



Original Article

## Development, validation, and testing of a physiotherapist initiated checklist of items for implementing pulmonary rehabilitation in Nigeria

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### ABSTRACT

**Objectives:** Pulmonary rehabilitation (PR) program is beneficial to patients with chronic respiratory diseases. However, PR services are limited or non-existent in many resource limited settings of the world, including Nigeria. Equally important, is lack of local guidelines or checklists to support the implementation of these programs. This study was aimed at developing, validating, and testing a physiotherapist initiated checklist of items for implementing of PR in Nigeria.

**Materials and Methods:** A panel of experienced cardiopulmonary physiotherapists was constituted to draw-up and agree on a list of items that they consider necessary for implementing of PR. The resulting items were collated as a checklist of items. The checklist was then locally validated by presenting it to a wider group of respiratory health-care professionals including chest physicians, nurses, occupational therapists, dieticians, and clinical psychologists, practicing within the study area. Each item was rated from strongly agree to strongly disagree on 5-point Likert scale. Thereafter, the performance of the items of the checklist was subjected to testing by assessing whether each item was addressed in the British Thoracic Society (BTS) PR guideline. This was done by rating each item with either a “yes,” “no,” or “not fully” to whether our checklists are included and described in the BTS guideline. Supporting evidence profile was also stated for some items, if applicable.

**Results:** A consensus was reached by the panel of physiotherapists to arrive at a 16-item checklist. Each item was further provided with specific details and/or examples that are relevant for instituting PR in a Nigerian setting. All items on the checklist were considered valid by other respiratory health-care professionals, with a rating consensus agreement of between 80% and 100%. Furthermore, the testing of checklists based on inclusion and description in the BTS guideline showed that six items were addressed fully in the BTS guideline (rated “yes”), six were partially addressed (rated “not fully”), while four were not addressed (rated “no”).

**Conclusion:** A checklist of items for the implementation of PR in Nigeria was successfully developed, validated, and tested. Nevertheless, there may be a need to develop a full guideline before instituting PR in view of the potential disparities with existing/established guidelines.

**Keywords:** Checklists, Guidelines, Chronic respiratory diseases, Pulmonary rehabilitation implementation, Low-resource settings

### INTRODUCTION

Chronic respiratory diseases affect millions of people across all ages, worldwide, and are responsible for substantial morbidity, health-care utilization, socioeconomic losses, and mortality rates.<sup>[1]</sup> These

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diseases are highly prevalent and represent a public health challenge in both industrialized and low-and-middle-income countries (LMICs).<sup>[2,3]</sup> Examples of these chronic respiratory diseases include chronic obstructive pulmonary disease (COPD), asthma, pneumoconiosis, interstitial lung diseases, pulmonary sarcoidosis, bronchiectasis, and pulmonary tuberculosis (PTB). At present, nearly 80% of deaths from these diseases occur in LMICs, which accounts for over half of the people with these diseases.<sup>[4]</sup> Furthermore, factors such as poor access to optimal health-care services, scarcity of resources, limited expertise for certain interventions (specialized staff), and lack of non-pharmacological interventions such as pulmonary rehabilitation (PR) have been identified to contribute to the high morbidity and mortality from these diseases in LMICs.

PR refers to a comprehensive intervention based on a thorough patient assessment followed by patient tailored therapies that include, but is not limited to exercise training, education, and behavior change interventions that are designed to improve both physical and psychological outcomes, as well as promoting long-term adherence to health enhancing behaviors in patients with chronic respiratory diseases.<sup>[5]</sup> At present, there is substantial and well-documented evidence to support the efficacy of PR for patients with chronic respiratory diseases.<sup>[6-8]</sup> Unfortunately, PR services are underprovided in most settings and uptake is mostly poor in those that offer it.<sup>[9]</sup>

