

# The State of Pulmonary Rehabilitation in Latin America during the COVID-19 Pandemic

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## Abstract

**Background:** In December 2019, China reported a severe upper respiratory failure syndrome caused by a new virus identified as coronavirus COVID-19. **Aims and Objectives:** The aim of this exploratory study is to outline the current state of pulmonary rehabilitation in Latin American (LA) countries during the COVID-19 pandemic. **Materials and Methods:** A total of 1162 rehabilitation professionals (rehabilitation medicine specialists and residents, physiotherapists, occupational therapists, and speech therapists) from 20 countries in LA answered a 34-question online survey related to the current state of pulmonary rehabilitation in LA during the COVID-19 pandemic. **Results:** More than half of the professionals reported the absence of pulmonary rehabilitation services in their work centers, limited or non-existent pulmonary rehabilitation materials or equipment, and little or no training by their multidisciplinary team and themselves. Regarding COVID-19, 49.2% of the respondents indicated not receiving the necessary material for the protection against COVID-19, and more than half reported limited equipment to perform interventions in patients hospitalized by this disease, and not to have clear about the recommendations to prescribe pulmonary physiotherapy in these patients. Moreover, almost all the professionals did not feel capable of treating patients with lung disease from COVID-19 and felt anxiety doing it. **Conclusion:** Pulmonary rehabilitation is vital for providing optimal care for respiratory impairments, and this relationship has been magnified by the COVID-19 pandemic. This manuscript highlights the limited professional training and resource availability in LA and provides recommendations to improve the current situation.

**Keywords:** COVID-19, Latin America, pulmonary rehabilitation, survey

## INTRODUCTION

In December 2019, in Wuhan (China), the first cases of severe upper respiratory failure syndrome, related to a new virus identified as coronavirus COVID-19, were reported.<sup>[1]</sup> The clinical characteristics of the infection vary from an asymptomatic condition to acute respiratory distress syndrome, leading to multi-organ failure and death in the most severe cases. The typical symptoms of the disease include fever, sore throat, fatigue, cough, headache, myalgia, or dyspnea.<sup>[2,3]</sup> With the World Health Organization alerting the scientific medical community of a possible public health crisis with a new pandemic, health-care professionals and policymakers around the world started working to prepare local and national

health-care systems to cope with the medical, psychological, economic, and social consequences of this new virus. The field of physical medicine and rehabilitation (PM&R) with its subspecialty in pulmonary rehabilitation was no exception.

During this pandemic event, health-care professionals worked together to design, develop, and implement evaluative,

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**How to cite this article:** Di Giusto ML, Grover P, Castillo C, Jimenez IH, García JC, Tijerina R, *et al.* The state of pulmonary rehabilitation in latin america during the COVID-19 pandemic. *J Int Soc Phys Rehabil Med* 2021;4:40-50.

**Submitted:** 09-Oct-2020; **Revised:** 09-Oct-2020; **Accepted:** 19-Oct-2020; **Published:** 22-Feb-2021

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preventive, and management protocols to reduce the magnitude of spread and mortality with COVID-19. The most severely affected patients – severe/critically ill per Centers for Disease Control terminology (<https://www.cdc.gov/coronavirus/2019-ncov/hcp/disposition-hospitalized-patients.html#definitions>) – demonstrate multisystem involvement requiring care in the intensive care unit (ICU) for prolonged periods. Aggressive rehabilitation focusing on the restoration of respiratory function for these patients is vital to prevent further complications related to deconditioning after prolonged immobilization.<sup>[4]</sup> Because of the high risk of infectivity, pulmonary rehabilitation is started in many centers after the acute phase has passed. However, there is potential for functional deterioration while waiting for the acute phase to resolve. A strong argument can be made for considering early pulmonary rehabilitation techniques for these patients because early rehabilitation is associated with a decrease in the duration of ventilatory mechanical assistance, shorter length of stay in the ICU, and a faster discharge from hospital.<sup>[5]</sup> Rehabilitation specialists play a very important role in the recovery process including in the pulmonary arena, and physiatrists can be well versed in this field, thus playing an essential role in the recovery of critically ill patients affected by COVID-19.

