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SPECIAL ARTICLE

# Evidence-based position paper on Physical and Rehabilitation Medicine (PRM) professional practice on telerehabilitation

## The European PRM position (UEMS PRM Section)

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## ABSTRACT

INTRODUCTION: The evidence on the utility and effectiveness of rehabilitation interventions delivered *via* telerehabilitation is growing rapidly. Telerehabilitation is expected to have a key role in rehabilitation in the future.
AIM: The aim of this evidence-based position paper (EBPP) is to improve PRM physicians' professional practice in telerehabilitation to be delivered to improve functioning and to reduce activity limitations and/or participation restrictions in individuals with a variety of disabling health conditions.
METHODS: To produce recommendations for PRM physicians on telerehabilitation, a systematic review of the literature and a consensus procedure by means of a Delphi process have been performed involving the delegates of all European countries represented in the UEMS PRM Section.
RESULTS: The systematic literature review is reported together with the 32 recommendations resulting from the Delphi procedure.
CONCLUSIONS: It is recommended that PRM physicians deliver rehabilitation services remotely, *via* digital means or using communication technologies to eligible individuals, whenever required and feasible in a variety of health conditions in favor of the patient and his/her family, based on evidence of effectiveness and in compliance with relevant regulations. This EBPP represents the official position of the European Union through the UEMS PRM Section and designates the professional role of PRM physicians in telerehabilitation.

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KEY WORDS: Telemedicine; Digital health; Telerehabilitation; Physical and Rehabilitation Medicine; Consensus.

## Introduction

The terms "telemedicine," "e-health," and "digital health" are increasingly being used in the health sector. The World Health Organization (WHO) defines telemedicine in a broader sense as "the delivery of healthcare services, where distance is a critical factor, by all healthcare professionals using information and communication technologies for the exchange of valid information for diagnosis, treatment and prevention of disease and injuries, research and evaluation, and for the continuing education of healthcare providers, all in the interests of advancing the health of individuals and their communities" (Quote. WHO, 2010, page 9).[1] Likewise, telerehabilitation, as part of the umbrella term Digital Health, is defined as "the delivery of medical or rehabilitative care to persons with rehabilitation needs *via* telecommunication or the internet" (Quote. Alexander, 2022, page 1).[2]

According to the WHO Global Observatory for eHealth (GOe) survey in 2010 aiming at acquiring information on eHealth in Member States, about 30% of responding countries were found to have a national agency for promoting and developing telemedicine with a similar situation in developing countries. As for those countries without any national telemedicine agencies, scientific institutions were attempting to develop telemedicine solutions in 50% of countries and 20% of those countries were evaluating the use of telemedicine.[1] Whereas in 2016, the WHO eHealth survey revealed that 70% of Member States had a national strategy or policy for eHealth with 90% of which indicating referral to universal health coverage.[3]

Due to these developments, the WHO released the guideline on digitally offered interventions with the aim of strengthening health systems based on the argument that digital technologies provide the potential to enhance the quality and coverage of health services.[4] Finally, in 2020, the WHO produced guiding principles for telemedicine in the COVID-19 era.[5] Another historical action was the submission of the draft "Regional digital health action plan for the WHO European Region 2023-2030" to the 72nd session of the WHO Regional Committee for Europe in September 2022,[6] which highlights the importance of digital health in improving the quality of care and making it more accessible.

In line with the efforts of the WHO, delivery of rehabilitation *via* telecommunication techniques (telerehabilitation) emerges as a priority in a changing world where the population is ageing rapidly resulting in functioning problems, and rehabilitation is considered the health strategy of the 21st century.[7]

Considering these arguments, it is desirable that telerehabilitation should be widely used among Physical and Rehabilitation Medicine (PRM) physicians in response to the growing needs for rehabilitation, given that at least one out of three individuals in the world are in need of rehabilitation at a certain point during a disease or injury.[8] The potential contribution of telerehabilitation to strengthening health systems becomes even more valuable, considering the resolution on "Strengthening rehabilitation in health systems" that has been adopted by the 76th World Health Assembly in May 2023.[9] The goal of the WHO resolution is the worldwide integration of rehabilitation into health systems so that any individual in need of rehabilitation may have access to it.[10] Telerehabilitation may play an important role in certain circumstances to address the unmet rehabilitation needs.

Indeed, the urgent need for telerehabilitation to be practiced during the pandemic has been discussed widely in the PRM community.[11-13] The feasibility of telerehabilitation in guaranteeing the continuity of rehabilitation care during the pandemic has been emphasized.[14] However, an evidence-based position paper (EBPP) still needs to be improved to promote telerehabilitation in the daily practice of PRM physicians.

The aim of this evidence-based position paper (EBPP) is to improve PRM physicians' professional practice in telerehabilitation to be delivered to improve functioning and to reduce activity limitations and/or participation restrictions in individuals in a variety of disabling health conditions.

## Materials and methods

This EBPP, comprising two parts, a "systematic review of the literature" and a "consensus with Delphi procedure among UEMS PRM Section delegates," is conducted based on the methodology proposed by the UEMS-PRM Section.[15] For the systematic review of the literature part,

the search term used was 'telerehabilitation' for retrieving articles in PubMed/MEDLINE.

The search was run on July 19th, 2022 first and updated searches were conducted in April 2023 and lastly on August 9th, 2023. Cochrane reviews (CRs), systematic reviews (SRs) and/or meta-analyses (MAs), randomized controlled trials (RCTs), and guidelines were prioritized in the systematic literature search. If an RCT was included in an SR, it was not addressed separately. Relevant RCTs published after the last search date of a systematic review were included to add recent evidence.

## Results

The systematic search of the literature (Figure 1 shows the paper selection process) guided us with significant scientific information regarding telerehabilitation practices both in terms of remote assessment and the delivery of rehabilitation interventions *via* telecommunication technologies. The evidence of effectiveness led to recommendations for improving professional practice of PRM physicians when delivering telerehabilitation within the fundamentals and principles of PRM.[16]

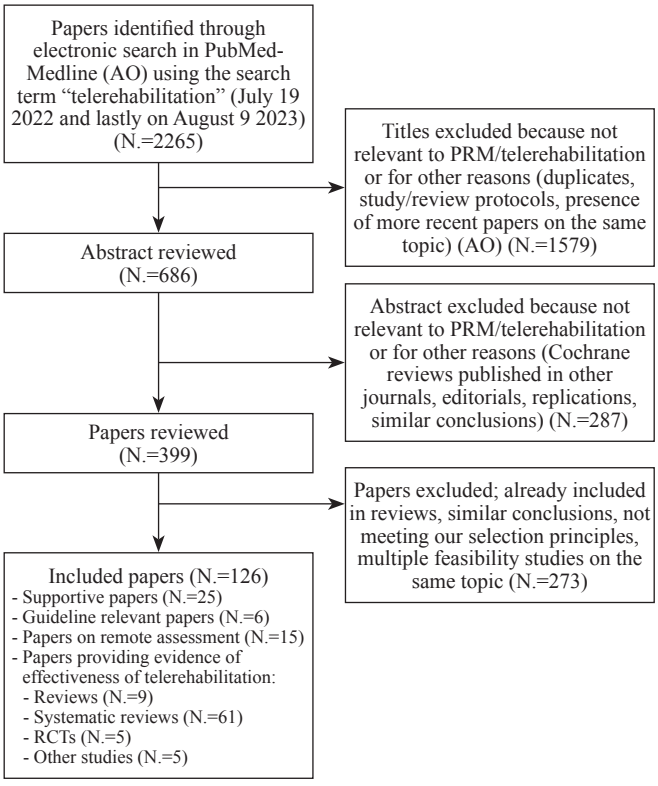


Figure 1.—Flow chart of paper selection.

### How to design an Individual Rehabilitation Project (IRP) using telecommunication technologies?

An IRP is a person-centered rehabilitation management scheme developed for each individual patient, composed of rehabilitation cycles which can be once or more.[17] Therefore, each component of the "rehabilitation cycle," including assessment (particularly functioning assessment), goal-setting, assignment and conduction of interventions, and evaluation[17, 18] need to be done using communication technologies, when referring to telerehabilitation, in accordance with regulations and guidelines for best practice, efficacy, and safety.[4, 5, 19-21]

### Diagnosis and assessment using digital techniques (remote assessment): a challenge for PRM physicians

Setting up or verifying clinical diagnosis belongs to the fundamental competencies of a PRM physician.[16] In certain circumstances, diagnosis can be made through videoconferencing. Telemedicine peripherals (examination medical devices) such as electronic stethoscopes, smartphones equipped with test-specific medical devices, wearables, and many others allow to perform many clinical tests that would be helpful in diagnosis, even if not a complete clinical examination. Since remote clinical examination does not allow manual and tactile approaches which are expected to provide clinically important information, reliability may be suboptimal in several aspects of remote evaluation, particularly in physical examination.[22-24] We need to be aware of the limitations in establishing primary diagnoses and verifying previous diagnoses during online consultations in PRM, particularly in newly referred patients, individuals with multimorbidity, and those reporting a recent change in their health.

