CHAPTER
11

Benefits of prescribing telemonitored exercises in patients with ankylosing spondylitis in the covid-19 pandemic: case series

Crossref doi https://doi.org/10.56238/emerrelcovid19-011

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ABSTRACT
Introduction: Ankylosing spondylitis (AS) is a complex disease characterized by inflammation of the spine and large joints. Considering the various losses caused by the COVID-19 pandemic, especially in individuals with chronic diseases due to cancellations of appointments and treatments, telemonitoring or telecare has become a good alternative for patients with AS, providing continuity of care. Objectives: To evaluate the effects of telemonitored exercises in patients with AS during the COVID-19 pandemic. Methods: Seven patients diagnosed with AS were included, evaluated, and followed up via messaging application. In the evaluations, several clinical issues were investigated, such as pain (VAS), stiffness, sleep, functionality (BASFI), quality of life (HAQ-S), and exercise frequency. The prescription and telemonitoring of home exercises occurred for 10 months by sending evaluation forms, videos with exercise guidelines, and monitoring via messaging application. Results: The frequency of exercises performed by the patients was a median between 165 and 217 minutes per week. No patient reported any adverse effect to the exercises, and it was possible to observe the improvement of pain and morning stiffness when comparing the variables of the initial and final evaluations, but without statistically significant differences. A strong correlation was found between functionality, morning pain, and momentary pain, as well as between momentary pain and stiffness time. Conclusion: Patients with AS had adherence to telemonitored exercises, as well as important benefits regarding functionality, sleep quality, morning pain intensity, quality of life, pain, and stiffness. In the patients with AS studied it was observed that the lower the pain intensity and the time of morning stiffness, the better the functionality.

Keywords: Ankylosing spondylitis, exercises, telemonitoring, rehabilitation.

1 INTRODUCTION

The scenario of the COVID-19 pandemic has generated insecurity and fear for the population in general, in addition to bringing important losses, especially to individuals with chronic diseases. The fact of going to work, to the market, and even buying their medicines of continuous use, led these individuals to fear for their health and that of their families. In this context, many appointments and elective treatments were canceled due to detachment, interfering with health care and disease control and leaving this population even more vulnerable (ESTRELA et al., 2020).

Also, for the control of the pandemic, it was recommended that all individuals perform activities to stay physically active, such as physical exercises at home, daily activities of home maintenance, games that move the body with children, reduction of sedentary time intervals with activities with higher energy expenditure and performance of other pleasurable physical activities in daily life (FERREIRA et al., 2020).

Individuals with rheumatic diseases are typically less active than the general population (HOOTMAN et al., 2003; CDC, 2011) and, as a consequence, have a higher risk of cardiovascular diseases and muscle weakening, further reducing their physical condition (TURESSON and MATTESON, 2007). These aspects highlight the importance of encouraging individuals with rheumatic diseases to maintain a physically active lifestyle.

Before the context of the COVID-19 pandemic, patients with Ankylosing Spondylitis (AS) already had significant health impairments when compared to the general population, both in functionality and in mental and social aspects (DAGFINRUD et al., 2004). And this limitation of functionality can result from reversible factors, such as pain and stiffness, or irreversible ones, such as structural damage from the disease (ALETAHA et al., 2006; LANDEWE et al., 2008). The reduction of functional capacity in patients with AS, therefore, depends not only on the level of disease activity but also on the level of structural damage (LANDEWE et al., 2008), smoking, sedentary lifestyle, and lack of social support (WARD, 2002).

The benefits of performing home exercises in patients with AS are already known (LIM et al., 2005) and the analgesic effects of pharmacological therapy favor the adherence of patients to exercises (MASIERO et al., 2011). The association of educational-behavioral training with exercises favors the functional improvement of patients with AS (MASIERO et al., 2013).

Considering the state of the pandemic by the novel coronavirus, the Federal Council of Physical Therapy and Occupational Therapy (COFFITO), in resolution No. 516, of March 20, 2020, began to allow the realization of non-face-to-face care through teleconsultation, teleconsulting and telemonitoring (COFFITO, 2020). The authorization of these new modalities allowed many patients to be efficiently monitored, both in the evaluation and prescription of physical exercises, as well as for the monitoring and application of health education strategies.