PM&R supervised pulmonary rehabilitation management includes treatments such as airway clearance techniques used to clear away mucus from the lungs to prevent infections and to improve lung function, posture (e.g., erect head-and-neck positioning), oxygen supplementation, breathing exercises, stretching, manual therapy, and physical activity.<sup>[6]</sup> Physical therapy regimens include, passive, active-assisted, active, or resisted joint range of motion exercises to maintain and improve joint, muscle, and range of motion integrity and prevent long-term complications in the postacute phase.<sup>[7]</sup> In Latin America, there are very few opportunities for physiatrists to get trained in pulmonary rehabilitation because postgraduate medical programs in this field are lacking. In addition, in many Latin American countries, the scarcity of investment in the health-care systems has placed pulmonary rehabilitation at a significant disadvantage compared with other specialties.<sup>[8]</sup> Although the last two decades have seen an increase in the number of pulmonary rehabilitation centers in some countries, many still lack the infrastructure and appropriately trained staff that can rehabilitate patients with lung diseases.<sup>[6]</sup>

In addition, since this region does not have a tradition of inpatient rehabilitation programs, pulmonary rehabilitation is often limited to outpatient-oriented and home-based programs.<sup>[9]</sup> With a lack of physiatrists, pulmonary rehabilitation is performed overwhelmingly by physical therapists specialized in treating lung diseases.<sup>[10]</sup> Despite these challenges, some Latin American countries have made progress in improving physiatrist training for pulmonary rehabilitation. For instance, Mexico has the only academic program endorsed by a national university that trains physiatrists in this subspecialty, focusing on developing the ability to lead a pulmonary rehabilitation program using evidence-based treatments.

In times of uncertainty, such as the current crisis with the COVID-19 pandemic, the health-care systems of countries must be prepared and focused, not only on infrastructure but also on having appropriate specialists to manage the needs of patients throughout the continuum of care. Pulmonary rehabilitation services and professionals trained in this field are even more essential during this type of crisis since they aim to improve respiratory function that can be severely affected by COVID-19. The purpose of this study was to conduct an online survey of rehabilitation professionals in Latin America to understand the current state of practice of pulmonary rehabilitation in this region. The results of this study hope to bring to the forefront the challenges these professionals face during this pandemic crisis, with the next steps focused on defining practical recommendations on improving the current situation.

## METHODS

### Participants

The sample consisted of a group of PM&R specialists, residents, and other professionals working in respiratory rehabilitation (physiotherapists, occupational therapists, and speech therapists). The inclusion criteria were (1) age more than 18 years, (2) PM&R specialist/resident and other professionals working in the area of respiratory rehabilitation, (3) Spanish or Portuguese as a primary language, and (4) currently working in Latin America or Spain.

### Measures

A deidentified cross-sectional survey was designed and developed to understand the state of pulmonary rehabilitation in Latin America. Three PM&R specialists created the survey, one of them with a specialization in respiratory rehabilitation, belonging to Asociación Médica Latinoamericana de Rehabilitación (AMLAR; LA Rehabilitation Medicine Association) and Comité Latinoamericano de Gestión de la Información Científica en Rehabilitación (CLAGIR; LA Committee for the Management of Scientific Information in Rehabilitation). The survey was initially developed in Spanish and later translated into Portuguese by a bilingual PM&R specialist. The survey consisted of 34 questions that addressed participant information and opinions about the inquired topic [Appendix]. The survey posed questions related to five domains, namely (a) sociodemographic characteristics; (b) pulmonary rehabilitation infrastructure and services; (c) pulmonary rehabilitation in spinal cord injury; (d) rehabilitation center response to COVID-19 pandemic; and (e) attitudes, qualifications, skills, and knowledge related to providing pulmonary rehabilitation and treatment to COVID-19 patients.

### Procedure

Once the survey was created, it was reviewed by one medical specialist in rehabilitation. The survey was integrated into the SurveyMonkey platform and disseminated through the social networks (Facebook, Instagram, and WhatsApp) of

AMLAR, as well as those of some of the authors. At the beginning of the survey, informed consent was included, specifying that in completing the survey, participants were consenting to participate voluntarily in the study and were able to decline participation at any time. In this document, participants were also informed that their data would be stored in a database along with responses from all participants, using an alphanumeric code for each case, to safeguard their anonymity. In addition, participants had to affirmatively answer the question, "Do you want to participate in this study?" to start the survey. The average time needed to complete the survey was ten minutes. The data collection of the Spanish version took place from April 4, 2020, to April 22, 2020, while the Portuguese version data were collected from April 10, 2020, to April 15, 2020. IRB Approval for the study was obtained from the Ethics Committee of Grupo Gamma, Red Integrada de Salud in Rosario, Argentina.

### Data analysis

The data were exported to the statistical program, SPSS version 23 (IBM Corp., 2015). Frequencies and means were reported for each question. The denominator used to calculate the percentages was adapted to the number of individuals who answered each question. This was done because not all participants answered all the survey questions. Results obtained are presented below, divided into three sections: (a) pulmonary rehabilitation infrastructure and training, (b) center response to COVID-19 pandemic, and (c) attitudes, qualifications, skills, and knowledge about providing pulmonary rehabilitation and treatment to COVID-19 patients.

## RESULTS

A total of 1162 professionals from 20 countries in Latin America and Spain answered the survey. For this study, the sample from Spain ( $n = 133$ ) was removed from the analysis since the intended purpose is to outline the state of pulmonary rehabilitation in Latin America. Seventeen additional participants were excluded because they were not rehabilitation professionals. Therefore, the analyses were performed with a final sample of 1012.

### Sociodemographic characteristics

The majority of the participants worked in Mexico (33.3%,  $n = 337$ ) and were between 30 and 39 years old (45.9%,  $n = 461$ ). More than half were PM&R specialists (55.4%,  $n = 560$ ) and 24.6% ( $n = 248$ ) physiotherapy graduates [Table 1].

### Pulmonary rehabilitation infrastructure and services

44.9% ( $n = 451$ ) of the professionals provided ambulatory and hospital (inpatient) services. The majority reported not having a pulmonary rehabilitation service (72.3%,  $n = 772$ ) or the necessary equipment and materials to provide pulmonary rehabilitation care in their workplace (70.3%,  $n = 702$ ), such as electromechanical equipment or devices for cough assistance (77.4%,  $n = 760$ ). In fact, 62.6% ( $n = 405$ ) reported having less than 5 beds for pulmonary rehabilitation care in their medical

**Table 1: Sociodemographic characteristics**

	Frequency, <i>n</i> (%)
What is the country where you work? ( $n=1012$ )	
Argentina	93 (9.2)
Bolivia	18 (1.8)
Brazil	45 (4.4)
Chile	30 (3.0)
Colombia	50 (4.9)
Costa Rica	13 (1.3)
Cuba	1 (0.1)
Ecuador	14 (1.4)
El Salvador	18 (1.8)
Guatemala	29 (2.9)
Haiti	1 (0.1)
Honduras	31 (3.1)
Mexico	337 (33.3)
Nicaragua	14 (1.4)
Panama	91 (9.0)
Paraguay	25 (2.5)
Peru	78 (7.7)
Dominican Republic	81 (8.0)
Uruguay	22 (2.2)
Venezuela	16 (1.6)
What is your age range? ( $n=1004$ )	
21- 29	144 (14.3)
30- 39	461 (45.9)
40- 49	216 (21.5)
50- 59	126 (12.5)
>60	57 (5.7)
What is your profession? ( $n=1010$ )	
Rehabilitation medicine specialist	560 (55.4)
Physiotherapy graduate	248 (24.6)
Occupational therapist	28 (2.8)
Speech therapist	9 (0.9)
Medical resident in rehabilitation medicine	152 (15.0)
Other	13 (1.3)

centers and only 21.7% ( $n = 136$ ) indicated having more than 15 beds in the ICU [Table 2].

### Center response to the COVID-19 pandemic

80.2% ( $n = 792$ ) of the professionals reported that their rehabilitation center modified the care measures since the COVID-19 pandemic and 38.1% ( $n = 381$ ) reported that the outpatient care in their rehabilitation center was closed the 2<sup>nd</sup> week after the first case in their country. However, half of participants (50.8%,  $n = 500$ ) indicated not receiving the necessary material for the protection of medical personnel against COVID-19 [Table 3].

