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Clinical Practice Guidelines

Telerehabilitation in Physical Therapist Practice: A Clinical Practice Guideline From the American Physical Therapy Association

Alan C. Lee, PT, DPT, PhD[1,†*], Judith E. Deutsch, PT, PhD, FAPTA[2,3], Lesley Holdsworth, OBE, PhD[4], Sandra L. Kaplan, PT, DPT, PhD, FAPTA[5], Heidi Kosakowski, PT, DPT, PhD[6], Robert Latz, PT, DPT[7], Lydia Lennox McNeary, MD[8], Jennifer O'Neil, PT, PhD[9], Oscar Ronzio, PT, DHSc[10], Kelly Sanders, PT, DPT, ATC[11], Michelle Sigmund-Gaines, BA[12], Michele Wiley, PT, DPT, DHSc[13], Trevor Russell, PT, PhD[14,†]

[1]Physical Therapy Department, Mount Saint Mary's University, Los Angeles, California, USA
[2]Rivers Lab, Department of Rehabilitation and Movement Sciences, Program Physical Therapy, Rutgers University, New Brunswick, New Jersey, USA
[3]Department of Rehabilitation and Movement Sciences, Program Physical Therapy, Graduate School, Rutgers University, New Brunswick, New Jersey, USA
[4]NHS 24, Caledonia House, 140 Fifty Pitches Rd, Cardinals, Glasgow, Scotland, United Kingdom
[5]Department of Rehabilitation and Movement Sciences, Program Physical Therapy, Rutgers University, New Brunswick, New Jersey, USA
[6]World Physiotherapy, Head of Membership and Policy, Unit 17, Empire Square, London, United Kingdom
[7]Chief Information Office (CIO), Trinity Rehabilitation Services, Florence, Kentucky, USA
[8]School of Medicine, Virginia Tech Carilion Research Institute, Roanoke, Virginia, USA
[9]Physiotherapy Program, School of Health Sciences, University of Ottawa, Ottawa, Canada
[10]Member of World Physiotherapy, Argentine Association of Kinesiology, Buenos Aires, Argentina
[11]Movement for Life Physical Therapy, Atascadero, California, USA
[12]Oregon Physical Therapist Licensing Board, Tigard, Oregon, USA
[13]Department of Physical Therapy, Shenandoah University, Winchester, Virginia, USA
[14]RECOVER Injury Research Centre, School of Health and Rehabilitation Sciences, University of Queensland, Brisbane, Queensland, Australia

*Address all correspondence to Dr Lee at: allee@msmu.edu

[†]Alan C. Lee and Trevor Russell contributed equally to this work as co–first authors.

Abstract

A clinical practice guideline on telerehabilitation was developed by an American Physical Therapy Association volunteer guideline development group consisting of international physical therapists and physiotherapists, a physician, and a consumer. The guideline was based on systematic reviews of current scientific literature, clinical information, and accepted approaches to telerehabilitation in physical therapist practice. Seven recommendations address the impact of, preparation for, and implementation of telerehabilitation in physical therapist practice. Research recommendations identify current gaps in knowledge. Overall, with shared decision-making between clinicians and patients to inform patients of service delivery options, direct and indirect costs, barriers, and facilitators of telerehabilitation, the evidence supports the use of telerehabilitation by physical therapists for both examination and intervention. The Spanish and Chinese versions of this clinical practice guideline, as well as the French version of the recommendations, are available as supplementary material (Suppl. Materials).

Keywords: Physical Therapist, Telehealth, Telerehabilitation

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Introduction

Overview

This clinical practice guideline (CPG) is based on a systematic review (SR) of published studies involving the delivery of physical therapist services via telerehabilitation for various health conditions. In addition to providing practice recommendations, this guideline highlights limitations in the literature, intentional vagueness, potential benefits, risks, harms, and costs of implementing each recommendation, and areas for future research.[1]

This CPG is intended to be used by all qualified and appropriately trained physical therapists and physical therapist assistants involved in the delivery of telerehabilitation. Additionally, it serves as an information resource for decision makers, health care professionals, consumers, funders, and regulatory people of interest. The guideline is intended for an international audience. Of note, the synonymous[2] terms "physical therapy" and "physiotherapy" are used only in reference to services that are provided by or under the direction and supervision of a licensed physical therapist or physiotherapist.

In the USA, the Health Resource Services Administration defines telehealth as the use of electronic information and telecommunication technologies to support long-distance clinical health care, patient and professional health–related education, public health, and health administration.[3] Recently, the World Health Organization defined digital health as the field of knowledge and practice associated with the development and use of digital technologies to improve health.[4] It is often used as a broad umbrella term encompassing eHealth and other developing fields of "big data," genomics, and artificial intelligence. Various health disciplines use other terms to describe the use of digital health in clinical practice, such as telemedicine,[5] telepractice,[6] and digital practice.[7] In this CPG, "licensed health care professional" refers to a person who licensed, registered, or certified under a jurisdictional state or national law while engaged in the professional or trade practices conducted under authority of that law. To be licensed, a health care professional must meet minimum standards for education, training, and experience, and in certain countries and states pass professional exams and criminal background checks. The term "clinician" refers to a health care provider qualified in the clinical discipline who provides principal care for a patient. Clinicians may be physical therapists, physical therapist assistants, physicians, nurses, pharmacists, or other health care professionals.[8] In this CPG, telerehabilitation will be defined as the use of telehealth technologies by physical therapists, or physical therapist assistants under the supervision of a physical therapist, who provide patient and client management, which includes diagnosis, prognosis, and intervention to optimize physical function, movement, performance, health, quality of life, and well-being across the lifespan. The term "patient" may refer to an adult or a child. When the term "patient" refers to a child, it implies both the child and their guardian, as appropriate.

Health Question and Rationale

The CPG is an evidence synthesis that aims to address questions on the efficacy, accuracy, outcomes, acceptability, cost-effectiveness, and occurrence of adverse events when delivering physical therapist examinations and interventions via telerehabilitation. It also examines the facilitators and barriers to telerehabilitation from the patient and provider perspectives.

The American Physical Therapy Association (APTA) selects CPG topics based on multiple factors, including input from various departments at APTA (scientific affairs, public affairs, advisory committees) and initial scanning of published literature. The topic of telerehabilitation was selected in 2020 during the early months of the coronavirus disease 2019 (COVID-19) pandemic. At that time, the physical therapist profession experienced a rapid shift to telerehabilitation, as noted in multiple reports by APTA in the *Impact of COVID-19 on the Physical Therapy Profession*.[9,10] This created the need for an evidence-based resource to assist the profession in patient care, and as a tool to assist in advocacy efforts for regulation and payment issues. Additionally, early reports of positive experiences with telerehabilitation further justified the utility of developing a CPG on the topic.[11]

Scope and Goals

The purpose of this CPG is to guide the delivery of physical therapist services via telerehabilitation (either 100% telerehabilitation or a hybrid of in person and telerehabilitation) to individuals of all ages with health conditions, based on the current best evidence. Current practice standards demand that clinicians use the best available evidence in their clinical decision-making, incorporate clinical expertise, and consider the patient's wants and needs. To assist clinicians, this CPG is based on a SR of the literature regarding physical therapist services delivered via telerehabilitation. This review included randomized controlled trials (RCTs), SRs, comparative studies, and qualitative studies published between January 1, 2010, and March 28, 2022, and identifies where there is strong evidence, where evidence is lacking, and topics that future research must target to improve the management of individuals with health conditions via telerehabilitation or a hybrid of in-person and telerehabilitation services. It is noteworthy that evidence in this CPG supports comparable outcomes for in-person and telerehabilitation services.

This CPG is an educational tool to guide qualified clinicians through a series of management decisions to improve service quality and efficiency and to reduce unwarranted variations in care. This CPG should not be construed as including all proper methods of care or excluding methods of care reasonably directed at obtaining the same treatment results. The ultimate judgment regarding the application of any specific procedure or treatment delivered though telerehabilitation must consider all circumstances presented by the patient, including safety, preferences, and health condition, and the needs and resources particular to the locality or institution. Processes and outcomes that expand or deviate from those expected when adhering to the CPG recommendations should be published to add to the evidence.

Intended Users

This CPG is intended to be used by physical therapists, and physical therapist assistants under the direction and supervision of physical therapists, for the delivery of physical therapist services via telerehabilitation. Physical therapists are licensed health care professionals who help individuals develop, maintain, restore, and improve movement, activity, and functioning to enable optimal performance and enhance

health, well-being, and quality of life.[1] Physicians, rehabilitation medicine providers and administrators, nurse practitioners, physician assistants, occupational therapists, speech language pathologists, and other health care professionals who utilize telehealth and telemedicine in various practice settings also may benefit from this guideline. This guideline is not intended to determine insurance benefits or payment policies for health care agencies, payers, professional organizations, or government entities.

Telerehabilitation as a means of physical therapist practice is based on decisions made by the health care team with an individual patient (or advocate). Use of technologies in telerehabilitation may require collaboration with information technology and cybersecurity specialists to manage and audit data for privacy and security.

Once the individual (or advocate) has been informed of the nature of the available therapies and has discussed options with their health care professional, an informed and shared decision can be made as to whether to utilize telerehabilitation.

Patient Population

This CPG addresses the physical therapists' uses of telerehabilitation in the management of individuals of all ages with various health conditions.

Methods

The methods used to develop this CPG aimed to minimize bias and enhance transparency in the selection, appraisal, and analysis of the available evidence. These processes are vital to the development of reliable, transparent, and accurate clinical recommendations for telerehabilitation in physical therapist practice. Methods from the *APTA Clinical Practice Guideline Manual*[1] were used in development of this CPG.

