



## Review

# Effectiveness of telerehabilitation interventions in persons with multiple sclerosis: A systematic review



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## ABSTRACT

**Background:** Telerehabilitation, a service delivery model using telecommunications technology to provide therapy at a distance, is used in persons with multiple sclerosis (pwMS), but evidence for their effectiveness is yet to be determined.

**Objective:** To investigate the effectiveness and safety of telerehabilitation intervention pwMS.

**Method:** A comprehensive literature search was conducted using medical and health science electronic databases. Three reviewers selected potential studies and independently assessed the methodological quality. A meta-analysis was not possible due to heterogeneity amongst included trials, and a qualitative analysis was performed for best evidence synthesis.

**Results:** Ten RCTs and 2 observational studies ( $n=564$  participants) investigated a wide variety of telerehabilitation intervention in pwMS, which included: physical activity; educational, behavioural and symptom management programmes. All studies scored “low to moderate” on the methodological quality assessment implying high risk of bias. Overall, the review found *low level* evidence for the effectiveness of telerehabilitation on reducing short-term disability and reducing and/or improving symptoms, such as fatigue. There was *low level* evidence suggesting some benefit of telerehabilitation in improving functional activities; improving symptoms in the longer-term; and psychological outcomes and quality of life. There is limited data on safety, process evaluation and no data on cost-effectiveness of telerehabilitation.

**Conclusions:** A wide range of telerehabilitation is used in pwMS, however, the quality of evidence on these interventions was low. More robust trials are needed to build evidence about these interventions.

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## 1. Introduction

Multiple sclerosis (MS) is the most common cause of neurological disability in young adults aged 18–50 years (Dombrov, 2011). The care needs in this population are complex, requiring longer-term multidisciplinary management (Khan and Gray, 2010; Khan et al., 2011; World Health Organisation (WHO), 2008). Despite recent advances in MS management, many persons with MS (pwMS) are unable to access these developments due to limited mobility, fatigue and related issues, costs associated with travel and limited access to services (Khan et al., 2009). With increasing financial constraints on healthcare systems, alternative methods of service delivery in the community and over a longer-term are regarded as a priority (Huijgen et al., 2008). The emerging advances in information and communication technology (ICT), telerehabilitation represent an alternative method to deliver therapy in a setting convenient to the patient, such as their home, by minimising the barriers of distance, time, cost and healthcare system load (Hailey et al., 2011; Khan et al., 2013).

Telerehabilitation can facilitate multifaceted, multidisciplinary management of person with MS (pwMS) beyond the clinical settings (Huijgen et al., 2008) and provide equal access to individuals who are geographically remote and are physically and economically disadvantaged (Hailey et al., 2011; Rogante et al., 2010). It can improve the quality of rehabilitation delivered (Hailey et al., 2011; Kairy et al., 2009; McCue et al., 2010; Rogante et al., 2010) by providing an opportunity to the therapists to evaluate the intervention previously prescribed, monitor adverse events, and patients' progress (Hailey et al., 2011; Steel et al., 2011). Moreover, through these programmes an intervention can be delivered to the number of the participants at any single time, which may not always be possible within the constraints of face-to-face treatment protocols (Hailey et al., 2011; Steel et al., 2011).

Telerehabilitation has been evaluated widely in literature and was found to be feasible and effective in various neurological conditions including stroke (Chumbler et al., 2012; Johansson and Wild, 2011; Legg and Langhorne, 2004; Perry et al., 2011), Parkinson's disease (Giansanti et al., 2008) and other non-neurological conditions such as musculoskeletal conditions (Russell et al., 2011; Tousignant et al., 2011), injuries (Bendixen et al., 2008; Forducey et al., 2003; Houlihan et al., 2011) and chronic diseases (Steel et al., 2011). A systematic review analysing telerehabilitation therapies in stroke survivors showed positive outcomes, with a reduction in the risk of deterioration, improved ability to perform activities of daily living, reduced costs and duration of rehabilitation (Legg and Langhorne, 2004). A wide range of telerehabilitation interventions have been trailed in pwMS (Hailey et al., 2011; Kairy et al., 2009; McCue et al., 2010; Rogante et al., 2010).

However, there is as yet no systematic review of studies using telerehabilitation in pwMS to guide treating clinicians with evidence regarding its feasibility, reliability, effectiveness and efficiency in this population. Therefore, the aim of this systematic review was to assess the effectiveness, safety and cost-efficiency of telerehabilitation interventions currently used for pwMS. This review included both qualitative (observational studies) and quantitative studies (experimental studies), to provide the broader picture of currently available evidence.

## 2. Methods

An integrated approach was employed, which included a comprehensive review of literature (peer review and grey literature), using medical and health science electronic databases: Medline, PubMed, EMBASE, AMED, CINAHL, PsycINFO, Cochrane Library databases up to August 2014. Bibliographies of identified articles and manual search of relevant journals for additional references was conducted. Authors and known experts in the field were contacted. Further, a grey literature search was conducted using different internet search engines and websites: such as the System for Information on Grey Literature in Europe, the New York Academy of Medicine Grey Literature Collection, the National Quality Measures Clearinghouse and Google Scholar. In addition, various healthcare institutions, governmental and non-governmental organisations associated with management of pwMS were also explored for relevant studies.

The same principle was used to search each database, which included all terms and phrases describing MS and telerehabilitation interventions, which was combined using the Boolean "OR". These terms then were grouped with the Boolean operator "AND" and the final search of the articles was performed from the displayed results. Medical subject heading (MeSH) search terms was used for all databases and a keyword search was used if the MeSH term was not available (Details available from authors). Publication bias was minimised by sourcing unpublished data where possible (Egger and Smith, 1998).

### 2.1. Inclusion and exclusion criteria

The term "telerehabilitation" for this review was defined as "the use of information and communication technologies as a medium for the provision of rehabilitation services to sites or patients that are at a distance from the provider" (Rogante et al., 2010; Theodoros and Russell, 2008). The applications encompass systems ranging from low-bandwidth low-cost videophones to highly expensive, fully immersive virtual reality systems with haptic interfaces (Theodoros and Russell, 2008).

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