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Abstract

Purpose: Because the number of return visits in a pro-bono setting is low and distributed over a longer timeframe, home exercise programs (HEP) adherence is crucial for patient success. The purpose of this study is to describe a process for HEP delivery and to collect measures of HEP adherence on patients at a pro- bono physical therapy clinic. **Methods:** Thirteen participants were instructed to perform at least four exercises at home. Exercises were chosen based on best available practice. Exercise images, instructions, and daily logs were populated using PHYSIOTEC® software. A follow up phone call was conducted approximately 4 days after the initial visit to answer questions regarding the exercises. Adherence outcomes were collected on the patient's first follow-up visit and when possible adherence data was repeatedly collected until discharge. The first performance outcome, scored by the treating therapist, was an observational evaluation of the patient performing the exercises exactly as instructed on the first visit. Second, the patient was asked to complete the Medical Outcomes Study General Adherence Items (MOSGAI) while the therapist reviewed and calculated a score for the exercise log. Measures of central tendency and variability of the demographic data and measures of exercise adherence were calculated using Statistical Package for the Social Sciences 23.0 (Chicago, Illinois). **Results:** Participants included 7 females and 6 males with an average age of 56.73 (SD ± 12.78) years and body mass index of 27.3kg/m^2. Self-reported HEP adherence was general good. The MOSGAI average was 85.3% (SD ± 24.3%), the HEP log average was 84% (SD ± 20.2%), and the therapist rated HEP accuracy scores was 79.16% (SD ± 29.84%). Trends in the data shown an improvement in self-reported HEP adherence overtime up to the third follow up visit. **Conclusion**: Initially our approach to HEP delivery in this pro-bono setting appears successful as reported measures of adherence and accuracy of performance were generally good compared to the existing literature. Clinicians could consider using a similar HEP delivery model to a population of patients with limited access to health care.

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Keywords: pro-bono physical therapy, home exercise program, adherence

INTRODUCTION

Pro-bono medical clinics are common in the United States. Over the last decade, pro-bono physical therapy clinics have become more numerous, and often partner with institutions of higher education.[1] There are unique challenges for both patients and therapists in pro-bono settings including therapist availability and the patient's lack of transportation.[2]

Because the number of return visits in the pro-bono setting is low and typically spread across a longer period of time, home exercise programs (HEPs) are an important and integral part of a physical therapy plan of care.[3] It has been recorded and widely accepted that HEPs reduce a patient's recovery time and improve overall health.[4-6] As a result, it is important to assess HEP adherence and to explore factors that might be impeding adherence in a pro-bono population.

The literature is replete with strategies for maximizing HEP adherence.[3,4] Patient motivation and effective communication between the therapist and patient are cited as primary strategies.[7] Motivation can be achieved by facilitating patient input in goal setting as well as during treatment interventions. Patient motivation to perform HEPs may be facilitated with pictorial handouts of the exercises.[8] Multimedia and technology may also play a role, although their effectiveness in maximizing HEP adherence is somewhat dubious.[3,9,10] Not surprisingly, communicating the specific benefits of exercise to the individual patient[8] and a supplemental follow-up phone call to the patient regarding the assigned exercises are also cited as strategies to improve exercise adherence.[4,8]

Many barriers to HEP adherence are intrinsic. Severity of disability, gender, psychological distress, socioeconomic status, and cultural background all play a role in patient adherence.[11] Lower socioeconomic classes tend to delay treatment for chronic pain secondary to cost or education of the medical condition.[12] Similarly, motivation and language barriers may adversely alter individual HEP adherence.[13] It is important for the therapist to be aware of these factors and provide culturally appropriate and adequate education all tailored to the individual patient's needs.[12]

Exercise adherence is reported with a variety of outcome measures. One method for measuring adherence is the use of concealed accelerometers.[9] However, accelerometers do not capture exercise performance quality, and the cost associated with providing all patients with concealed accelerometers is not clinically feasible. The most common method to measure adherence is an exercise log (exercise diary), which is completed by the patient after each exercise.[14] Typically, the log includes a list of exercises to be completed each week and contains boxes to check off when the prescribed exercises have been performed. Another self-reported outcome is the Medical Outcomes Study General Adherence Items (MOSGAI) that provides the clinician with an adherence percentage. The MOSGAI has an internal consistency of approximately 0.80 but is not specific to exercise as it was originally designed for compliance to medical treatment.[15]

Other methods for measuring HEP adherence are indirect but may be useful. One way to determine the quality of exercises performed is to critically evaluate the patient performing the exercises at a follow up visit. For example, Harkapaa et al used a Likert rating scale to determine the number of faultless exercises the patient performed.[16]

It is important to note that in a recent randomized controlled trial, Nicolson et al found that self-reported scales and logs that track exercise adherence have questionable validity as patients tend to over-report when compared to the accelerometer gold standard.[9] Because of the limitations in the validity of clinically accessible measures of HEP adherence, The World Health Organization (WHO) recommends combining several outcome measure of exercise adherence to obtain a more accurate measure.[17]Triangulation of outcome measures would provide the therapist with a more complete and accurate measure of exercise adherence.

The primary purpose of this study is to investigate multiple measures of HEP adherence in a group of patients receiving services from a pro- bono physical therapy clinic. The secondary purpose of this study is to explore possible relationships between those measures of HEP adherence. By investigating HEP adherence in an underserved population, treating physical therapists can begin to understand how to improve adherence. Ultimately, higher levels of adherence will likely yield higher levels of function and improvements in overall health.

METHODS

Individuals who sought physical therapy intervention, who met the inclusion criteria, and who consented to participate were invited to take part in the study. After obtaining informed consent, the patients completed a demographic questionnaire and underwent a comprehensive standardized history and physical examination. All interventions and measures were performed by one licensed physical therapist with 17 years of experience.

The following *inclusion criteria* were used to determine eligibility for this study: a) an adult between the ages of 18 - 65 years seeking physical therapy intervention and b) the patient had to be appropriate for physical therapy intervention as defined by the American Physical Therapy Associations (APTA) criteria (Guide to Physical Therapist Practice 3.0).[18]The following were used as *exclusion criteria*: a) the patient presented with a condition that was contraindicated for light exercise as defined by the Kisner and Colby;[19] b) the patient was currently receiving physical or occupational therapy for the same condition; c) the patient did not demonstrate sufficient fluency in spoken or written English to communicate with the research examiner and complete questionnaires; d) the patient did not have a translator available; and e) the patient did not agree to comply with the treatment and follow up schedule; including a scenario where a potential participant was planning to move away from the metro region before the 1-2 week scheduled follow up.

After consent, the therapist determined at least four exercises that were consistent with published APTA clinical practice guidelines (when available). For each exercise, dosages (sets, repetitions, and frequencies) were based on acuity, comorbidities, and patient response to treatment. The therapist explained the importance of the exercises as it relates to the patient's condition, and then demonstrate each exercise. The patients were asked to repeat the exercise to the therapist until the exercise was performed correctly. If the patient reported any increase in their baseline concordant pain during the exercise, the exercise was not prescribed in its current form. Patients were sent home with a paper copy of the finalized exercises including both pictures and instructions that were embedded in an exercise log. The log contained the days of the week, image of the exercise with sets, repetitions, and frequencies. The patient was instructed to complete the exercise log to the extent that they are performing it. Finally, the patient was asked if there are any questions or points of clarification needed. Each patient scheduled for a follow up appointment in 1 -2 weeks from the initial evaluation.