Regarding assessment, particularly assessment of functioning, it is the first step in the "rehabilitation cycle" and the starting point of rehabilitation management.[18] Remote assessments are challenging for rehabilitation professionals. The COVID-19 pandemic, particularly during lock-down periods, made remote assessment imperative in certain conditions which may be achieved by remote consultations.[25]

Assessment in telerehabilitation may be done in synchronous or/and asynchronous environments, the former being conducted in real-time as a live session with a healthcare provider and on-line in the context of videoconferencing allowing a dynamic interaction. The latter is not real-time and adapted offline with a delay between the individual's input and the output of the healthcare provider after reviewing non-simultaneously. EMG-enhanced

motion analysis and wearable technologies including various types of sensors (force-based or speed-based or teleceptive sensors), intelligent robots, and augmented reality-based telerehabilitation systems with haptics can be helpful in remote assessment.[26-29] In addition, artificial intelligence as exemplified in the evaluation of swallowing sound in patients with amyotrophic lateral sclerosis in a study,[30] can be used for remote assessment.[31] Increasing research deals with the feasibility and validity of assessment methods and the specific tools used for assessment in diverse health conditions. A scoping review aimed at identifying outcome measures used for remote assessment of motor function and participation in neurological disorders listed a considerable number of measures ranging from range of motion, upper and lower extremity function, spasticity, and balance to a variety of assessment tools using diverse methods including virtual reality and wearable sensors, asynchronous mobile applications, synchronous videoconferencing, and others.[32] An SR looked at evidence regarding remote assessment of hand function in individuals with chronic neurological disorders in 74 retrieved studies including patients with Parkinson's disease, stroke, multiple sclerosis, spinal cord injury, and amyotrophic lateral sclerosis. The assessment modalities identified included external devices such as a wrist-worn accelerometer, tablet or smartphone (application-based assessments), and telerehabilitation platforms allowing synchronous assessment with high patient acceptability and feasibility. The most assessed functional domains included handwriting, hand tremor, finger tapping speed, and finger dexterity. Assessment *via* telerehabilitation platforms and smartphone or tablet applications showed statistically significant correlations with traditional in-presence assessment in most of the studies.[33] Another SR showed the feasibility of mobility assessment using physical performance measures at a distance or in a self-administered way in adults with the use of simple tools such as a chair and a stopwatch, smartphone applications, and/or videoconferencing.[34]

Recently, inertial measurement unit (IMU)-based motion capture (Mocap) systems have been introduced in remote assessment. An SR demonstrated that the IMU-based Mocap system was used for assessment in 82% of the studies evaluated while its use for training was 12% and the combination of both for assessment and training was 6%. System measurement categories included human kinematics, gait variables, and body motion. These systems are under development for achieving power-efficient chips or lower-consumption transmission methods to overcome sensor drift and low battery life as well as minimizing sensor errors.[35]

As a rule of thumb, when performing remote assessment some basic principles on effective and ethical conduction need to be followed as suggested in guidelines which include ensuring test security, preparatory virtual meeting before actual remote assessment, and a plan for troubleshooting problems as well as others depending on the assessment.[5, 36, 37]

### Evidence on the efficacy/effectiveness of telerehabilitation

Evidence regarding the utility and effectiveness of rehabilitation interventions delivered *via* telerehabilitation is growing rapidly in diverse areas of rehabilitation as will be detailed below.

### Telerehabilitation in disabling neurological conditions

Telemedicine was proposed to play an important role in approaching individuals with neurological disorders in terms of patient-clinician-interaction, remote clinical assessment and monitoring, and treatment.[38] The value of telerehabilitation in regaining motor function has been investigated in a variety of health conditions including neurological diseases.[39]

A randomized controlled multicenter trial aiming to investigate the feasibility of a telerehabilitation intervention for arm/hand function in a home setting showed a non-inferiority of home intervention as compared with usual care.[40] Telerehabilitation is deemed a viable alternative to traditional center-based rehabilitation with advantages of increased accessibility and being less costly[41] in neurological conditions.

#### *Stroke*

While telemedicine was encouraged to be integrated in standard stroke care[42] with growing stroke networks including teleconsultation and teleconference systems[43] before the pandemic, the COVID-19 pandemic served as a catalyst for the delivery of stroke rehabilitation using telecommunication. A Cochrane Review involving studies up to June 2019 indicated no difference between telerehabilitation and in-person rehabilitation regarding activities of daily living based on low certainty evidence.[44] Several SRs pointed to the comparable outcomes of telerehabilitation when compared to in-person traditional rehabilitation on upper extremity function and balance[45, 46] with strong evidence for balance[47] as well as equivalency in some other outcomes such as Barthel Index[48] and ADL.[49] Guide-

lines[50] can be consulted for details of providing rehabilitation to individuals with stroke using telecommunication technologies.

*Traumatic brain injury (TBI)*

The use of communication technologies in TBI revealed favorable outcomes such as improvement in emotional well-being, mood, functioning, sleep quality, and health-related quality of life (HRQoL) with structured telephone interventions and favorable effects on motivation with encouragement to return to home with virtual reality-based telerehabilitation.[51]

*Parkinson's disease (PD)*

An SR pointed to the feasibility of telerehabilitation in individuals with PD with effectiveness in improving or at least maintaining some parameters such as gait, balance, voice, speech, patient satisfaction, and HRQoL.[52] Another SR found virtual reality and exergames/telerehabilitation promising in the cognitive rehabilitation of patients with PD.[53] A third SR looked at the effectiveness of mobile application-based telerehabilitation revealing favorable results regarding HRQoL and patient adherence while not being superior to usual care in terms of balance and disease severity in PD.[54]

*Multiple sclerosis (MS)*

The effectiveness of telerehabilitation in MS was investigated in a Cochrane Review in 2015 which revealed low certainty evidence for telerehabilitation in reducing disability and symptoms (*e.g.*, fatigue) in the short term as well as low certainty evidence in improving functioning, some symptoms (*e.g.* pain, fatigue, insomnia) and HRQoL in the long term.[55] An SR reported that integrated telerehabilitation approach produced large effects on motor disability, medium effect on balance and gait, and small effects on cognitive functions and participation outcomes.[56] A recent SR investigating the effectiveness of home-based virtual reality training and telerehabilitation on balance in neurological diseases including MS reached to a conclusion of comparability to conventional therapy with the suggestion of their use as an add-on to outpatient care and to lengthen rehabilitation duration.[57] Indication of the effectiveness of Pilates-based telerehabilitation in improving physical performance and HRQoL in individuals with MS has been shown[58] so has the association with higher exercise compliance and satisfaction in addition to similar levels on measures of urinary incontinence, overactive bladder, and HRQoL.[59]

*Spinal cord injury (SCI)*

Telerehabilitation for people with SCI, termed as TeleSCI, has been used for prevention, chronic pain management, depression, anxiety, and for the delivery of rehabilitation interventions mostly using videoconferencing and expecting the use of application-based systems, wearable devices, bio and neurofeedback mechanisms with potential favorable impacts on health outcomes.[60] A review suggested potential effectiveness for communicating and collaborating, to be used for examination and guidance, but without conclusive evidence and with concerns for the safety and security that need further research.[61] An SR revealed improvements in the management of pressure ulcers, functioning, depression, and HRQoL in individuals with SCI living in low- and middle-income countries based on insufficient evidence for recommendations.[62] A recent scoping review concluded that telehealth/telerehabilitation may ensure efficient follow-up, rehabilitative care continuity, early detection of secondary complications, and their management in community-dwelling patients with SCI.[63] An RCT demonstrated that videoconferencing may be used efficiently for the management of pressure injuries in terms of HRQoL, healing, interaction, and satisfaction compared to conventional care for people with SCI.[64] Another RCT pointed to the feasibility, effectiveness, and safety of TeleSCI in terms of improvement in self-care, mobility, and anxiety in individuals with SCI.[65]

*Telerehabilitation in speech, language, and swallowing disorders relevant to neurological conditions*

Similar gains were reported both with telerehabilitation and face-to-face speech and language therapy regarding naming accuracy, auditory comprehension, Aphasia Quotient and functional communication skills in individuals with neurological health conditions including additional cognitive impairments.[66] An SR drew attention to the utility of the use of telehealth for the assessment and treatment of speech and language disorders and for educating students in this area.[67]

Remote dysphagia rehabilitation was suggested as a valid resource requiring further studies.[68]

*Cost-effectiveness of telerehabilitation in neurological conditions*

An SR evaluating ten studies pointed to its utility in terms of both cost and effectiveness when compared to in-presence rehabilitation in chronic neurological diseases. Cognitive-behavioral therapy delivered *via* telecommunication technologies was the most cost-saving among the different

interventions evaluated. Also, motor telerehabilitation, and monitoring and assessment devices at home revealed promising results in this regard.[69]

### Telerehabilitation in disabling pulmonary conditions

*Chronic obstructive pulmonary disease (COPD)*

A Cochrane Review demonstrated the effectiveness of center-based pulmonary rehabilitation in patients with COPD in reducing dyspnea and fatigue and improving emotional function, exercise capacity, and HRQoL when compared with conventional care.[70] The question whether pulmonary rehabilitation delivered using communication technologies is effective and safe has also been addressed by another Cochrane Review,[71] which showed that primary or maintenance pulmonary rehabilitation delivered *via* telerehabilitation were similarly and favorably effective with regard to outcomes such as exercise capacity, dyspnea, and HRQoL when compared with traditional, center-based, in-person pulmonary rehabilitation without compromising safety and with the likelihood of also reducing hospitalizations and anxiety.[71] Subsequent SRs demonstrated telerehabilitation as an effective strategy in COPD for maintaining and improving functioning, dyspnea and HRQoL[72] as well as with favorable effects on anxiety and depression.[73] The designs of pulmonary telerehabilitation programs were heterogeneous; however, consistently including exercise and education.[74]

*Lung cancer*

Studies showed that telerehabilitation could be proposed in individuals with lung cancer as a complementary approach to center-based programs or as an alternative if center- or community-based programs are not possible with potential benefits of increasing self-efficacy and physical activity.[75]

*Lung transplantation*

An SR showed the association of telemedicine with improvement in self-care.[76]

### Telerehabilitation in disabling cardiovascular conditions

An SR of 2015 already demonstrated the comparability of cardiac telerehabilitation with center-based cardiac rehabilitation without being inferior to center-based rehabilitation and with the advantages of more accessibility.[77] Afterwards, several SRs reiterated the similarity.[78-80] Comparable effectiveness was found in improvement in functioning, physical activity habits, and depression as well as physiological risk factors, smoking habits, cardiac-related hospitalization, adherence to medications, and HRQoL in individuals with coronary heart disease.[81] As for heart failure, cardiac telerehabilitation was found associated with successful outcomes regarding physical fitness, mental health and HRQoL[82] with a large effect when compared with no treatment and with non-inferiority effect when compared with conventional treatment regarding exercise capacity.[83] Telerehabilitation was found superior in terms of improvement in functioning as measured using 6-Minute Walk-Test and peak oxygen uptake as well as improvement in HRQoL when compared with usual care without cardiac rehabilitation in individuals with heart failure.[84] Regarding the safety of home-based cardiac rehabilitation, an SR involving five studies indicated that a severe adverse event was reported in one study with the estimated incidence rate of severe adverse events being one per 23,823 patient-hour of home-based exercise.[85]

