

What is the clinical effectiveness and cost-effectiveness of nebulised 7% sodium chloride in patients with chronic obstructive pulmonary disease?

Submission date 03/03/2021	Recruitment status No longer recruiting	<input type="checkbox"/> Prospectively registered <input checked="" type="checkbox"/> Protocol
Registration date 01/06/2021	Overall study status Completed	<input type="checkbox"/> Statistical analysis plan <input type="checkbox"/> Results
Last Edited 13/08/2025	Condition category Respiratory	<input type="checkbox"/> Individual participant data <input checked="" type="checkbox"/> Record updated in last year

Plain English summary of protocol

Background and study aims

Chronic obstructive pulmonary disease (COPD) is a chronic inflammatory lung disease that causes obstructed airflow from the lungs. Symptoms include breathing difficulty, cough, mucus (sputum) production and wheezing.

We want to study whether breathing in salty water through a nebuliser can help patients with COPD cough up phlegm, make them feel better and cut down the number of chest infections they have. We also would like to know whether this is better than taking capsules (carbocisteine), also thought to help patients clear phlegm from the airways.

A nebuliser is a machine that creates a mist, which can be inhaled through a mask or tube. The salty water can be inhaled through a nebuliser to help clear excess mucus from the airways. There is poor evidence of what treatments help clear mucus from the airways. Usually carbocisteine tablets are used (to help clear mucus from the airways). The study investigators believe inhaling salty water is better at clearing mucus from the airways and has additional beneficial effects combating bacterial and viral infection.

Who can participate?

Participants aged 18 years or older with COPD that have either chronic bronchitis and/or associated bronchiectasis and have self-reported difficulty self-expectorating

What does the study involve?

We will recruit 860 patients with COPD throughout the UK.

Half of the group, at random, will inhale salty water through a nebuliser twice a day for 1 year. The other half will get carbocisteine capsules daily for 1 year. It is not possible for it to be a blind trial because the participants and clinician will obviously know the treatment given. Both groups will be taught chest clearance using a video of breathing and coughing techniques that they can use twice a day to help clear phlegm from the chest.

The main goal of the study is to see whether inhaled sodium chloride is better and is more cost-effective than oral carbocisteine which is the traditional medication used. Theoretically, inhaled

sodium chloride is better than carbocysteine at clearing phlegm in the airways.
Participants will be asked to attend three appointments in total – one to join the study and again at 6 months and 1 year.

What are the possible benefits and risks of participating?

There are no direct benefits to taking part in this study, but the results from this study might help to improve the healthcare of patients in the future.

There are not thought to be many disadvantages to taking part in the study. It does involve taking time to attend three appointments and undergo tests, complete diaries each week for a year and complete three questionnaires which might not find convenient.

Some patients may experience side effects from taking the study medications. Like with any new medication there is a risk of allergic reaction.

Where is the study run from?

NHS Lothian (UK)

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

June 2020 to November 2024

Who is funding the study?

The NIHR Health Technology Assessment Programme (UK)

Who is the main contact?

1. Beatrice Selby, bselby@ed.ac.uk
2. Prof. Adam Hill, adam.hill@nhs.scot

Study website

<https://www.ed.ac.uk/usher/edinburgh-clinical-trials/our-studies/all-current-studies/mucact>

Contact information

Type(s)

Public

Contact name

Ms Emma Ward

Contact details

Edinburgh Clinical Trials Unit
Usher Institute, University of Edinburgh
5-7 Little France Road
Edinburgh
United Kingdom
EH16 4UX
+44 (0)131 651 9975
bselby@ed.ac.uk

Type(s)

Scientific

Contact name

Prof Adam Hill

ORCID ID

<https://orcid.org/0000-0002-1789-9257>

Contact details

Department of Respiratory Medicine
Royal Infirmary of Edinburgh
51 Little France Crescent
Edinburgh
United Kingdom
EH16 4SA
+44 (0)131 242 1921
adam.hill@nhs.scot

Additional identifiers**EudraCT/CTIS number**

2020-001949-39

IRAS number

281629

ClinicalTrials.gov number

Nil known

Secondary identifying numbers

AC20047, HTA - NIHR128443, IRAS 281629

Study information**Scientific Title**

An open pragmatic UK multi-centre parallel randomised controlled trial with process evaluation and health economic analysis in participants with COPD that have either chronic bronchitis and/or associated bronchiectasis that have self-reported difficulty self-expectorating to assess whether nebulised 7% sodium chloride plus Active Cycle Breathing Technique (ACBT) is superior compared with carbocysteine plus ACBT when comparing the change in COPD Assessment Tests (CAT) over one year period.

Acronym

MucAct COPD

Study objectives

This study will provide knowledge on whether hypertonic sodium chloride is superior to carbocysteine in aiding sputum expectoration. In addition to improving sputum clearance, it is expected that there will be a prolongation in time to first exacerbation and overall a reduced number of exacerbations over one year.

Ethics approval required

Old ethics approval format

Ethics approval(s)

Approved 09/04/2021, East Midlands - Leicester South Research Ethics Committee (The Old Chapel, