

# Knowledge, confidence, and clinical experience of physiotherapists and multiprofessional team on pulmonary rehabilitation

*Conhecimento, confiança e experiência clínica dos fisioterapeutas e equipe multiprofissional sobre reabilitação pulmonar*

*Conocimiento, confianza y experiencia clínica de los fisioterapeutas y el equipo multiprofesional sobre la rehabilitación pulmonar*

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**ABSTRACT** | The knowledge deficit of health professionals has been a barrier to expanding and implementing of pulmonary rehabilitation (PR) services, despite the reported benefits of PR for individuals with Chronic Respiratory Disease (CRD). This study aims to assess the preparedness of health care professionals from two Brazilian cities to perform PR in the public health system. This survey is part of a larger project to implement PR in the Brazilian public health system. A self-administered questionnaire was used to assess the knowledge (19 questions), training (7 questions), confidence (10 questions), and clinical experience (8 questions) of physical therapists (PT) and the multiprofessional team (MT) before a PR workshop. In total, 44 PT and 231 MT answered the questionnaire. The mean total knowledge score was 10±3 for PT and 6±3 for MT. Few physical therapist reported having “a lot” of experience (25%) and confidence (22.7%) to perform PR, as well as sufficient training to conduct the

six-minute walk test (27.3%). Even fewer MT reported having “a lot” of experience (10%) and sufficient training (4.8%) to perform PR, as well as to plan the educational program for patients (10%) and the confidence to refer patients to PR (6.5%). This is the first study to evaluate the preparedness of professionals from the Brazilian public health network to provide PR. Notably, both PT and MT have low preparation to perform PR in the studied cities, reinforcing the need for continuing education.

**Keywords** | Lung diseases; Chronic Obstructive Pulmonary Disease; Rehabilitation; Physical Therapists; Health Care Professional.

**RESUMO** | O déficit de conhecimento dos profissionais de saúde tem sido uma barreira para a expansão e implementação dos serviços de Reabilitação Pulmonar (RP), apesar dos seus benefícios comprovados para

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indivíduos com Doença Respiratória Crônica (DRC). Este estudo, do tipo *survey*, foi parte de um projeto maior para implementação da RP no sistema público de saúde brasileiro, avaliando o preparo dos profissionais de saúde de dois municípios brasileiros para fornecê-la. Foi utilizado um questionário autoaplicável para avaliar o conhecimento (19 questões), o treinamento (7 questões), a confiança (10 questões) e a experiência clínica (8 questões) dos fisioterapeutas (FT) e da equipe multiprofissional (EM), aplicado previamente em um workshop sobre RP. A pontuação média de conhecimento foi de  $10 \pm 3$  para FT e  $6 \pm 3$  para EM. Menos de um terço dos FT referiu ter “muita” experiência (25%) e confiança (22,7%) para realizar RP, bem como treinamento suficiente para realizar o teste de caminhada de seis minutos (27,3%). Poucos profissionais da EM relataram ter “muita” experiência (10%) e treinamento suficiente (4,8%) para realizar RP, assim como para planejar o programa educacional (10%) e ter confiança para encaminhar pacientes para a RP (6,5%). Este é o primeiro estudo a avaliar o preparo dos profissionais da rede pública de saúde no Brasil para fornecer RP e pode-se notar que, nos municípios onde foi realizado, tanto o FT quanto o EM têm baixo preparo para realizá-la, reforçando a necessidade de realização de educação continuada

**Descritores** | Pneumopatias; Doença Pulmonar Obstrutiva Crônica; Reabilitação; Fisioterapeutas; Profissionais de Saúde.

**RESUMEN** | El déficit de conocimientos entre los profesionales de la salud ha sido una barrera para la expansión e implementación

