

Supplemental File

Scoping Review of Telehealth for Musculoskeletal Disorders: Applications for the COVID-19 pandemic

Frank M Bucki, DC; Clay Michael, DC, MPH; Tobicznyk Hannah, DC;

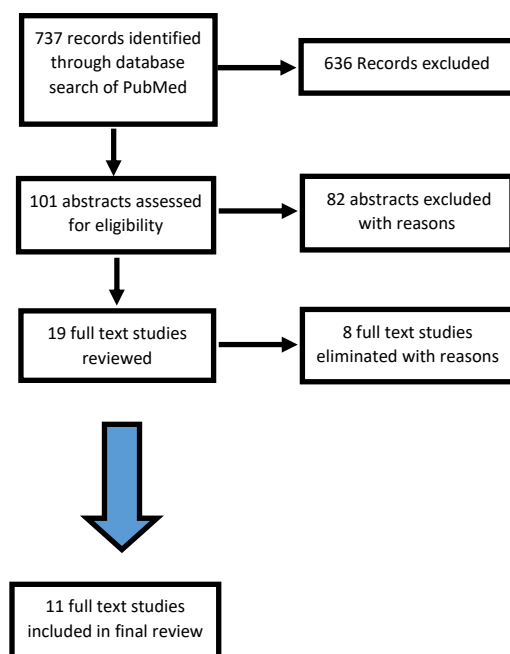
Bart Green, DC, MEd, PhD

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Search strategy

telerehabilitation AND musculoskeletal
telemedicine AND chiropractic
tele AND therapy AND efficacy
tele AND ergonomics
tele AND exercise
telerehabilitation and cost
telerehabilitation AND access
telerehabilitation AND Patient Satisfaction
telerehabilitation AND veteran
tele AND rehabilitation

Study Flow Diagram



Reasons for exclusion

Study Name	Type of Study	Round 1 (I/E)	Round 2 (I/E)	Round 3 (I/E)	Round 4 (I/E)	Exclusion reasons/ comments	MESH Term Used
Effectiveness of physiotherapy with telerehabilitation in surgical patients: a systematic review and meta-analysis.	Systematic review and Meta-analysis	Exclude				Systematic Review	Telerehabilitation and Patient Satisfaction Abstracts for Review
Use of a modified treatment-based classification system for subgrouping patients with low back pain: Agreement between telerehabilitation and face-to-face assessments.	RCT	Include					Telerehabilitation and Patient Satisfaction Abstracts for Review
The Role of Virtual Rehabilitation in Total and Unicompartmental Knee Arthroplasty.	Retrospective Review	Exclude				Not a comparative study	Telerehabilitation and Patient Satisfaction Abstracts for Review
USEQ: A Short Questionnaire for Satisfaction Evaluation of Virtual Rehabilitation Systems.	??? Case study	Exclude				Not a comparative study	Telerehabilitation and Patient Satisfaction Abstracts for Review
Telerehabilitation of Patients with Injuries of the Lower Extremities.	Clinical Trial	Exclude				Not video-based	Telerehabilitation and Patient Satisfaction Abstracts for Review
The cost-effectiveness of a web-based multimodal therapy for unilateral cerebral palsy: the Mitii randomized controlled trial.	RCT	Exclude				Not musculoskeletal	Telerehabilitation and Patient Satisfaction Abstracts for Review
Effectiveness of telerehabilitation programme following surgery in shoulder impingement syndrome (SIS): study protocol for a randomized controlled non-inferiority trial.	RCT	Exclude				Trial	Telerehabilitation and Patient Satisfaction Abstracts for Review