The challenges of using social media to carry out telemonitoring in Brazil are diverse, among which are the infrastructure, economic, judicial, and social aspects. The most important aspects, however, are related to the conditions of the patients, such as age and education, and also of the therapist, which included lack of knowledge about computers, access to updated devices, and internet speed (DANTAS et al., 2020).

Despite the barriers observed, it is essential that the physiotherapist can make the necessary adaptations that allow the practice of telecare, aiming to achieve benefits for his patient. Still, with the growth and increasing ease of use of social networks and digital communication channels, this means of monitoring and therapy becomes easier to be performed and more accessible to patients and health professionals (PEGORARI et al., 2020).

Considering the pandemic context and the difficulty of access to face-to-face care, the objective of this study was to verify the benefits promoted by telemonitored exercises in patients with AS, as well as to correlate changes in functionality with the stiffness and intensity of pain reported.

2 METHODOLOGIES

A prospective convenience case series sample study was carried out, which was part of the Project "Aquatic physiotherapy for patients with neuromusculoskeletal disorders", approved by the Ethics Committee Involving Human Beings (seem n°4.050.304), carried out from the Free and Informed Consent of the participant recorded in audio.

Seven patients with a clinical diagnosis of AS were included, three women and four men. All patients were treated at the Aquatic Center of the Regional University Hospital of Northern Paraná (HURNP) in Londrina and, due to the distancing recommendations recommended by the COVID-19 pandemic, face-to-face treatment was interrupted. In order not to cause greater harm to health, patients were invited to be followed by the messaging application by forwarding videos and monitoring the performance of specific physical exercises remotely.

The patients who agreed to participate in the study by sending recorded audio confirmed their acceptance and were subsequently evaluated through the application of specific instruments via telephone call or in the form of online forms, according to the patient's choice and according to their availability of time.

For the evaluations, a questionnaire was applied to contain several questions addressing subjects such as medication use, pain, stiffness, quality of life, frequency of exercises, and expectations regarding the exercise program. The following were applied: the verbal analog scale (VAS) for pain intensity analysis (PARAIZO et al., 2019), the Bath Ankylosing Spondylitis Functional Index (BASFI) questionnaire for functionality (CUSMANICH et al., 2012), the questionary The Health Assessment Questionnaire for the Spondiloar arthropathies (HAQ-S) for quality of life (SHINJO et al., 2007), and a question about the patient's perception of their sleep quality.

The verbal analog scale (VAS) has its measurement from 0 to 10, where 0 is the absence of symptoms and 10 is the greatest pain, you have ever felt, to assess momentary pain and morning pain (PARAIZO et al., 2019).

The Bath Ankylosing Spondylitis Functional Index (BASFI) is an instrument composed of 8 questions about functionality in AS and 2 about how the patient deals with daily life. All questions are answered using a 10 cm horizontal visual analog scale with a score from 0 to 10. The average of the answers gives the BASFI score that has a minimum score of 0 and a maximum of 10, with 0 corresponding to the absence of disability and 10 to the maximum disability. The BASFI meets the criteria required for a functional index, is of quick and easy applicability, can be self-administered or applied by an interviewer, is also easy to understand, reliable, and sensitive to changes in aspects of the disease (CALIN et al., 1994). The BASFI was translated and validated into Portuguese (CUSMANICH et al., 2012).

The HAQ-S is an instrument for assessing the quality of life of patients with spondyloarthropathies composed of 22 questions and has 10 domains, namely, dressing and grooming, getting up, eating, walking, personal hygiene, reach, usual activities and activities associated with posture and driving. These domains are graded from 0 to 3 and their total score is the sum of the points of the components divided by 8, and the lower the score the better the quality of life (SHINJO et al., 2007).

In the monthly evaluations, sleep quality was assessed using a specific question, where the patient classified sleep as "good, regular, or poor". Morning stiffness was also assessed through a specific question, where the patient reported the time of morning stiffness, if any.

The follow-up of patients remotely occurred between May 2020 and February 2021, and in the first seven months guidance videos were sent and the following three months were only follow-up.

After the initial evaluations, videos, and booklets were sent through social media with guidelines and sequences of home exercises. The exercises aimed to improve mobility, flexibility, and maintenance of muscle strength in different decubitus, as well as guidance on the use of thermotherapy in periods of complaints.