The Telerehabilitation Clinical Practice Guideline Development Group (GDG) consisted of physical therapist members from different APTA academies and sections (pediatrics, private practice, orthopedics, neurology, leadership and innovation, and research); and representatives from international professional associations in Argentina, Australia, Canada, and the United Kingdom; a physician from Virginia Tech Carilion School of Medicine; and a consumer from the Oregon Board of Physical Therapy who had experienced telerehabilitation as a patient (Fig. 1). All GDG members, APTA staff, and methodologists were free of financial conflicts of interest relevant to the topic under study, as recommended by the National Academies of Sciences and Medicine's *Clinical Guidelines We Can Trust*.[12] GDG members with intellectual conflicts, due to authorship on articles included for review, abstained from appraising those articles and voting on recommendations that included their evidence. The GDG began meeting January 20, 2021 to define the CPG scope and create patient, intervention, comparison, outcome, and time (PICOT) questions to direct the literature search (Suppl. Material).

The GDG identified and prioritized outcomes of interest based on a preliminary literature search and clinical expertise of the GDG. It is noted that most studies did not report on many of the predefined outcomes. The body of evidence for this CPG reports on the best approximation of these critical outcomes. Outcomes pertaining to activities and participation were considered critical, and those pertaining to body functions and structures were considered important. Because the

Voting Members

Alan C. Lee, PT, DPT, PhD *Co-Chair; American Physical Therapy Association, Board-Certified Clinical Specialist in Geriatric Physical Therapy, Board-Certified Clinical Specialist in Wound Management*
Trevor Russell, PT, PhD *Co-Chair; Australian Physiotherapy Association*
Judith E. Deutsch, PT, PhD, FAPTA *American Physical Therapy Association, APTA Academy of Research*
Lesley Holdsworth, OBE, PhD *The Chartered Society of Physiotherapy, UK Fellow of the Chartered Society of Physiotherapy Scottish Government, Digital Lead Fellow of the Faculty of Clinical Informatics*
Sandra L. Kaplan, PT, DPT, PhD, FAPTA *American Physical Therapy Association, Academy of Pediatric Physical Therapy Methodologist*
Heidi Kosakowski, PT, DPT, PhD *World Physiotherapy*
Robert Latz, PT, DPT *American Physical Therapy Association, Academy of Leadership and Innovation*
Lydia Lennox McNeary, MD *Physical Medicine and Rehabilitation*
Jennifer O'Neil, PT, PhD *Canadian Physiotherapy Association*
Oscar Ronzio, PT, DHSc *Asociación Argentina de Kinesiología*
Kelly Sanders, PT, DPT, ATC *American Physical Therapy Association, APTA Private Practice; Board-Certified Clinical Specialist in Orthopaedic Physical Therapy*
Michelle Sigmund-Gaines, BA *Oregon State Board of Physical Therapy Consumer representative*
Michele Wiley, PT, DPT, DHSc *American Physical Therapy Association, Academy of Pediatric Physical Therapy, Board-Certified Clinical Specialist in Pediatric Physical Therapy*

APTA and ECRI Staff/Contributors

1. Anita Bemis-Dougherty, PT, DPT, MAS, Senior Advisor, Scientific Affairs Unit, APTA
2. Jeanine Kolman, PT, DPT, Specialist, Practice, APTA
3. Stacey Schwartz, PT, DPT, Specialist, Practice, APTA
4. Janice Kaczmarek, MS, ECRI Guidelines Trust
5. Karen Finnin, PT, Australian Physiotherapy Association
6. Christopher Peterson, PT, DPT, American Telemedicine Association
7. Mike Billings, PT, DHSc, MS, American Physical Therapy Association, Academy of Neurologic Physical Therapy

Figure 1. Guideline Development Group roster. APTA = American Physical Therapy Association; ECRI = Emergency Care Research Institute.

scope of the CPG focused on the use of telerehabilitation as a delivery method for physical therapist services, outcome measures were included based on the reviewed studies; however, these measures are not all inclusive and do not focus on the psychometric properties of the measures.

APTA sought the expertise of the Emergency Care Research Institute Evidence–Based Practice Center as paid consultants to assist the GDG with its literature search and study appraisal. Information professionals performed literature searches within the Emergency Care Research Institute (ECRI) Health Technology Assessment/EPC Information Center following established guidelines and procedures as identified by the director of the Information Center. Consistent with the ECRI evidence–based searching protocol, all key questions were searched for SRs and RCTs (Suppl. Material: Supplementary Documents) in these databases: MEDLINE and EMBASE (via EMBASE.com), In Process Medline and PubMed-unique content (via PubMed.gov), and Cumulative Index to Nursing and Allied Health Literature for the time-period of January 1, 2010, through July 26, 2021. Search terms were identified by reviewing relevant SRs on similar topics identified by members of the research staff; reviewing how other relevant studies are indexed, their subject-heading terms, and their keywords; reviewing MeSH, EMTREE, and the PsycINFO thesaurus for relevant and appropriate terms; reviewing the search strategies for previously published relevant guidelines and publications; and discussions with the GDG. Once search terms were established, combinations of subject headings and key words were used in both phases of the literature search to retrieve SRs, RCTs, comparative studies, and qualitative studies that addressed the key questions.

As ECRI limited its search to SRs, RCTs, comparative studies, and qualitative studies, and to ensure currency, GDG members conducted supplementary searches for recommendations 1, 3, and 4. Details are below.

Literature searches in phase 1 identified 5085 citations potentially addressing the key questions of interest to this evidence review. Of those, 4235 were excluded upon title review for clearly not meeting inclusion criteria (eg, not pertinent to the topic, not published in English, published prior to study inclusion publication date, or not a full-length article). Overall, 850 abstracts were reviewed with 363 of those being excluded for the following reasons: not a SR or clinical study, did not address a key question of interest to this review, did not enroll a population of interest, or published prior to January 1, 2010. A total of 487 full-length articles were reviewed. Of those, 347 were excluded at a first pass review for the following: did not address a key question of interest, did not enroll the population of interest, did not meet inclusion criteria for clinical study or SR, did not meet inclusion criteria for any key question, or was a duplicate. A total of 140 full-length articles were thought to address 1 or more key questions and were further reviewed. Of these, 110 ultimately were excluded with reasons presented in Figure 2.

Overall, 30 studies from phase 1 of the literature search addressed 1 or more of the key questions and were considered as evidence in this CPG (Fig. 2).

Following review of the initial ECRI results, the GDG updated the search for recommendations 1 and 2 to include RCTs through November 14, 2022. Of the 1223 titles and abstracts screened, 14 additional studies were included.

Following review of the initial ECRI process, the GDG broadened the search criteria for recommendations 3 and 4 to include cohort, survey, and secondary analyses studies and updated the original search through March 28, 2022, resulting in 118 new articles. Of the 118 new articles identified, 35 did not answer the research question and 80 were not related to telerehabilitation. Following both title and abstract and full text reviews, 1 additional qualitative study and 2 additional survey studies were included, for a total of 15 articles.

ECRI staff screened study titles and abstracts and performed full-length article appraisals of the included quantitative studies using the US Preventative Services Task Force[13] criteria for RCTs and the Grading of Recommendations, Assessment, Development, and Evaluation (GRADE)[14] system for assessing the overall quality (or uncertainty) of the body of evidence for each outcome in the PICOT question. The GRADE system primarily considers the following factors: overall study quality (or overall risk of bias or study limitations), consistency of evidence, directness of evidence, and precision of evidence.[14] Given time and resources, other factors such as publication bias were considered (Tab. 1). The GRADE system rates the overall quality of the body of evidence as high, moderate, low, and very low. A body of evidence consisting of RCTs automatically starts with a rating of high quality. This rating can be downgraded if the RCTs have serious methodological flaws, if the findings are inconsistent, or if effect sizes lack precision. Study designs other than RCTs begin as low evidence and can be upgraded, depending on methodological rigor and consistency of findings across studies.

For recommendation 1, 4 of the GDG members completed the appraisals of the additional 14 studies using GRADE criteria.

Prior to individual ratings, 1 article was used to establish reliability on the GRADE ratings among the reviewers. Conflicts within appraisal pairs were resolved by a third appraiser.

For recommendations 3 and 4, GDG members appraised the included 15 articles using the Critical Appraisal Skills Programme appraisal tool for qualitative studies,[15] and the Centre for Evidence–Based Medicine Survey tool[16] for surveys. Reliability was established for each tool at 100% and each article was appraised by paired readers. Conflicts within appraisal pairs were resolved by the third appraiser. Qualitative studies were categorized as high (≥7/10), moderate (5 or 6/10), or low (≤4/10) quality.

Best Evidence Synthesis

ECRI's Process

SRs with quantitative syntheses were the first line of evidence used. For questions in which a previous SR was available, primary studies meeting that published SR's inclusion criteria were used to supplement or update the earlier SR. For questions where multiple SRs with similar arrays of included individual studies were available, the most comprehensive (in terms of the number of high-quality cited studies) and/or recent SR was chosen to avoid multiple ratings of a similar evidence base. SRs not contributing to the overall grading of evidence were included in ECRI's narrative summaries, particularly if they contained a small number of unique but high-quality, individual studies. For PICOT questions for which no previous SR was available, individual study summaries of the overall findings for the outcomes of interest were provided.