de los servicios de rehabilitación pulmonar (RP) a pesar de sus beneficios comprobados para las personas con enfermedad respiratoria crónica (ERC). Este estudio de encuesta forma parte de un proyecto más amplio para implantar la RP en el sistema público sanitario brasileño mediante la evaluación de la preparación de los profesionales sanitarios de dos municipios brasileños para proporcionarla. Se utilizó un cuestionario autoadministrado para evaluar los conocimientos (19 preguntas), la formación (7 preguntas), la confianza (10 preguntas) y la experiencia clínica (8 preguntas) de los fisioterapeutas (FT) y del equipo multiprofesional (EM), aplicado previamente en un taller sobre RP. La puntuación media de los conocimientos fue de  $10 \pm 3$  para FT y de  $6 \pm 3$  para EM. Menos de un tercio de los FT afirmaron que tenían “mucha” experiencia (25%) y confianza (22,7%) para realizar la RP, así como formación suficiente para realizar la prueba de la marcha de seis minutos (27,3%). Pocos profesionales del EM declararon que tenían “mucha” experiencia (10%) y formación suficiente (4,8%) para realizar la RP, así como para planificar el programa educativo (10%) y tenían confianza para derivar a pacientes para la RP (6,5%). Este es el primer estudio que evalúa la preparación de los profesionales de la red pública de salud en Brasil para proporcionar la RP, y se observa que, en los municipios donde se realizó, tanto los FT como el EM están poco preparados para llevarla a cabo, lo que refuerza la necesidad de una formación continuada.

**Palabras clave** | Enfermedades Pulmonares; Enfermedad Pulmonar Obstrutiva Crónica; Rehabilitación; Fisioterapeutas; Profesionales de la Salud.

## INTRODUCTION

Chronic respiratory diseases (CRD) are a worldwide health problem that can affect both the upper and lower airways. Among the CRD, chronic obstructive pulmonary disease (COPD)<sup>1</sup> stands out, with a prevalence of 11.7% and causing around three million deaths worldwide every year<sup>2,3</sup>. It is estimated that the prevalence of COPD will increase over the next 40 years and that, by 2060, there could be more than 5.4 million deaths attributable to COPD<sup>3,4</sup>. In Brazil, the PLATINO<sup>5</sup> study found a COPD underdiagnosis rate of 70% in a São Paulo city cohort and, in 2019, the cost to the public health system was around 25 million dollars, corresponding to 109,995 hospitalizations for COPD<sup>6</sup>.

The Global Initiative for Chronic Obstructive Lung Disease (GOLD)<sup>3</sup> recommends pulmonary rehabilitation (PR) as the most effective non-pharmacological

treatment for people with COPD, reducing dyspnea, increasing exercise capacity and quality of life, reducing anxiety and depression, and accelerating recovery after an exacerbation<sup>3,7-9</sup>.

A recent study identified 217 PR centers throughout Latin America, of which 124 were in Brazil. The number of centers in Brazil increased eightfold compared to 1988<sup>10</sup>. However, considering the high prevalence of COPD, there is only one center for every 4,000 people with COPD in Brazil. These data show the need to expand this service<sup>10</sup>. Despite all the benefits, PR is still underused worldwide and often inaccessible to most patients<sup>7,9</sup>. Evidence indicates that less than 5% of COPD patients have access to PR<sup>11-13</sup> due to the limited numbers of programs and low referral rates. Some of the reasons for the low referral of patients to PR are the lack of healthcare practitioner’s training, the lack of knowledge of physicians regarding PR benefits, the lack of financial

resources to provide PR programs, and inadequate structure to perform PR programs in rural or remote areas<sup>7,14</sup>. Most people with COPD are unaware of the benefits of PR<sup>12</sup> and are therefore unlikely to seek referral to PR programs. In addition, from 8% to 50% of patients referred to PR never attended to it and around 10% to 32% of those who started a PR program dropped out at some point before completion<sup>15</sup>.

The American Thoracic Society and European Respiratory Society agreed that, to improve the implementation, use and provision of PR, it is important to offer continuous education to the health professionals who will perform PR to the patients<sup>7</sup>. International studies have shown that the preparedness of health professionals and physical therapist to perform PR are low regarding knowledge, experience, and confidence in managing patients with CRD, especially in rural and remote areas<sup>16–18</sup>. In Brazil, there is a knowledge gap regarding health professionals' ability to perform PR, as there are no published studies. This study is the first to evaluate the preparedness of health care practitioners in Brazil to perform PR to people with CRD. Thus, this study aimed to assess the knowledge, confidence, and clinical experience of health professionals to perform PR in the public health system in two cities in Minas Gerais State, Brazil.

## METHODOLOGY

### Study design

This survey is part of a larger project that intends to implement low-cost pulmonary rehabilitation in the Brazilian public health system. All participants provided written informed consent to participate.

### Participants

Study participants were health care practitioners who worked predominantly in the primary and secondary levels of the public health system and received patients from all specialties, thus being considered generalists. The workshop was held at two cities in Minas Gerais (city A was 14 kilometers from the capital and city B was 239 kilometers) and all professionals who showed an interest in attending the training workshop were included. Participants who filled out the questionnaire but did not identify their professional category were excluded.