A few barriers for instituting optimal PR services include lack of trained health professionals to conduct it, patient limited confidence in its effectiveness, and financial load on the patient and health-care system.<sup>[10]</sup> Furthermore, PR guidelines for managing chronic respiratory diseases appear to be non-existent for most low-resource settings.<sup>[11]</sup> In addition, available treatment guidelines or statements were developed by international stakeholders such as the European Respiratory Society, American Thoracic Society, British Thoracic Society (BTS), and other similar organizations. Unfortunately, these guidelines may not be wholly applicable to low-resource settings because of differences in capacity, health system arrangement, socioeconomic indices, and cultural practices.<sup>[12]</sup> There is a need for local guidelines or a checklist (at the least) to improve optimal PR services worldwide. Current efforts from two resource limited settings (Uganda and Congo) have shown that adapting some aspects of PR is efficacious in managing patients with post-PTB, asthma, or COPD.<sup>[13,14]</sup> A checklist of items that take into account cultural and health system realities of resource limited settings, and originating from local and relevant respiratory health-care professionals, is necessary. Therefore, this study aimed to develop, validate, and test a physiotherapist initiated checklist of items to aide implementation PR services for Nigerian settings.

## MATERIALS AND METHODS

### Development of checklist

A panel of four cardiopulmonary physiotherapists with experience in providing some aspects of PR or physiotherapy (mainly exercise training and breathing exercises) for patients with cardiac and/or pulmonary disorders was established. The physiotherapists were mainly drawn from three tertiary hospitals in Northwest, Nigeria, namely; Aminu Kano Teaching Hospital (\*2), Usmanu Danfodiyo Teaching Hospital (\*1), and Ahmadu Bello University Teaching Hospital (\*1). All members of the panel were required to have a postgraduate qualification in physiotherapy (with interest or specialization in cardiopulmonary physiotherapy specialization), and at least 5 years of clinical experience in a cardiopulmonary or respiratory physiotherapy unit of their hospital.

Initially, each panel member was contacted and asked to provide a list of items they felt was important to institute optimal PR in their practice. The list of items was collated into one document and the panel met in April 2021 to agree on the content of the draft checklist items. Specific example(s) and/or description were also suggested for the items. The primary author (JM) who also has experience in respiratory physiotherapy coordinated the meeting and took note of all items reaching consensus to be included. Following the meeting, items that the primary author considered to be similar were later regrouped under one subheading until a final checklist of items was arrived at and agreed on by the panel.

### Validation of checklist

To establish face and content validity, the checklist of items was shared to a wider group of respiratory health-care professionals practicing in Northwest Nigeria. The inclusion criteria were that respiratory health-care professionals had at least 5 years of clinical experience in managing patients with chronic respiratory diseases. In the end, two chest physicians, a dietician, two occupational therapists, two physiotherapists, and a clinical psychologist were approached and they were asked to rate each item on the checklist based on relevance and acceptability using a 5-point Likert scale (strongly agree = 5, agree = 4, neutral = 3, disagree = 2, and strongly disagree = 1). The final score was collated in percentile and items not reaching 70% (consensus) agreement rate were dropped from the checklist.

### Pilot testing of checklist

To test the performance of the developed checklist, an existing guideline was chosen and had to fulfill the following criteria:

- i. Be focused on the management of COPD or other chronic respiratory diseases by means of PR
- ii. Provide both comprehensive and specific recommendations for the different aspects of PR services
- iii. Be sponsored or attributable to a professional association or a government institution
- iv. Be of high quality by meeting the criteria stated in the Appraisal of Guidelines for Research and Evaluation (AGREE) checklist.

This was examined to determine whether it addressed each of the items on the checklist, rated as “Yes,” “No,” or “Not fully” with a brief explanation.

## RESULTS

### Checklist

After an initial telephone conversation with each member of the panel (cardiopulmonary physiotherapists) and one physical meeting, several items (about 27 items) were suggested. After streamlining the items, a shorter list of 18 items was drawn up by the primary researcher (JM). Finally, a consensus was reached for a 16-item checklist. In addition, specific details and examples were provided for each item, where necessary [Table 1].