Regarding cost-effectiveness of exercise-based cardiovascular rehabilitation programs delivered *via* telerehabilitation, an SR including 12 studies revealed that most of the studies included in the review provided strong evidence that telecardiovascular rehabilitation was as cost-effective as center-based cardiovascular rehabilitation.[86]

### Telerehabilitation in disabling musculoskeletal conditions

*Knee osteoarthritis and/or knee replacement*

No statistically significant differences were found between telerehabilitation and in-person rehabilitation in terms of reduction in pain and functioning as measured using WOMAC in individuals with knee osteoarthritis in two SRs.[87, 88] Another SR indicated beneficial effects of telerehabilitation for pain reduction and HRQoL but not for physical function in people having chronic knee pain and/or knee osteoarthritis.[89] An SR points to no difference in pain and function in individuals after knee replacement when telerehabilitation and conventional rehabilitation are compared regarding comparable improvements in outcomes[90] leading to a suggestion of telerehabilitation as a practical alternative[91] and with implications for more favorable outcomes in physical function tests.[92] Regarding cost-effectiveness, more favorable cost outcomes were also found similar in total hip replacement in relation to traditional approach.[93]

*Low back pain*

An SR shows digital health interventions focusing on self-maintenance and education are equally effective as other face-to-face interventions in terms of pain and functional status in individuals with chronic low back pain.[94]

*Fibromyalgia*

An RCT suggested similarities between telerehabilitation and control groups in pain, function, fibromyalgia impact, isometric strength, or HRQoL at 6-month follow-up, however without evidence of effectiveness.[95]

*Shoulder pain*

No difference was found between telerehabilitation and in-person rehabilitation for improvement in pain and disability in individuals with shoulder pain, however, the findings were based on very low to low certainty evidence.[96]

*Spinal deformities management in an outpatient setting*

Two papers focusing on Health Policy and System Research[97] showed the feasibility, acceptability, and methodology of telerehabilitation in substitution of classical outpatient regimen during the pandemic.[11, 98]

### Telerehabilitation in disabling COVID-19, including post COVID-19 condition

Telemonitoring and interventions delivered *via* telerehabilitation were found to have favorable effects on patient outcomes and similar effectiveness when compared with standard care in individuals with COVID-19 or chronic COVID-19 related lung diseases.[99] Several SRs suggested that telerehabilitation is effective in the delivery of exercise[100, 101] with improvement in functional capacity[101] leading to recovery in the short and long-term in patients with COVID-19. Telerehabilitation was found beneficial for improving lower extremity muscle strength, ambulation, dyspnea, and depression. However, these findings are based on moderate- to very low-certainty evidence,[102] similar to the findings regarding improvement of persistent symptoms after COVID-19.[103]

*Telerehabilitation for people with low vision*

A Cochrane Review involved only one study regarding telerehabilitation of people with low vision. This study reported similar effectiveness for telerehabilitation and on-site consultations; however, all outcomes were judged as based on very low certainty evidence.[104]

*Other rehabilitation fields*

There are studies on the use of telerehabilitation in metabolic syndrome,[105] burns[106] and urinary incontinence[107] which show some positive effects or feasibility of telerehabilitation.

An SR found little evidence for exercise behavior promoting the role of remote exercises in individuals with cancer.[108] Another SR pointed to the potential of telerehabilitation to improve health and desire and hope for treatment continuation in breast cancer survivors.[109]

Telerehabilitation was used in the geriatric population during the COVID-19 pandemic.[110] Cardiovascular telerehabilitation was found to improve fitness, functional capacity, and HRQoL in older individuals.[111] Various dimensions of HRQoL were found to have improved with telerehabilitation follow-up in older people.[112] Real-time telerehabilitation was found to improve physical performance at the same level as in-person rehabilitation in older individuals with musculoskeletal conditions.[113]

Evidence suggests that telerehabilitation can be deemed effective in children with a variety of health conditions, as documented during the COVID-19 pandemic[114] with diverse characteristics of available programs.[115]

It is important to note that the application of telerehabilitation may not be limited to health conditions with evidence of effectiveness mentioned above but could also be applied to other diseases not mentioned in the position paper because no papers have been published so far.

Considering the systematic review of the relevant literature, we recommend the following for PRM physicians to improve professional practice on telerehabilitation along with "strength of evidence (SoE) and "strength of recommendation (SoR) (where NA means "not applicable"). Table I and Table II show the results of the Delphi Rounds and overall view of the recommendations.

## Recommendations for PRM Professional Practice in Telerehabilitation in Europe

### Overall general recommendations

1. The professional role of PRM physicians in telerehabilitation is to deliver rehabilitation services remotely *via* digital means or using communication technologies to eligible individuals whenever required and feasible in a variety of health conditions in favor of the patient and his/her family or caregiver. Applying telerehabilitation in clinical practice needs to be based on evidence of effectiveness and needs to follow current general and local guidelines, standards, regulations, legislations, and laws regarding the use of information and communication technologies (digital health/eHealth/ telemedicine/ telerehabilitation)[6, 11-14, 19-21] [SoE: NA; SoR: A].

2. It is recommended that PRM physicians consider telerehabilitation within the "individual rehabilitation

TABLE I.—*Results of the Consensus procedure: recommendation review and votes.*

| Delphi rounds | N. of recommendations | Accept as is | Accept with suggestions | Reject |
|---|---|---|---|---|
| Round 1 | | | | |
| 1st vote | 32 | 12.5% | 71.9% | 15.6% |
| 2nd vote | 32-2+1=31 | 64.5% | 19.4% | 16.1% |
| Round 2 | 31+1= 32 | 41.9% | 45.2% | 12.9% |
| Round 3 | 32 | 100% | NA | 0 |
| Round 4 | 32 | Strength of recommendations (SoR) is voted among authors | | |
| Round 5 | 32 | 100% | NA | 0 |

NA: not applicable.

TABLE II.—*Overall view of the recommendations.*

| Content | N. of recommendations | | Strength of Recommendations (SoR) | | | | Strength of evidence (SoE) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | N. | % | A | B | C | D | I | II | III | IV | NA |
| Overall recommendation(s) | 3 | 9.4% | 100% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100% |
| PRM physicians role in Medical Diagnosis according to ICD | 3 | 9.4% | 100% | 0 | 0 | 0 | 0 | 0 | 0 | 33.3% | 66.7% |
| PRM physicians' role in PRM diagnosis according to ICF | 1 | 3.1% | 100% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100% |
| PRM physicians' role in PRM assessment according to ICF | 4 | 12.5% | 75% | 25% | 0 | 0 | 0 | 0 | 0 | 50% | 50% |
| Recommendations on PRM management and process | 17 | 53.1% | 76.5% | 17.6% | 5.9% | 0 | 11.8%* | 0 | 0 | 0 | 88.2% |
| Recommendations on future research on PRM professional practice | 4 | 12.5% | 25% | 75% | 0 | 0 | 0 | 0 | 0 | 0 | 100% |
| Total | 32 | 100% | 75% | 21.9% | 3.1% | 0 | 6.3%* | 0 | 0 | 9.4% | 84.3% |

*Recommendations number 12 and 19 have subitems. If there was a level SoE for any of the items, that recommendation was considered as having the SoE of I.

project(s) (IRP)"[17] across the continuum of care for rehabilitation management in suitable stages, including the different steps of the rehabilitation cycle(s) (assessment, goal-setting, assignment, conducting interventions, and evaluation) using digital telecommunication technologies. A hybrid IRP including virtual, asynchronous text interaction and live techniques can be considered and may often be useful and complementary for complex situations[11-13] [SoE: NA; SoR: A].

3. It is recommended that PRM physicians, when applying telerehabilitation, identify barriers and enablers to achieve the IRP goals with potential solutions for quality management and quality improvement and to consider privacy issues in compliance with General Data Protection Regulation (GDPR)[19, 20, 50] [SoE: NA; SoR: A].

### Recommendations on PRM physicians' role in Medical Diagnosis according to ICD in the context of telerehabilitation

4. It is recommended that PRM physicians gain expertise in making diagnosis using digital telecommunication technologies when telerehabilitation is needed and teleassessment is possible in case of application solely remotely rather than combined physical/on-site and remote assessments[22-25, 34] [SoE: NA; SoR: A].

5. It is recommended PRM physicians get familiar with the use and safety of physical sensors for tele-physical assessment including augmented reality-based systems with haptics and others and biometric sensors such as electromyography and other sensors, both wearable and/or non-contact, for diagnostic purposes when delivering telerehabilitation [SoE: IV;[26-29] SoR: A].

6. It is recommended that PRM physicians consider the diagnosis of other comorbidities beyond the primary diagnosis even remotely, with proper telecommunication technology and digital medicine platform.[11, 12, 21, 50] One may refer to "WHO-ITU document"[116] regarding technical requirements for telehealth platforms for persons with disabilities with specific needs [SoE: NA; SoR: A].

### Recommendations on PRM physicians' role in PRM diagnosis according to ICF in the context of telerehabilitation

7. It is recommended that PRM physicians pay particular attention to the identification of impairments in body

functions, activity limitations, and participation restrictions as well as environmental factors, adjustable personal factors and health conditions when using remote technologies within the context of telerehabilitation with the reference point being the ICF[18] [SoE: NA; SoR: A].

**Recommendations on PRM physicians' role in PRM assessment according to ICF in the context of telerehabilitation**

8. It is recommended that PRM physicians rely on the "Individual Rehabilitation Project" also for telerehabilitation as a framework for rehabilitation[17] where ICF is the reference system for operationalizing functioning as a basis for assessment within the context of telerehabilitation. Digital technologies can facilitate functional assessment with the use of teleconsultation, video-based consultations-online patient visit including looking at and listening to the patients' complaints, video-based consultations including validated remote assessment/examination, video-based consultations including detailed assessment using tele-biometrics such as diagnostic tele-ultrasonography, telemonitoring, and wearable devices, prioritizing that the remote assessment is valid and reliable [SoE: IV;[11-13, 20-29, 34, 50] SoR: A].