### Attitudes, qualifications, skills, and knowledge about providing pulmonary rehabilitation and treatment to COVID-19 patients

Most of the professional had not completed a postgraduate degree in pulmonary rehabilitation (93.8%,  $n = 946$ ) and did not consider themselves qualified to perform pulmonary rehabilitation (74.1%,  $n = 738$ ). In addition, more than half

**Table 2: Pulmonary rehabilitation infrastructure and services**

	Frequency, <i>n</i> (%)
Does the place where you work have a pulmonary rehabilitation service? ( <i>n</i> =999)	
Yes	277 (27.7)
No	772 (72.3)
What kind of service do you provide to patients? ( <i>n</i> =1005)	
Ambulatory	496 (49.4)
Hospital (inpatient)	58 (5.8)
Both	451 (44.9)
If you work in in an inpatient hospital, how many beds are intended to provide pulmonary rehabilitation care? ( <i>n</i> =647)	
<5	405 (62.6)
5- 10	85 (13.1)
10- 15	49 (7.6)
>15	108 (16.7)
If you work in an inpatient hospital, what number of beds does the ICU have ( <i>n</i> =626)	
<5	176 (28.1)
5- 10	213 (34.0)
10- 15	101 (16.1)
>15	136 (21.7)
Does your medical center have electromechanical equipment or devices for cough assistance? ( <i>n</i> =982)	
Yes	222 (22.6)
No	760 (77.4)
Does your workplace have the necessary equipment and materials to provide pulmonary rehabilitation care? ( <i>n</i> =998)	
Yes	296 (29.7)
No	702 (70.3)

ICU: Intensive care unit

**Table 3: Center response to COVID-19 pandemic**

	Frequency, <i>n</i> (%)
Has your rehabilitation center modified care protocols since the COVID-19 pandemic? ( <i>n</i> =987)	
Yes	792 (80.2)
No	195 (19.8)
Has outpatient care at your rehabilitation center closed? ( <i>n</i> =999)	
No	188 (18.8)
Yes, in the 1 <sup>st</sup> week after the first case in the country	265 (26.5)
Yes, in the 2 <sup>nd</sup> week after the first case in the country	381 (38.1)
Yes, after 3 <sup>rd</sup> week of the first case in the country	165 (16.5)
Has your care center provided you with the necessary material PPE against COVID-19? ( <i>n</i> =985)	
Yes	485 (49.2)
No	500 (50.8)

PPE: Personal protective equipment

consider not having an interdisciplinary team capable of providing pulmonary rehabilitation (55.7%, *n* = 549).

Regarding the COVID-19, the majority (90.2%, *n* = 906) of the respondents were familiar with the equipment and individual protection measures against the virus. However, 72.9% (*n* = 725) were not clear about the recommendations to prescribe pulmonary physiotherapy in these patients, 87.0% (*n* = 866) did not feel capable of treating patients with lung disease from COVID-19, and treating these patients generated anxiety in 73.3% (*n* = 733) of the sample. In addition, 68.0% (*n* = 662) of the professionals consider that their medical team did not have the necessary skills to perform a timely intervention in patients hospitalized

by COVID-19. For these reasons, almost all professionals indicated that they were interested in receiving training for pulmonary rehabilitation during the COVID-19 pandemic (96.3%, *n* = 965) [Table 4].

28.3% (*n* = 78) of the professionals who had a pulmonary rehabilitation service in their workplace consider that they did not have the equipment and materials necessary to provide pulmonary rehabilitation care. Furthermore, 27.8% (*n* = 76) believe that they did not have an interdisciplinary team capable of attending to patients in pulmonary rehabilitation.