As a strategy in health education, guidance for the use of thermotherapy was used, and two videos were sent with explanations of the use of cold and heat for pain relief. The application of the resource was demonstrated and oriented at which times they could be used, such as painful conditions, before or after the performance of the exercises, in addition to alerting the places of risk of application. The use of cryotherapy was recommended for acute pain, where it could have the presence of edema, with the application of an ice pack at the site of discomfort, without having direct contact with the skin, for 20 minutes. For the use of heat, it was recommended for chronic pain, preferably they could apply before the exercises to improve mobility or after the performance for muscle relaxation, where they applied a towel with hot water on the spot. The control of the use of the thermotherapy intervention was performed together with the monthly reassessments, where the patient answered if he had used the resource, which application strategy he used, and in which places he applied.

Every four weeks, patients received a new sequence of video-guided exercises, in different decubitus positions and with adaptations according to individual conditions. The exercises were instructed to be performed at a place and time of each patient's preference and with a minimum frequency of twice a week and the reassessments were done monthly, as well as three months after the end of the video submission. Patients used messaging apps to clear up any questions about the exercises with individualized follow-up.

In the statistical analysis, the Shapiro-wilk normality test was used, being described as mean ± standard deviation when normal, and when not, they were described as the median and interquartile range (25-75%). For the correlation analysis between the variables functionality (BASFI), morning pain, momentary pain, and time of morning stiffness, the Spearman correlation coefficient (ρ) was used. The correlations were considered weak ($0.1 < \rho \leq 0.4$), moderate ($0.41 \leq \rho \leq 0.69$) or strong ($\rho \geq 0.7$). The SPSS 27.0 software was used for the analyses and the statistical significance was set at 5%.

3 FINDINGS

Seven patients were selected to participate in the study, but one of them did not adhere to the protocol, interrupting the treatment because he did not adapt to the intervention.

The study sample consisted of 6 patients (3 men and 3 women), with an ID of 54.2 (SD = 4.4) years, weight 78.0 (SD = 3.9) kg, height 1.6 (SD = 0.2) m and time of diagnosis of 9.0 (Md [25-75%] = [4.5-20.0]) years. The pain was the most frequent complaint. Considering that this is a series of cases, the particularities can be seen in Table 1.

Table 1: Characteristics of the patients included in the study.

Patient	**Age (years)**	**Sex**	**Time since clinical diagnosis (years)**	**Main complaint**
1	60	Female	4	Pain in hand fingers, knee and spine
2	51	Female	10	Pain in feet, shoulders and knees
3	48	Female	10	Pain in the spine
4	70	Male	31	Low back pain in the right shoulder and limitation of cervical movements
5	47	Male	5	Pain in the left foot
6	18	Male	4	Pain in the left hip and left knee

Regarding the frequency of exercises performed by the patients, a median (Md) was found between 165 and 217 minutes per week, with greater dedication to the practice in the fifth month (Table 2). None of the patients analyzed reported any adverse effects of the exercises.

In the evaluation of the effects of telemonitored exercises on the functionality of patients, it was possible to observe a median reduction of 1 point in the BASFI score when comparing the initial and final scores. These findings demonstrate improvement in function, because the lower the BASFI score, the better the individual's function (Table 3).

When the quality of life of the patients was assessed, there was a reduction of Md of 1.1 in the HAQ-S score (Table 3), indicating an improvement in the quality of life of the individuals, but in the last evaluation, this benefit was not maintained.

Regarding morning pain, there was an Md reduction of 1.5 points in VAS when the initial and final scores were compared. In pain at the time, there was an increase of 0.5 points when we observed the initial and final scores. In addition, there was a 32.5-minute Md reduction in the time of morning stiffness between the initial and final evaluations (Table 3).

The evaluation regarding the perception of sleep quality showed apparent improvement between the 1st and 2nd evaluations and worsening in the 6th evaluation, which can be observed in Table 5.

Despite the improvement in the absolute values of the outcomes analyzed, no statistically significant differences ($P>0.05$) were found between the evaluations for any of the variables presented in Table 3.

It was observed that during the evaluations, the BASFI score showed a reduction, indicating an improvement in functionality, as well as morning pain and momentary pain (Table 4). Thus, a strong correlation was found ($\rho = 0.771$; $P = 0.072$) between functionality (BASFI) and morning pain, which cannot be considered statistically significant, and between functionality and momentary pain ($\rho = 0.870$; $P= 0.024$), indicating that the lower the pain, the better the function.