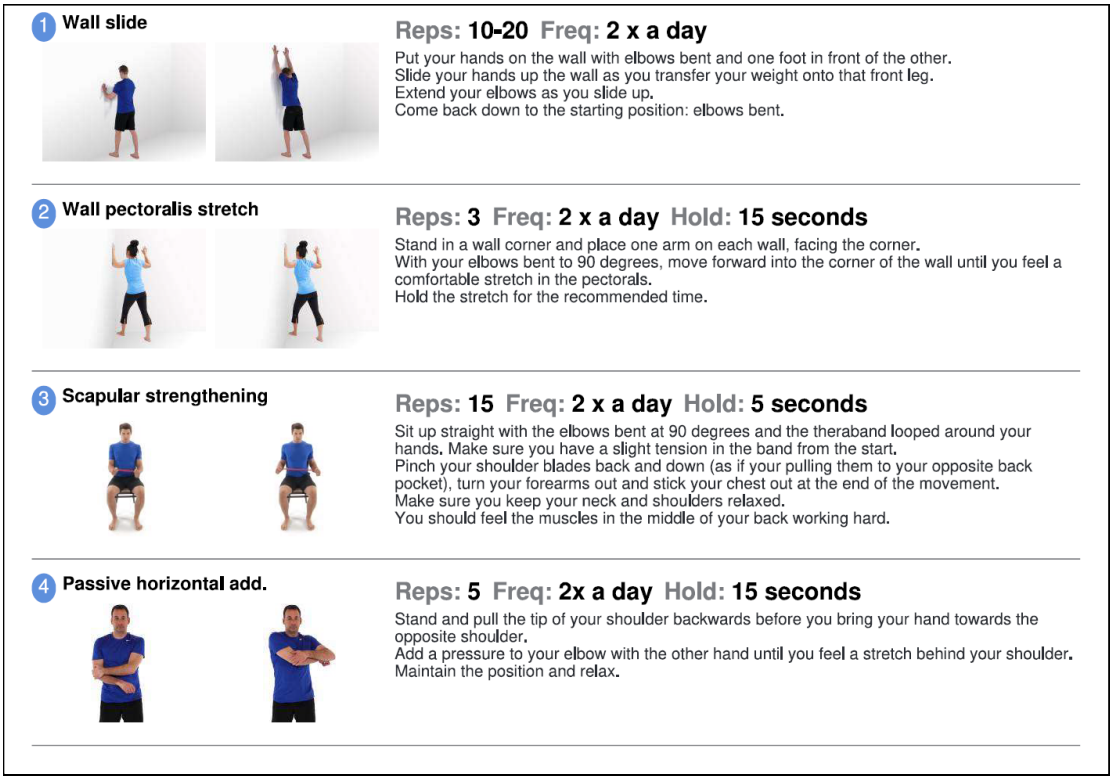

Figure 1. Example of a Home Exercise Handout

A physical therapy student, present at the time of the HEP prescription, made a follow up phone call to the patient. The phone call was consistently 4-7 days (depending the date of the patient's scheduled follow up) after the initial visit to answer any questions regarding the prescribed exercises. When the patient returned for the first scheduled follow up visit, the physical therapist performed on observational evaluation of the patient's exercise performance. The patient was asked to demonstrate the prescribed exercises and the therapist rated the patient on a scale of 0 to 4.[16] The number assigned by the therapist represented the number of exercises performed exactly as prescribed after the initial evaluation. In order to reduce the risk of bias, the therapist informed the patient at the beginning of the follow up session not to report HEP adherence. Following this assessment of exercise performance, the patient

competed the MOSGAI (appendix). Next, the therapist reviewed the exercise log with the patient and the therapist calculated an exercise log score. For patients falling below a score of 80% on the exercise log or 24/30 on the MOSGAI, the patient was asked a question related to perceived barriers of performing the HEP. Subsequently physical therapy care resumed with the appropriate re-evaluation, treatment procedures and assignment of a modified HEP. “Insert Figure 2 here”