Toward Patient-Centered Telerehabilitation Design: Understanding Chronic Pain Patients' Preferences for Web-Based Exercise Telerehabilitation Using a Discrete Choice Experiment.	RCT	Exclude				Not a comparative study	Telerehabilitation and Patient Satisfaction Abstracts for Review
The effectiveness and satisfaction of web-based physiotherapy in people with spinal cord injury: a pilot randomised controlled trial.	RCT	Exclude				Not Musculoskeletal	Telerehabilitation and Patient Satisfaction Abstracts for Review
Is an in-home telerehabilitation program for people with proximal humerus fracture as effective as a conventional face-to face rehabilitation program? A study protocol for a noninferiority randomized clinical trial.	RCT	Exclude				Trial	Telerehabilitation and Patient Satisfaction Abstracts for Review
Patient Satisfaction with In-Home Telerehabilitation After Total Knee Arthroplasty: Results from a Randomized Controlled Trial.	RCT	Include					1.Telerehabilitation and Patient Satisfaction Abstracts for Review 2.Telerehabilitation AND Cost
Home tele-rehabilitation for rheumatic patients: impact and satisfaction of care analysis.	RCT	Exclude				Not musculoskeletal	Telerehabilitation and Patient Satisfaction Abstracts for Review
Clinical outcomes of remote asynchronous telerehabilitation are equivalent to traditional therapy following total knee arthroplasty: A randomized control study.	RCT	Exclude				Not live – pre-recorded video	Telerehabilitation and Patient Satisfaction Abstracts for Review
Effects of physical therapy delivery via home video telerehabilitation on functional and health-related quality of life outcomes.	Research Support, US Government, Non-PHS	Exclude				Not a comparative study	Telerehabilitation and Patient Satisfaction Abstracts for Review

Web-based physiotherapy for people moderately affected with Multiple Sclerosis; quantitative and qualitative data from a randomized, controlled pilot study.	RC pilot study	Exclude				Not musculoskeletal	Telerehabilitation and Patient Satisfaction Abstracts for Review
The patient's perspective of in-home telerehabilitation physiotherapy services following total knee arthroplasty.	Research Support, Non-US Gov't	Exclude				Not a comparative study	Telerehabilitation and Patient Satisfaction Abstracts for Review
Patients' satisfaction of healthcare services and perception with in-home telerehabilitation and physiotherapists' satisfaction toward technology for post-knee arthroplasty: an embedded study in a randomized trial.	Embedded study in randomized trial	Include					1. Telerehabilitation and Patient Satisfaction Abstracts for Review 2. Telerehabilitation AND Access
An exploration of chronic pain patients' perceptions of home telerehabilitation services.	Research Support, Non-US Gov't	Exclude				Not a comparative study	Telerehabilitation and Patient Satisfaction Abstracts for Review
Patients' experiences of telerehabilitation at home after shoulder joint replacement.	??? Case study	Exclude				Not a comparative study	Telerehabilitation and Patient Satisfaction Abstracts for Review
Feasibility study of home telerehabilitation for physically inactive veterans.	Research Support, US Gov't, Non-PHS	Exclude				Not Video based	Telerehabilitation and Patient Satisfaction Abstracts for Review
Functional and clinical outcomes of telemedicine in patients with spinal cord injury.	Multicenter Study, RCT	Exclude				Not musculoskeletal	Telerehabilitation and Patient Satisfaction Abstracts for Review
A systematic review of clinical outcomes, clinical process, healthcare utilization and costs	Systematic Review	Exclude				Systematic Review	Telerehabilitation and Patient Satisfaction Abstracts for Review

associated with telerehabilitation.							
Telerehabilitation for veterans with a lower-limb amputation or ulcer: Technical acceptability of data.	Evaluation Studies, Research Support, US Gov't, Non-PHS	Exclude				Not musculoskeletal	Telerehabilitation and Patient Satisfaction Abstracts for Review
Utilization of Interactive Clinical Video Telemedicine by Rural and Urban Veterans in the Veterans Health Administration Health Care System.	Observational Study	Exclude				Not a comparative study	Miscellaneous
Factors influencing the adoption of telemedicine for treatment of military veterans with post-traumatic stress disorder.	Review	Exclude				Not musculoskeletal	Miscellaneous
Financial and Temporal Advantages of Virtual Consultation in Veterans Requiring Specialty Care.	Cohort Study	Exclude				Not a comparative study	Miscellaneous
Digital Support Interventions for the Self-Management of Low Back Pain: A Systematic Review.	Systematic Review	Exclude				Systematic Review	Miscellaneous
First-contact care with a medical vs chiropractic provider after consultation with a swiss telemedicine provider: comparative of outcomes, patient satisfaction, and health care costs in spinal, hip, and shoulder pain patients.	Comparative Study, Research Support Non-US Gov't	Exclude				Not video-based	Miscellaneous
Tracking the evolution of virtual reality applications to rehabilitation as a field of study.	Review	Exclude				Not a comparative study	Tele and therapy and efficacy
A physical therapy programme for functional motor symptoms: A telemedicine pilot study.	Pilot study	Exclude				Not a comparative study	Tele and therapy and efficacy
Evaluation of an innovative tele-education intervention in chronic pain management for primary care clinicians	Pre-post study	Exclude				Not Musculoskeletal	Tele and therapy and efficacy