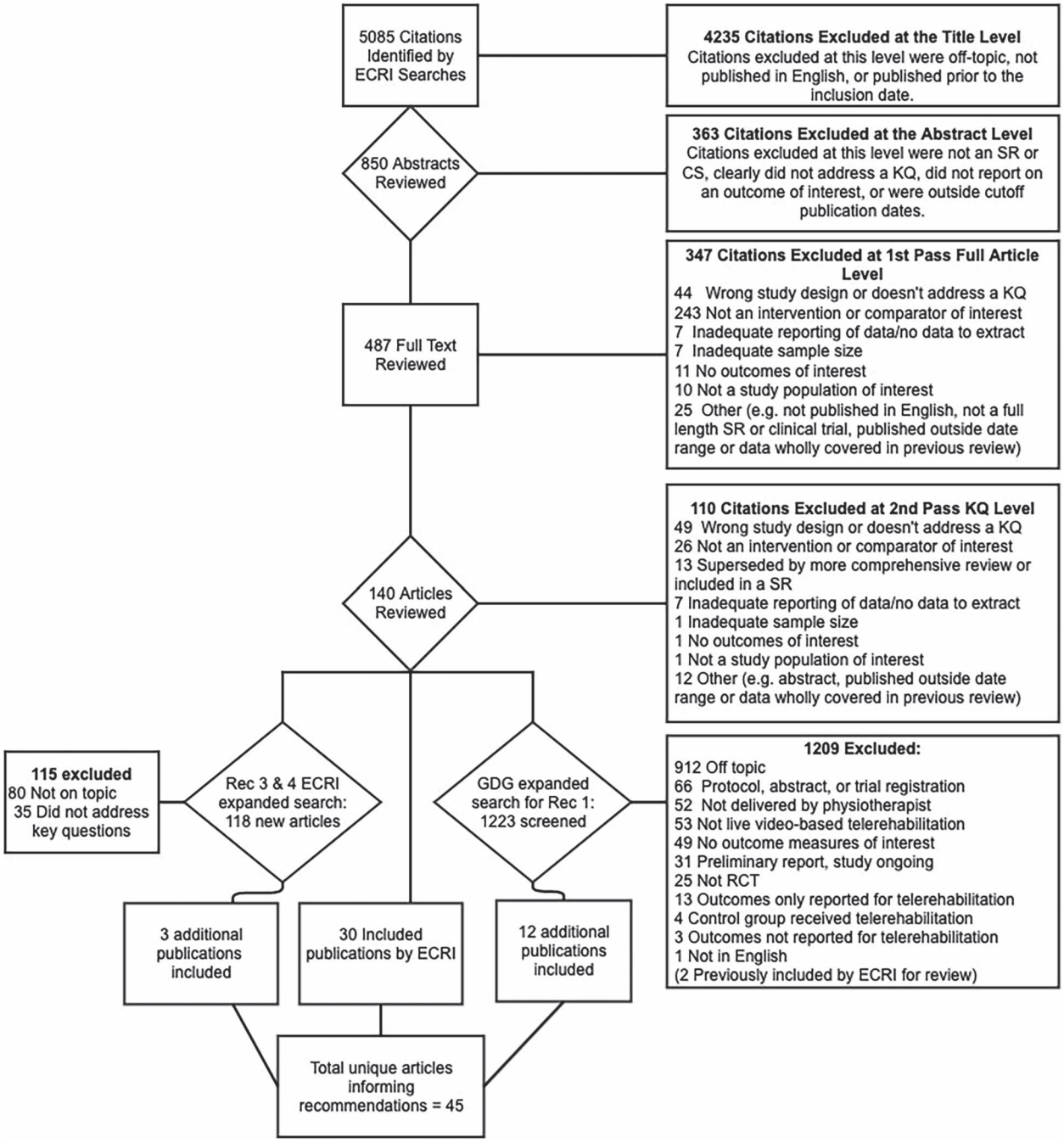

Figure 2. Study flow diagram. Note: the study flow diagram generated by ECRI in the Supplementary Materials contained an error and was updated. The total number of citations identified by ECRI searches is 5085. CS = clinical study; ECRI = Emergency Care Research Institute; GDG = Guideline Development Group; KQ = key question; RCT = randomized controlled trial; Rec = recommendation; SR = systematic review.

Teams of GDG members were assigned to PICOT questions to review the ECRI evidence summaries and additional appraised articles if appropriate, and to generate first drafts of a recommendation to address the question. Recommendations and evidence summary profiles were shared with the full GDG for discussion, editing, and eventual voting.

A summary of recommendations is provided in Table 2, and the strength of the recommendations is shown in Table 3. The strength of recommendation takes into account the quality, quantity, and trade-off between the benefits and harms of a process, measure or intervention, the magnitude of effect, and whether there are data on critical outcomes.

Recommendation strength was based on the body of evidence and could be upgraded if study results were consistent, even when methodologies were considered lower level (weaker RCTs or observational designs), and when the magnitude of potential benefit outweighed potential harm when implementing the recommendation. Each incidence of upgrading or downgrading is noted in its respective recommendation. When reported in studies, specific patient-reported outcomes are presented in the recommendation rationales.

Table 1. GRADE Factors Used to Assess the Quality of a Body of Experimental Evidence[a]

Evidence Category	Definition
Study quality (internal validity or risk of bias)	Study quality takes into account the overall risk of bias rating of all the studies included in the evidence base. For the purpose of this review, the overall risk of bias would be the average or median USPSTF rating for studies comprising an evidence base for a key outcome.
Consistency of evidence	Consistency of evidence refers to the degree of similarity in the direction of effects or the degree of similarity in the effect sizes (magnitude of effect) across individual studies within an evidence base.
Directness of evidence	Direct evidence directly compares interventions of interest in populations of interest and measures patient-oriented outcomes. Evidence can be indirect if the tested intervention differs from the intervention of interest, the study population differs from the population of interest, the outcomes differ from those of primary interest, or treatment comparisons have not been tested in head-to-head comparisons.
Precision of evidence	Precision is the degree of certainty surrounding an estimate of effect with respect to an outcome. Precision is primarily assessed by examining the 95% CIs around the summary effect size. CIs within the following ranges are not statistically significant but are considered precise and should not be downgraded for precision. Furthermore, if a key question is focused on comparative effectiveness of 2 interventions' estimates within these bounds, then a finding of equivalence or no difference is supported. • Summary estimates using ratio statistics: lower CI = 0.80; upper CI = 1.25. • Summary estimates using standardized mean difference: lower CI = −0.2; upper CI = 0.2. • Summary estimates using raw mean difference: depends on measure or instrument; default is 20% difference on each side. Estimates outside of these bounds would be considered imprecise and downgraded for imprecision.

[a]GRADE = Grading of Recommendations Assessment, Development and Evaluation; USPSTF = US Preventive Services Task Force.

Table 2. Summary of Recommendations

Telerehabilitation Practice, Preparation, and Implementation	Quality of Evidence	Strength of Recommendation	Recommendation
Telerehabilitation in physical therapist practice	Moderate	♦♦♦◊	Recommendation 1: Physical therapists should recommend telerehabilitation or hybrid care, as they are at least equivalent to in-person physical therapy with respect to patient acceptability and satisfaction and are superior to in-person physical therapy with respect to adherence and attendance for certain health conditions.
Telerehabilitation preparation	Moderate	♦♦♦◊	Recommendation 2: Physical therapists and patients should discuss whether telerehabilitation is a cost-effective option compared with in-person care in the context of the patient's circumstances and conditions.
	High	♦♦♦♦	Recommendation 3: Physical therapists should identify and work to reduce barriers and promote facilitators identified from the patient's perspectives and experiences when planning and providing telerehabilitation services.
	Moderate to high	♦♦♦♦	Recommendation 4: Physical therapists should identify and work to reduce clinician and organizational barriers and promote facilitators to support the delivery of telerehabilitation services.
Telerehabilitation implementation	Low	♦♦◊◊	Recommendation 5: When physical therapists perform components of an examination via telerehabilitation, they may use the results to inform the diagnosis with comparable accuracy to an in-person visit for certain health conditions.
	Low	♦♦♦◊[a]	Recommendation 6: Physical therapists should use telerehabilitation to achieve outcomes similar to in-person care for certain health conditions.
	Low	♦♦♦♦[b]	Recommendation 7: Physical therapists should anticipate, prevent, manage, and document occurrences of adverse events specific to telerehabilitation as the mode of delivery.

[a]Weak upgraded to moderate due to consistent results and inability to blind patients for clinicians. [b]Recommendation strength upgraded from weak to strong to be consistent with professional codes of ethics to ensure patient safety.

Structure of the Recommendations

Each recommendation contains information on the quality of the body of evidence and the strength of each recommendation. Additional categories are also provided for potential benefits, risks, harms, and costs of implementing each recommendation; future research; value judgments; intentional vagueness; exclusions; quality improvement; and implementation and audit. The rationales for each recommendation are intended to provide the reader with an overview of the included studies, highlighting consistencies or discrepancies in results where applicable, and are not intended to provide specific details of each study. References of the included studies for each recommendation are provided in the action statement profiles, and readers are encouraged to search individual studies for details. Additionally, information on quality improvement (what aspect of practice would improve by following the recommendation) and implementation and audit (specific strategies for implementing

Table 3. Strength of Recommendations[a]

Strength of Recommendations	Language of Obligation	Definition
Strong ♦♦♦♦	Must or should	A high level of certainty of *moderate to substantial* benefit, harm, or cost, or a *moderate* level of certainty for *substantial* benefit, harm, or cost (based on a preponderance of level 1 or 2 evidence[1] with at least 1 level 1 study).
Moderate ♦♦♦◊	Should	A high level of certainty of *slight to moderate* benefit, harm, or cost, or a *moderate* level of certainty for a *moderate* level of benefit, harm, or cost (based on a preponderance of level 2 evidence or a single high-quality RCT).
Weak ♦♦◊◊	May	A moderate level of certainty of *slight* benefit, harm, or cost, or a weak level of certainty for moderate to substantial benefit, harm, or cost (based on level 2 through 5 evidence).
Theoretical/foundational ♦◊◊◊	May	A preponderance of evidence from animal or cadaver studies, from conceptual/theoretical models/principles, or from basic science/bench research, or published expert opinion in peer-reviewed journals that support the recommendation.
Best practice ♦◊◊◊	May or should	Recommended practice based on current clinical practice norms, exceptional situations in which validating studies have not or cannot be performed yet there is a clear benefit, harm, cost, or expert opinion.
Research	N/A	An absence of research on the topic or disagreement among conclusions from higher quality studies on the topic.