## Procedures

This study is part of a larger project aimed at training health professionals to implement low-cost PR in Brazil, called *Projeto Respirar – Pulmões Pela Vida* [Breathe Project – Lungs for Life], from the Federal University of Minas Gerais. Two cities in the Minas Gerais State, Brazil, showed interest to participate in this project and implement low-cost PR in the public health system, since there were no local pulmonary rehabilitation programs. Municipal Health Departments were responsible for inviting health professionals to participate. Each city divided the training into two days, making the workshop available in the morning and afternoon, so as not to impact on health services. Health professionals could choose whether or not they would like to participate.

The first recruitment took place in April 2018, in one city, and the second recruitment in another city, in November 2018. All the health professionals who agreed to participate were informed in advance about the research project and filled out the consent form before the workshop. Data collection took place in the auditorium provided by the health departments, in person, moments before the workshop entitled “Pulmonary rehabilitation and the multiprofessional health team.” The health professionals (including physical therapists) who attended the workshop were then asked to complete the pre-workshop questionnaire. The questionnaire was anonymous.

### Questionnaire

The questionnaire used in this study was designed by the Breathe Easy Walk Easy (BEWE) project,<sup>16</sup> and was translated into Portuguese and adapted for the Brazilian population.

The questionnaire evaluated health care practitioners' experience, training, and confidence in managing people with CRD. However, COPD was the main condition used to evaluate the professionals' knowledge due to its higher prevalence and the strong evidence of the benefits of PR in this patients.

The questionnaire included questions on demographics and prior knowledge, clinical experience, training, and confidence in managing people with CRD, particularly in performing PR. Participants' knowledge was evaluated by 19 multiple-choice questions about a COPD case vignette. The response options were “true,” “false,” or “unsure.” A score of 1 point was given for each correct answer and zero if the response was “unsure,” incorrect, or omitted. Participants' prior experience and training in PR were self-rated via

nine and eight questions, respectively, using 3-point Likert scales (1 to 3) with anchors of “none,” “a little,” and “a lot”, and confidence in performing PR was also self-rated in 10 questions using 4-point Likert scales (1 to 4) with anchors of “not at all,” “a little,” “moderately,” and “a lot”.

## Sample Size

A sample calculation was performed for the multiprofessional team and another for the physical therapists. Calculations were based on the outcome “knowledge about PR.” For sample calculations, the total population of MT and PT professionals was considered, using data provided by the Municipal Health Departments. Adding up the number of professionals from the two cities, 7,200 professionals were part of the MT and 47 of the PT. Those were the numbers used for the calculation.

As the expected result is unknown, the chance of it being 50% positive and 50% negative was considered. Thus, the outcome “knowledge about PR” was considered to be 50%. A 5.5% error and a 90% confidence interval were considered. The calculation determined a sample size of 39 physical therapists and at least 217 other health care professionals. The website <openepi.com/SampleSize/SSPropor.htm><sup>19</sup> was used for sample calculation.

## Data analysis

Descriptive continuous data are presented as mean and standard deviation (SD), or median and interquartile range, according to the sample distribution. Categorical variables are presented in absolute values and percentage. Data were analyzed using Statistical Package for the Social Sciences (SPSS), version 25.0.

The participants were divided into two subgroups: physical therapists (PT) and multiprofessional team (MT) (all health care professional, but physical therapists). The data from the PT were analyzed separately from the data from the MT because as the former usually have the expertise to conduct exercise testing and training for people with CRD in a PR program.

## RESULTS

### Participant characteristics

Table 1 shows participant characteristics. A total of 300 professionals signed up to participate in the workshop,

and, of these, 277 met the inclusion criteria and two were excluded for not having filled in the “profession” field on the form. The “others” category corresponds to oral health technicians (n=2), nurse technicians (n=62), and nursing auxiliaries (n=2). The participants’ workplaces were health centers, specialized clinics, or hospitals. The time since graduation was <5 years for 19.1% (n=49) of the professionals, 5 to 10 years for 23.3% (n=60), and >10 years for 57.6% (n=148). The time in their current job position was <5 years for 36.8% (n=98) of the professionals, 5 to 10 years for 26.7% (n=71) of the professionals, and >10 years for 36.5% (n=97) of the professionals. Most participants were specialists in their areas of expertise (n=208) and had completed complementary training: 17.5% (n=48) professional development course; 45.5% (n=125) specialization; 8.4% (n=23) specialist residency; 2.5% (n=7) master’s degree; 1.1% (n=3) PhD degree, and 0.7% (n=2) post-doctoral training.