On the one hand, 63.7% (*n* = 163) of the professionals who consider themselves trained to perform pulmonary rehabilitation

**Table 4: Attitudes, qualifications, skills, and knowledge about providing Pulmonary rehabilitation and treatment to COVID-19 patients**

	Frequency, <i>n</i> (%)
Have you completed a postgraduate degree in pulmonary rehabilitation? ( <i>n</i> =1008)	
Yes	62 (6.2)
No	946 (93.8)
Do you consider yourself qualified to perform pulmonary rehabilitation? ( <i>n</i> =996)	
Yes	258 (25.9)
No	738 (74.1)
Do you consider that you have an interdisciplinary team capable of caring for patients in pulmonary rehabilitation? ( <i>n</i> =986)	
Yes	437 (44.3)
No	549 (55.7)
Does your medical team have the necessary skills to perform a timely intervention in patients hospitalized by COVID-19? ( <i>n</i> =974)	
Yes	312 (32.0)
No	662 (68.0)
Are you clear about the recommendations to prescribe pulmonary physiotherapy in patients with COVID-19? ( <i>n</i> =995)	
Yes	270 (27.1)
No	725 (72.9)
Do you feel capable to treat patients with lung disease from COVID-19? ( <i>n</i> =995)	
Yes	129 (13.0)
No	866 (87.0)
Are you familiar with the equipment and individual protection measures against COVID-19? ( <i>n</i> =1004)	
Yes	906 (90.2)
No	98 (9.8)
Treating these patients generates anxiety? ( <i>n</i> =1000)	
Yes	733 (73.3)
No	267 (26.7)
Would you be interested in receiving training in pulmonary rehabilitation at COVID-19? ( <i>n</i> =1002)	
Yes	965 (96.3)
No	37 (3.7)

did not feel trained to treat patients with lung disease due to COVID-19, and 55.5% (*n* = 142) were unclear on the recommendations to grant pulmonary physiotherapy to these patients. On the other hand, 59.7% (*n* = 77) of the professionals who feel trained to treat patients with lung disease due to COVID-19 reported feeling anxiety when treating these patients.

Finally, 96.1% (*n* = 827) of the professionals who did not feel trained to treat patients with lung disease from COVID-19 were interested in receiving training in pulmonary rehabilitation against COVID-19.

## DISCUSSION

The purpose of the study was to describe the state of pulmonary rehabilitation in Latin America during the current COVID-19 pandemic. Information on the benefits of pulmonary rehabilitation is extensive; however, the same cannot be said regarding pulmonary rehabilitation practices in Latin America as it is constrained. Hence, much of the following discussion is based on practicing physicians' expertise and experience to provide context to the study results.

### Pulmonary rehabilitation infrastructure and services

In general, infrastructure (electromechanical equipment, devices for cough assistance, ICU beds, etc.) and qualified

personnel to provide pulmonary rehabilitation are limited across Latin America. Almost a quarter of the professionals with a pulmonary rehabilitation service find the equipment and materials scarce or absent. The lack of economic resources is the main barrier to adequately implementing and equipping exclusive areas for pulmonary rehabilitation since financial resources and highly trained professionals are required. Latin America lags in medical coverage in rehabilitation in general.

There is a lack of pulmonary rehabilitation knowledge among colleagues and other team members accompanied by a lack of financial support in this specific area of rehabilitation. This is justified by the relative scarcity in the regional scientific information that promotes the knowledge of this subfield, the scarce diffusion of the benefits or scope that it may have within PM&R, and the tremendous general confusion and erroneous synonymy between physical therapy, respiratory therapy, and pulmonary rehabilitation. This last item has led to the erroneous belief by health authorities that having the first two areas of care is sufficient. Even within the medical field, the belief that patients with pulmonary impairments have no other option than pharmacological treatment has led to ignorance of this area of rehabilitation.

### Centers' response to the COVID-19 pandemic

The majority of inpatient centers modified their health-care protocols, closed the outpatient services within the first 2 weeks of the first cases in their country, and provided some of the necessary personal protective equipment against COVID-19.

In the face of the worldwide pandemic declaration of severe acute respiratory syndrome coronavirus 2, all countries began to make decisions to implement preventive measures and care for their population. The expansion of COVID-19 in the different regions of the world, mainly through the experiences of China, Spain, and Italy, gave the opportunity in Latin America to observe and know how the disease was presenting and provided more opportunity to take preventive action measures.