[a]N/A = not applicable; RCT = randomized controlled trial.

a particular recommendation and how its implementation might be measured for adherence) is provided for each recommendation.

Voting on the Recommendations

GDG members voted on the strength and language of each recommendation. A 60% majority was needed for a recommendation to pass; all recommendations received 100% agreement among the eligible quorum of the voting GDG. No disagreements were recorded during recommendation voting.

Patient Involvement

A consumer representative who had received services via telerehabilitation as a patient and served as executive director of the Oregon Board of Physical Therapy participated in the development of this CPG as a member of the GDG. Three additional consumers who used telerehabilitation services reviewed the CPG and provided comments.

Revision Plans

This CPG represents a cross-sectional view of current management strategies and may become outdated as new evidence becomes available. The original search terms will be used to search and evaluate new literature yearly. Within the next 5 years, APTA will initiate the CPG review process and will either revise the CPG in accordance with new evidence, changing practice, rapidly emerging treatment options, and new technology; reaffirm the CPG; or withdraw the CPG.

Dissemination Plans

The primary purpose of this CPG is to provide interested readers with full documentation of the best available evidence for telerehabilitation in physical therapist practice.

This CPG is published as an open-access article. It is available in Spanish and Chinese, and the recommendations are available in French (see Suppl. Materials).

This CPG will be disseminated via online resources, such as webinars, podcasts, pocket guides (https://www.guidelinecentral.com/aptamembers/), continuing education courses at national and international professional annual meetings, and social media. A CPG+, which includes an appraisal rating using the AGREE II tool, highlights of the CPG, a check-your-practice section, and review comments, is available on APTA website (https://www.apta.org/patient-care/evidence-based-practice-resources/cpgs). A knowledge translation group comprising both international and APTA academy/section members has been formed to create additional implementation tools that will be available on the APTA Evidence-Based Documents web page (https://www.apta.org/patient-care/evidence-based-practice-resources).

Role of the Funding Source

APTA, which funded the ECRI services and provided coordination, played no role in the design, conduct, and reporting of the recommendations.

External Review: Peer Review and Public Commentary

Following the formation of a final draft, the CPG draft was subjected to a 3-week peer review for additional input from external content experts and interested parties. More than 55 comments from 6 societies were collected via an electronic structured review form. All peer reviewers were required to disclose any potential conflicts of interest, which were recorded and, as necessary, addressed.

After modifying the draft in response to peer review, the CPG was subjected to a 2-week public comment period. Commenters consisted of the APTA Board of Directors (Board), the APTA Scientific and Practice Affairs Committee, all relevant APTA sections and academies, interested organizations, and the physical therapist community at large. More than 130 public comments were received from 42 individuals from the USA and other countries. Draft revisions were made in response to relevant comments before submitting for Journal review and publication.

Telerehabilitation in Physical Therapist Practice

Recommendation 1 ♦♦♦◊

Physical therapists should recommend telerehabilitation or hybrid care, as they are at least equivalent to in-person physical therapy with respect to patient acceptability and satisfaction and are superior to in-person physical therapy with respect to adherence and attendance for certain health conditions. *Evidence Quality: moderate, limited by inability to double blind; Recommendation Strength: moderate.*

Action Statement Profile

Aggregate Evidence Quality: 1 moderate-quality SR,[17] 1 high-quality RCT,[18] 4 moderate-quality RCTs,[19–22] 5 low-quality RCTs,[23–27] and 4 very low-quality RCTs.[28–31]

Rationale

One SR ($n = 1904$)[17] comparing telerehabilitation to in-person rehabilitation targeted people living with chronic respiratory diseases. Fourteen additional RCTs in the clinical areas of orthopedics (hip and knee arthroplasty, rotator cuff tendinopathy), heart failure, stroke, chronic obstructive pulmonary disease (COPD), chronic respiratory disease, and spinal cord injury were reviewed.

Overall, the quality of evidence comparing telerehabilitation to conventional in-person therapy on satisfaction, treatment adherence, and completion varies but the results are consistent. With regard to acceptability and satisfaction, there is consistent evidence to suggest that satisfaction with telerehabilitation interventions in physical therapy is high.

Acceptability/Satisfaction

Nelson et al[23] in a randomized controlled noninferiority trial of telerehabilitation versus usual care following total hip replacement found that satisfaction was high (>85%) across both groups for all 14 items of the health care satisfaction questionnaire. The only difference between groups was for the item "my therapy session was easy to attend" in which the telerehabilitation group scored higher (intervention mean = 95 [SD = 10]; control mean = 86 [SD = 18]; mean difference = 9 [95% CI = 2 to 16]; $P = .017$). Results were identical for the overall satisfaction item, "in general, were you satisfied with the health care and services you received" (intervention mean = 97 [SD = 10]; control mean = 97 [SD = 10]; $P = .96$). These results were supported by an RCT by Hwang et al[28] where no difference in satisfaction was observed between patients receiving home-based telerehabilitation for chronic heart failure compared with usual care ($P = .17$). Moffet et al[18] demonstrated no difference in satisfaction between a usual care and telerehabilitation care group in a total knee arthroplasty sample ($P = .34$), a finding supported by an earlier trial by Tousignant et al[24] for the same diagnostic group ($P = .920$).

Mixed results have been demonstrated in patients with stroke. Lin et al[29] compared telerehabilitation intervention with usual care intervention for patients with chronic stroke living in long-term care facilities and found no statistical difference between perceived satisfaction of the interventions. Cramer et al,[25] however, found significantly higher satisfaction with an in-clinic intervention compared with telerehabilitation at the end of week 1: (in clinic = 56.6 [SD = 7.4]; telerehabilitation = 52.6 [SD = 8.8]; $P = .012$) and week 6 (in clinic = 58.5 [SD = 8.0]; telerehabilitation = 55.2 [SD = 7.7]; $P = .015$) on a Patient Satisfaction Questionnaire (maximum score = 70).

High levels of satisfaction have been demonstrated in other RCTs for telerehabilitation interventions, with Russell et al[20] demonstrating rates of >9/10 on satisfaction scales. Dallolio et al[21] compared standard care alone with standard care supplemented with telerehabilitation; satisfaction was significantly higher ($P < .001$) in the group receiving supplemental telerehabilitation (mean = 7.9 [SD = 1.24]) than in the group receiving standard care alone (mean = 6.9 [SD = 1.55]).

Attendance

For these guidelines, attendance was defined as the rate at which patients attended their scheduled physical therapist appointments.

A high level of satisfaction with telerehabilitation has been found to translate to a high level of attendance at telerehabilitation appointments. Attendance rates were found to be at least equivalent, but often higher for telerehabilitation when compared with in-person appointments. Hwang et al[28] demonstrated that compared with in-person care, participants in the telerehabilitation group were significantly more likely to be categorized as attending (relative risk = 2.39; 95% CI = 1.27 to 4.51) and significantly less likely to be categorized as partly attending appointments (relative risk = 0.46; 95% CI = 0.23 to 0.92). The only participants categorized as nonadherent (<20% of sessions attended) in that study were in the control group. The telerehabilitation group had significantly higher attendance rates than the control group, with a mean difference of 6 (95% CI = 2 to 9) sessions. This trend was also observed by Cramer et al[25] who found that among patients who initiated at least 1 treatment session, those in the telerehabilitation group attended a mean of 35.4 of the 36 assigned therapy sessions (98.3%), while those assigned to in-person care attended a mean of 33.6 of the 36 assigned therapy sessions (93.3%).

Cox et al[19] showed that the mean number of sessions attended by participants did not differ significantly between groups (telerehabilitation = 13 [SD = 3] sessions; center-based pulmonary rehabilitation = 13 [SD = 4] sessions; range for both groups = 1–16 sessions); however, the proportion of telerehabilitation participants who completed ≥70% of prescribed sessions was higher (84% telerehabilitation versus 79% center-based rehabilitation; $P = .4$).

Some RCTs have not statistically compared attendance between groups but give weight to the observation that attendance with telerehabilitation is not worse than usual in-person care. Hansen et al[26] conducted an RCT comparing telerehabilitation with in-person care for pulmonary rehabilitation in severe COPD. Although a significant difference between groups was not reported for attendance, participants in the telerehabilitation group attended a median of 25 sessions (interquartile range = 20–28) compared with a median of 16 (interquartile range = 8–19) by the in-person group. Dallolio et al[21] reported a similar rate of attendance for both groups of adult patients with nonprogressive, complete, or incomplete spinal cord injury (77% in the telerehabilitation trial group and 80% in the control trial group).

Adherence

For these guidelines, adherence is defined as the rate at which patients completed their prescribed home management/exercise program.

Evidence suggests that completion of the home management program for patients who are receiving telerehabilitation may be higher than completion rates seen with in-person care. Although nonsignificant, Russell et al[20] observed that adherence with the home exercise program, evaluated through the completion of an exercise diary, revealed a mean adherence of 1.7 (SD = 0.8) exercise sessions per day in the control group compared with 2.2 (SD = 0.5) sessions per day in the telerehabilitation group ($z = -1.55$; $P = .12$). Nelson et al[23] also demonstrated that the telerehabilitation group was more compliant with their home exercise program, with an overall compliance of 86% (SD = 20%) compared with 74% (SD = 26%) for the control group (mean difference = 12%; 95% CI = 1%–23%; $P = .048$). Bettger et al[27] observed a significantly higher exercise program adherence rate of 88% in patients receiving telerehabilitation compared with 65.4% of patients receiving traditional physical therapist care ($P < .001$). Cox et al[19] found more participants in the telerehabilitation group, 68 (97%), engaged with education and self-management training versus 59 (84%) participants receiving center-based pulmonary rehabilitation ($\chi^2_1 = 6.9$; $P = .009$).