Table 1. Profile of study participants (n=275)

Multiprofessional team, n (%)	
Community health agent	26 (9.5)
Social worker	6 (2.2)
Physical educator	5 (1.8)
Nurse	60 (21.8)
Physical therapist	44 (16.0)
Physician	40 (14.5)
Dietitian	2 (0.7)
Psychologist	2 (0.7)
Occupational therapist	9 (3.3)
Pharmacists	4 (1.4)
Speech therapists	9 (3.3)
Dentists	2 (0.7)
Others*	66 (24)
Time since completion of the course / professional experience, median (IQR)	
Time since completion of the course (years)	13 (0–32)
Time in current job position (years)	7 (0–32)

Data presented as median (IQR) or n (%).

Acronyms: IQR=interquartile range.

\*Nurse technicians, nursing auxiliaries, oral health technicians, and community health agents

### Knowledge

The mean total knowledge score (number of correct answers out of 19) was 10±3 for physical therapists and 6±3 for multiprofessional teams. The question with the highest

rate of correct responses was “COPD means chronic obstructive pulmonary disease,” which was correctly chosen by all PT and 91% of health practitioners (Table 2). Questions relating to the disease pathophysiology and patient education showed higher rates of correct responses than those related to PR for all professionals. Physical

therapists had few correct answers to questions related to the six-minute walk test (6MWT), such as the importance of the 6MWT, how to measure the distance on this test, how to prescribe exercise routines based on this test, and the minimum clinically important difference for COPD after PR, and about the purpose of the Borg Scale.

Table 2. Participant knowledge to perform pulmonary rehabilitation.

Total knowledge MT (n=231)/ PT (n=44)	Correct n(%)		Wrong n(%)		Not sure n(%)		Missing n(%)	
	MT	PT	MT	PT	MT	PT	MT	PT
Meaning of the acronym COPD	211(91.3)	44(100.0)	1(0.4)	0	13(5.6)	0	6(2.6)	0
Main cause of COPD	163(70.6)	38(86.4)	35(15.2)	3(6.8)	24(10.4)	3(6.8)	9(3.9)	0
COPD causes airflow obstruction	186(80.5)	40(90.9)	7(3.0)	1(2.3)	24(10.4)	1(2.3)	14(6.1)	2(4.5)
Difference between COPD and asthma	101(43.7)	27(61.4)	37(16.0)	5(11.4)	80(34.6)	11(25.0)	13(5.6)	1(2.3)
Difference between COPD and bronchiectasis	108(46.8)	35(79.5)	23(10.0)	4(9.1)	88(38.1)	4(9.1)	12(5.2)	1(2.3)
Use of spirometry in the diagnosis of COPD	72(31.2)	25(56.8)	41(17.7)	5(11.4)	99(42.9)	10(22.7)	19(8.2)	4(9.1)
Interpretation of spirometry results	84(36.4)	21(47.7)	6(2.6)	0	131(56.7)	22(50.0)	10(4.3)	1(2.3)
Purpose of the Borg Scale	5(2.2)	21(47.7)	54(23.4)	10(22.7)	164(71.0)	12(27.3)	8(3.5)	1(2.3)
Interpretation of the BMI	67(29.0)	15(34.1)	72(31.2)	15(34.1)	76(32.9)	13(29.5)	16(6.9)	1(2.3)
6MWT: how to measure the walking distance	48(20.8)	19(43.2)	44(19.0)	13(29.5)	130(56.3)	11(25.0)	9(3.9)	1(2.3)
Importance of two 6MWT in the initial assessment	28(12.1)	5(11.4)	25(10.8)	18(40.9)	167(72.3)	20(45.5)	11(4.8)	1(2.3)
Use of the 6MWT to prescribe exercise program	27(11.7)	14(31.8)	36(15.6)	13(29.5)	158(68.4)	16(36.4)	10(4.3)	1(2.3)
Walking speed prescription: 80% of 6MWT	34(14.7)	4(9.1)	24(10.4)	15(34.1)	165(71.4)	24(54.5)	8(3.5)	1(2.3)
6MWD initial walking intensity calculation	25(10.8)	9(20.5)	11(4.8)	1(2.3)	184(79.7)	34(77.3)	11(4.8)	0
Minimal clinically important change in 6MWD after PR in COPD	9(3.9)	5(11.4)	11(4.8)	1(2.3)	195(84.4)	38(86.4)	16(6.9)	0
PR session: how the exercise program should be	85(36.8)	42(95.5)	24(10.4)	0	106(45.9)	2(4.5)	16(6.9)	0
Optimal duration of the exercise program	12(5.2)	14(31.8)	53(22.9)	3(6.8)	155(67.1)	27(61.4)	11(4.8)	0
How to prescribe a resistance program for upper limbs	55(23.8)	33(75.0)	27(11.7)	2(4.5)	140(60.6)	9(20.5)	9(3.9)	0
Patient education improves exercise capacity	165(71.4)	38(86.4)	11(4.8)	3(6.8)	47(20.3)	3(6.8)	8(3.5)	0

