

# Neuromuscular electrical stimulation (NMES) as an adjunct to pulmonary rehabilitation in patients with COPD

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|----------------------------------------|------------------------------------------|--------------------------------------------------------------------------------------------------------------|
| <b>Submission date</b><br>04/12/2017   | <b>Recruitment status</b><br>Stopped     | <input checked="" type="checkbox"/> Prospectively registered<br><input type="checkbox"/> Protocol            |
| <b>Registration date</b><br>14/12/2017 | <b>Overall study status</b><br>Stopped   | <input type="checkbox"/> Statistical analysis plan<br><input type="checkbox"/> Results                       |
| <b>Last Edited</b><br>11/10/2019       | <b>Condition category</b><br>Respiratory | <input type="checkbox"/> Individual participant data<br><input type="checkbox"/> Record updated in last year |

## Plain English summary of protocol

### Background and study aims

Chronic obstructive pulmonary disease (COPD) is a disease of the lungs that results in narrowing of the airways. Although mainly a disease of the lungs, research has shown that the leg muscles in patients with COPD are weaker than those in healthy people of a similar age. Leg muscle weakness in COPD has been shown to reduce exercise ability, which can affect independence and quality of life. Currently the only effective treatment at reversing muscle weakness in patients with COPD is through Pulmonary Rehabilitation (PR). PR is a supervised programme that consists of exercise training and education and has been shown to improve exercise capacity and quality of life; however the effects of PR on muscle strength are modest. In patients who have muscle weakness, neuromuscular electrical stimulation (NMES) may offer a means of enhancing muscle strength. NMES uses a small battery-operated machine and pads, which are placed over each thigh to produce a comfortable stimulation of the underlying muscles. Several small research studies have shown that using NMES in patients with COPD has improved leg muscle strength. However, there is very little data examining the role of NMES in enhancing the benefits of PR. Therefore we want to examine whether NMES of the thigh muscle in addition to PR can increase leg muscle strength and function more than PR alone in people with COPD. Therefore the aim of this study is to examine whether NMES of the thigh muscle in addition to a pulmonary rehabilitation programme can increase leg muscle strength and function more than pulmonary rehabilitation alone in people with COPD.

### Who can participate?

Adults aged 40 years old who COPD and have been referred to PR.

### What does the study involve?

Participants are randomly allocated to one of two groups. Those in the first group receive the bilateral NMES of the quadriceps for 30 minutes daily for eight weeks in addition to an eight-week PR course. Those in the second group receive a "sham" therapy for 30 minutes daily for eight weeks in addition to an eight-week PR course.

What are the possible benefits and risks of participating?

It is hoped that the NMES device will help enhance the benefits of pulmonary rehabilitation on participants leg muscles however; it is possible that participants may not gain any additional benefits from using the NMES device. The information that is gained from this study should help us provide better care for people with COPD. There are no significant risks associated with participating in the proposed research. There is a very small risk of a sports related injury. This will be minimised by encouraging gentle warming-up exercises prior to performing the tests. The NMES devices have been used in a wide range of medical conditions and there should be no side effects. Participants may feel a slight muscle soreness after first using NMES because it is a form of exercise, but this generally settles after a day or two.

Where is the study run from?

Harefield Hospital (UK)

When is the study starting and how long is it expected to run for?

April 2017 to March 2022

Who is funding the study?

Royal Brompton & Harefield NHS Foundation Trust (UK)

Who is the main contact?

Ms Sarah Jones (Scientific)

## Contact information

**Type(s)**

Scientific

**Contact name**

Ms Sarah Jones

**ORCID ID**

<https://orcid.org/0000-0002-1875-1078>

**Contact details**

Harefield Hospital  
Hill End Road  
Harefield  
Middlesex  
United Kingdom  
UB9 6JH

## Additional identifiers

**Protocol serial number**

36500

## Study information

**Scientific Title**

Quadriceps neuromuscular electrical stimulation (NMES) as an adjunct to pulmonary rehabilitation in patients with COPD and quadriceps weakness - a randomised double-blind placebo-controlled trial

## **Acronym**

QUEST-PR

## **Study objectives**

It is hypothesised that those patients with COPD receiving active NMES in addition to an eight-week outpatient pulmonary rehabilitation programme will have improved lower limb muscle function, exercise capacity and health related quality of life compared to those in the control group.