practicing in underserved areas.							
Testing Tele-Savvy: Protocol for a randomized controlled trial.	RCT	Exclude				Trial	Tele and therapy and efficacy
Efficacy of tele-rehabilitation compared with office-based physical therapy in patients with knee osteoarthritis: A randomized clinical trial.	RCT	Exclude				Not video-based	Tele and therapy and efficacy
Abstinence Reinforcement Therapy (ART) for rural veterans: Methodology for an mHealth smoking cessation intervention.	RCT	Exclude				Not musculoskeletal	Tele and therapy and efficacy
Development and Implementation of Tele-Savvy for Dementia Caregivers: A Department of Veterans Affairs Clinical Demonstration Project.	Multicenter Study, Research Support, US Gov't, Non-PHS	Exclude				Not musculoskeletal	Tele and therapy and efficacy
[Rehabilitation using telemedicine].	Review	Exclude				Not a comparative study	Tele and therapy and efficacy
Group tele-exercise for improving balance in elders.	Evaluation Study	Exclude				Not musculoskeletal	Tele and therapy and efficacy
The effect of McKenzie therapy as compared with that of intensive strengthening training for the treatment of patients with subacute or chronic low back pain: A randomized controlled trial.	RCT	Exclude				Does not address our question	Tele and therapy and efficacy
Effect of tele-rehabilitation on glucose control, exercise capacity, physical fitness, muscle strength and psychosocial status in patients with type 2 diabetes: A double blind randomized controlled trial.	RCT	Exclude				Not musculoskeletal	Tele and exercise
Rationale and design of a Scale-Up Project Evaluating Responsiveness to Home Exercise And Lifestyle Tele-	Trial	Exclude				Trial and not a comparative study	Tele and exercise

Health (SUPER-HEALTH) in people with physical/mobility disabilities: a type 1 hybrid design effectiveness trial.							
A home-based tele-rehabilitation protocol for patients with hip fracture called @ctivehip.	Clinical Trial, Research Support, Non-US Gov't	Exclude				Does not address our question	Tele and exercise
Feasibility and Clinical Efficacy of a Multidisciplinary Home-Telehealth Program to Prevent Falls in Older Adults: A Randomized Controlled Trial.	RCT	Exclude				Not musculoskeletal	Tele and exercise
Combining the benefits of tele-rehabilitation and virtual reality-based balance training: a systematic review on feasibility and effectiveness.	Systematic review	Exclude				Systematic Review	Tele and exercise
Rationale and design of the tele-exercise and multiple sclerosis (TEAMS) study: A comparative effectiveness trial between a clinic- and home-based telerehabilitation intervention for adults with multiple sclerosis (MS) living in the deep south.	Research Support, Non-US Gov't	Exclude				Not musculoskeletal	Tele and exercise
TEAMS (Tele-Exercise and Multiple Sclerosis), a Tailored Telerehabilitation mHealth App: Participant-Centered Development and Usability Study.	Usability Study	Exclude				Not musculoskeletal	Tele and exercise
Exploring physical activity behaviour - needs for and interest in a technology-delivered, home-based exercise programme among patients with intermittent claudication.	Cross-Sectional Study	Exclude				Not video-based	Tele and exercise
The rehabilitation enhancing aging through connected health (REACH) study: study	study protocol for a quasi-experimental clinical trial.	Exclude				Not musculoskeletal	Tele and exercise