Data presented as n (%). Acronyms: MT= multiprofessional team, PT=physiotherapists, COPD=chronic obstructive pulmonary disease, BMI= body mass index, 6MWT= six-minute walk test, 6MWD=six-minute walk distance, PR= pulmonary rehabilitation.

### Training

Table 3 shows details of the respondents’ self-ratings of their prior training to perform PR programs. The PT responded to

questions related to their clinical practice, whereas the other healthcare practitioners were evaluated on the more generic aspects of care. The results show that both PT and MT had none or low training to perform a PR program.

Table 3. Participants' self-rating training to perform pulmonary rehabilitation.

Level of training MT (n=231)/ PT (n=44)	None n (%)		Some n (%)		A lot n (%)		Missing n (%)	
	MT	PT	MT	PT	MT	PT	MT	PT
Assessing a patient with chronic respiratory disease	105(45.5)	7(15.9)	103(44.6)	27(61.4)	17(7.4)	10(22.7)	6(2.6)	0
Performing a spirometry test	183(79.2)	29(65.9)	39(16.9)	14(31.8)	2(0.9)	1(2.3)	7(3.0)	0
Performing a 6MWT	183(79.2)	10(22.7)	36(15.6)	22(50.0)	2(0.9)	12(27.3)	10(4.3)	0
Planning and running a PR program	190(82.3)	13(29.5)	30(13.0)	23(52.3)	2(0.9)	8(18.2)	9(3.9)	0
Planning and carrying out patient education	139(60.2)	8(18.2)	70(30.3)	24(54.5)	11(4.8)	11(25.0)	11(4.8)	1(2.3)
Prescribing an individualized PR program	193(83.5)	15(34.1)	27(11.7)	22(50.0)	3(1.3)	7(15.9)	8(3.5)	0
Running an exercise program	188(81.4)	10(22.7)	33(14.3)	25(56.8)	3(1.3)	8(18.2)	7(3.0)	1(2.3)
Running an exercise program in remote areas	199(86.1)	27(61.4)	23(10.0)	14(31.8)	2(0.9)	3(6.8)	7(3.0)	0

Data presented as n (%).

Acronyms: MT= multiprofessional team, PT=physical therapists, 6MWT=6-minute walk test, PR= pulmonary rehabilitation.

## Experience

Table 4 shows details of the respondents' self-rating of their experience to work in a PR program. The experience was also evaluated separately based on the physical therapists' clinical practice and also on the more generic aspects of the care provided by the MT. As with training,

experience was rated as none or low for both PT and MT.

## Confidence

Table 5 presents the self-rated confidence to perform PR, separating physical therapists from MT. Few PT or MT reported "a lot" of confidence for any component evaluated.

Table 4. Participants' self-rating clinical experience to perform pulmonary rehabilitation.