Nonsignificant differences in adherence between telerehabilitation and in-person management have been reported in a number of studies. Asano et al[22] found no significant differences in median exercise time spent in a 3-month telerehabilitation intervention compared with usual care ($P = .847$). They reported a median of 2577 minutes (interquartile range = 159–4832) in the telerehabilitation group compared with 2565 minutes (interquartile range = 1504–5040) in the usual care group. Similarly, Cramer et al[25] found no significant difference ($P = .73$) in the number of assigned unsupervised sessions in which participants demonstrated adherence (completed >40 minutes of the 70-minute session) between the usual care and home-based telerehabilitation groups.

Malliaras et al[31] compared the management of patients with rotator cuff–related shoulder pain in 3 groups: advice only, recommended care without telerehabilitation, and recommended care with telerehabilitation. Although not compared statistically, acceptable adherence (defined as greater than >70% of participants performing exercises 2 or 3 times per week) was found only in the telerehabilitation group (92% adherent) compared with recommended care without telerehabilitation (67% adherent). Although not compared statistically, similar rates of adherence were reported by Doiron-Cadrin et al[30] for a prehabilitation program delivered via telerehabilitation (77% adherence) compared with an in-person prehabilitation program (80% adherence).

Potential Benefits, Risks, Harms, and Costs of Implementing This Recommendation

Benefits are as follows:

- Improves adherence to treatment and completion of prescribed tasks (eg, home exercise, scar massage, mobilization).
- Greater flexibility in care models (eg, increases patient and clinician choice of delivery method such as videoconferencing, store-and-forward, hybrid).
- Improves satisfaction for patients.

Risks, harms, and/or costs are as follows:

- None identified for acceptability, satisfaction, attendance, or adherence.

Benefit-harm assessment: The benefits outweigh the risks, harms, and costs of providing telerehabilitation as compared with in-person services for certain health conditions.

Value Judgments

None.

Intentional Vagueness

The recommendation is vague with respect to specific patients and clients due to the lack of rigorous studies across health conditions and age groups; however, it is noted that consistent results are seen across health conditions including orthopedics (hip and knee arthroplasty), heart failure, stroke, breast cancer, incontinence, COPD, chronic respiratory disease, and Parkinson disease. These conditions may not be representative of the broader population nor of their social determinants of health.

Role of Patient Preferences

Patients may appreciate engaging with clinicians in shared decision-making to determine if telerehabilitation is an acceptable mode of delivery.

Exclusions

Exclusions include when the patient indicates a preference for in-person care, when the clinician is not trained in telerehabilitation, or when health conditions preclude safe delivery of telerehabilitation services.

Quality Improvement

Organizations could use documentation of patient experiences to determine acceptability, satisfaction, adherence, and attendance to inform service improvement strategies.

Implementation and Audit

Physical therapists should consider when to recommend telerehabilitation or hybrid care, document adherence and attendance rates for telerehabilitation and nontelerehabilitation sessions, and routinely collect and review acceptability and satisfaction ratings.

Future Research

Rigorous studies are needed with additional patient health conditions and age groups (including pediatric patients) to further evaluate acceptability, satisfaction, attendance, and adherence when using telerehabilitation in clinical practice and to understand the influential factors.

Telerehabilitation Preparation

Recommendation 2 ♦♦♦◊

Physical therapists and patients should discuss whether telerehabilitation is a cost-effective option compared with in-person care in the context of their circumstances and conditions. *Evidence Quality: moderate; Recommendation Strength: moderate.*

Action Statement Profile

Aggregate Evidence Quality: 1 moderate-quality SR,[32] 1 moderate-quality RCT,[33] and 1 low-quality RCT.[27]

Rationale

For this recommendation, 1 SR with 9 RCTs ($n = 1266$),[32] 1 RCT[27] targeting patients with total hip arthroplasty/total knee arthroplasty ($n = 306$),[27] and 1 RCT targeting patients with heart failure ($n = 53$)[33] were examined. Within the SR, only 4 of the 9 RCTs evaluated resource utilization. According to Janssen et al,[32] study quality of the included RCTs was predominantly affected by the lack of blinding. Of note, blinding is particularly challenging when performing comparative research with telerehabilitation.

The number of studies comparing telerehabilitation versus conventional in-person therapy is limited in number yet consistent results suggest that overall health care costs are lower for telerehabilitation. These findings are limited to patients with total hip arthroplasty/total knee arthroplasty[27,32] and patients with chronic heart failure.[33] Generalizability to other patient populations may be limited at this time.

Physical therapists should consider differentiating costs to patients, providers, and society for telerehabilitation during discussions on overall cost effectiveness of treatment options.

For example, Hwang et al[33(p1801)] reported "telerehabilitation appears to be a cost-saving intervention for the health care provider, compared to traditional centre based rehabilitation." However, they further reported the use of "relatively low-cost technologies in the home, including resistance bands and laptop computers, versus the technologies used in the centers."[33(p1802)] They also reported the "inclusion of hospital costs only" and the "exclusion of other health system costs such as costs related to general practitioner visits or medications (ancillary costs)."

Jansson et al[32] reported significant differences in costs only when the distance from home to the health care center was more than 30 km (18.64 miles). This moderate-quality evidence indicates that costs per session are lower with telerehabilitation than with in-person care for patients with total hip arthroplasty/total knee arthroplasty who live at least 30 km from the health care center.[32] When looking at patients who live closer than 30 km to the health care center, cost per session did not vary between treatment conditions in rural and urban regions.[32]

This cost difference could be viewed from the patient perspective, that is, the further the travel, the higher the savings for the patient, or from the provider perspective when the comparisons include clinicians traveling to conduct home health visits. Bettger et al[27] reported costs from the patient perspective, noting "lower total post-hospital costs at 12 weeks" following hospital discharge. Physician, urgent care, emergency room, home health, and outpatient physical therapist visits, and inpatient hospital, rehabilitation, and skilled nursing facility stays, reported by patients and participating sites, were assigned costs based on Medicare fee-for-service rates. Since telerehabilitation services were not reimbursable services, a *total intervention cost* was assigned to include telerehabilitation direct (clinical encounter) and indirect (technology setup) time. The study did not include the technology costs to patients and therapists, home equipment installation and removal, or patient co-pays, deductibles, travel, and clinic wait time.[27]

Tousignant et al[24] defined costs as an economic evaluation following international guidelines for conducting cost analysis alongside a clinical RCT. The economic analysis was based solely on a health center perspective and not patient-related costs. Additionally, only costs related to the delivery of the 2 services, telerehabilitation and in-person visits, were counted. More specifically, the costs were divided into 2 categories: costs related to the clinical aspects and costs related to the technology. For these cost categories, direct costs (ie, therapist and patient encounter time) were defined as essential for delivering clinical intervention, and indirect costs (ie, travel distance/km from the clinic) were related to the intervention without being part of it.[24]

Overall, telerehabilitation direct and indirect costs were poorly outlined in the available evidence, or not defined with standardized methods.

Potential Benefits, Risks, Harms, and Costs of Implementing This Recommendation

Benefits are as follows:

- Patient discussions with a provider on telerehabilitation may improve informed decision-making.
- Cost transparency may remove presuppositions and improve access to care.
- Improved flexibility for workforce and practice management of health care providers.
- Greater adherence with treatment plan completion and better clinical outcomes may result in better reimbursement models with certain payers.

Risks, harms, and/or costs are as follows:

- Individuals receiving care, and/or health care providers, might find unexpected cost barriers to providing care, which may limit the individuals' participation in their treatment plan. Some cost barriers might include:
  - Lack of insurance coverage for telerehabilitation.
  - Complex payment policies.
  - Lack of access to appropriate or affordable technology and/or connectivity.

Benefit-harm assessment: The benefits outweigh the risks, harms, and costs of discussing the costs of telerehabilitation as compared with in-person services for certain health conditions and patient populations in the context of individual circumstances.

Value Judgments

The APTA Physical Therapist Standards of Practice[34] state that fiscal management must allow for cost-effective resource utilization. Even so, the value placed on cost effectiveness discussions with patients may vary among individuals, organizations, and society. The total cost of care *is* a factor in achieving optimal patient outcomes. This factor disproportionately impacts patients in lower socioeconomic situations or with geographic challenges. For this reason, it is even more important to define and discuss the burden of direct health care costs, as well as indirect costs, such as those associated with time away from work or home, travel challenges, childcare, and unintended factors that may limit access, despite an individual's commitment to participate in the treatment plan.

Physical therapists must consider these costs of care, inclusive of individual social determinants, when offering in-person or telerehabilitation options.

Intentional Vagueness

None.

Role of Patient Preferences

Patients should engage in shared decision-making with their clinicians to determine if telerehabilitation is a cost-effective mode of delivery for the patient's condition and specific treatment session.

Exclusions

None.

Quality Improvement

Telerehabilitation costs may be impacted by access, service delivery options, staffing capacity, geography, and patient choice. Quality of service delivery may be improved through shared decision-making between patients and service providers.

Implementation and Audit

Clinicians may need training on the actual costs of both service delivery modes and culturally sensitive methods of discussing costs with patients.

Audit the frequency of documented shared decision-making about the costs of telerehabilitation versus in-person care delivery.

Future Research

Rigorous studies are needed to define the total cost of care, including direct and indirect costs to patients and providers, potential cost savings from rehospitalizations, earlier triage to care, duration and completion of care, caregiver burden, and across more health conditions, age groups, and practice settings as a result of receiving physical therapy through telerehabilitation.