Strong correlations were found between HAQ-S and morning pain ($\rho = 0.829$; $P= 0.042$) HAQ-S and momentary pain ($\rho = 0.725$, $P = 0.103$), moderate correlation between HAQ-S and weekly exercise frequency ($\rho = -0.429$; $P= 0.397$) and weak correlation between HAQ-S and morning stiffness time ($\rho = 0.290$; $P = 0.577$). Indicating that the greater the momentary pain and morning pain, the worse the quality of life of the individual. The correlation between the weekly frequency of exercise and quality of life indicates that the more active the individual remains, the better the quality of life.

Another variable that showed a reduction throughout the evaluations was morning stiffness (Table 4). Thus, it was possible to observe a moderate correlation ($\rho = 0.580$; $P = 0.228$) between functionality and morning stiffness, demonstrating that the shorter the time of morning stiffness, the better the quality of life of the individual.

Correlations were also found between weekly exercise frequency and morning pain, with a strong correlation ($\rho = -0.771$; $P = 0.072$), for momentary pain outcomes ($\rho = -0.058$; $P = 0.913$) and stiffness time ($\rho = 0.232$; $P = 0.658$) weak correlations were found. Thus, it was possible to observe that the higher the weekly frequency of exercises, the lower the morning pain reported.

Table 2: Frequency of execution of telemonitored exercises throughout the follow-up period (n=6).

	Review 1	**Review 2**	**Review 3**	**Review 4**	**Review 5**	**Review 6**	**Review 7**	**Follow-up**
				Md [25-75%]				
Frequency Exercises (without)	5,5 [2,6-7,0]	5,5 [2,6-7,0]	4,5 [3,5-5,3]	5,0 [2,8-6,3]	5,0 [2,8-6,3]	5,0 [0,8-6,3]	5,0 [1,8-6,3]	4,5 [1,5-6,3]
Time Exercises (min)	32,5 [26,3-41,3]	32,5 [26,3-41,3]	37,5 [30,0-50,3]	42,5 [27,5-62,5]	42,5 [27,5-62,5]	36,0 [11,3-48,8]	35,0 [25,0-52,5]	35,0 [7,5-75,0]
Total Time Exercises (min)	165,0 [63,8-288,8]	165,0 [63,8-288,8]	187,5 [105,0-250,5]	187,5 [75,0-420,0]	217,5 [60,0-285,0]	198,5 [11,3-273,8]	192,5 [27,5-292,5]	192,5 [15,0-435,0]
Daily executions n (%)								
0	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (16,7)	0 (0)	1 (16,7)
1	5 (83,3)	5 (83,3)	5 (83,3)	4 (66,7)	4 (66,7)	4 (66,7)	5 (83,3)	4 (66,7)
2	1 (16,7)	1 (16,7)	1 (16,7)	2 (33,3)	2 (33,3)	1 (16,7)	1 (16,7)	1 (16,7)
Another exercise n (%)								
Yes	4 (66,7)	3 (50,0)	2 (33,3)	3 (50,0)	3 (50,0)	2 (33,3)	1 (16,7)	3 (50,0)
No	2 (33,3)	3 (50,0)	4 (66,7)	3 (50,0)	3 (50,0)	4 (66,7)	5 (83,3)	3 (50,0)

Legend: Md (median); [25-75%] (interquartile range); without (week); min (minutes); n (absolute frequency); % (relative frequency).

Table 3: Changes in functionality, quality of life, pain, and stiffness at the beginning and end of the exercise telemonitoring period.

Variable	Initial	Final
	Md [25-75%]	
BASFI (points)	7,2 [4,1-8,4]	6,2 [2,6-7,8]
HAQ-S (points)	1,3 [0,9-2,3]	1,4 [0,9-2,1]
Morning pain (VAS)	7,0 [4,5-7,3]	5,5 [2,3-7,3]
Pain at the moment (VAS)	4,0 [1,5-4,3]	4,5 [0,0-6,3]
Stiffness (min)	40,0 [8,3-138,8]	7,5 [4,5-67,5]

Legend: Md (median); [25-75%] (interquartile range); cm (centimeters); min (minutes).

Table 4: Changes in symptoms, functionality and quality of life throughout the exercise telemonitoring period (n=6).