Level of clinical experience MT (n=231)/ PT (n=44)	None n (%)		Some n (%)		A lot n (%)		Missing n (%)	
	MT	PT	MT	PT	MT	PT	MT	PT
Assessing a patient with chronic respiratory disease	74(32.0)	6(13.6)	129(55.8)	24(54.5)	20(8.7)	14(31.8)	8(3.5)	0
Performing a spirometry test	195(84.4)	30(68.2)	27(11.7)	14(31.8)	2(0.9)	0	7(3.0)	0
Performing a 6MWT	183(79.2)	12(27.3)	36(15.6)	20(45.5)	4(1.7)	11(25.0)	8(3.5)	1(2.3)
Working with health programs for chronic respiratory disease	104(45.0)	9(20.5)	83(35.9)	22(50.0)	34(14.7)	13(29.5)	10(4.3)	0
Planning and running a PR program	175(75.8)	12(27.3)	41(17.7)	25(56.8)	5(2.2)	7(15.9)	10(4.3)	0
Planning and carrying out patient education	116(50.2)	3(6.8)	80(34.6)	28(63.6)	23(10.0)	13(29.5)	12(5.2)	0
Prescribing an individualized PR program	188(81.4)	11(25.0)	30(13.0)	26(59.1)	4(1.7)	6(13.6)	9(3.9)	1(2.3)
Running an exercise program	175(75.8)	10(22.7)	42(18.2)	26(59.1)	6(2.6)	8(18.2)	8(3.5)	0
Running an exercise program in remote areas	189(81.8)	23(52.3)	32(13.9)	16(36.4)	3(1.3)	4(9.1)	7(3.0)	1(2.3)

Data presented as n (%).

Acronyms: MT= multiprofessional team, PT=physiotherapists, 6MWT=6-minute walk test, PR= pulmonary rehabilitation.

Table 5. Participants' self-rating of confidence to administer pulmonary rehabilitation

Level of confidence MT (n=231)/ PT (n=44)	Not all n (%)		A little n (%)		Moderately n (%)		Very n (%)		Missing n	
	MT	PT	MT	PT	MT	PT	MT	PT	MT	PT
Explaining COPD and bronchiectasis	51(22.1)	2(4.5)	88(38.1)	12(27.3)	69(29.9)	18(40.9)	17(7.4)	12(27.3)	6(2.6)	0
Assessing a patient with chronic respiratory disease	60(26.0)	5(11.4)	76(32.9)	14(31.8)	72(31.2)	16(36.4)	13(5.6)	9(20.5)	10(4.3)	0
Determining who to refer for PR	84(36.4)	2(4.5)	83(35.9)	10(22.7)	39(16.9)	19(43.2)	15(6.5)	13(29.5)	10(4.3)	0
Performing a spirometry test	166(71.9)	24(54.5)	41(17.7)	15(34.1)	11(4.8)	5(11.4)	4(1.7)	0	9(3.9)	0
Performing a 6MWT	161(69.7)	7(15.9)	39(16.9)	13(29.5)	19(8.2)	13(29.5)	5(2.2)	10(22.7)	7(3.0)	1(2.3)
Assessing QOL and treatment goals	73(31.6)	3(6.8)	94(40.7)	12(27.3)	41(17.7)	20(45.5)	15(6.5)	8(18.2)	8(3.5)	1(2.3)
Planning a program of patient education	112(48.5)	5(11.4)	75(32.5)	17(38.6)	30(13.0)	14(31.8)	7(3.0)	7(15.9)	7(3.0)	1(2.3)
Prescribing an exercise program	165(71.4)	3(6.8)	40(17.3)	17(38.6)	17(7.4)	17(38.6)	1(0.4)	7(15.9)	8(3.5)	0
Carrying out an exercise program	144(62.3)	4(9.1)	56(24.2)	17(38.6)	17(7.4)	17(38.6)	8(3.5)	6(13.6)	6(2.6)	0
Monitoring outcomes of a PR program	138(59.7)	8(18.2)	57(24.7)	18(40.9)	25(10.8)	14(31.8)	6(2.6)	4(9.1)	5(2.2)	0

Data presented as n (%).

Acronyms: MT= multiprofessional team, PT=physical therapists, COPD=chronic obstructive pulmonary disease, PR= pulmonary rehabilitation, 6MWT=6-minute walk test, QOL=quality of life.

## DISCUSSION

The main findings of this study, related to the questionnaire topics, demonstrated that: i) Objectively measured knowledge was low for PT in the areas of 6MWT performance, how to prescribe exercises based on 6MWT results, as well as knowledge about the clinically important change in 6MWT distance during reassessment after a PR program. The knowledge of the MT group was low particularly regarding the pathophysiology of COPD; ii) Self-reported training showed that PT had little or no training to prescribe individualized exercise, or to plan and carry out a PR program, and that MT had little or no training to evaluate patients with CRD; iii) Self-reported experience showed that most PT had some experience with PR, but none with performing spirometry, and that MT had no experience in most items assessed, but reported having some experience in evaluating individuals with CRD; iv) Self-reported confidence showed that PT felt “a little confident” to perform PR programs, and the MT group felt “a little confident” to work on educational programs for people with CRD.