9. It is recommended, if the patient agrees, that PRM physicians use different advanced technologies including robotic systems that make precise, cost-effective, and repeatable measurements[26, 28, 29] as well as artificial intelligence[30, 31] for functional assessment [SoE: IV;[26-31] SoR: B].

10. It is recommended that PRM physicians consider ICF categories in the environmental factors regarding products and technology for communication and education (with regard to the features of the actual method used and individuals' knowledge about these) and societal attitudes (with regard to individuals' beliefs about this technology) to identify/assess barriers and enablers for achieving the goals[11, 12] [SoE: NA; SoR: A].

11. If relevant, the ICF category titles in "Support and Relationships" chapter in the environmental factors such as family members and personal care providers for involvement in telerehabilitation programs of care, should be assessed[11, 12, 50] [SoE: NA; SoR: A].

**Recommendations on PRM management and process**

*Inclusion criteria (*e.g.*, when and why to prescribe telerehabilitation)*

12. It is recommended that PRM physicians prescribe telerehabilitation for patients with health conditions for which there is already some evidence of efficacy or at least clinical positive experiences. These include neurological disorders in general [SoE: I-IV;[38-40] SoR: A] specifically including stroke[42, 43] [SoE: I;[44-49]SoR:A], traumatic brain injury [SoE: I[51] (particularly for cognitive rehabilitation); SoR: A], Parkinson's disease [SoE: I;[52-54] SoR: A], multiple Sclerosis[55-59] [SoE: I (low level);[55] SoR: A] and spinal cord injury [SoE: II-IV;[60-65] SoR: A ] and respiratory conditions[70] [SoE: I;[71-76] SoR: A], cardiovascular conditions [SoE: I;[77-84] SoR: A], musculoskeletal conditions[73, 74] such as knee osteoarthritis [SoE: I;[87-89] SoR: A] and orthopedic conditions such as joint replacement surgery [SoE: I;[90-92] SoR: A], low back pain [SoE: I;[94] SoR: A], fibromyalgia [SoE: II;[95] SoR: A], shoulder pain [SoE: I (very low);[96] SoR: A], COVID-19 including post COVID-19 condition [SoE: I;[99-103]SoR:A], low vision [SoE: II (very low);[104] SoR: A] and others such as metabolic syndrome [SoE: IV;[105] SoR: A] burns [SoE: II;[106] SoR: A] and urinary incontinence [SoE: IV;[107] SoR: A] as well as rehabilitation fields such as cancer rehabilitation [SoE: (insufficient);[108, 109] SoR: A], geriatric rehabilitation in general [SoE: I;[110-113] SoR: A] and specifically for those with cognitive impairment [SoE: I;[66] SoR: A] and pediatric rehabilitation [SoE: I;[114, 115] SoR: A] (may not be limited to those as evidence emerges).

13. It is recommended to apply telerehabilitation to eligible individuals any time rehabilitation is needed and in-person rehabilitation is unavailable and once safety and suitability of telerehabilitation are ensured and patients' preferences and values are respected[12, 13, 19-21] [SoE: NA; SoR: A].

14. Regarding when to prescribe telerehabilitation, it would be recommended to follow predefined algorithms based on specific criteria and protocols for specific health conditions, if any, and collect data if patients agree[12, 13, 19, 50] [SoE: NA; SoR: B].

*Project definition (definition of the overall aims and strategy of telerehabilitation)*

15. It is recommended that telerehabilitation is offered in hospitals and in specialized in-patient and out-patient rehabilitation services and in primary and community care both in terms of expertise in telerehabilitation and also in terms of the health condition with the aim of improving body functions and reducing or preventing activity limitations and participation restrictions and remove barriers in the environment of the individual[11-13] [SoE: NA; SoR: A].

**Teamwork (professionals involved and specific modalities of teamwork)**

16. Telerehabilitation, like any other rehabilitation intervention, is recommended to involve a multiprofessional ex-

pert team[108] working in an interdisciplinary way composed of relevant physicians according to the health condition treated and other rehabilitation professionals, other health professionals, family members/caregivers together with the patient, under the leadership of PRM physician, who has expertise, experience, and required competencies in telerehabilitation. The digital platform allows a team to be involved virtually, allowing individual and collective contact with the patient. Furthermore, digital health/e-health/digital medicine allows the possibility of an extended team to include experts from all over the world, either at local, national, or international levels[12, 13, 50] [SoE: NA; SoR: A].

17. It is recommended that multiprofessional rehabilitation team members receive training on how to use telerehabilitation platforms and to be competent in the delivery of telerehabilitation using a specific platform/modality[1, 19, 20, 116] [SoE: NA; SoR: A].

18. It is recommended to involve non-clinician members in the project team who are competent in technical administration and coordination to continuously monitor telerehabilitation process to see if the program proceeds as planned and expected including quality and performance management as well as to arrange and support telerehabilitation activities[19, 20, 50] [SoE: NA; SoR: B].

**Interventions delivered by telerehabilitation**

19. It is recommended that PRM physicians consider the delivery of the following using telecommunication technologies:

a) information technology/computer training for being involved in and lead telerehabilitation programs (service providers), if needed[19, 20] [SoE: NA; SoR: A];

b) counselling for health-related well-being[11, 12] [SoE: NA (no study for solely counselling); SoR: A];

c) in some cases, medication prescription, if appropriate and safe[11, 12] [SoE: NA; SoR: A];

d) patient, caregiver and family members' education/Self-management education[11, 12] [SoE: NA; SoR: A];

e) home-based monitoring of vital parameters and functional activity using specific sensors when possible [SoE: IV;[29, 99, 105] SoR: A];

f) exercise training when there is no risk of harm and if safety can be ensured [SoE: I;[75, 86, 100, 106-108] SoR: A];

g) activities of daily living (ADL) training if safety can be ensured [SoE: NA (no specific study); SoR: A];

h) screening for any assistive device including orthoses, prostheses and assistive technologies in general as well as their prescription, training (if needed), and evaluation [SoE: NA (no study); SoR: A];

i) psychological interventions (*i.e.*, Cognitive behavioural therapy, neuropsychological assessment and training) [SoE: I-II;[53, 66, 95] SoR: A];

j) speech and language therapy [SoE: I;[66, 67] SoR: A];

k) swallowing assessment, training and management if safety can be ensured, after hands-on testing and acceptance, and with proper local health care providers [SoE: IV;[68] SoR: A];

l) virtual reality [SoE: I;[45, 53, 57] SoR: B];

m) the whole rehabilitation management process/plan when possible and follow-up of the rehabilitation management process [SoE: NA (no study-mostly hybrid); SoR: A];

n) coordination of care [SoE: NA (no study solely investigating this outcome); SoR: A];

o) vocational training when there is no risk of harm [SoE: IV;[117] SoR: A];

p) Occupational interventions, that are possible *via* telerehabilitation, if needed. [SoE: IV[118] SoR: A].

20. In addition to delivering interventions, it is recommended that PRM teams may also use telecommunication technologies for staff meetings and other procedures for rehabilitation process management with the aim of monitoring and adapting the "Rehabilitation Management Plan" including the IRPs.[11] Telecommunication technologies may be helpful in encouraging interdisciplinary syntheses and multi-professional consultation meetings for complex situations [SoE: NA; SoR: A].

**Outcome criteria**

21. It is recommended that PRM physicians together with the patients determine patient-centered outcome criteria in relation to the individual patient's impairments in body functions, activity limitations, and participation restrictions as defined in the ICF according to the health condition diagnosed as is the case for on-site/in-person rehabilitation[18] [SoE: NA; SoR: A].

22. It is recommended that quality of patient care/patient satisfaction are included as measurable outcomes relating to availability, accessibility, patients' experiences, user-friendliness and how well telerehabilitation is received along with patient adherence in the case of telerehabilitation as well as patients' attitudes toward digital health technology[20, 50] [SoE: NA; SoR: A].

23. It is recommended that PRM physicians may consider specific outcome criteria such as staff satisfaction, cost-effectiveness of care and socioeconomical and environmental benefits that may be a step forward toward a green and sustainable service [119] [SoE: NA; SoR: B].

24. An evaluation method could be automated to judge

the effectiveness of the program such as using a computerized SCED (single case experimental design) [SoE: NA; SoR: C].

**Length/duration/method of delivery/setting (overall practical PRM approach to telerehabilitation)**

25. It is recommended that PRM physicians follow general guidelines/legal documents for the general principles of delivery of telerehabilitation at international and national levels as well as guidelines for specific health conditions regarding specific treatment strategies adapted to the medical condition and needs of the specific individual[21] [SoE: NA; SoR: A].

26. It is recommended that PRM physicians suggest the criteria and the appropriateness of use of telerehabilitation in the continuity of care, at home or in the community [SoE: NA; SoR: A].

**Discharge criteria (*e.g.*, when and why to end telerehabilitation)**

27. It is recommended that PRM physicians may use telerehabilitation as a rehabilitation maintenance strategy after a positive telerehabilitation experience; therefore, telerehabilitation may continue as long as the specific individual needs rehabilitation interventions if the capabilities of using digital technology are maintained including lifelong continuation. It should be combined with in-person rehabilitation when needed [SoE: NA; SoR: A].

28. Telerehabilitation may stop when all goals of the IRP are obtained, the patient is a non-responder to the telerehabilitation program, or when it needs to be done in-person [SoE: NA; SoR: A].

**Recommendations on future research on PRM professional practice**

29. It is recommended that PRM physicians get involved in research on telerehabilitation using "Rehabilitation definition for research purposes" proposed by Cochrane Rehabilitation[120] to better identify the benefits of telerehabilitation on an individual's functioning and particularly the effects on activity limitations and participation restrictions [SoE: NA; SoR: A].

30. It is recommended that PRM physicians conduct research to investigate remote assessment methods for validity and reproducibility [SoE: NA; SoR: B].

31. It is recommended that PRM physicians conduct research to investigate how technological and cultural/conceptual barriers (*e.g.*, patients' perceptions as to the treatment ability of telerehabilitation) could affect the delivery of telerehabilitation[11, 12] [SoE: NA; SoR: B].