Md [25-75%]	**Baseline**	**Review 1**	**Review 2**	**Review 3**	**Review 4**	**Review 5**	**Review 6**	**Review 7**	**Follow-up**
Morning pain (cm)	7,0 [4,5-7,3]	5,5 [3,8-7,3]	3,5 [2,0-7,3]	3,5 [1,8-7,3]	3,5 [1,8-7,0]	3,5 [2,0-6,8]	4,5 [1,8-6,5]	5,5 [2,8-6,3]	5,5 [2,3-7,3]
Pain moment (cm)	4,0 [1,5-4,3]	3,0 [0,0-4,3]	3,0 [0,0-5,0]	0,5 [0,0-5,3]	1,5 [0,0-4,5]	1,0 [0,0-8,3]	3,0 [0,0-4,3]	3,5 [0,0-5,5]	4,5 [0,0-6,3]
Rigidity (min)	40,0 [8,3-138,8]	15,0 [6,0-93,8]	4,0 [2,0-90,0]	4,0 [1,5-90,0]	5,0 [2,0-75,0]	5,0 [1,5-90,0]	20,0 [2,3-75,0]	20,0 [5,0-75,0]	7,5 [4,5-67,5]
BASFI (points)	7,2 [4,1-8,4]	6,5 [3,3-7,4]	6,5 [3,0-7,6]	5,5 [3,1-7,0]	5,8 [3,0-7,9]	5,8 [2,3-7,7]	5,6 [3,4-8,0]	7,1 [2,6-7,8]	6,2 [2,6-7,8]
HAQ-S (points)	1,3 [0,9-2,3]	1,1 [0,8-2,4]	1,1 [0,9-1,9]	1,4 [0,8-2,3]	1,8 [0,8-2,1]	1,8 [0,9-2,1]	1,3 [1,0-1,9]	1,4 [1,0-2,1]	1,4 [0,9-2,1]

Legend: Md (median); [25-75%] (interquartile range); cm (centimeters); min (minutes).

Table 5 – Changes in sleep quality over time.

n (%)	*Baseline*	Review 1	Review 2	Review 3	Review 4	Review 5	Review 6	Review 7	*Follow-up*
Good	2 (33,3)	5 (83,3)	3 (50,0)	4 (66,7)	4 (66,7)	4 (66,7)	3 (50,0)	4 (66,7)	4 (66,7)
Regular	2 (33,3)	1 (16,7)	3 (50,0)	2 (33,3)	2 (33,3)	2 (33,3)	3 (50,0)	2 (33,3)	2 (33,3)
Bad	2 (33,3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Legend: n (absolute frequency); % (relative frequency).

4 DISCUSSIONS

Physical exercise is one of the main non-pharmacological treatments for AS, as it can interfere with several physical and psychological aspects (LIANG *et al.*, 2020). The exercise program is very important to improve or maintain the physical state of the patient and should be planned and applied individually according to the patient's needs (van der HEIJDED *et al.*, 2017).

The use of telecare has seen a major increase during the COVID-19 pandemic, primarily as a means of reducing the impact of discontinuing in-person treatments (KU *et al.*, 2021). In the present study, the strategy was used to promote the continuity of treatment of patients with AS, maintaining the benefits achieved during face-to-face therapies.

It was possible to observe in the present study that the performance of telemonitored physical exercises promoted improvement in the functionality of individuals with AS. Pécourneau et al. (2017), in a meta-analysis, concluded that protocols that include physical exercises are beneficial for this population, reducing the BASFI score, which corresponds to improved functionality, as well as reduced cardiovascular risk, improved respiratory function and prevention of osteoporosis (PÉCOURNEAU *et al.*, 2017).

Lim *et al.* (2005) conducted a study in which patients in the intervention group participated in an exercise program lasting 8 weeks, which was composed of exercises similar to those used in the present study, being performed by patients in their homes. As in the present study, the patients showed significant improvement in functionality and pain reduction, demonstrating that it is possible to achieve good results in these aspects through guided home exercises.

Masiero *et al.* (2011) conducted a randomized clinical trial comparing a group of patients who underwent rehabilitation with an educational-behavioral program and another group that performed only rehabilitation, which was composed of physical exercises guided by physiotherapists and performed by patients at home. As in the present study, the study used home exercises and a monthly follow-up through telephone calls. At the end of the study, significant improvements were observed in the scores of BASMI, BASFI, BASDAI, spinal mobility and other variables evaluated in the rehabilitation and rehabilitation plus educational program group. In the present study, conducted with a single intervention group, it was also possible to observe an improvement in the BASFI score, indicating an improvement in the functionality of the patients.