Knowledge, clinical experience, and confidence are key elements clinical practitioners must have to manage individuals with CRD and conduct the multiple components of PR programs, such as patient assessment, exercise prescription and physical training, patient self-care education, nutritional advice and psychosocial support, among others. Pulmonary rehabilitation performed by a multiprofessional team with expertise and experience in the area can bring significant benefits to patients with CRD<sup>20</sup>. Physical therapists are accredited to provide exercise rehabilitation<sup>21,22</sup>. For this reason, PT and MT groups are reported separately as their roles within a PR program are different, with the PT providing exercise prescription and training with some patient self-management education and the MT providing education within their discipline-specific expertise related to CRD.

In a PR program, a comprehensive patient assessment is essential to identify and treat the systemic manifestations of CRD, such as dyspnea, peripheral muscle dysfunction, reduced exercise tolerance, anxiety, and depression<sup>20,23</sup>. Assessment guides treatment objectives to achieve goals according to patients' individual needs<sup>20,22</sup>.

In this study, both PT and MT groups demonstrated very little knowledge, experience, or confidence to carry out the assessment of individuals with CRD. Many PT reported having limited ability to perform the 6MWT,

and many MTs reported lacking the experience and confidence to assess individuals with CRD. In addition, both groups had difficulty understanding the use of body mass index for nutritional assessment, or how to assess health-related quality of life, patient treatment goals, or to perform and interpret the spirometry test. These issues must be improved in both groups since patient assessment and reassessment are essential to measure changes in patient outcomes and to ensure the quality of PR services<sup>24</sup>.

Another point that stands out in this study is the low number of correct answers in the objective assessment of the COPD case vignette (PT=10±3 vs MT=6±3). This result shows the lack of knowledge of both PT and MT about COPD, which is one of the most prevalent CRD, as well as the low level of knowledge in assessing functional exercise capacity, health-related quality of life, prescribing exercises, and assessing patient outcomes at the end of a PR program. These elements of PR are essential for providing rehabilitation and managing patients with CRD. Moreover, the health professionals reported that they had received insufficient training and had little experience in PR, which impacted the answers about confidence levels, as very few PT and MT reported having “a lot” of confidence to carry out the PR.

A survey carried out to assess the skills of health practitioners to perform PR in rural and remote areas in Australia found that experience levels and previous training were low in topics such as assessing people with COPD, performing the 6MWT and spirometry, prescribing individualized exercise, and carrying out the PR program. Furthermore, few health practitioners reported being very confident in differentiating COPD and bronchiectasis, prescribing an exercise program, or monitoring the results of a PR program<sup>16</sup>. The total mean knowledge score of the Australian study<sup>16</sup> was 8.5 (SD 4.5) correct answers out of 19 questions. The methodology used in the current study was similar to that one<sup>16</sup>, which allows the results to be compared. Generally, the findings of both studies indicate a lack of skills on the part of health practitioners and indicate that training should be improved not only for patient assessment and exercise prescription and training, but also for background knowledge, such as the pathophysiology of CRD.

One of the physical therapist's requirements is to assess functional exercise capacity, as it is the basis for prescribing the intensity of exercise training during a PR program<sup>23,25</sup>. The 6MWT<sup>25</sup> is the most widely used test to assess functional exercise capacity and requires

few resources<sup>26</sup>. Physical therapists are the most qualified and accredited health professionals to carry out the exercise assessment and prescription<sup>18,22,27</sup>. However, in this study, physical therapists had low knowledge scores related to the 6MWT, such as measuring the covered distance, the importance of two tests (learning effect), prescribing exercises based on test results, and the minimum clinically important improvement in the 6MWT after PR. In addition, the amount of self-reported training to perform the 6MWT was low and most reported low confidence in performing it. This is concerning, as the 6MWT is considered a standard test for assessing patients' functional exercise capacity.