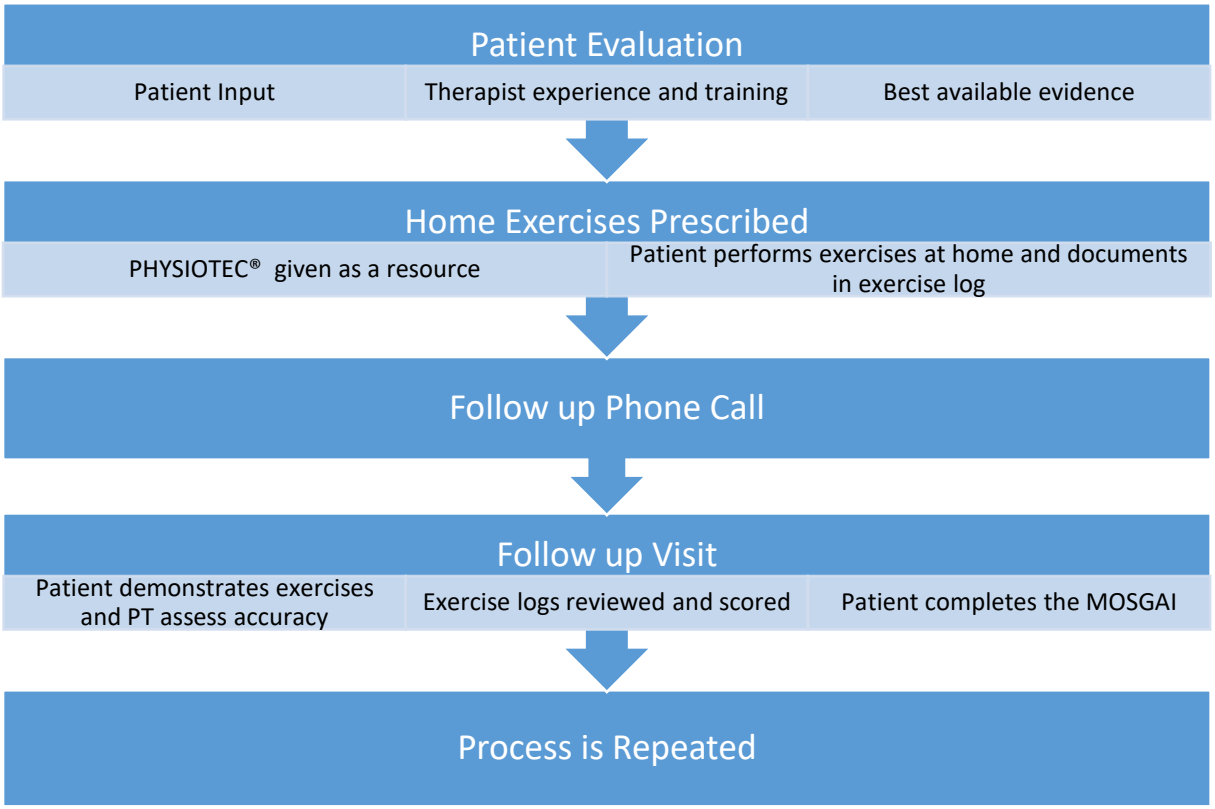

Figure 2. Summary of Study Methodology

Instrumentation:
Data collection required the use of the following instruments: Patient Exercise Log, 11-point Numeric Rating Scale, PT Evaluation of Exercise, and the Medical Outcomes Study General Adherence Items. Collectively these instruments were completed to determine how accurately the patient followed their HEP.

Patient Exercise Log
Exercise logs have also been shown to increase motivation for patient adherence.[14] Although subject to overestimation, exercise logs have been shown to provide a more accurate measure of adherence compared to a self-reported numeric rating scale.[9]

Therapist Rated HEP Accuracy Score
One point is awarded for each exercise that is demonstrated to therapist exactly as originally prescribed. The total number of points awarded is then divided by the number of exercises prescribed to obtain a percentage. Harkapaa et al. do not report on inter rater reliability. However, the measure was sensitive enough to differentiate between two different patient groups with low back pain and a group of controls after 3 months of prescribed home exercises.[16]

Medical Outcomes Study General Adherence Items (MOSGAI)
For a secondary self-reported outcome measure of home exercise adherence, all patients completed a modified version of the MOSGAI during the follow-up visits. The MOSGAI is a five item, Likert scale questionnaire originally designed by Ron Hayes M.D. in a large medical outcomes study of general adherence. A score of 30 would indicate complete adherence to the prescribed exercises and a score of six would indicate no adherence. The MOSGAI has been shown to have good intra-rater reliability among physicians[15] and has been used in a previous similar study.[20]

Statistical Analysis:
The statistical analysis included measures of central tendency and variability of the descriptive data and three measures of exercise adherence using Statistical Package for the Social Sciences 23.0 (Chicago, Illinois). Exercise log adherence rates were calculated by multiplying the number of exercise sessions recorded by the number of exercises performed in each session. Secondarily we investigated the relationships between three measures of exercises adherence using Pearson's correlation coefficient (MOSGAI and patient log; MOSGAI and therapist observation; Patient log and therapist observation). Patient barriers in performing the exercises were also recorded.

RESULTS
Participants included 7 females and 6 males with an average age of 56.73 (SD ±12.78) years and an average body mass index (BMI) of 30.01kg/m² (Table 1).

Table 1: Descriptive Statistics

Subjects	N=13
Age (y)	56.7±12.8
BMI(kg/m^2)	30.01±8.83
Primary Language	11 English, 1 French, 1 Arabic
Employment	5 employed/student, 8 unemployed

y = year, kg = kilograms, m = meters, BMI = body mass index

Self-reported measures of HEP adherence (MOSGAI average 85.5% (SD ± 24.3%)) and (HEP log average 84% (SD ± 20.2%) were generally good. The therapist rated HEP accuracy score was 79.16% (SD ± 29.84%). Trends in the data show an improvement in self-reported HEP performance overtime and remained steady up through the third visit. There were no statistically significant relationships between the three outcome measures p > .34 (Table 2).