protocol for a quasi-experimental clinical trial.							
Development of a Multidisciplinary and Telemedicine Focused System Database.	??? Case study (introducing software to group of patients)	Exclude				Does not address our question	Tele and exercise
Effects of home-based tele-exercise on sarcopenia among community-dwelling elderly adults: Body composition and functional fitness.	RCT	Exclude				Not musculoskeletal	Tele and exercise
Consumer Perceptions of and Willingness to Use Remotely Delivered Service Models For Exercise Management of Knee and Hip Osteoarthritis: A Cross-Sectional Survey.	Cross-Sectional	Exclude				Not a comparative study	Tele and exercise
Web-based interventions in multiple sclerosis: the potential of tele-rehabilitation.	Review	Exclude				Not musculoskeletal	Tele and exercise
Motion trajectory analysis for evaluating the performance of functional upper extremity tasks in daily living: a pilot study.	Pilot study	Exclude				Does not address our question	Tele and exercise
Improving Preventive Healthcare with an User-centric Mobile Tele-monitoring Model.	Case study	Exclude				Not musculoskeletal	Tele and exercise
Tele-Supervised FES-Assisted Exercise for Hemiplegic Upper Limb.	RCT	Exclude				Not musculoskeletal	Tele and exercise
Quality and Quantity of Rehabilitation Exercises Delivered By A 3-D Motion Controlled Camera: A Pilot Study.	Pilot study	Exclude				Not a comparative study	Tele and exercise
Design, construction and validation of a portable care system for the daily telerehabilitation of gait.	Validation Study	Exclude				Does not address our question	Tele and exercise

The Effect of Tele-Monitoring on Exercise Training Adherence, Functional Capacity, Quality of Life and Glycemic Control in Patients With Type II Diabetes.	Review	Exclude				Not musculoskeletal	Tele and exercise
Comparison of telecommunication, community, and home-based Tai Chi exercise programs on compliance and effectiveness in elders at risk for falls.	RCT	Exclude				Not musculoskeletal	Tele and exercise
Trends in VA Telerehabilitation Patients and Encounters Over Time and by Rurality.	??? Review	Exclude				Not a comparative study	Telerehabilitation AND Veterans Abstracts for review
The Effect of Telerehabilitation on Missed Appointment Rates.	RCT	Exclude				Not musculoskeletal	Telerehabilitation AND Veterans Abstracts for review
Department of Veterans Affairs Polytrauma Telerehabilitation: Twenty-First Century Care.	Review	Exclude				Not Musculoskeletal	Telerehabilitation AND Veterans Abstracts for review
Web-based alcohol intervention for veterans: PTSD, combat exposure, and alcohol outcomes.	RCT	Exclude				Not Musculoskeletal	Telerehabilitation AND Veterans Abstracts for review
Increasing Access to Cost Effective Home-Based Rehabilitation for Rural Veteran Stroke Survivors.	RCT	Exclude				Not Musculoskeletal	Telerehabilitation AND Veterans Abstracts for review
Benefits and Challenges of Delivering Tele-rehabilitation Services to Rural Veterans.	??? Case study	Exclude, could extract data				Not a comparative study	Telerehabilitation AND Veterans Abstracts for review
Home Clinical Video Telehealth Promotes Education and Communication with Caregivers of Veterans with TBI.	Case Report, Research Support, US Gov't Non-PHS	Exclude				Not musculoskeletal	Telerehabilitation AND Veterans Abstracts for review
Feasibility study of home telerehabilitation for physically inactive veterans.	Research Support, US Gov't Non-PHS	Exclude				Not video-based	Telerehabilitation AND Veterans Abstracts for review

Military and VA telemedicine systems for patients with traumatic brain injury.	Research Support, US Gov't Non-PHS, Non-US Gov't	Exclude				Not Musculoskeletal	Telerehabilitation AND Veterans Abstracts for review
Telerehabilitation for veterans with a lower-limb amputation or ulcer: Technical acceptability of data.	Evaluation Study, Research Support, US Gov't Non-PHS	Exclude				Not Musculoskeletal	Telerehabilitation AND Veterans Abstracts for review
Telehealth and ergonomics: a pilot study.	Pilot Study	Exclude				Pilot study	Tele and ergonomics
Measurement of physical quantities in upper-limb tele-rehabilitation.	Evaluation Study	Exclude				Not Musculoskeletal	Tele and ergonomics
Apps and Mobile Health Technology in Rehabilitation: The Good, the Bad, and the Unknown.	Review	Exclude				Not video-based	Telerehabilitation AND Musculoskeletal abstracts for review
Clinicians' Perspectives of a Novel Home-Based Multidisciplinary Telehealth Service for Patients with Chronic Spinal Pain.	Crossover study	Exclude				Does not address our question	Telerehabilitation AND Musculoskeletal abstracts for review
Telehealth Physical Therapy in Musculoskeletal Practice.	Review	Exclude				Not a comparative study	Telerehabilitation AND Musculoskeletal abstracts for review
Case Studies in Physical Therapy: Transitioning A "Hands-On" Approach into A Virtual Platform.	Case Report	Exclude				Not a comparative study	Telerehabilitation AND Musculoskeletal abstracts for review
Follow-up monitoring of physical activity after rehabilitation by means of a mobile application: Effectiveness of measurements in different age groups.	Clinical Trial	Exclude				Not video-based	Telerehabilitation AND Musculoskeletal abstracts for review
The Role of Virtual Rehabilitation in Total Knee and Hip Arthroplasty.	Research Support, Non-US Gov't	Exclude				Not live video based	Telerehabilitation AND Musculoskeletal abstracts for review