The population served at rehabilitation centers and services is highly vulnerable and therefore considered to be at a significant risk of contagion and complications; for this reason, closing these services and modifying the care methodology was a correct decision. In addition, they had the opportunity to plan the action measures for the arrival of positive cases and the patients recovered by the care staff of these places and the modification or restructuring of the care of patients who come to the rehabilitation centers.

The COVID-19 pandemic has not yet concluded, so surely there is still much to learn. However, what is evident is that the pandemic has further highlighted the importance of the rehabilitation field. Not only that, it has also reinforced the need for continued training and commitment to comprehensive, multi- and interdisciplinary work. Pursuing these gaps can allow and help promote the growth of pulmonary rehabilitation in this region. In fact, recently, based on the results of this study, CLAGIR gathered PM&R professionals from all over Latin America, the United States, and Spain to develop a Spanish manual of recommendations for the rehabilitation of patients with COVID-19, published online on June 23, 2020, <https://www.portalamlar.org/2020/06/23/manual-de-recomendaciones-para-la-atencion-integral-en-rehabilitacion-para-pacientes-con-covid-19-consenso-latinoamericano-en-rehabilitacion/>. These recommendations focus on training, education, collaboration, and dissemination of information. Future work should aim at partnering with local health-care institutions and government, as well as nongovernmental organizations (NGOs), to expand knowledge and training in the field of pulmonary rehabilitation.

### Attitudes, qualifications, skills, and knowledge about providing pulmonary rehabilitation and treatment to COVID-19 patients

Almost a quarter of the professionals find they have a scarce or absent interdisciplinary team to support their efforts. Professionals' opinion of the ability to perform pulmonary rehabilitation independently or as a team with the scant appropriate equipment is consistent with objective evidence. This could relate to sociopolitical and economic factors

and health system types, where some specialties are given preference above other less revenue-generating services.

Training poses another significant barrier to pulmonary rehabilitation provision. This reflects the lack of neurorehabilitation and pulmonary rehabilitation available as a postgraduate degree (e.g., fellowship training).<sup>[11]</sup> This lack of health-care professionals in Latin America trained in pulmonary rehabilitation leads to not generating pulmonary rehabilitation services. In turn, this may be the reason for a scarcity of interdisciplinary teams; it may be that the different professional expertise is not available or that there is a lack of knowledge in terms of how to ensemble such a team together. This poses a unique challenge for providers in this region, given the limitations in training and experience in caring for patients with respiratory rehabilitation needs.<sup>[12]</sup>

Although there is acknowledgment in the literature regarding the respiratory needs of the patient populations PM&R traditionally cares for, these are limited.<sup>[12]</sup> It is interesting, but not surprising, to note that although rehabilitation medicine specialists are more confident in their ability to provide pulmonary care than other professionals (e.g., physiotherapists), in this study, this percentage is only a little more than half of all physiatrists. This reflects the limited training available for pulmonary rehabilitation.

Considering that there are approximately between 0.25 (Brazil) and 3 (Uruguay) physiatrists per 100,000 individuals on average in Latin America,<sup>[12]</sup> the number of professionals trained to provide the needed pulmonary rehabilitation services will be even more limited. This likely relates once more to the finite resources, very different training programs, variability, and access to training opportunities present in the region. Moreover, given that traditionally rehabilitation has focused its academic training and clinical care in neuromusculoskeletal pathologies, there has been abandonment or lack of interest in chronic diseases as those of pulmonary origin. Thus, at this time, where the need for patient care secondary to infections by COVID-19 has taken us off guard, it is imperative to perform new analyses and proposals pursuing a modification of academic and clinical programs in the rehabilitation centers of our countries.

The strong recommendation to overcome this barrier is to increase the number of training programs for pulmonary rehabilitation adapted to the needs and resources available to each country. As a future next step, one could consider homogenized and standardized programs available across Latin America.

COVID-19 poses a novel challenge for pulmonary rehabilitation in Latin America, with a majority of professionals unconfident about their ability to provide timely intervention. Even trained pulmonary rehabilitation professionals are unclear about current pulmonary physiotherapy recommendations<sup>[13-17]</sup> and feel unsure about their ability to offer quality pulmonary care for patients with COVID-19 infections. This feeling of

incompetence, along with the shortage of materials necessary for pulmonary rehabilitation and protection against the virus, combined with the fear of getting infected, likely explains the anxiety reported by the professionals when treating these patients for lung disease. That is why it would be highly recommended to have a team of psychologists who can assist these professionals with techniques and strategies for managing anxiety. Furthermore, having to work under so much pressure and being exposed to so many deaths can lead to feelings of uncertainty, guilt, sadness, and even traumatic stress that should cope with psychological support.