Recommendation 3 ♦♦♦♦

Physical therapists should identify and work to reduce barriers and promote facilitators identified from the patient's perspectives and experiences when planning and providing telerehabilitation services. *Evidence Quality: high; Recommendation Strength: strong.*

Action Statement Profile

Aggregate Evidence Quality: 1 high-quality SR[35] and 5 high-quality descriptive studies.[36–40]

Rationale

The SR[35] examined 16 studies (429 patients) of multiple designs using a framework for implementation studies (Consolidation Framework for Implementation Research). The remaining 5 studies (243 patients)[36–40] were qualitative and involved semi-structured provider interviews, with some studies including self-reported questionnaires, surveys and/or focus groups. All studies compiled, analyzed, and categorized participant interview/survey results according to themes or domains.[36–40]

Studies were conducted across the globe (Australia, the Netherlands, Singapore, and the United Kingdom) on adults with chronic conditions, such as amyotrophic lateral sclerosis, low back pain, COPD, whiplash, and knee osteoarthritis and acute conditions, such as stroke. The studies examined various modalities for telerehabilitation delivery, including telephone-based exercise therapy, video conferencing, and home-based self-monitoring.

Common facilitators identified by patients in all studies included better access to care, increased flexibility with scheduling, and convenience of in-person care for patients in rural areas or with conditions that limited travel ability. Some patients felt telerehabilitation served as a self-motivator to perform exercises on their own or to incorporate exercise into their daily activities. Lawford et al[38] used only telephone-based therapy; patients felt more comfortable and less anxious engaging with their therapists over the phone than with in-person consultations. These patients also felt that their care was more personalized because their therapists focused solely on them.

Barriers identified by patients frequently corresponded with their health conditions and severity levels, comorbidities, ages, familiarity with technology, and social demands. Some patients, such as those in the acute phase after stroke, found setting up the required equipment too cumbersome, which served as a demotivator to engage in telerehabilitation sessions.[40] The main human factor barrier reported in all studies was the lack of or a desire for human contact. These included patients wanting hands-on guided exercise demonstrations, and patients who required caregiver assistance to perform exercises, which may not always be possible. Technology was a barrier cited in all studies including lack of digital literacy, software and hardware issues, connectivity challenges, and slow data extraction in the case of using home or self-monitoring devices.

Potential Benefits, Risks, Harms, and Costs of Implementing This Recommendation

Benefits are as follows:

- Accurate identification of barriers and facilitators may clarify which patients will benefit from telerehabilitation.
- Improved adherence to treatment and completion of prescribed tasks (eg, home exercise, scar massage, mobilization).
- Increased patient confidence, ease, and reduced anxiety with physical therapist services if barriers can be accommodated.

Risks, harms, and/or costs are as follows:

- Lack of identifying barriers (eg, lack of access to connectivity and suitable technology) to telerehabilitation may limit successful service provision.
- Breach of privacy and cybersecurity concerns (eg, when people not related to the treatment may be co-located).
- Ineffective referral or service provision when patients' barriers to receiving telerehabilitation are not predetermined.

Benefit-harm assessment: The benefits of assessing and addressing facilitators and barriers experienced by patients seeking or receiving physical therapist services via telerehabilitation outweigh the risks, harms, and costs of assessing and addressing barriers and facilitators.

Value Judgments

Patients need to be assessed on an individual basis, taking into consideration their health condition, personal and environmental factors, ability to afford, access, and navigate technology and therapeutic equipment, motivation and desire

to perform therapy on their own, the home environment, and their social support networks.

Intentional Vagueness

None.

Exclusions

None.

Quality Improvement

Identifying barriers and facilitators to telerehabilitation as an optional mode of delivery for patients in the service delivery locale may enhance screening efficiency to determine appropriate candidates.

Implementation and Audit

Organizations may benefit from comparing the types of technology used to deliver telerehabilitation to track those technologies that are successful.

Standardized assessments may be needed to document patients' characteristics, available technology, human factors, and access barriers and facilitators to ensure patient readiness for telerehabilitation.

Audit the frequency of typical barriers in the geographic service area to develop appropriate solutions or supports.

Future Research

Research on patient barriers and facilitators across health conditions and the lifespan may enhance service delivery. Development of psychometrically sound telerehabilitation readiness questionnaires for patients may enhance care.

Recommendation 4 ♦♦♦♦

Physical therapists should identify and work to reduce clinician and organizational barriers and promote facilitators to support the delivery of telerehabilitation services. *Evidence Quality: high to moderate; Recommendation Strength: strong.*

Action Statement Profile

Aggregate Evidence Quality: 1 high-quality SR,[35] 1 high-quality,[41] 2 moderate-quality,[42,43] and 1 low-quality[44] survey studies, and 6 high-quality qualitative studies.[36,39,40,45–47]

Rationale

One SR and 10 descriptive studies were identified. The SR35 examined 16 studies of multiple designs (37 health care providers) using an implementation framework (Consolidation Framework for Implementation Research). The remaining 10 studies (1687 physical therapists and 63 other health care providers including nurses, occupational therapists, respiratory therapists, physicians, and technicians) were descriptive, with some studies including self-reported questionnaires, surveys, focus groups, and/or semi-structured provider interviews. All studies compiled, analyzed, and categorized participant interview/survey results according to themes or domains. All studies were cross-sectional except a longitudinal study by Rayce et al.[39]

Studies were conducted across the globe, in Australia, the USA, Denmark, Kuwait, Ireland, the Netherlands, Saudi Arabia, Singapore, Switzerland, and the United Kingdom, in public and private settings. Patient populations included adults and children, with chronic health conditions, such as amyotrophic lateral sclerosis, low back pain, COPD, whiplash, and knee osteoarthritis, and acute conditions, such as stroke, along with unspecified health conditions.

All studies addressed facilitators and barriers of using telerehabilitation from the health care provider perspective. The SR[35] focused on physical therapists serving patients with amyotrophic lateral sclerosis. This study included videoconferencing, home-based self-monitoring, and non-invasive ventilation monitoring as the telerehabilitation delivery mechanisms. Two studies[36,45] surveyed providers who treated patients with musculoskeletal conditions/injuries and included telerehabilitation delivered through videoconferencing. Three studies[39,46,47] addressed telerehabilitation delivery for patients with chronic respiratory conditions, and 1 addressed telerehabilitation for persons in the acute phase after stroke.[40] Four studies[41–44] addressed delivery of telerehabilitation to patients with unspecified conditions; 1 was targeted toward the pediatric population.[43] Three studies addressed telerehabilitation implementation during the COVID-19 pandemic.[41–43]

Patient Facilitators as Perceived by Physical Therapists

Providers in the majority of studies reported that telerehabilitation improved patient access to care and was convenient, especially for patients who needed to travel long distances or had difficulty leaving their home to attend in-person appointments.[35,36,40,42,45,46] Telerehabilitation was viewed as an option for assessing patients and a desirable intervention delivery mode between in-person appointments.[35,36,40,42,45] Indirect cost savings to the patients were cited when patients had to request time off from work, arrange/pay for childcare to attend in-person therapy sessions, or pay for transportation.[36,40] Facilitators to telerehabilitation provision included having caregiver assistance,[36,40,43] use of simple technology interfaces,[35] and a robust internet connection.[35,43]

Patient Barriers as Perceived by Physical Therapists

Therapists' perceived patient barriers to telerehabilitation included access to the appropriate equipment,[36,42,43,45] poor (or lack of) internet connectivity,[35,42,43,45] limited ability to navigate the technology,[36,42,45,47] inability to perform the exercises without hands-on assistance,[36,40,42,43,45] and overall receptiveness to participate in telerehabilitation.[36,40,42,43,45] Therapists cited low health literacy and low digital literacy as barriers to effective treatment via telerehabilitation.[36,42,45,47] Cultural and social barriers, specifically gender issues, were reported in the Kuwaiti study.[42] The Singapore[40] study using telerehabilitation to treat patients with acute stroke noted cultural issues surrounding the expectations of domestic help hired to assist patients.

Provider Facilitators

Provider characteristics that facilitated telerehabilitation use were clinician attitudes, skills and knowledge, the setting for telerehabilitation delivery, assessment standardization, and support for care delivery for both staff and patients. Having clinicians who valued and were willing to provide telerehabilitation services were identified as facilitators.[42] Skills in and knowledge of technology, in particular reading remote monitoring data,[35] staff training,[42,45] and training and support for patients[35] facilitated telerehabilitation delivery. Finally,

providing telerehabilitation from a clinical setting where one could consult with other clinicians[44] and having a standardized assessment[35] also facilitated telerehabilitation.

Provider Barriers

Clinicians consistently reported being unable to perform comprehensive assessments.[35,39,41,42,45] Specifically, the lack of physical contact hindered both the assessment[35,40,41] and treatment.[36,41,45] Furthermore, they felt they could not fully observe patients.[39,40] These issues were exacerbated with high clinical complexity or when patients' sensory deficiencies commonly associated with aging interfered with communication quality.[36,40] The need for an engaged caregiver was deemed essential in providing care via telerehabilitation for pediatric[43] and acute neurological cases.[40] Concerns were raised about patient safety and well-being in relation to undertaking neurological assessments.[45] Clinicians expressed concerns about the lack of evidence to support telerehabilitation.[45,47] It is worth noting that therapists with more telerehabilitation experience generally reported fewer barriers (eg, "lack of connection" through the screen, and "pushing patients") than inexperienced therapists.[46]

Technology was a major barrier identified by providers across studies. Technical barriers included: poor connectivity,[35,40,43,45] complicated user interfaces,[40] cumbersome protocols,[35] and slow internet speeds that resulted in prolonged periods of data extraction during remote monitoring.[35] Therapists cited lack of specific training in telerehabilitation service delivery and inadequate information technology support as barriers to effective telerehabilitation service delivery.[42,44]

Providers were concerned about the costs associated with telerehabilitation services[35,42,44] as well as adequate reimbursement for those services.[35,39,43] Workload was perceived as increased with telerehabilitation, either with the delivery of therapy[42] or with the amount of un-reimbursed time to prepare for therapy sessions (eg, training, preparation of materials, etc.).[36]

Both patient and clinician characteristics and expectations were noted as possible facilitators and barriers to effective telerehabilitation delivery.[36,40,42,43] Depending on the severity of patient conditions, both barriers and facilitators were identified: when mild they were viewed by clinicians as facilitators and when moderate they were considered barriers.[40,43] Patient and clinician care expectations and previous telerehabilitation experience were noted as influencers on whether clinicians considered the telerehabilitation sessions to be effective.[36,40,43] As with other forms of therapy, telerehabilitation may be more appropriate for some therapists and patients than others and is heavily influenced by skills, knowledge, and previous experience with telerehabilitation.