Telehealth applications for outpatients with neuromuscular or musculoskeletal disorders.	Review	Exclude				Not a comparative study	Telerehabilitation AND Musculoskeletal abstracts for review
Service provider perceptions of telerehabilitation as an additional service delivery option within an Australian neurosurgical and orthopaedic physiotherapy screening clinic: A qualitative study.	Multicenter Study	Exclude				Does not address our question	Telerehabilitation AND Musculoskeletal abstracts for review
Randomized Controlled Trial of Adding Telephone Follow-Up to an Occupational Rehabilitation Program to Increase Work Participation.	RCT	Exclude				Not video-based	Telerehabilitation AND Musculoskeletal abstracts for review
Evidence of Benefit of Telerehabilitation After Orthopedic Surgery: A Systematic Review.	Systematic Review	Exclude				Systematic Review	Telerehabilitation AND Musculoskeletal abstracts for review
Telerehabilitation after arthroscopic subacromial decompression is effective and not inferior to standard practice: Preliminary results.	RCT	Include	Exclude			Telerehabilitation intervention was not live and included TR system of recording and app	1. Telerehabilitation AND Musculoskeletal abstracts for review 2. Telerehabilitation AND Access 3. Telerehabilitation AND Cost
Use of videoconferencing for physical therapy in people with musculoskeletal conditions: A systematic review.	Systematic Review	Exclude				Systematic Review	Telerehabilitation AND Musculoskeletal abstracts for review
Real-time telerehabilitation for the treatment of musculoskeletal conditions is effective and comparable to standard practice: a systematic review and meta-analysis.	Systematic Review	Exclude				Systematic review	Telerehabilitation AND Musculoskeletal abstracts for review

Validity and reliability of Internet-based physiotherapy assessment for musculoskeletal disorders: a systematic review.	Systematic Review	Exclude				Systematic review	Telerehabilitation AND Musculoskeletal abstracts for review
Physiotherapy assessment and diagnosis of musculoskeletal disorders of the knee via telerehabilitation.	Cross-over study; RCT	Include					Telerehabilitation AND Musculoskeletal abstracts for review
Effects of Adding an Internet-Based Pain Coping Skills Training Protocol to a Standardized Education and Exercise Program for People With Persistent Hip Pain (HOPE Trial): Randomized Controlled Trial Protocol.	RCT	Exclude				not video based	Telerehabilitation AND Musculoskeletal abstracts for review
Efficacy of a telerehabilitation intervention programmed using biofeedback among computer operators.	Case study					Not Musculoskeletal	Telerehabilitation AND Musculoskeletal abstracts for review
The validity of physical therapy assessment of low back pain via telerehabilitation in a clinical setting.	RCT, Validation Study	Include					1. Telerehabilitation AND Musculoskeletal abstracts for review 2. Telerehabilitation AND Access
Agreement between telerehabilitation and face-to-face clinical outcome assessments for low back pain in primary care.	RCT	Exclude				Pilot study	Telerehabilitation AND Musculoskeletal abstracts for review
Assessment and Diagnosis of Musculoskeletal Shoulder Disorders over the Internet.	RCT	Include					Telerehabilitation AND Musculoskeletal abstracts for review
Validity and reliability of the assessment and diagnosis of musculoskeletal elbow disorders using telerehabilitation.	RCT, Validation Study	Include					Telerehabilitation AND Musculoskeletal abstracts for review