It is essential to recognize that while there is a constant barrage of literature on rehabilitation programs for those affected with COVID-19 and pulmonary programs as well,<sup>[6,18-24]</sup> this serves as information overload can make it challenging to filter reliable information. Given how little time has passed since the pandemic started, many studies have small sample sizes and limited follow-up. Other studies focus more specifically on implementing a program, the philosophy adopted, and the steps to follow.<sup>[25]</sup> One potential solution is a committee to review these studies periodically in the form of a meta-analysis to create clinical practice guidelines (CPGs) and then create formal dissemination mechanisms to ensure maximum impact.

An overwhelming majority of rehabilitation professionals are very receptive to receiving training on COVID-19 and pulmonary rehabilitation specifically for it. This pandemic has highlighted not only the deficits in the health-care system<sup>[12,25]</sup> but also the community's willingness to learn. With the diverse sociopolitical systems across Latin America, international professional organizations such as AMLAR, comprising 21 Latin American societies<sup>[26]</sup> are vital, not only for gathering information, but also making a case for resource allocation for education, training, and clinical care.

The results of this study should be interpreting in the light of the following limitations. (1) Most Latin American countries also have schools or associations of physical therapists dedicated to respiratory rehabilitation. Although the responses obtained through this study represent a significant number of providers in the region, there are still a large number of health-care providers, including therapists, who do not belong to the surveyed network of professionals (AMLAR) and were not part of this online survey. (2) Other professionals who provide care for these patients, such as pulmonologists, internists, respiratory therapists, and others, were not part of the survey because they did not belong to the AMLAR or related network of professionals. For this reason, it is not possible to generalize these results to other professionals that were not represented in the survey data that were obtained.

This study has significant clinical and research implications. (1) The results of this survey will be used to develop CPGs for pulmonary rehabilitation programs to treat COVID-19 patients in Latin America. (2) Rehabilitation professionals should work together with government and NGOs to improve the health-care systems and increase the resources available

in their centers to cope with the challenges that have come with this pandemic. (3) Rehabilitation professionals should develop and implement prevention programs to be used for health-care professionals to be prepared early on before they have cases in their countries. (4) Local national and Latin American professional associations like AMLAR should promote research and secure funding for such initiatives from government and NGOs. (5) Many studies have shown that health-care professionals are prone to develop mental health problems during the pandemic.<sup>[27-29]</sup> Thus, it is recommended that rehabilitation centers in Latin American countries provide psychological support to the rehabilitation team to assist with coping with the feelings of depression, anxiety, posttraumatic stress, and grief that may come with facing an extraordinary situation such as the COVID-19 pandemic.

## CONCLUSION

To the best of the authors' knowledge, this is the first study outlining the perception of PM&R providers describing the state of pulmonary rehabilitation in Latin America. In general, the results highlight the lack of trained providers in pulmonary rehabilitation, the limited infrastructure in Latin American countries, as well as the extreme interest expressed by current professionals to learn more. Possible factors that could explain these results are the lack of interest in the disability generated by respiratory diseases and dated academic programs that train both psychiatrists and graduates in physical, occupational, and language therapy. In addition, the lack of consensus on the scope of pulmonary rehabilitation and pulmonary physiotherapy in Latin America may be contributing to the fact that this discipline is not considered a broader, more diverse, and comprehensive program whose premise almost entirely addresses the possible sequelae derived from lung disease. Therefore, it is of utmost importance that medical specialties recognize and become open to the integration of comprehensive rehabilitation as part of medical treatment across the continuum of care, from the preventive phase through complications and sequelae.

## Acknowledgment

Ramos-Usuga was supported by a predoctoral fellowship from the Basque Government (PRE\_2019\_1\_0164).

## Financial support and sponsorship

Nil.

## Conflicts of interest

There are no conflicts of interest.