Potential Benefits, Risks, Harms, and Costs of Implementing This Recommendation

Benefits are as follows:

- Increase in skills, knowledge, and confidence in using telerehabilitation with clinicians' ability to assess barriers and facilitators.
- Improved access to care when in-person services are unavailable or less convenient (eg, geographic distance, cost, social distancing specific to the pandemic) and barriers can be accommodated.
- If barriers are identified and accommodated, indirect costs for patients may be reduced (eg, need to take time off from work, arrange or pay for childcare, or pay for transportation).
- Identifying organizational barriers may support strategies to increase patient access to services and decrease unwarranted variations in service quality.

Risks, harms, and/or costs are as follows:

- Potential for poorer patient outcomes and experiences if barriers compromise physical therapists' ability to effectively manage a plan of care via telerehabilitation.
- Physical therapist dissatisfaction and disengagement with telerehabilitation as a viable service delivery option if too many barriers exist.
- Reduction of patient choice and disadvantage to certain sectors of the population if barriers prevent spatial access to services such as specialty care.

Benefit-harm assessment: The benefits of assessing and addressing facilitators and barriers experienced by therapists when providing telerehabilitation outweigh the risks, harms, and costs of assessing and addressing barriers and facilitators.

Value Judgments

Physical therapists need to have the knowledge, skills, infrastructure, tools, and support to perform telerehabilitation assessments and effectively deliver therapist services to their clients.

Intentional Vagueness

None.

Exclusions

None.

Quality Improvement

Organizations can evaluate whether using standardized assessments aids the efficacy, efficiency, and costs of determining barriers and facilitators to telerehabilitation service delivery.

Implementation and Audit

Clinicians may require formal technical and clinical education for telerehabilitation to effectively deliver telerehabilitation services. International resources exist to support this type of education.[48,49]

Clinicians must be aware of practice regulations or patient location to avoid providing illegal or unreimbursed telerehabilitation services.

Organizations may audit documentation of standardized assessments, care plans, and the reported barriers and facilitators to delivering care.

Clinician digital literacy, knowledge of, confidence in, and satisfaction with using telerehabilitation should be regularly reviewed to inform educational and organizational strategies.

Future Research

Rigorous research that addresses barriers identified by clinicians across various practice settings, and the hands-on skills essential for the delivery of quality care would be useful. This may clarify which patient groups are or are not suitable for telerehabilitation. Validating reported facilitators, such as

standardized assessments or checklists, would further enhance telerehabilitation delivery. Research about the education and development of clinicians in telerehabilitation practice may address perceived or real barriers.

Telerehabilitation Implementation

Recommendation 5 ♦♦◊◊

When physical therapists perform components of an examination via telerehabilitation, they may use the results to inform the diagnosis with comparable accuracy to an in-person visit for certain health conditions. *Evidence Quality: low; Recommendation Strength: weak.*

Action Statement Profile

Aggregate Evidence Quality: 8 low-quality RCTs.[50–57]

Rationale

Overall, the evidence comparing the diagnostic accuracy of telerehabilitation with that of in-person assessment of patients entering into physical therapy is consistent but limited. Eight small randomized studies reported moderate concurrent validity between telerehabilitation and in-person assessments of adults with low back pain,[52,57] other musculoskeletal conditions (eg, ankle, shoulder, elbow),[50,51,53,55,56] and Parkinson disease.[54] There was strong concurrent validity for decisions to refer adult patients for physical therapy, psychology, and dietetics.[50] The studies were all small but adequately powered, with sample sizes of <50 patients; information was lacking regarding sample and study setting representativeness.

Very low-quality evidence supports telerehabilitation for assessing range of motion, symptoms as measured by the straight leg raise test, and pain with motion in patients with low back pain[57] but postural assessment of adults with low back pain is less likely to be as accurate as in-person assessments.[57] Very low-quality evidence suggests that overall assessments of adults with low back pain may have some agreement between telerehabilitation and in-person physical therapy, but these assessments are highly variable.

Very low-quality evidence with consistent results supports using telerehabilitation for diagnosing patients with musculoskeletal conditions.[50,51,53,55,56] These studies showed substantial to almost perfect agreement between telerehabilitation and in-person physical examination findings, suggesting reasonable utility of telerehabilitation across a range of populations. The consistent methodology used across studies strengthens these findings.

The papers all share common investigators and were carried out in laboratory or clinical settings rather than in real-world settings. It is unclear how the high level of agreement seen in experimental settings would translate to real-world settings.

Very low-quality evidence supports using telerehabilitation to assess patients with Parkinson disease.[54] Agreement was high for all ordinal assessment items (ie, step test, steps in 360° turn), with the exception of the total Berg Balance Scale scores. Further analysis showed that the individual item "Standing on one leg" scored the lowest (50.0%). The limits of agreement for all continuous data variables (functional and lateral reach, timed up and go test, timed stance test) fell within the clinically acceptable criteria for adequate agreement. This study employed methodology and technology similar to the studies assessing musculoskeletal injury[50,51,53,55,56] and 1 study assessing low back pain.[57] In this study, however, in-person investigators were present at all times to ensure participant safety.

Potential Benefits, Risks, Harms, and Costs of Implementing This Recommendation

Benefits are as follows:

- Patient examinations via telerehabilitation may extend services or service delivery options to those who experience difficulty attending in person, or when in-person care is challenging (eg, extreme weather, natural disasters, lack of transportation).
- Ability to conduct examinations via telerehabilitation may increase patient and clinician choice of delivery methods.
- Potential improvement in the timeliness of service delivery.
- Ability for examination to be conducted in a patient's environment providing relevant contextual information.

Risks, harms, and/or costs are as follows:

- Potential costs of equipment, software, and internet access by patient and provider if not currently available.
- Potential risks to patient safety that may occur during an examination if a caregiver is unable to assist the patient at home.
- Potential requirement for increased caregiver support for individuals with cognitive, communication, and safety deficits.
- Increased administrative burden to secure and organize a telerehabilitation encounters.
- Potential payment inequity or lack of parity based on geographic locations.

Benefit-harm assessment: The benefits outweigh the risks, harms, and costs of providing telerehabilitation to inform a physical therapist diagnosis as compared with in-person examination for certain health conditions.

Role of Patient and Client Preferences

Patients and clients may need to assume a more active role in the telerehabilitation examination process. For example, they may need to set up the telerehabilitation environment and technology, self-palpate during a telerehabilitation examination, and find alternative equipment. Some telerehabilitation examinations may require caregiver assistance to ensure patient safety, or to access and use telerehabilitation technology.

Value Judgments

None.

Intentional Vagueness

Given the limited research available across the entire spectrum of ages and diagnoses, recommendations regarding other health conditions, age groups, standalone telerehabilitation or hybrid combinations, types of telerehabilitation systems, and supervised versus unsupervised telerehabilitation cannot be made. Although certain outcome measures were noted in the evidence, this is not an all-inclusive list.

Exclusions

Regulations or payers for certain locales may not permit examination via telerehabilitation. Clinicians must check with their local regulatory agencies.

Quality Improvement

Using telerehabilitation for physical therapist examinations may increase the ability to serve a wider patient clientele, with improved timeliness and greater patient satisfaction.

Implementation and Audit

To maintain patient confidentiality and privacy, organizations must use telerehabilitation systems with adequate security (eg, Health Insurance Portability and Accountability Act [HIPAA] or GDPR-Gen Data Protection Regulation) that are compliant with required standards and documentation processes.

Physical therapists providing telerehabilitation examinations for patients younger than 18 will need to ensure that a parent or guardian is in attendance and recognize that published reliability may not apply, depending on the nature of the condition and the level of patient cooperation.

Physical therapists and clinicians will need to self-assess their levels of comfort and effectiveness for telerehabilitation examination processes, including their ability to establish a positive "webside" manner.

Training in telerehabilitation technology and processes may be needed to ensure patient safety, regulatory compliance, and effective care.

Organizations may audit whether patients are provided a choice of delivery models and the frequency of telerehabilitation and in-person visits for examinations.

Interested parties (eg, clinicians, managers, organizations, agencies) may audit documentation to assess examinations completed via telerehabilitation.

Future Research

Rigorous studies are needed with broader patient and client representation to evaluate the effectiveness of telerehabilitation examination processes (diagnosis and or screening, validity of specific outcome measures used remotely) in real-life clinical practice to improve generalizability.

Recommendation 6 ♦♦♦◊

Physical therapists should use telerehabilitation to achieve outcomes similar to in-person care for certain health conditions. *Evidence Quality: low; Recommendation Strength: weak upgraded to moderate due to consistent results and inability to use single- or double-blind research designs.*

Action Statement Profile

Aggregate Evidence Quality: 2 moderate-quality SRs,[32,58] 1 low-quality SR,[17] and 3 moderate-quality RCTs.[28,59,60]

Rationale

Most of the included studies comparing telerehabilitation with in-person physical therapy are rated fair for certain patient conditions and diagnoses. The methodological quality of the RCTs included in 2 SRs[32,58] was rated fair and in 1 SR,[17] they were rated poor. Similarly, the methodological quality of the 3 individual RCTs[28,59,60] was rated fair. Poor to fair ratings were primarily due to sample size, lack of blinding, attrition, and some concerns around allocation procedures or data handling. Evidence was available for the following health conditions.

Chronic Heart Failure

Critical outcomes: Evidence from 1 ($n = 53$) RCT[28] suggests that there are no differences between telerehabilitation and in-person care for improving exercise capacity in patients with chronic heart failure. The data met criteria for noninferiority at the end of treatment but did not meet criteria at 12 weeks of follow-up.