32. It is recommended that PRM physicians conduct research in the field of "integrative rehabilitation sciences"[121] to elucidate the best way for integrating telerehabilitation in health systems [SoE: NA; SoR: B].

## Discussion

The value of rehabilitation delivered *via* telerehabilitation has been recognized long ago. From the beginning of the 21st century, along with the consistent development of technology and rehabilitation research, delivery of rehabilitation at a distance emerged as a promising approach.[122] The growing evidence regarding efficacy supports telerehabilitation where new technologies could facilitate the delivery of rehabilitation services. Telerehabilitation, showing similar efficacy with that of center-based rehabilitation in certain areas of rehabilitation (see the relevant citations in the "Evidence on the effectiveness of telerehabilitation" section) seems to be an attractive alternative with the potential to increase patient access to rehabilitation and to be used more widely not only in response to demands due to the profound unfavorable impact of the COVID-19 pandemic on the delivery of traditional in-person, center-based rehabilitation for continuous provision of rehabilitation care,[14] but also for its efficacy and feasibility to be used widely in the future. Telerehabilitation has been found acceptable by individuals with a high level of satisfaction.[11] It is vital to facilitate the implementation of telerehabilitation in common practice. It is recommended that PRM physicians are encouraged to consider creative models of delivery of telerehabilitation.

**Implementation of telerehabilitation in PRM**

The COVID-19 pandemic forced medical service systems all over the world to make changes to adapt different medical models in different fields to meet the new limitations and behaviors. The medical specialty of PRM was not an exception. Telerehabilitation practices were developed spontaneously to manage a huge number of patients staying at home. As a result, different interventions were implemented in different countries throughout this period.

A wide discussion was organized by the UEMS PRM Section, with delegates from most European countries to find out which telerehabilitation practices were in use throughout the pandemic period in different parts of Europe. As a result, six models were identified:

1. Hybrid Individual Rehabilitation Project (IRP): clas-

sic multidisciplinary IRP project, according to a unified program, under the leadership of a PRM physician. Mostly live assessment is performed, but in the treatment plan, some virtual and some hybrid techniques are involved to access the defined functional goals.

2. PRM physician consultation: communication with previously known patients by any type of virtual connection, in an outpatient clinic, or for follow-up after discharge. The aim can be the modulation of the IRP, or others.

3. Management of specific types of training by any rehabilitation professional from the multidisciplinary team, using different communication techniques or devices. The aim can be to give specific instructions, monitor and support patients and families in any kind of training (*e.g.*, motor, cognitive, speech, psychologic, or others).

4. Monitoring of patients' activity can be performed to monitor patients' activity and functioning at home or at work for analyzing and moderating the project. Another option is automatic monitoring of patients' activity according to program and training requirements. The monitoring requires having an automatic analysis by a device, which transmits signals to a workstation where the professional can evaluate the progress.

5. Patient, family, and staff education at all stages of rehabilitation.

6. Rehabilitation process management. Staff meetings or other organizational forms in use for everyday rehabilitation practice. The aim can be to monitor and adapt both the IRP and Rehabilitation Management Plan. This can be performed through virtual communication and by analyzing different types of patients' electronic data.

In most countries, some mixture of different types of telerehabilitation practices are implemented at a practical level.

The end of the COVID-19 pandemic lockdowns currently does not mean that telerehabilitation will not be utilized as much as it has been during the pandemic. On the contrary, health systems are encouraged to adopt telemedicine practices for strengthening healthcare delivery.[1, 3, 5, 6] Therefore, it is crucial for PRM physicians to improve their professional practice of telerehabilitation. However, there are also barriers to telerehabilitation. An SR identified barriers for "telestroke" including technological availability, the need for training and/or support, device using difficulty, costly equipment, issues relevant to internet connectivity, and telephone tag.[123] There is a need to overcome these barriers with proper solutions.

A key qualitative Cochrane Review[124] recently identified the factors that can influence the provision of telerehabilitation. They included 223 studies and sampled 53 of them. They found that patients find these services convenient, encouraging patients' self-management and empowerment, with some issues of privacy and confidentiality, and the need for support and good communication. Patients see telerehabilitation as an affordable and cost-saving opportunity for service availability, with challenges of correct exercise assessment, interruptions from family members, lack of and difficulty with equipment, infrastructure, and maintenance sometimes leading patients to frustration. Patients and providers suggest that telerehabilitation can change the nature of their relationship, but there are contrasting feelings (from better communication to abandoning). Requests include easy-to-use technologies, training and support, personalization, and some in-person sessions.[124]

The remaining issues include the effectiveness of telerehabilitation in health conditions other than those that have already been studied and optimal/ideal duration as well as its economic costs. Furthermore, it is important to evaluate how technological, cultural, and conceptual barriers such as patients' perceptions, regarding its treatment ability, could affect the delivery of telerehabilitation.[11] For future research, it may be recommended to use the Health Technology Assessment Framework for the assessment of telerehabilitation that includes the domains of technological, organizational, social, legal, and ethical aspects in addition to clinical effectiveness in particular health conditions, differing effectiveness across a variety of health conditions, and cost-effectiveness.[125] An SR revealed that these domains were not assessed in studies of telerehabilitation in a balanced way with a focus on clinical effectiveness, social aspects in terms of behavioral changes in most of the studies, and safety was assessed the least.[126]

Furthermore, Health Policy and Systems Research[97] is crucial in the worldwide integration of telerehabilitation in health systems. Lastly, it should be noted that digital medicine and telerehabilitation are still relatively new fields. There are risks and challenges that need to be addressed, such as data security and privacy, the accuracy and reliability of digital tools, and the use of technology in a way that supports, rather than replaces, traditional medical practices. Despite these challenges, telerehabilitation and digital medicine offer tremendous potential to improve health and healthcare, and will likely play an increasingly important role in the delivery of care in the years to come. In the near future, it is likely that we are going to use multimodal digital solutions including telemedicine and even

artificial general intelligence to maximize patients' recovery and improve their quality of life while paying utmost attention to the safe use of artificial intelligence.

## Conclusions

Evidence suggests equivalent outcomes for rehabilitation delivered *via* telecommunication technologies when compared to onsite rehabilitation in a variety of rehabilitation fields and in diverse health conditions.

Together with face-to-face rehabilitation, the use of digital technologies for the delivery of rehabilitation will probably offer an extra opportunity to ensure continuity in the provision of rehabilitation needed by patients. Telerehabilitation may have socioeconomical and environmental benefits and may be a step toward a green and sustainable health care, a topic in light of climate change pointing to environmentally friendly services and those services that do not damage resources for the future generations.[119] It is noteworthy that telerehabilitation does not replace face-to-face rehabilitation and that a hybrid rehabilitation scheme could lead to positive synergic effects on the outcomes.

PRM physicians are recommended to deliver rehabilitation services including consultation, assessment, diagnosis, prevention, therapeutics/interventions for rehabilitation/PRM interventions, palliation, and monitoring *via* telerehabilitation whenever required and feasible and possible in a variety of health conditions based on available research evidence of effectiveness. More research is needed to better understand what the optimal methods are and to identify best practices. Telerehabilitation practices anticipate innovative follow-up ideas to be evaluated and tested for safety and efficacy in the context of remote rehabilitation services.

In conclusion, PRM physicians play a critical role in telerehabilitation, working to ensure that patients receive safe and effective rehabilitation services through remote means. Their expertise, knowledge, and commitment to patient care are essential to the success of telerehabilitation and the overall goal of improving health and healthcare.

## References

**1.** World Health Organization. WHO Global Observatory for eHealth. Telemedicine: opportunities and developments in Member States: report on the second global survey on eHealth; 2010 [Internet]. Available from: https://apps.who.int/iris/handle/10665/44497 [cited 2024, Jan 30].

**2.** Alexander M. Chapter 1- Introduction. In: Alexander M. Telerehabilitation Principles and Practice. Elsevier, 2022.

**3.** World Health Organization. Regional Office for Europe. From innovation to implementation: eHealth in the WHO European Region; 2016 [Internet]. Available from: https://apps.who.int/iris/handle/10665/326317 [cited 2024, Jan 30].

**4.** World Health Organization. WHO guideline: recommendations on digital interventions for health system strengthening; 2019 [Internet]. Available from: https://apps.who.int/iris/handle/10665/311941 [cited 2024, Jan 30].

**5.** World Health Organization. Regional Office for the Western Pacific. Implementing telemedicine services during COVID-19: guiding principles and considerations for a stepwise approach; 2020 [Internet]. Available from: https://apps.who.int/iris/handle/10665/336862 [cited 2024, Jan 30].

**6.** World Health Organization Regional Committee for Europe. Regional digital health action plan for the WHO European Region 2023–2030. Seventy-second session; 2022 [Internet]. Available from: https://apps.who.int/iris/bitstream/handle/10665/360950/72wd05e-DigitalHealth-220529.pdf [cited 2024, Jan 30].

**7.** Stucki G, Bickenbach J, Gutenbrunner C, Melvin J. Rehabilitation: the health strategy of the 21st century. J Rehabil Med 2018;50:309–16.

**8.** Cieza A, Causey K, Kamenov K, Hanson SW, Chatterji S, Vos T. Global estimates of the need for rehabilitation based on the Global Burden of Disease study 2019: a systematic analysis for the Global Burden of Disease Study 2019. Lancet 2021;396:2006–17.

**9.** World Health Organization. Landmark resolution on strengthening rehabilitation in health systems. Document EB 152/10. 76th WHA; 2023 [Internet]. Available from: https://www.who.int/news/item/27-05-2023-landmark-resolution-on-strengthening-rehabilitation-in-health-systems [cited 2024, Jan 30].

**10.** Seijas V, Kiekens C, Gimigliano F. Advancing the World Health Assembly's landmark resolution on strengthening rehabilitation in health systems: unlocking the future of rehabilitation. Eur J Phys Rehabil Med 2023;59:447–51.