### Validation

The draft checklist of items for implementing PR was presented to eight respiratory health-care professionals; five responded and completed the validation. Three respondents declined to participate in the face validation of the checklist, citing lack of adequate knowledge about PR. Those who responded are as follows: Two chest physicians, two physiotherapists (different from the members of the panel), and one occupational therapist. All items included in the draft checklist reached consensus to be included (each item scored >70% agreement rate), with most agreement around the indication and team composition for PR. The percentile scores generated for each item on the checklist based on the Likert scoring is presented in [Table 2].

### Pilot test

The BTS guideline for the PR in adults was chosen to test the checklist as it met the pre-specified criteria. [Table 3] presents the results of the pilot testing of the checklist of items against the BTS guideline. The results indicated that six items were rated “yes,” six were rated “not fully,” while four were rated “no.” Thereafter, each item on the checklist was assessed by checking whether the BTS guideline has provided a detailed evidence profile or recommendation for it. Finally, the evidence profile to support each checklist item from the BTS guideline was presented.

## DISCUSSION

This study aimed to develop, validate, and test a physiotherapist initiated checklist of items that can be utilized as a guide for implementing PR in the Nigerian health-care settings. The study offers one of the first attempts aimed at providing a guiding template for implementing PR in a low-resource African setting. In addition to helping to institute specialized care such as PR, this checklist of items can help authorities to quantify the minimal standard for practice required when instituting PR services, which is not only scarce, but non-existent in most low-resource settings.<sup>[15]</sup>

Even though there are a few studies that have utilized an adapted form of PR in the African settings, there has been no mention of a guideline or any evidence-based recommendations covering all aspects of PR.<sup>[4]</sup> Therefore, this checklist of items may offer an important initial step toward achieving a more standardized and uniform PR services in Nigeria and similar settings.

This guideline checklist primarily emanated from cardiopulmonary physiotherapists practicing in Nigeria. This is because physiotherapists play a major role during rehabilitation of patients. For example, patients with COPD are known to greatly benefit from PR, especially those that require more exercise training, which is a cornerstone of PR.<sup>[16,17]</sup> Furthermore, PR is mainly offered in local settings through a direct referral from a physician to a physiotherapist. Consequently, there is a high likelihood that physiotherapists (respiratory) will likely be more conversant, interested, and possibly have a better knowledge of PR. Furthermore, other health-care professionals, aside doctors and physiotherapists, that form part of the PR team often lack adequate knowledge of PR services because these services are either limited or non-existent. Specifically, the role played by physiotherapists managing patients with chronic respiratory disease in our setting is usually delayed until after pharmacotherapy has been initiated. Moreover, these roles mainly aim to improve ventilation through the use of breathing exercises, inspiratory muscle training, aerobic exercises, and other adjuncts.<sup>[18]</sup> Physiotherapists have also been reported to have advanced knowledge and skills in PR.<sup>[19]</sup>

Existing international statements or guidelines often vary because they take into account environmental and health-care settings peculiarities when offering a guideline.<sup>[20-23]</sup> Our results confirm the presence of these variations because not all the items on our checklist were fully addressed by the BTS guideline in the pilot test. At present, since there is a lack of recommendation or guidelines that originate from LMICs/African settings, there is a need for a full guideline to be commissioned by a relevant professional association. Moreover, as it stands, it has been recommended that existing guidelines should only be used after local adaption have been done.