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## APPENDIX: SURVEY

### I. Rehabilitation Professionals

What is the country where you work?

- Argentina
- Bolivia
- Brazil
- Chile
- Colombia
- Costa Rica
- Cuba
- Ecuador
- El Salvador
- Guatemala
- Haiti
- Honduras
- Mexico
- Nicaragua
- Panama
- Paraguay
- Peru
- Dominican Republic
- Spain
- Uruguay
- United States
- Venezuela

2. What is your age range?

- 21-29
- 30-39
- 40-49
- 50-59
- 60 or more

3. What is your profession?.

- Rehabilitation Medicine Specialist
- Physiotherapy graduate
- Occupational Therapist
- Speech therapist
- Medical resident in rehabilitation medicine
- Other

4. If your answer was different, specify:

5. Mention the hospital or clinic where you work.

6. Have you completed a postgraduate degree in pulmonary rehabilitation?

- Yes
- No

7. If your answer is yes, please indicate where and which:

II. Workplace and Pulmonary Rehab

9. Does the place where you work have a pulmonary rehabilitation service?

- yes
- No

10. What kind of service do you provide to patients?

- Ambulatory
- Hospital (inpatient)
- Both

12. If you work in hospital, how many beds are intended to provide pulmonary rehabilitation care?.

- Less than 5
- 5 to 10
- 10 to 15
- More than 15

13. If you work in hospital, what number of beds does the Intensive Care Unit have?.

- Less than 5
- 5 to 10
- 10 to 15
- More than 15

16. Does your medical center have electro mechanical equipment or devices for cough assistance?.

- yes
- No

### III. Workplace, SCI and pulmonary rehab

26. In your medical practice, is lung rehabilitation performed in patients with spinal cord injury?

- Yes
- No

27. Has your training center provided you with pulmonary rehabilitation training in spinal cord care?

- Yes
- No

28. If the previous question was affirmative, does the interdisciplinary team have training in pulmonary rehabilitation?

- Yes
- No

31. How many beds does your hospital have available to take care of spinal cord injury patients who require pulmonary rehabilitation?

- Less than 5
- 5 to 10
- 10 to 15
- More than 15

32. Do you usually treat patients with spinal cord injury who require ventilatory mechanical assistance?

- Yes
- No

### IV. COVID-19

19. Has your health center modified the care measures since the COVID-19 pandemic?

- Yes
- No

20. If your answer is yes, what changes have been made?

21. Has the care at the medical center where you work closed your outpatient service?

No

- Yes, in week 1 of the first case in the country.
- Yes, in week 2 of the first case in the country.
- Other time

22. Other time when?:

23. Has your care center provided you with the necessary material for the protection of medical personnel against COVID-19?
- Yes
  - No

#### V. PROFESSIONAL OPINIONS

8. Do you consider yourself qualified to perform pulmonary rehabilitation?
- Yes
  - No
11. Does your workplace have the necessary equipment and materials to provide pulmonary rehabilitation care?.
- Yes
  - No
14. Do you consider that you have an interdisciplinary team capable of caring for patients in pulmonary rehabilitation?.
- Yes
  - No
15. Does your medical team have the necessary measures to perform a timely intervention in patients hospitalized by COVID-19?
- Yes
  - No
17. Are you clear about the recommendations to prescribe pulmonary physiotherapy in patients with COVID-19?
- Yes
  - No
18. ¿ Do you feel capable to treat patients with lung disease from COVID 19 ?.
- Yes
  - No
24. Are you familiar with the equipment and individual protection measures against COVID-19 ?.
- Yes
  - No
- Question Title
25. Treating these patients generates anxiety?
- Si
  - No
29. Do you consider yourself capable of performing pulmonary rehabilitation in patients with spinal cord injury?
- Yes
  - No
30. Do you consider that you have an interdisciplinary team capable of providing pulmonary rehabilitation in patients with spinal cord injury?
- Yes
  - No
33. Would you be interested in receiving training in pulmonary rehabilitation at COVID-19?
- Yes
  - No
34. Would you be interested in receiving a training in pulmonary rehabilitation in patients with spinal cord injury before COVID-19 ?.
- Yes
  - No