**11.** Negrini S, Donzelli S, Negrini A, Negrini A, Romano M, Zaina F. Feasibility and Acceptability of Telemedicine to Substitute Outpatient Rehabilitation Services in the COVID-19 Emergency in Italy: An Observational Everyday Clinical-Life Study. Arch Phys Med Rehabil 2020;101:2027–32.

**12.** Negrini S, Kiekens C, Bernetti A, Capecci M, Ceravolo MG, Lavezzi S, *et al.* Telemedicine from research to practice during the pandemic. "Instant paper from the field" on rehabilitation answers to the COVID-19 emergency. Eur J Phys Rehabil Med 2020;56:327–30.

**13.** Leochico CF, Rey-Matias BM, Rey-Matias RR. Telerehabilitation perceptions and experiences of physiatrists in a lower-middle-income country during the COVID-19 pandemic. PM R 2022;14:210–6.

**14.** Brigo E, Rintala A, Kossi O, Verwaest F, Vanhoof O, Feys P, *et al.* Using Telehealth to Guarantee the Continuity of Rehabilitation during the COVID-19 Pandemic: A Systematic Review. Int J Environ Res Public Health 2022;19:10325.

**15.** Negrini S, Kiekens C, Zampolini M, Wever D, Varela Donoso E, Christodoulou N. Methodology of "physical and rehabilitation medicine practice, evidence-based position papers - The European position" produced by the UEMS-PRM Section. Eur J Phys Rehabil Med 2016;52:134–41.

**16.** European Physical and Rehabilitation Medicine Bodies Alliance. White Book on Physical and Rehabilitation Medicine (PRM) in Europe. Chapter 1. Definitions and concepts of PRM. Eur J Phys Rehabil Med 2018;54:156–65.

**17.** Zampolini M, Selb M, Boldrini P, Branco CA, Golyk V, Hu X, *et al.*; UEMS-PRM Section and Board. The Individual Rehabilitation Project as the core of person-centered rehabilitation: the Physical and Rehabilitation Medicine Section and Board of the European Union of Medical Specialists Framework for Rehabilitation in Europe. Eur J Phys Rehabil Med 2022;58:503–10.

**18.** Rauch A, Cieza A, Stucki G. How to apply the International Classification of Functioning, Disability and Health (ICF) for rehabilitation management in clinical practice. Eur J Phys Rehabil Med 2008;44:329–42.

**19.** Brennan DM, Tindall L, Theodoros D, Brown J, Campbell M, Christiana D, *et al.*; American Telemedicine Association. A blueprint for telerehabilitation guidelines—October 2010. Telemed J E Health 2011;17:662–5.

**20.** Richmond T, Peterson C, Cason J, Billings M, Terrell EA, Lee AC, *et al.* American Telemedicine Association's Principles for Delivering Telerehabilitation Services. Int J Telerehabil 2017;9:63–8.

**21.** Anil K, Freeman JA, Buckingham S, Demain S, Gunn H, Jones RB, *et al.* Scope, context and quality of telerehabilitation guidelines for physical disabilities: a scoping review. BMJ Open 2021;11:e049603.

**22.** Weinstein RS, Krupinski EA, Doarn CR. Clinical Examination Component of Telemedicine, Telehealth, mHealth, and Connected Health Medical Practices. Med Clin North Am 2018;102:533–44.

**23.** Wahezi SE, Duarte R, Kim C, Sehgal N, Argoff C, Michaud K, *et al.* An Algorithmic Approach to the Physical Exam for the Pain Medicine Practitioner: A Review of the Literature with Multidisciplinary Consensus. Pain Med 2022;23:1489–528.

**24.** Wang G, Fiedler AK, Warth RJ, Bailey L, Shupe PG, Gregory JM. Reliability and accuracy of telemedicine-based shoulder examinations. J Shoulder Elbow Surg 2022;31:e369–75.

**25.** Montes J, Eichinger KJ, Pasternak A, Yochai C, Krosschell KJ. A post pandemic roadmap toward remote assessment for neuromuscular disorders: limitations and opportunities. Orphanet J Rare Dis 2022;17:5.

**26.** Borresen A, Wolfe C, Lin CK, Tian Y, Raghuraman S, Nahrstedt K, *et al.* Usability of an Immersive Augmented Reality Based Telerehabilitation System with Haptics (ARTESH) for Synchronous Remote Musculoskeletal Examination. Int J Telerehabil 2019;11:23–32.

**27.** Annaswamy TM, Pradhan GN, Chakka K, Khargonkar N, Borresen A, Prabhakaran B. Using Biometric Technology for Telehealth and Telerehabilitation. Phys Med Rehabil Clin N Am 2021;32:437–49.

**28.** Atashzar SF, Carriere J, Tavakoli M. Review: How Can Intelligent Robots and Smart Mechatronic Modules Facilitate Remote Assessment, Assistance, and Rehabilitation for Isolated Adults With Neuro-Musculoskeletal Conditions? Front Robot AI 2021;8:610529.

**29.** Yen JM, Lim JH. A Clinical Perspective on Bespoke Sensing Mechanisms for Remote Monitoring and Rehabilitation of Neurological Diseases: scoping Review. Sensors (Basel) 2023;23:536.

**30.** Nakamori M, Ishikawa R, Watanabe T, Toko M, Naito H, Takahashi T, *et al.* Swallowing sound evaluation using an electronic stethoscope and artificial intelligence analysis for patients with amyotrophic lateral sclerosis. Front Neurol 2023;14:1212024.

**31.** Cingolani M, Scendoni R, Fedeli P, Cembrani F. Artificial intelligence and digital medicine for integrated home care services in Italy: opportunities and limits. Front Public Health 2023;10:1095001.

**32.** O'Neil J, Barnes K, Morgan Donnelly E, Sheehy L, Sveistrup H. Identification and description of telerehabilitation assessments for individuals with neurological conditions: A scoping review. Digit Health 2023;9:20552076231183233.

**33.** Gopal A, Hsu WY, Allen DD, Bove R. Remote Assessments of Hand Function in Neurological Disorders: systematic Review. JMIR Rehabil Assist Technol 2022;9:e33157.

**34.** Morgan A, Bégin D, Heisz J, Tang A, Thabane L, Richardson J. Measurement Properties of Remotely or Self-Administered Lower Extremity Mobility Performance Measures in Adults: A Systematic Review. Phys Ther 2022;102:pzac078.

**35.** Gu C, Lin W, He X, Zhang L, Zhang M. IMU-based motion capture system for rehabilitation applications: A systematic review. Biomimetic Intelligence and Robotics 2023;3:100097.

**36.** Bilder RM, Postal KS, Barisa M, Aase DM, Cullum CM, Gillaspy SR, *et al.* Inter Organizational Practice Committee Recommendations/Guidance for Teleneuropsychology in Response to the COVID-19 Pandemic†. Arch Clin Neuropsychol 2020;35:647–59.

**37.** Mulligan CA, Ayoub JL. Remote Assessment: Origins, Benefits, and Concerns. J Intell 2023;11:114.

**38.** Spina E, Trojsi F, Tozza S, Iovino A, Iodice R, Passaniti C, *et al.*; Digital Technologies, Web and Social Media Study Group of the Italian Society of Neurology (SIN). How to manage with telemedicine people with neuromuscular diseases? Neurol Sci 2021;42:3553–9.

**39.** Agostini M, Moja L, Banzi R, Pistotti V, Tonin P, Venneri A, *et al.* Telerehabilitation and recovery of motor function: a systematic review and meta-analysis. J Telemed Telecare 2015;21:202–13.

**40.** Huijgen BC, Vollenbroek-Hutten MM, Zampolini M, Opisso E, Bernabeu M, Van Nieuwenhoven J, *et al.* Feasibility of a home-based telerehabilitation system compared to usual care: arm/hand function in patients with stroke, traumatic brain injury and multiple sclerosis. J Telemed Telecare 2008;14:249–56.

**41.** Del Pino R, Díez-Cirarda M, Ustarroz-Aguirre I, Gonzalez-Larragan S, Caprino M, Busnatu S, *et al.* Costs and effects of telerehabilitation in neurological and cardiological diseases: A systematic review. Front Med (Lausanne) 2022;9:832229.

**42.** Corea F, Hubert G, Abilleira S. Letter by Corea et al Regarding Article, "Telemedicine Quality and Outcomes in Stroke: A Scientific Statement for Healthcare Professionals From the American Heart Association/American Stroke Association". Stroke 2017;48:e139.

**43.** Bernetti L, Nuzzaco G, Muscia F, Gamboni A, Zedde M, Eusebi P, *et al.* Stroke networks and telemedicine: an Italian national survey. Neurol Int 2018;10:7599.

**44.** Laver KE, Adey-Wakeling Z, Crotty M, Lannin NA, George S, Sherrington C. Telerehabilitation services for stroke. Cochrane Database Syst Rev 2020;1:CD010255.

**45.** Hao J, Pu Y, Chen Z, Siu KC. Effects of virtual reality-based telerehabilitation for stroke patients: A systematic review and meta-analysis of randomized controlled trials. J Stroke Cerebrovasc Dis 2023;32:106960.

**46.** Su Z, Guo Z, Wang W, Liu Y, Liu Y, Chen W, *et al.* The effect of telerehabilitation on balance in stroke patients: is it more effective than the traditional rehabilitation model? A meta-analysis of randomized controlled trials published during the COVID-19 pandemic. Front Neurol 2023;14:1156473.

**47.** Deshmukh S, Madhavan S. Can post stroke walking improve via telerehabilitation? A systematic review in adults with stroke. Front Rehabil Sci 2023;4:1154686.

**48.** Sharififar S, Ghasemi H, Geis C, Azari H, Adkins L, Speight B, *et al.* Telerehabilitation service impact on physical function and adherence compared to face-to-face rehabilitation in patients with stroke: A systematic review and meta-analysis. PM R 2023;15:1654–72.

**49.** Tarihoran DE, Daryanti Saragih I, Saragih IS, Tzeng HM. Effects of videoconferencing intervention on stroke survivors: A systematic review and meta-analysis of randomised controlled studies. J Clin Nurs 2023;32:5938–47.