In a cross-sectional study<sup>18</sup> with 379 respiratory therapists who answered a self-administered questionnaire, the authors were able to verify the professionals' opinions about PR programs and how these opinions influenced their behavioral intentions to promote the PR program. The study concluded that positive attitudes, support from managers and co-workers, and self-efficacy needed to be improved. Thus, they suggested that hospital managers should establish guidelines related to the functions of respiratory therapists in PR, providing greater professional support, as well as enabling a supportive environment with more time available for initial contact with the patient to explain the benefits of PR. The authors also suggested the need to provide opportunities for continuing education and communication training. The participation of health practitioners in continuing education (in-service) and training programs, aimed at developing skills for carrying out PR, would help establish effective programs in different settings and could directly influence the provision of PR and increase the accessibility and acceptance of PR by patients<sup>18,28-30</sup>.

Several studies have shown the diversity of health care practitioners that may be responsible for performing PR programs, as well as the differences between programs regarding what is included in assessment, interventions, and monitoring<sup>16,18,31</sup>. Due to the diversity, it is important that each health care practitioner knows their role and scope of practice in promoting and providing PR. The results of this study showed that only 6.5% of the MT group reported having the confidence to determine which patients could be referred to PR, showing a lack of knowledge about CRD relevant to PR referral.

One of the possible reasons why our study found low rates of knowledge, experience, and confidence of PT and MT groups to carry out PR may be related to the professional skills among participants. Most participants

were general practitioners, as they were from primary health care, where they deal with a diversity of patient cases. Regardless of the training of these health professionals, there was a knowledge gap regarding the management of CRD, the benefits of PR, and the referral of patients to PR, which indicated a lack of continuing education. Therefore, continuing education is essential to improve the quality of care for people with CRD<sup>20</sup>.

The lack of skills among professionals to manage people with CRD and to carry out PR can be considered a barrier to creating new PR services<sup>7,14,32</sup>. The multidisciplinary team lack of knowledge about the pathophysiology of the main respiratory diseases and the components of PR may hinder the identification of candidates for the programs and directly influence referral rates.

This study presents some limitations. It was not possible to differentiate the workplaces of health professionals (primary care, clinics, and hospitals), as the questionnaire did not include this specification, but the municipal health departments reported that the participants were predominantly enrolled in primary and secondary levels of care. Furthermore, it was not possible to distinguish which professionals did or did not work with CRD patients; however, all professionals should have been able to answer questions about CRD and PR.

Another point to be clarified concerns the presentation of the results separating the two cities. In the subgroup analysis, the MT and PT groups from cities A and B were compared in relation to the topics of the variable's knowledge, experience, training, and confidence. As the groups presented similar results between the cities, with no significant difference, it was decided to present the results of this study in a unified way, as we believe that this would not impact the study and would facilitate understanding.

Another analysis was performed regarding knowledge (number of correct answers in the clinical case) of each of the professions that compose the MT group. The professions that had the highest number of correct answers in the clinical case were physicians, with a mean of  $8.2 \pm 2$  vs  $10.6 \pm 2$ ; physical education professionals, with a mean of  $9 \pm 3$  vs  $9 \pm 1$ ; and nurses, with a mean of  $6 \pm 2$  vs  $7 \pm 3$ , in cities A and B, respectively. These findings are consistent with a study in low- and middle-income countries, which points to the lack of knowledge of health professionals, including physicians, who are considered to be primarily responsible for most referrals of CRD patients to PR, as a barrier to the implementation of these programs<sup>33</sup>.



This is a pioneering study in Brazil, which evaluated public service health professionals in two cities in Minas Gerais, therefore, the findings can be generalized in light of the recruitment process of the participants. Therefore, future studies should evaluate the preparedness of health professionals to manage patients with CRD and perform PR more comprehensively, including the different regions of Brazil.

The study raises some questions for reflection and further investigation, for example: Does professional training at undergraduate level or at professional training courses give the necessary skills for pulmonary rehabilitation? Do health practitioners really know their roles when working in pulmonary rehabilitation? What is the impact of a training program for health practitioners on the performance pulmonary rehabilitation? These results could help managers create public policies to train and equip health professionals to provide comprehensive care for this population.

## CONCLUSION

Both PT and MT groups had low levels of knowledge, training, clinical experience, and confidence to carry out or contribute to PR programs. The PT showed a lack of knowledge on issues specific to their own practice, such as how to perform the 6MWT and prescribe exercise training programs. The MT demonstrated a lack of generic skills, such as managing CRD patients, and planning and carrying out patient education programs. Therefore, it is necessary to develop training and continuing education programs for these health professionals, according to their professional area, so that the appropriate management of people with CRD can be enabled, especially the referral to and provision of sustainable PR programs.

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