**Table 1:** Proposed checklists of items for implementation of PR.

S. No.	Item	Details
1.	Indication (population)	People with chronic respiratory disease, especially those with COPD, PTB, atelectasis, bronchiectasis, cystic fibrosis, and post-lung surgery should be considered for PR to improve exercise capacity, dyspnea, muscle strength, and quality of life.
2.	Qualification of patients	Patients coming for PR should first be cleared by referring physician, who should have an understanding of PR based on the indication stated above.
3.	Assessment on entry	All chronic respiratory disease patients for PR should undergo imaging to confirm diagnosis. The goal standard should be a chest CT scan, if affordable, or a chest X-ray. Spirometry should be conducted for these patients. Sub-maximal exercise testing such as 6 min walk test, shuttle walk test should be conducted by physiotherapist to ascertain the appropriate level of exercise before administering intervention. Use pulse oximeter to assess oxygen saturation levels. Use validated (locally translated) questionnaires addressing quality of life, functional ability, breathlessness level, disease severity, anxiety, and depression levels.
4.	Structure	PR programs should last for a minimum of 2 months. Patients should be seen at least twice a week. PR should comprise goal setting, a combination of strength training and aerobic exercises. An educative component may be offered to a group of patients.
5.	Setting	PR should be hospital based and coordinated from the physiotherapy department. On a case-by-case basis, certain patients may be offered some component of PR at home.
6.	Composition of the PR program	Education and awareness Dietary intervention Exercise training Breathing exercises Psychological counseling (on a case-by-case bases to be decided by the team) Monitoring pharmacotherapy
7.	Exercise training	More traditional means of exercises would be more appropriate due to geographical and cultural factors. These include brisk walking, cycle ergometry, running, and climbing steps. Exercise training should be moderate to vigorous in intensity, at least 30 min. Oxygen therapy may be used for patients with reduced saturation levels during exercise training. Aerobic exercises and resistance training exercises should be offered for a minimum of twice weekly.
8.	Breathing exercises	Breathing exercises may include, slow breathing (with visual biofeedback), pursed lip breathing, breathing control techniques. In some patients with secretions in the airways, deploy forced expiratory techniques such as huffing coughing along with breathing exercises.
9.	Equipment	A gymnasium with treadmill, bicycle ergometer, oxygen concentrator, sound system (for music), sitting area (for education component of PR), a changing room (with toilet access), breathing exercise devices (e.g., incentive spirometer, Acapella devices), a corridor or field to carry out sub-maximal walk tests, dumbbells, and electrical stimulator/TENS.
10.	Composition of the PR team	The team should comprise the following professions; chest physician, physiotherapists, dieticians, and a nurse. If available, an occupational therapist, clinical psychologist, health educator, and exercise specialist should be included.
11.	Professional competence	The team members to be involved in PR program should have a collective competence as follows; (i) patient assessment and management; (ii) dyspnea assessment and management; (iii) oxygen assessment, management, and titration; (iv) pharmacotherapy; (v) accurate diagnosis of non-chronic obstructive pulmonary disease; (vi) exercise testing; (vii) exercise training; (viii) psychosocial management; (ix) tobacco cessation intervention; and (x) emergency responses for patients and program personnel.
12.	Patient education	A structured group education program should be organized at least once during the PR program. Topics should be around anatomy/physiology of the respiratory system, clinical features of chronic respiratory diseases, and preventive strategies and self-management options. An education session should be in simple or local language.
13.	Program evaluation	A biweekly assessment of key outcomes on a patient-by-patient basis should be carried out to monitor progress.

(Contd...)

**Table 1:** (Continued)

S. No.	Item	Details
14.	Maintenance program	Continuation of exercise training after completing PR program should be encouraged at home. This may be done by offering the patient exercise training options. However, patients should visit the hospital for follow up at least once monthly.
15.	Payment for PR	Most patients in Nigeria pay for health-care cost directly out of pocket (not insured). Hence, there is a need to carefully select those who can benefit the most from PR before they are enrolled.
16.	PR in the community or home	PR could be offered in home setting for patients who can afford it. Community-based health centers should be appropriately equipped with staff and infrastructure before implementing PR.