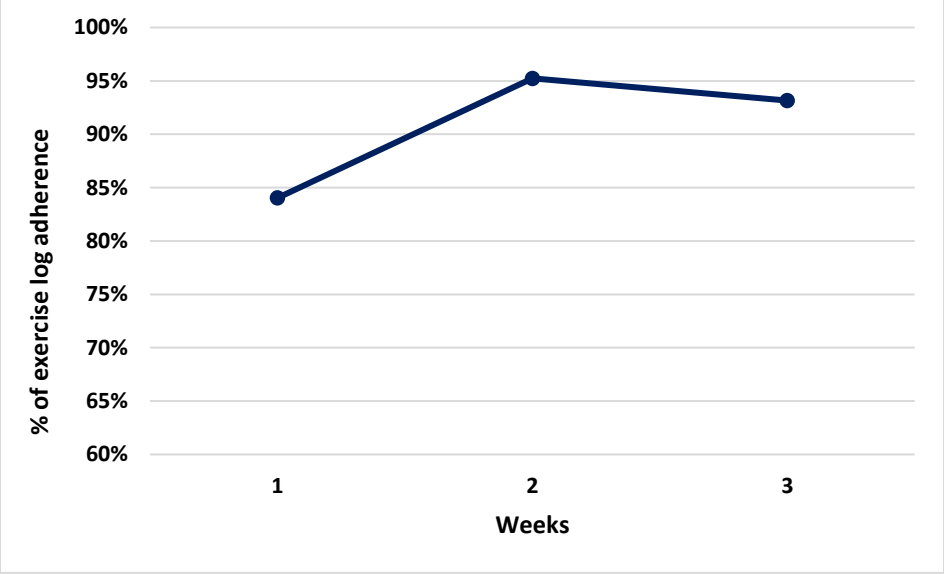

Figure 3. Average Adherence Rates per Week: Home Exercise Program Log

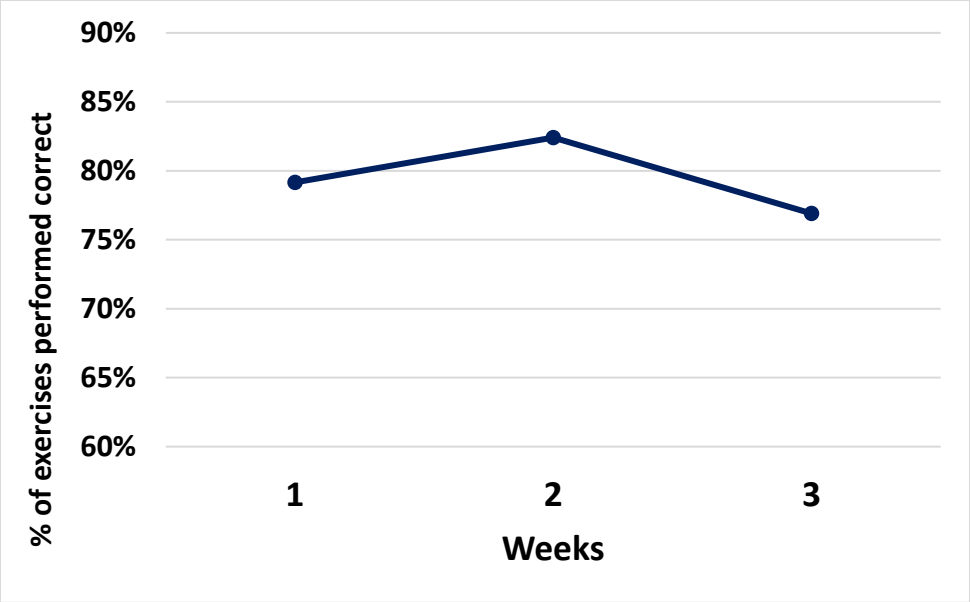

Figure 4. Average Percentage of Exercises Performed Correctly as Rated by the Therapist

Table 2: Pearson's Correlations among Exercise Adherence Scores

Exercise Adherence Measure	1	2	3
1. MOSGAI	-		
2. HEP log average	.165	-	
3. Therapist rated HEP accuracy score	.333	.094	-

MOSGAI = Medical Outcomes Study General Adherence Items, HEP = home exercise program

Pain, secondary to returning to work, and frustration that functional progress was too slow were reported as barriers to completing the exercises as prescribed.