**50.** Salbach NM, Mountain A, Lindsay MP, Blacquiere D, McGuff R, Foley N, *et al.*; Canadian Stroke Best Practice Recommendations Advisory Committee, in collaboration with the Canadian Stroke Consortium and the Canadian Partnership for Stroke Recovery. Canadian Stroke Best Practice Recommendations: Virtual Stroke Rehabilitation Interim Consensus Statement 2022. Am J Phys Med Rehabil 2022;101:1076–82.

**51.** Bonanno M, De Luca R, De Nunzio AM, Quartarone A, Calabrò RS. Innovative technologies in the neurorehabilitation of traumatic brain injury: A systematic review. Brain Sci 2022;12:1678.

**52.** Vellata C, Belli S, Balsamo F, Giordano A, Colombo R, Maggioni G. Effectiveness of telerehabilitation on motor impairments, non-motor symptoms and compliance in patients with Parkinson's disease: A systematic review. Front Neurol 2021;12:627999.

**53.** Marotta N, Calafiore D, Curci C, Lippi L, Ammendolia V, Ferraro F, *et al.* Integrating virtual reality and exergaming in cognitive rehabilitation of patients with Parkinson disease: a systematic review of randomized controlled trials. Eur J Phys Rehabil Med 2022;58:818–26.

**54.** Özden F. The effect of mobile application-based rehabilitation in patients with Parkinson's disease: A systematic review and meta-analysis. Clin Neurol Neurosurg 2023;225:107579.

**55.** Khan F, Amatya B, Kesselring J, Galea M. Telerehabilitation for persons with multiple sclerosis. Cochrane Database Syst Rev 2015;4:CD010508.

**56.** Di Tella S, Pagliari C, Blasi V, Mendozzi L, Rovaris M, Baglio F. Integrated telerehabilitation approach in multiple sclerosis: A systematic review and meta-analysis. J Telemed Telecare 2020;26:385–99.

**57.** Truijen S, Abdullahi A, Bijsterbosch D, van Zoest E, Conijn M, Wang Y, *et al.* Effect of home-based virtual reality training and telerehabilitation on balance in individuals with Parkinson disease, multiple sclerosis, and stroke: a systematic review and meta-analysis. Neurol Sci 2022;43:2995–3006.

**58.** Eldemir K, Guclu-Gunduz A, Eldemir S, Saygili F, Ozkul C, Irkec C. Effects of Pilates-based telerehabilitation on physical performance and quality of life in patients with multiple sclerosis. Disabil Rehabil 2023;May 6:1–8.

**59.** Yavas I, Kahraman T, Sagici O, Ozdogar AT, Yigit P, Baba C, *et al.* Feasibility of Telerehabilitation-Based Pelvic Floor Muscle Training for Urinary Incontinence in People With Multiple Sclerosis: A Randomized, Controlled, Assessor-Blinded Study. J Neurol Phys Ther 2023;47:217–26.

**60.** Touchett H, Apodaca C, Siddiqui S, Huang D, Helmer DA, Lindsay JA, *et al.* Current Approaches in Telehealth and Telerehabilitation for Spinal Cord Injury (TeleSCI). Curr Phys Med Rehabil Rep 2022;10:77–88.

**61.** Irgens I, Rekand T, Arora M, Liu N, Marshall R, Biering-Sørensen F, *et al.* Telehealth for people with spinal cord injury: a narrative review. Spinal Cord 2018;56:643–55.

**62.** Solomon RM, Dhakal R, Halpin SJ, Hariharan R, O'Connor RJ, Allsop M, *et al.* Telerehabilitation for individuals with spinal cord injury in low-and middle-income countries: a systematic review of the literature. Spinal Cord 2022;60:395–403.

**63.** Mirbaha S, Morgan A, Tang A, Smith-Turchyn J, Richardson J. Models of Telehealth Service Delivery in Adults With Spinal Cord Injuries: scoping Review. JMIR Rehabil Assist Technol 2023;10:e41186.

**64.** Irgens I, Midelfart-Hoff J, Jelnes R, Alexander M, Stanghelle JK, Thoresen M, *et al.* Videoconferencing in Pressure Injury: Randomized Controlled Telemedicine Trial in Patients With Spinal Cord Injury. JMIR Form Res 2022;6:e27692.

**65.** Swarnakar R, Yadav S, Wadhwa S, Venkataraman S. Effectiveness of Telerehabilitation in Persons With Spinal Cord Injury During the COVID-19 Pandemic (TELE-SCOPE): A Single-Center, Double-Blind, Randomized Controlled Trial. Cureus 2023;15:e41513.

**66.** Cacciante L, Pietà CD, Rutkowski S, Cieślik B, Szczepańska-Gieracha J, Agostini M, *et al.* Cognitive telerehabilitation in neurological patients: systematic review and meta-analysis. Neurol Sci 2022;43:847–62.

**67.** Shahouzaie N, Gholamiyan Arefi M. Telehealth in speech and language therapy during the COVID-19 pandemic: a systematic review. Disabil Rehabil Assist Technol 2022;Sep 21:1–8.

**68.** Reverberi C, Gottardo G, Battel I, Castagnetti E. The neurogenic dysphagia management via telemedicine: a systematic review. Eur J Phys Rehabil Med 2022;58:179–89.

**69.** Maida E, Bresciamorra V, Triassi M, Lanzillo R, Bonavita S, Lavorgna L. Cost-Analysis of Telemedicine Interventions Compared with Traditional Care in the Management of Chronic Neurological Diseases: A Systematic Review. Telemed J E Health 2023.

**70.** McCarthy B, Casey D, Devane D, Murphy K, Murphy E, Lacasse Y. Pulmonary rehabilitation for chronic obstructive pulmonary disease. Cochrane Database Syst Rev 2015;2:CD003793.

**71.** Cox NS, Dal Corso S, Hansen H, McDonald CF, Hill CJ, Zanaboni P, *et al.* Telerehabilitation for chronic respiratory disease. Cochrane Database Syst Rev 2021;1:CD013040.

**72.** Isernia S, Pagliari C, Bianchi LN, Banfi PI, Rossetto F, Borgnis F, *et al.*; CPTM Group. Characteristics, Components, and Efficacy of Telerehabilitation Approaches for People with Chronic Obstructive Pulmonary Disease: A Systematic Review and Meta-Analysis. Int J Environ Res Public Health 2022;19:15165.

**73.** Reychler G, Piraux E, Beaumont M, Caty G, Liistro G. Telerehabilitation as a Form of Pulmonary Rehabilitation in Chronic Lung Disease: A Systematic Review. Healthcare (Basel) 2022;10:1795.

**74.** Michaelchuk W, Oliveira A, Marzolini S, Nonoyama M, Maybank A, Goldstein R, *et al.* Design and delivery of home-based telehealth pulmonary rehabilitation programs in COPD: A systematic review and meta-analysis. Int J Med Inform 2022;162:104754.

**75.** Burton M, Valet M, Caty G, Aboubakar F, Reychler G. Telerehabilitation physical exercise for patients with lung cancer through the course of their disease: A systematic review. J Telemed Telecare 2022;May 12: 1357633X221094200.

**76.** Gholamzadeh M, Abtahi H, Safdari R. Telemedicine in lung transplant to improve patient-centered care: A systematic review. Int J Med Inform 2022;167:104861.

**77.** Huang K, Liu W, He D, Huang B, Xiao D, Peng Y, *et al.* Telehealth interventions versus center-based cardiac rehabilitation of coronary artery disease: A systematic review and meta-analysis. Eur J Prev Cardiol 2015;22:959–71.

**78.** Arian M, Valinejadi A, Soleimani M. Reviews evaluating information technology-based cardiac rehabilitation programs and support: A systematic review. Iran J Public Health 2022;51:1525–37.

**79.** Arian M, Valinejadi A, Soleimani M. Quality of life in heart patients receiving telerehabilitation: an overview with meta-analyses. Iran J Public Health 2022;51:2388–403.

**80.** Jin Choo Y, Chang MC. Effects of telecardiac rehabilitation on coronary heart disease: A PRISMA-compliant systematic review and meta-analysis. Medicine (Baltimore) 2022;101:e29459.

**81.** Ramachandran HJ, Jiang Y, Teo JY, Yeo TJ, Wang W. Technology acceptance of home-based cardiac telerehabilitation programs in patients with coronary heart disease: systematic scoping review. J Med Internet Res 2022;24:e34657.

**82.** Maulana S, Trisyani Y, Mirwanti R, Amirah S, Kohar K, Priyatmoko Putri AI, *et al.* The potential of cardiac telerehabilitation as delivery rehabilitation care model in heart failure during COVID-19 and transmissible disease outbreak: A systematic scoping review of the latest RCTs. Medicina (Kaunas) 2022;58:1321.

**83.** Isernia S, Pagliari C, Morici N, Toccafondi A, Banfi PI, Rossetto F, *et al.*; CPTM Group. Telerehabilitation approaches for people with chronic heart failure: A systematic review and meta-analysis. J Clin Med 2022;12:64.

**84.** Cavalheiro AH, Silva Cardoso J, Rocha A, Moreira E, Azevedo LF. Effectiveness of tele-rehabilitation programs in heart failure: A systematic review and meta-analysis. Health Serv Insights 2021;14:11786329211021668.

**85.** Stefanakis M, Batalik L, Antoniou V, Pepera G. Safety of home-based cardiac rehabilitation: A systematic review. Heart Lung 2022;55:117–26.

**86.** Batalik L, Filakova K, Sladeckova M, Dosbaba F, Su J, Pepera G. The cost-effectiveness of exercise-based cardiac telerehabilitation intervention: a systematic review. Eur J Phys Rehabil Med 2023;59:248–58.

**87.** Latif-Zade T, Tucci B, Verbovetskaya D, Bialkin E, Ng B, Heddon S, *et al.* Systematic review shows tele-rehabilitation might achieve comparable results to office-based rehabilitation for decreasing pain in patients with knee osteoarthritis. Medicina (Kaunas) 2021;57:764.

**88.** Xie SH, Wang Q, Wang LQ, Wang L, Song KP, He CQ. Effect of internet-based rehabilitation programs on improvement of pain and physical function in patients with knee osteoarthritis: systematic review and meta-analysis of randomized controlled trials. J Med Internet Res 2021;23:e21542.

