aim: to run interviews with stroke survivors to find out whether and how they found a video-based memory intervention useful. Community patients; Recruited via online stroke forum adverts, referred to neuropsychology; Inclusion: age 18+, stroke 3 months prior, post-stroke memory probs., available for intervention; Exclusion: progressive neurodegenerative memory disorder, psychiatric issues, severe language issues, Total inc.: 25 stroke survivors	6-weeks telehealth memory rehab program; 1:1 sessions; Aim: improve everyday memory, use compensatory strategies, psychoeducation, lifestyle improvements; Outcome measures: Memory tests	Thematic interview analysis: Outcomes: 1. About content of programme: just reflections made; 2. Strategy usage: 80% of participants enjoyed this component, 3. Learning about self/confidence: 40% of participants found psychoeducation helpful; 4. Tailored content: use of 1:1 tailored to patient discussed, mixed feedback 5. Rapport: good rapport via telehealth/video work 6. Integration of method with home life: 33% found this useful to do at home Role of telerehab.: 68% participants valued access to rehab via telehealth	25 stroke survivors who completed the course and 9 clinicians were interviewed about the usefulness of the course; Improvements of everyday memory strategy use:- 72% of participants found this beneficial, the others had not used the strategies; Telehealth method was accepted by participants.	Good quality; Highly standardised intervention and interview
899	S. Tyagi et al (2018). Acceptance of Tele-Rehabilitation by Stroke Patients:	Community, Singapore Qualitative study with semi-structured interviews and focus groups	Study was part of a larger RCT (Singapore Tele-technology Aided Rehabilitation in Stroke trial). Stroke patients had completed the TR programme	Perceived barriers and facilitators for telerehab uptake as reported by stroke patients, their	Facilitators identified by patients: affordability and acceptability	**N/A** No SIGN checklist

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	Perceived Barriers and Facilitators. Arch Phys Med Rehabil. 99: 12. 2472-2477.	n=37 stroke patients and their caregivers, tele-therapists selected by purposive sampling.	and were enrolled along with their caregiver.	caregivers and teletherapists. Analysed using thematic analysis.	Facilitators identified by tele-therapists: filling a service gap Both groups identified unexpected benefits (e.g. detecting uncontrolled hypertension). Barriers identified by patients: difficulties with equipment set up and limited scope of exercises Barriers identified by tele-therapists: patient assessments, interface problems and limited scope of exercises. Both groups identified connectivity issues. Patient perceptions and choice of rehab were modified by patient characteristics (age, stroke severity, caregiver support and cultural influences).	Recruited participants who had completed the intervention in the RCT.