COPD: Chronic obstructive pulmonary disease, PTB: Pulmonary tuberculosis, PR: Pulmonary rehabilitation, TENS: Transcutaneous electrical nerve stimulator

**Table 2:** Results of the checklist validation.

S. No.	Items*	Strongly agree (%)	Agree (%)	Neutral (%)	Disagree (%)	Strongly disagree
1.	Indication (population)	80	20	-	-	-
2.	Qualification of patients	60	40	-	-	-
3.	Assessment on entry	60	20	20	-	-
4.	Structure	40	60	-	-	-
5.	Setting	40	40	-	20	-
6.	Composition	60	20	20	-	-
7.	Exercise training	60	20	20	-	-
8.	Breathing exercises	40	60	-	-	-
9.	Equipment	60	40	-	-	-
10.	Composition of the PR team	80	20	-	-	-
11.	Professional competence	60	40	-	-	-
12.	Patient education	40	60	-	-	-
13.	Program evaluation	20	80	-	-	-
14.	Maintenance program	40	60	-	-	-
15.	Payment for PR	40	60	-	-	-
16.	PR in the community or home	40	40	20	-	-

\*Refer to Table 1 for details on each item. PR: Pulmonary rehabilitation

At present, developing a “full guideline” is expected to follow the rigor as stated in the AGREE II recommendations which may include using systematic reviews/meta-analyses and Delphi procedures. However, since the evidence profile to support the use of PR in LMICs is limited, we had to use a panel generated list of items in our study. Moreover, since optimal PR services are not currently provided by a team of respiratory health professionals in Nigeria in a specified department, using a Delphi design may not be feasible to address our study objectives.

Due to the need to enhance the acceptability of this checklist of items, we included a face validation component, whereby chest physicians and other allied respiratory professionals were invited to rate each item included in the initial checklist draft. This has helped our checklist to be potentially acceptable among important stakeholders that make up the PR team, and possibly reduce any potential

bias. PR is typically offered by a team mainly comprising physicians, physiotherapists, occupational therapists, nurses, social workers, psychologists, and nutritionists/dieticians.<sup>[24]</sup> At present, most of these professionals in Nigeria are not involved directly in rehabilitation due to several reasons such as lack of awareness, expertise, and skill.<sup>[25]</sup> This may explain why the validation was not completed by some of the respiratory health professionals.

The BTS guideline is of high quality that was developed in accordance with the AGREE recommendations.<sup>[26]</sup> Nevertheless, the BTS guideline did not address some of the items included in our checklist. For example, music has been used as an adjunct during PR of post-TB adults in Uganda (Jones *et al.*, 2017) and may be relevant for the Nigerian population. There is also evidence to support the use of items like TENS for managing pain and certain muscle weaknesses among some patients with chronic respiratory disease undergoing rehabilitation.<sup>[27,28]</sup> Similarly, incentive

**Table 3:** Results of the pilot test of the checklist of items against the BTS guideline.

S. No.	Items*	Does the BTS guideline address this item?	Evidence profile from the BTS guideline	Remarks
1.	Indication (population)	Not fully	COPD (Evidence level 1++) No asthma (Evidence level 2+) ILD (Evidence level 1-) Non-CF bronchiectasis (Evidence level 1-)	There is no mention of PTB, pre or post-lung surgery patients as indications for PR in the BTS guideline
2.	Qualification of patients	No	PR aim to exercise capacity, dyspnea, well-being, and health status of chronic respiratory disease patients (Evidence level 1++)	A referral by the attending physician is not explicitly stated as a means to identify/qualify patients in the BTS guideline
3.	Assessment on entry	Not fully	Spirometry, dyspnea, comorbidities, medication, anxiety/depression, and chronic respiratory failure (variable evidence level)	There is no mention of radiological investigations, submaximal exercise tests, and locally validated questionnaires during PR in the BTS guideline. Rather the BTS guideline recommends a more thorough assessment based on spirometry, dyspnea, comorbidities, medication, anxiety/depression, and chronic respiratory failure
4.	Structure	Yes	PR program of 6–12 weeks with a minimum of 12 supervised sessions are recommended (Evidence level 1++)	The structure of PR is similar between our checklist of items and what is stated in the BTS guideline
5.	Setting	Not fully	Not applicable	There is no mention of physiotherapy department as the center for conducting PR, even though PR is mainly hospital based.
6.	Composition of PR program	Yes	Not applicable	The composition recommended in our checklist is similar to that of the BTS guideline
7.	Exercise training	Not fully	Interval training and continuous training are equally effective modes of training in patients with COPD. (Evidence level 1++) Resistance training in combination with aerobic training leads to greater improvements in peripheral muscle strength than aerobic training alone. (Evidence level 1+)	Aside intensity of aerobic exercises, other aspects of exercise training were not similar between our checklist and the BTS guideline
8.	Breathing exercises	No	None or limited evidence	No description of breathing exercises for PR in the BTS guideline
9.	Equipment	Not fully	Not applicable	Equipment listed in our checklist are not fully described in the BTS guideline
10.	Composition of the PR team	Yes	Not applicable	The recommendation for the composition of PR team members in our checklist is similar to those of the BTS guideline
11.	Professional competence	No	Not applicable	Qualifications of those required to deliver PR not described in the BTS guideline
12.	Patient education	Yes	Not available	The recommendation of the BTS guideline is similar to the presentation in the checklist
13.	Program evaluation	Not fully	Not applicable	The BTS guideline offers a more intensive program evaluation than what is stated in our checklist
14.	Maintenance program	Yes	Continuation of supervised exercise training beyond PR protects the patient from a decline in exercise capacity compared with a control group. (Evidence level 1-)	The BTS guideline also recommends for the need of a maintenance program as presented in our checklist