## **Ethics approval required**

Old ethics approval format

## **Ethics approval(s)**

London - Riverside Research Ethics Committee, 16/11/2017, ref: 17/LO/1830

## **Primary study design**

Interventional

## **Study design**

Randomised; Interventional; Design type: Treatment, Device, Rehabilitation

## **Study type(s)**

Treatment

## **Health condition(s) or problem(s) studied**

Chronic lower respiratory diseases

## **Interventions**

Participants are randomly allocated to one of two groups: the control or the intervention group.

Control Group: "Sham" bilateral NMES of the quadriceps for 30 minutes daily for eight weeks in addition to an eight-week pulmonary rehabilitation course.

Intervention Group: "Active" bilateral NMES of the quadriceps for 30 minutes daily for eight weeks in addition to an eight-week pulmonary rehabilitation course.

Participants are assessed for their cycle endurance, their walking exercise, functional performance, lower limb muscle strength and mass, and health related quality of life.

## **Intervention Type**

Other

## **Primary outcome(s)**

Cycle endurance measured using constant work rate test at 80% workload at baseline and eight-weeks.

## **Key secondary outcome(s)**

1. Walking exercise capacity measured using incremental shuttle walk test (ISW) and endurance shuttle walk test (ESW) at baseline and eight-weeks
2. Functional performance measured using short physical performance battery (SPPB), stair climb power test (SCPT) and the self-paced step test at baseline and eight weeks
3. Lower limb muscle strength and mass as measured by quadriceps maximal voluntary contraction, bioelectrical impedance analysis and ultrasound at baseline and eight weeks
4. Health related quality of life as measured by COPD assessment test and EQ5D5L at baseline and eight-weeks

**Completion date**

31/03/2022

**Reason abandoned (if study stopped)**

Staff departure

## Eligibility

**Key inclusion criteria**

1. Aged  $\geq 40$  years
2. Confirmed diagnosis of COPD according to GOLD guidelines
3. Referred for outpatient PR
4. Quadriceps muscle weakness defined as quadriceps maximum voluntary contraction (QMVC, kg) / Body Mass Index (BMI, kg/m<sup>2</sup>) ratio  $\leq 1.2$
5. Able to provide written informed consent

**Participant type(s)**

Patient

**Healthy volunteers allowed**

No

**Age group**

Adult

**Sex**

All

**Key exclusion criteria**

1. Any condition that precludes providing informed consent e.g. cognitive impairment or inadequate English
2. Participation in an exclusively home-based pulmonary rehabilitation programme
3. Predominant neuromuscular or joint limitation to walking or cycling
4. Co-existing progressive neurological or neuromuscular condition
5. Contraindication for unsupervised use of NMES including pregnancy, implanted cardiac pacemaker, skin abrasion, metallic lower limb prosthesis
6. Formal supervised pulmonary rehabilitation in the preceding six months
7. Unstable cardiac conditions including unstable angina, unstable congestive heart failure, severe aortic stenosis, suspected aortic aneurysm
8. Active or suspected thromboembolic disease including recent pulmonary embolism
9. An acute exacerbation requiring antibiotics within the preceding four weeks

**Date of first enrolment**

02/01/2018

**Date of final enrolment**

01/01/2021

## Locations

**Countries of recruitment**

United Kingdom

England

**Study participating centre****Harefield Hospital**

Hill End Road

Harefield

Middlesex

United Kingdom

UB9 6JH

## Sponsor information

**Organisation**

Royal Brompton & Harefield NHS Foundation Trust

**ROR**

<https://ror.org/02218z997>

## Funder(s)

**Funder type**

Government

**Funder Name**

National Institute for Health Research

**Alternative Name(s)**

National Institute for Health Research, NIHR Research, NIHRresearch, NIHR - National Institute for Health Research, NIHR (The National Institute for Health and Care Research), NIHR

**Funding Body Type**

Government organisation

### Funding Body Subtype

National government

### Location

United Kingdom

## Results and Publications

### Individual participant data (IPD) sharing plan

The datasets generated and/or analysed during the current study during this study will be included in the subsequent results publication.

### IPD sharing plan summary

Other

### Study outputs

| Output type                          | Details | Date created | Date added | Peer reviewed? | Patient-facing? |
|--------------------------------------|---------|--------------|------------|----------------|-----------------|
| <a href="#">HRA research summary</a> |         |              | 28/06/2023 | No             | No              |