DISCUSSION

Patients' HEP adherence in a pro-bono PT clinic is crucial for both short and long-term success.[21,22] Initially, our approach to HEP delivery in this pro-bono setting appears successful as reported measures of adherence and accuracy of performance were generally good compared to the existing literature. Current literature estimates adherence rates between 35% and 72%.[23] Peek et al reported 15% - 39% adherence in patients with chronic low back pain using a similar multifaceted approach to collecting data on home exercise adherence.[24] A study by Bennell reported that self-reported patient adherence was between 60% and 75% depending on whether an electronic HEP was issued. [25] The variability found between the studies is likely due to the differences in the method of exercise prescription and the different patient populations being treated.

The procedural decision of using multiple measures of exercise adherence was confirmed in our study as there were no statistically significant relationships between any of the measures. Because each exercise adherence measure appears to be measuring a different facet of exercise adherence, it is important for the clinician to consider taking multiple measures of exercise adherence with their patient. Based on the results of this study, gathering both patient and therapist reported measures appears to give a more comprehensive understanding of exercise adherence in the pro-bono setting.

A noteworthy feature of this study is the methodology that may have yielded a higher-than-average HEP adherence rate. The crucial components of HEP prescription includes patient input into program planning, explanation for why the therapist is recommending the exercise, and demonstration of the exercise by the therapist to the patient. Answering patient concerns or questions, allowing the patient to demonstrate the exercises back to the therapist (making corrections as needed), and giving the patient written and visual instructions of the home exercise are important considerations. Additionally, a student physical therapist called the patient at least one time between visits to remind the patient of the exercises and to answer questions. Finally, the patient to demonstrated the exercises on the first follow up visit, which allowed the opportunity for early and critical feedback that have potential implications for outcomes.

HEP adherence logs improved from the first week when compared to both the second and third weeks. It is possible that by the second and third weeks our patients developed a habit of performing exercises in the home so that forgetting to perform the exercises is less likely. Because we only consistently collected data for up to 3 weeks, we cannot firmly conclude that continued care would affect HEP adherence either adversely or for the better. To our knowledge no specific study has investigated the learning effect on HEP compliance over time deeming this topic a noteworthy future study.[26]

Unlike the self-reported exercise log adherence, the correctness of exercises performed was consistent and did not demonstrate a trend. One explanation for the trendless data could be due to the weekly adjustments to the HEP. It is the author's opinion that frequent changes to the HEP is necessary to effectively progress the patient. However, there may be a small cost to those frequent changes. Anecdotally, the patient's misunderstanding and forgetfulness of the exercise specifics seems to be more problematic immediately after the new exercises are adjusted or prescribed. Thus, frequent adjustments and new exercises introduce ongoing challenges to the patients learning which may ultimately stabilize the patient's accuracy of exercise performance over time.

Limitations

Ongoing data collection is needed so that a more robust statistical analysis can be conducted. Trends in the literature are demonstrating that home exercise adherence is slightly better for patients that receive an electronic version of the HEP.[3,27] The age range of this study was narrow (44- 68 years old), and as such, the results of this study can only be applied to the middle age population. Because the treating therapist also scored the correctness of exercise performance, we cannot rule out a bias of the assigned scoring. Finally, the research subjects might have felt a sense of responsibility or duty to report positive adherence especially because they were receiving pro-bono physical therapy.

Future Studies

Future studies should consider using electronic HEP software to enhance adherence.[3,27] Future studies should also consider using a reliable and valid questionnaire to improve accuracy of self-reported HEP adherence, such as the exercise adherence rating scale (EARS).[28] The EARS was been shown to be a sensitive tool for measuring adherence in patients with a variety of conditions like knee OA, chronic pain, and low back pain. Use of the EARS provides the clinician with opportunities to explore potential mitigating barriers to HEP adherence.[29] Finally, it is assumed that high HEP compliance yields better patient outcomes. There are few studies demonstrating physical therapy efficacy in a pro-bone setting, especially when in-person visits are less than one time a week. Therefore, future research should explore exercises adherence using the EARS over a period of 4 weeks and finally explore the relationship between HEP adherence and objective outcome measures.

Clinical Significance

Our approach utilizes the best evidence from the literature for maintaining HEP adherence.[22,30] This research may be helpful to physical therapists who want to increase their patient HEP adherence to improve patient outcomes particularly in pro bono clinics where visits are often sparse.

CONCLUSION

Our approach to HEP delivery in this pro-bono setting appears successful as reported measures of adherence and accuracy of performance were generally good compared to the existing literature. On-going data collection is needed so that a more robust statistical analysis can be conducted. This research may be helpful to physical therapists who want to increase their patient HEP adherence with the overall goal of improving patient outcomes.

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