Telerehabilitation mediated physiotherapy assessment of ankle disorders.	RCT, Validation Study	Include					Telerehabilitation AND Musculoskeletal abstracts for review
The diagnostic accuracy of telerehabilitation for non-articular lower-limb musculoskeletal disorders.	RCT, Validation Study	Include					1.Telerehabilitation AND Musculoskeletal abstracts for review 2.Telerehabilitation AND Access
Virtual rehabilitation-- benefits and challenges.	Review; Research Support	Exclude				Not a comparative study	Telerehabilitation AND Musculoskeletal abstracts for review
A home-based tele-rehabilitation protocol for patients with hip fracture called @ctivehip		Already Excluded				duplicate	Telerehabilitation AND Access
Effectiveness of an interactive telerehabilitation system with home-based exercise training in patients after total hip or knee replacement: study protocol for a multicenter, superiority, no-blinded randomized controlled trial	RCT	Exclude				Not complete study protocol	Telerehabilitation AND Access
Cost analysis of telerehabilitation after arthroscopic subacromial decompression.	RCT	Exclude				Study used TR program that included app software and not just video based one on one	1.Telerehabilitation AND Access 2.Telerehabilitation AND Cost
Telerehabilitation of Patients with Injuries of the Lower Extremities	Trial	Already Excluded				duplicate	Telerehabilitation AND Access

Telerehabilitation after arthroscopic subacromial decompression is effective and not inferior to standard practice: Preliminary results	RCT	Already Included				duplicate	Telerehabilitation AND Access
Patient Satisfaction with In-Home Telerehabilitation After Total Knee Arthroplasty: Results from a Randomized Controlled Trial.	RCT	Already Included				duplicate	Telerehabilitation AND Access
Conditions of Use, Reliability, and Quality of Audio/Video-Mediated Communications During In-Home Rehabilitation Teletreatment for Postknee Arthroplasty	RCT	Exclude				Did not compare with face to face in MSK setting	Telerehabilitation AND Access
The validity of physical therapy assessment of low back pain via telerehabilitation in a clinical setting	RCT	Already Included				duplicate	Telerehabilitation AND Access
A randomized controlled trial of home telerehabilitation for post-knee arthroplasty	RCT	Include					Telerehabilitation AND Access but actually measured outcomes and not access
Internet-based outpatient telerehabilitation for patients following total knee arthroplasty: a randomized controlled trial.	RCT	Include					Telerehabilitation AND Access but actually measured outcomes and not access
The diagnostic accuracy of telerehabilitation for nonarticular lower-limb musculoskeletal disorders.	RCT	Already Included				Duplicate	Telerehabilitation AND Access
Cost-effectiveness of a blended physiotherapy intervention compared to usual physiotherapy in patients with hip and/or knee osteoarthritis: a cluster randomized controlled trial	RCT	Exclude				Study blended Video and Face to Face and not direct comparison.	Telerehabilitation AND Cost
Cost analysis of telerehabilitation after	RCT	Already Excluded				Duplicate	Telerehabilitation AND Cost

arthroscopic subacromial decompression							
Efficacy of tele-rehabilitation compared with office-based physical therapy in patients with knee osteoarthritis: A randomized clinical trial	RCT	Already Excluded				Duplicate	Telerehabilitation AND Cost
Telerehabilitation after arthroscopic subacromial decompression is effective and not inferior to standard practice: Preliminary results.	RCT	Already Included				Duplicate	Telerehabilitation AND Cost
Effectiveness of telerehabilitation programme following surgery in shoulder impingement syndrome (SIS): study protocol for a randomized controlled non-inferiority trial	RCT	Already Excluded				Duplicate	Telerehabilitation AND Cost
Patient Satisfaction with In-Home Telerehabilitation After Total Knee Arthroplasty: Results from a Randomized Controlled Trial	RCT	Already Included				Duplicate	Telerehabilitation AND Cost
Effects of Adding an Internet-Based Pain Coping Skills Training Protocol to a Standardized Education and Exercise Program for People With Persistent Hip Pain (HOPE Trial): Randomized Controlled Trial Protocol	RCT	Already Excluded				Duplicate	Telerehabilitation AND Cost
Cost analysis of in-home telerehabilitation for post-knee arthroplasty	RCT	Exclude				Did not compare Video to MSK setting face to face.	Telerehabilitation AND Cost