(Contd...)

**Table 3:** (Continued)

S. No.	Items*	Does the BTS guideline address this item?	Evidence profile from the BTS guideline	Remarks
15.	Payment for PR	No	Not applicable	The BTS guideline is well suited and grounded in the National Health Service, UK, which has more coverage than what is obtainable in the National Health Insurance Scheme in Nigeria. Moreover, most patients in Nigeria pay out of pocket for similar essential services
16.	PR in the community or home	Yes	Home-based PR can lead to similar improvements in walking distance compared with supervised hospital pulmonary programs; however, the educational needs, supervision, patient selection, and provision of exercise equipment need to be considered (Evidence level 1+)	The BTS guideline also supports the possibility of community or home-based PR as stated in the last item of our checklist

Evidence profile based on the BTS guideline, \*Refer to Table 1 for details on each item, 1++: High-quality meta-analyses, systematic reviews of RCTs, or RCTs with a very low risk of bias, 1+: Well-conducted meta-analyses, systematic reviews of RCTs, or RCTs with a low risk of bias, 1-: Meta-analyses, systematic reviews of RCTs, or RCTs with a high risk of bias, 2+: Well-conducted case-control or cohort studies with a low risk of confounding, bias or chance, and a moderate probability that the relationship is causal. COPD: Chronic obstructive pulmonary disease, PTB: Pulmonary tuberculosis, PR: Pulmonary rehabilitation, TENS: Transcutaneous electrical nerve stimulator, RCT: Randomized controlled trial, BTS: British Thoracic Society

spirometry one of the important physiotherapy gadgets is indicated for some chronic respiratory disease patients (especially post-surgery or prone to atelectasis).<sup>[29]</sup> Moreover, Nigerian physiotherapists often use it routinely during management of these patients.

Therefore, in the next steps, there is a need to compare this checklist with other international guidelines or perform additional studies in the Nigerian setting. There is also a need to ascertain the evidence profile from high-quality systematic reviews and meta-analyses of African studies that focus on the appropriateness of efficacy of the items included in this checklist in the future.

Finally, it is our expectation that resource-limited settings in Nigeria and other settings with similar cultural and health systems to take consider or possibly adapt the items presented in this checklist before instituting PR services. Perhaps the number of patients with chronic respiratory diseases that lack access to optimal PR<sup>[30]</sup> could benefit pending the commissioning a full guideline.

## CONCLUSION

A checklist of items for the implementation of pulmonary rehabilitation in Nigeria was successfully developed, validated and tested. This checklist could be utilized as a resource for delivering pulmonary rehabilitation services in Nigeria and other similar settings. Nevertheless, we recommend the need for a full guideline in view of the potential disparities with existing international guidelines.

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## Declaration of patient consent

Patient's consent not required as there are no patients in this study.

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## Conflicts of interest

There are no conflicts of interest.

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