**89.** Chen T, Or CK, Chen J. Effects of technology-supported exercise programs on the knee pain, physical function, and quality of life of individuals with knee osteoarthritis and/or chronic knee pain: A systematic review and meta-analysis of randomized controlled trials. J Am Med Inform Assoc 2021;28:414–23.

**90.** Tsang MP, Man GC, Xin H, Chong YC, Ong MT, Yung PS. The effectiveness of telerehabilitation in patients after total knee replacement:

A systematic review and meta-analysis of randomized controlled trials. J Telemed Telecare 2022;1357633X221097469.

**91.** Jansson MM, Rantala A, Miettunen J, Puhto AP, Pikkarainen M. The effects and safety of telerehabilitation in patients with lower-limb joint replacement: A systematic review and narrative synthesis. J Telemed Telecare 2022;28:96–114.

**92.** Wang Q, Lee RL, Hunter S, Chan SW. The effectiveness of internet-based telerehabilitation among patients after total joint arthroplasty: A systematic review and meta-analysis of randomised controlled trials. J Telemed Telecare 2023;29:247–60.

**93.** Nelson M, Russell T, Crossley K, Bourke M, McPhail S. Cost-effectiveness of telerehabilitation versus traditional care after total hip replacement: A trial-based economic evaluation. J Telemed Telecare 2021;27:359–66.

**94.** Lara-Palomo IC, Gil-Martínez E, Ramírez-García JD, Capel-Alcaraz AM, García-López H, Castro-Sánchez AM, *et al.* Efficacy of e-Health interventions in patients with chronic low-back pain: A systematic review with meta-Analysis. Telemed J E Health 2022;28:1734–52.

**95.** Hernando-Garijo I, Medrano-de-la-Fuente R, Jiménez-Del-Barrio S, Mingo-Gómez MT, Hernández-Lázaro H, Lahuerta-Martin S, *et al.* Effects of a telerehabilitation program in women with fibromyalgia at 6-month follow-up: secondary analysis of a randomized clinical trial. Biomedicines 2022;10:3024.

**96.** Gava V, Ribeiro LP, Barreto RP, Camargo PR. Effectiveness of physical therapy given by telerehabilitation on pain and disability of individuals with shoulder pain: A systematic review. Clin Rehabil 2022;36:715–25.

**97.** Frontera WR, Degroote W, Ghaffar A; Health Policy and Systems Research for Rehabilitation Group. Importance of health policy and systems research for strengthening rehabilitation in health systems. A call to action to accelerate progress. Eur J Phys Rehabil Med 2023;59:657–9.

**98.** Romano M, Negrini A, Negrini S. Lessons learned in two months of exclusive application of telephysiotherapy instead of classical physiotherapy during the lockdown in Italy. Spine J 2021;21:366–9.

**99.** Sanchez-Ramirez DC, Pol M, Loewen H, Choukou MA. Effect of telemonitoring and telerehabilitation on physical activity, exercise capacity, health-related quality of life and healthcare use in patients with chronic lung diseases or COVID-19: A scoping review. J Telemed Telecare 2022;Aug 31:1357633X221122124.

**100.** Bernal-Utrera C, Montero-Almagro G, Anarte-Lazo E, Gonzalez-Gerez JJ, Rodriguez-Blanco C, Saavedra-Hernandez M. Therapeutic Exercise Interventions through Telerehabilitation in Patients with Post COVID-19 Symptoms: A Systematic Review. J Clin Med 2022;11:7521.

**101.** Seid AA, Aychiluhm SB, Mohammed AA. Effectiveness and feasibility of telerehabilitation in patients with COVID-19: a systematic review and meta-analysis. BMJ Open 2022;12:e063961.

**102.** Huang J, Fan Y, Zhao K, Yang C, Zhao Z, Chen Y, *et al.* Do patients with and survivors of COVID-19 benefit from telerehabilitation? A meta-analysis of randomized controlled trials. Front Public Health 2022;10:954754.

**103.** Valverde-Martínez MÁ, López-Liria R, Martínez-Cal J, Benzo-Iglesias MJ, Torres-Álamo L, Rocamora-Pérez P. Telerehabilitation, A viable option in patients with persistent post-COVID syndrome: A systematic review. Healthcare (Basel) 2023;11:187.

**104.** Bittner AK, Yoshinaga PD, Rittiphairoj T, Li T. Telerehabilitation for people with low vision. Cochrane Database Syst Rev 2023;1:CD011019.

**105.** Máthéné Köteles É, Rafael B, Korom A, Vágvölgyi A, Ábrahám JE, Domján A, *et al.* Physiological and psychological effects of a 12-week home-based telemonitored training in metabolic syndrome. Front Cardiovasc Med 2023;9:1075361.

**106.** Plaza A, Paratz J, Cottrell M. A six-week physical therapy exercise program delivered via home-based telerehabilitation is comparable to in-person programs for patients with burn injuries: A randomized, controlled, non-inferiority clinical pilot trial. Burns 2023;49:55–67.

**107.** Le Berre M, Filiatrault J, Reichetzer B, Dumoulin C. Group-based pelvic floor telerehabilitation to treat urinary incontinence in older women: A feasibility study. Int J Environ Res Public Health 2023;20:5791.

**108.** Ibeggazene S, Turner R, Rosario D, Bourke L. Remote interventions to improve exercise behaviour in sedentary people living with and beyond cancer: a systematic review and meta-analysis. BMC Cancer 2021;21:308.

**109.** Keikha L, Maserat E, Mohammadzadeh Z. Telerehabilitation and monitoring physical activity in patient with breast cancer: systematic review. Iran J Nurs Midwifery Res 2022;27:8–17.

**110.** Ahmadi Marzaleh M, Peyravi M, Azhdari N, Bahaadinbeigy K, Sarpourian F. Application of telerehabilitation for older adults during the COVID-19 Pandemic: A systematic review. Disaster Med Public Health Prep 2022;17:e402.

**111.** Nacarato D, Sardeli AV, Mariano LO, Chacon-Mikahil MP. Cardiovascular telerehabilitation improves functional capacity, cardiorespiratory fitness and quality of life in older adults: A systematic review and meta-analysis. J Telemed Telecare 2022;Dec 5: 1357633X221137626.

**112.** Eslami Jahromi M, Ayatollahi H. Impact of telecare interventions on quality of life in older adults: a systematic review. Aging Clin Exp Res 2023;35:9–21.

**113.** Jirasakulsuk N, Saengpromma P, Khruakhorn S. Real-time telerehabilitation in older adults with musculoskeletal conditions: systematic review and meta-analysis. JMIR Rehabil Assist Technol 2022;9:e36028.

**114.** Alonazi A. Effectiveness and acceptability of telerehabilitation in physical therapy during COVID-19 in children: findings of a systematic review. Children (Basel) 2021;8:1101.

**115.** Camden C, Pratte G, Fallon F, Couture M, Berbari J, Tousignant M. Diversity of practices in telerehabilitation for children with disabilities and effective intervention characteristics: results from a systematic review. Disabil Rehabil 2020;42:3424–36.

**116.** World Health Organization and International Telecommunication Union. WHO-ITU global standard for accessibility of telehealth services. Geneva: World Health Organization; 2022.

**117.** Kettlewell J, Lindley R, Radford K, Patel P, Bridger K, Kellezi B, *et al.* Factors affecting the delivery and acceptability of the ROWTATE telehealth vocational rehabilitation intervention for traumatic injury survivors: A mixed-methods study. Int J Environ Res Public Health 2021;18:9744.

**118.** Ding J, Yang Y, Wu X, Xiao B, Ma L, Xu Y. The telehealth program of occupational therapy among older people: an up-to-date scoping review. Aging Clin Exp Res 2023;35:23–40.

**119.** Leochico CF, Di Giusto ML, Mitre R. Toward green and sustainable educational conferences in physical and rehabilitation medicine. J Int Soc Phys Rehabil Med 2021;4:201–2.

**120.** Negrini S, Selb M, Kiekens C, Todhunter-Brown A, Arienti C, Stucki G, *et al.*; 3rd Cochrane Rehabilitation Methodology Meeting participants. Rehabilitation definition for research purposes. A global stakeholders' initiative by Cochrane Rehabilitation. Eur J Phys Rehabil Med 2022;58:333–41.

**121.** Stucki G, Reinhardt JD, Grimby G. Organizing human functioning and rehabilitation research into distinct scientific fields. Part II: conceptual descriptions and domains for research. J Rehabil Med 2007;39:299–307.

**122.** Zampolini M, Todeschini E, Bernabeu Guitart M, Hermens H, Ilsbroukx S, Macellari V, *et al.* Tele-rehabilitation: present and future. Ann Ist Super Sanita 2008;44:125–34.

**123.** Stephenson A, Howes S, Murphy PJ, Deutsch JE, Stokes M, Pedlow K, *et al.* Factors influencing the delivery of telerehabilitation for stroke: A systematic review. PLoS One 2022;17:e0265828.

**124.** Velez M, Lugo-Agudelo LH, Patiño Lugo DF, Glenton C, Posada AM, Mesa Franco LF, *et al.* Factors that influence the provision of home-based rehabilitation services for people needing rehabilitation: a qualitative evidence synthesis. Cochrane Database Syst Rev 2023;2:CD014823.

**125.** Finnish Office for HTA. EUnetHTA WP4 - HTA Core Model for diagnostic technologies - Version 1.0r; 2008. Available from: https://www.eunethta.eu/wp-content/uploads/2018/01/HTA-Core-Model-for-Diagnostic-Technologies-1.0r.pdf [cited 2024, Jan 30].

**126.** Chapel B, Alexandre F, Heraud N, Ologeanu-Taddei R, Cases AS, Bughin F, *et al*. Standardization of the assessment process within telerehabilitation in chronic diseases: a scoping meta-review. BMC Health Serv Res 2022;22:984.

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*Conflicts of interest*
The authors certify that there is no conflict of interest with any financial organization regarding the material discussed in the manuscript.

*Authors' contributions*
Mauro Zampolini and Aydan Oral share first authorship. All authors read and approved the final version of the manuscript.

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