Chronic Respiratory Disease

Critical outcomes: Evidence from 1 SR[17] suggests that there are no differences between telerehabilitation and in-person care for improving exercise capacity, physical activity, or breathlessness in patients with chronic respiratory disease.

Parkinson Disease

Critical outcomes: Evidence from 1 small but adequately powered ($n = 76$) RCT[60] suggests that balance at the end of treatment was improved for patients with Parkinson disease who were given access to telerehabilitation using the TeleWii-lab platform relative to patients receiving in-person sensory integration balance training; this difference was no longer evident at 1 month after treatment concluded.

Stroke

Critical outcomes: Evidence from 1 SR[58] shows no difference between treatment groups for improving balance.

Evidence from 1 SR[58] and 1 small but adequately powered ($n = 52$) RCT[59] is inconsistent with respect to function. Although there was no difference between treatment conditions for upper limb function,[58] Fugl–Meyer Assessment scores were improved in the telerehabilitation condition.[58]

Total Knee or Total Hip Arthroplasty

Critical outcomes: Evidence from 1 RCT reported in 1 SR[32] shows improvements in stiffness scores on the Western Ontario and McMaster Universities Osteoarthritis Index[61] following telerehabilitation relative to in-person care. Other Western Ontario and McMaster Universities Osteoarthritis Index dimensions did not vary between treatment groups.

Evidence from 1 RCT[20] reported in the SR[32] shows improvements in distance covered in the 6-Minute-Walk Test following telerehabilitation relative to in-person care. Other Western Ontario and McMaster Universities Osteoarthritis Index dimensions did not vary between treatment groups.

Potential Benefits, Risks, Harms, and Costs of Implementing This Recommendation

Benefits are as follows:

- Improved access to care when in-person services are unavailable (eg, geographic distance, cost, social distancing specific to pandemic).
- Improved continuity of care (eg, consistent patient-provider relationship).
- Greater flexibility in care models (eg, increased patient and clinician choice of delivery method such as videoconferencing, store-and-forward, hybrid).
- No significant difference in incidence of safety-related adverse events for certain health conditions.

- Ability to monitor patients remotely (eg, physiological data, therapeutic activities, movement, sleep) when health condition precludes contact.

Risks, harms, and/or costs are as follows:

- Increased burden on caregivers to support telerehabilitation consultations for individuals living with disability.
- Potential need for additional training and technology requiring time and resources.

Benefit-harm assessment: The benefits outweigh the risks, harms, and cost of providing telerehabilitation for patients in need of physical therapist rehabilitation services for certain health conditions.

Role of Patient and Client Preferences

Telerehabilitation in physical therapy may require caregiver assistance to ensure participant safety or to access technology. The patient's active role in telerehabilitation has demonstrated higher satisfaction.

Value Judgments

None.

Intentional Vagueness

Evidence to date was insufficiently precise to judge the findings equivalent. Most studies had small sample sizes in certain health conditions, and limited health conditions and age groups were studied.

Exclusions

None.

Future Research

Rigorous studies are needed across health conditions and age groups with standardized documentation of telerehabilitation interventions that specify session frequency, length, type of platforms, and deliverables that can be replicated in real-life clinical practice, taking into consideration social determinants of health.

Recommendation 7 ♦♦♦♦

Physical therapists should anticipate, prevent, manage, and document occurrences of adverse events specific to telerehabilitation as the mode of delivery. *Evidence Quality: low; Recommendation Strength: weak upgraded to strong, to be consistent with professional codes of ethics to ensure patient safety by being accountable for making sound professional judgments (Principles 3, 6B APTA Code of Ethics).*[62] *Competencies and standards of safe practice while providing telerehabilitation services should be considered.*[49]

Action Statement Profile

Aggregate Evidence Quality: 2 moderate-quality SRs[32,58] and 2 moderate-quality RCTs[26,28] with consistent results.

Rationale

Patients seeking physical therapy can use telerehabilitation without concern for increased frequency of adverse events related to telerehabilitation compared with in-person care. Adverse or negative events, when reported, were related to consequences of the physical therapists' interventions, such as postsession fatigue or pain. No reported events were related to the mode of delivery. The incidence of reported adverse events specific to physical therapist interventions, as indicated in the different studies, ranged from 8 out of 53[28] to 11 out of 1937[58] to 0 out of 1266,[32] with an overall incidence of 19/3256, or 0.58%.

The body of evidence addressing adverse/negative events in patients undergoing physical therapy via telerehabilitation versus in-person therapy was small yet consistent despite the mixed health conditions in the included studies (eg, stroke, chronic heart failure, total hip or knee arthroplasty, congestive obstructive pulmonary disease). In studies that reported adverse or negative events, it was suggested that there were no differences between the modes of delivery. It should be noted that these were all low-quality RCTs that had limited evidence strength due to small sample sizes with many outcome measures, even in SRs that only report on 1 or 2 small studies.

In highly supervised experimental settings, rates and types of adverse or negative events in both the in-person and telerehabilitation treatment groups were low. Combined with the findings from the recommendation on patient outcomes, the evidence suggests that, overall, there are low adverse or negative event rates associated with providing physical therapy whether in person or via telerehabilitation.

Potential Benefits, Risks, Harms, and Costs

Benefits are as follows:

- Support of patient safety and quality improvement.
- Ability for documentation to clarify incidence and types of events related specifically to telerehabilitation as the mode of delivery.
- Demonstration of adherence to professional codes of ethics.

Risks, harms, and/or costs are as follows:

- None identified for prevention, management, or documentation.

Benefit-harm assessment: The benefits outweigh the risks, harms, and cost of providing telerehabilitation for patients in need of physical therapist rehabilitation services for certain health conditions.

Value Judgments

Professional codes of ethics and commitment to "do no harm" are strongly valued in physical therapist practice. The value placed on patient choice of service delivery modes may vary among individuals, organizations, or countries.

Intentional Vagueness

Study descriptions of adverse events lacked differentiation between the types of outcomes that are typically expected due to the health condition, age group, and interventions versus telerehabilitation as the mode of delivery.

Role of Patient Preferences

Despite no reported adverse events related to telerehabilitation, clinicians should ensure that patients are aware of their potential to occur. Clinicians and patients should engage in shared decision-making to determine if telerehabilitation is an acceptable mode and to obtain patients' informed consents.

Exclusions

None.

Quality Improvement

Organizations can monitor occurrences and severity of adverse events within each mode of delivery to develop service improvement strategies.

Implementation and Audit

Clinicians may need training on strategies for preventing potential adverse events.

Clinicians may need training to accurately document and review adverse events that contribute to the evidence associated with digital health care versus the consequences of healing and exercise.

Electronic health records, where used, may need to be adapted to record adverse event types and severity.

Future Research

Studies of adverse event occurrence, severity, and type specific to the mode of physical therapist delivery versus events associated with age group and diagnosis-specific treatments are needed.

Conclusion

Seven recommendations address the efficacy, delivery, facilitators, barriers, and potential for adverse events when preparing and implementing telerehabilitation as a mode of delivery in physical therapist care. The overall body of evidence ranged from strong to weak, generating future research recommendations to move the evidence forward. It is strongly recommended that clinicians self-assess their knowledge, skills, and local regulations for delivering physical therapist care through telerehabilitation and obtain further training and technical support to enhance digital health care in physical therapy. Additional telerehabilitation research is needed for all ages, digital health applications, physical therapist measures, and interventions. Overall, this CPG supports the digitally enabled physical therapist and physical therapist assistant to offer telerehabilitation as a mode of delivering physical therapist services to patients who would benefit from services and whose barriers can be accommodated.

Disclaimer

This CPG was developed by an APTA volunteer GDG consisting of international physical therapists and physical therapists, a physician, and a consumer. It was based on SRs of current scientific literature, clinical information, and accepted approaches to telerehabilitation in physical therapist practice. This CPG is not intended to be a fixed protocol, as some individual patient needs may call for more or fewer interventions, as well as services delivered in person, via telerehabilitation, or a combination. Patients seeking care may not be the same as participants in a clinical trial or in the literature used to inform this guideline. Patient care and treatment should always be based on a shared decision-making process with the patient, adjusting for the clinician's independent clinical judgment, the individual patient's clinical circumstances and preferences, and local regulatory and cultural factors.

Author Contributions

Alan C. Lee (Conceptualization, Data curation, Project administration, Writing—original draft, Writing—review & editing), Judith E. Deutsch (Formal analysis, Writing—original draft), Lesley Holdsworth (Formal analysis, Methodology, Writing—review & editing), Sandra L. Kaplan (Data curation, Formal analysis, Methodology, Writing—original draft, Writing—review & editing), Heidi Kosakowski (Conceptualization, Data curation, Formal analysis, Methodology, Writing—original draft, Writing—review & editing), Robert Latz (Formal analysis, Writing—review & editing), Lydia Lennox McNeary (Formal analysis, Writing—review & editing), Jennifer O'Neil (Formal analysis, Writing—review & editing), Oscar Ronzio (Formal analysis, Writing—review & editing), Kelly Sanders (Formal analysis, Writing—original draft, Writing—review & editing), Michelle Sigmund-Gaines (Writing—review & editing), Michele Wiley (Writing—review & editing), and Trevor Russell (Conceptualization, Data curation, Project administration, Writing—original draft, Writing—review & editing)

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Data Availability

Supplementary files contain data used for this clinical practice guideline. Additional data elements are available upon request. Peer review comments are available, upon reasonable request, from practice@apta.org.

Disclosures

In accordance with APTA policy, all individuals whose names appear as authors or contributors to this clinical practice guideline filed a disclosure statement declaring whether they have any competing interests as part of the submission process. All panel members provided full disclosure of potential conflicts of interest prior to voting on the recommendations contained within this clinical practice guideline.

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