Hsieh *et al* (2014) conducted a randomized clinical trial with 44 patients with AS divided into two intervention groups, including home exercises, with one group performing mobility, breathing and stretching exercises and the other group receiving guidance to perform mobility exercises, muscle strengthening and aerobic exercises. The individuals participating in the study were monitored through telephone calls made every 2 weeks by a physical therapist. The program lasted 3 months and at the end, the authors observed an improvement in aerobic capacity and functionality, assessed using BASFI, in the patients of the second group. The study reinforces the effectiveness of home exercises and adherence to this treatment modality by the population with AS (HSIEH *et al.,* 2014).

There are some similarities between the study by Masiero *et al.* (2011) and that of Hsieh *et al.* (2014), in the way telemonitoring was used. In both studies, the patients received face-to-face training regarding the exercises to be performed at home, guided by a professional linked to the program and periodic follow-up was performed through telephone calls. Telemonitoring, therefore, was applied as a means of monitoring and reassessing the patients of the program. In the present study, telemonitoring was applied integrally, both in the sending and orientation of the exercises and for monitoring and reassessments, thus allowing that, regardless of where the patient was, he could receive and perform the exercises without prejudice, with close and frequent contact of the project monitors.

Curbelo Rodrígues *et al.* (2015) observed the main barriers to the practice of exercises by patients with AS. These authors conducted a qualitative study with 11 patients who were interviewed and asked about the main barriers and difficulties that lead them not to practice physical exercises. The main barriers cited were lack of information, accessibility, and periods of breaks in exercise, such as during vacations or personal problems, among other factors. In contrast, a prospective cohort study by Ji *et al.* (2019) presents data that demonstrate that telecare can be an effective strategy to bring information and perform care, saving time and costs, and benefiting patients and health professionals.

It was possible to observe that the teleservice strategy was effective for the prescription of exercises for patients with AS, and can also be used for behavioral change, health education strategy and so that patients have the possibility of continuing the exercises during the holidays or periods that cannot attend a face-to-face service.

Some difficulties arose during the study, such as the adaptation to technological resources for the prescription of exercises, the adequacy of exercises to facilitate their execution by the patient in his residence and the difficulty in maintaining the motivation of the patients to the remote intervention after a few months of treatment.

The use of telecare can enrich clinical practice and can be used to add exercises to the routine of patients, as well as a strategy for continuity of therapies in periods when the patient cannot attend in person for the therapy, thus avoiding losses during this period.

Although a small number of patients have been investigated, several benefits of this strategy can be mentioned, such as the possibility of individualized attention throughout the follow-up period, as well as the adaptation of the exercises to the needs and difficulties of each one in a personalized way. Even in the face of individualized follow-up, two patients who agreed to participate in the study did not adhere to the protocol, being removed from the final sample of the study.

It was observed that, with the practice of home exercises and individual monitoring through social media, the patients with AS who participated in the study obtained important benefits, such as improvement in stiffness, morning pain, and functionality. Some limitations of this study can be mentioned, such as the small number of the sample and the prolonged time of asynchronous remote follow-up, in addition to some outcomes, such as "quality of life" and "momentary pain", having worsened at the end of the follow-up, which can be justified by the prolonged time of the asynchronous follow-up and loss of motivation of the patients.

The results found may be useful to demonstrate the effectiveness of telemonitored home exercises for individuals with AS, thus contributing to a new means of prescribing exercises to maintain the treatment and performance of physical exercises by patients even in situations of travel difficulties. As implications for clinical practice, it is suggested that telemonitored exercises be performed synchronously, as well as concomitant and/or interspersed with face-to-face consultations with a scheduled frequency that meets individual needs. Considering the small sample size of the present study, it is suggested that nine surveys be conducted including home exercises and telecare compared to face-to-face modalities with a larger sample to confirm the benefits.

5 CONCLUSIONS

The patients with AS studied adhered to the modality of telemonitored home exercises, presenting improved functionality, improved sleep quality, and reduced morning pain and morning stiffness.

Strong correlations were observed between functionality and morning pain and between functionality and momentary pain, thus demonstrating that the lower the patient's pain, the better his functionality. There was also a moderate correlation between functionality and morning stiffness, therefore, the shorter the duration of morning stiffness, the better the functionality of the individual. Similarly, the higher the weekly frequency of exercise, the lower the morning pain and the better the quality of life in the patients.

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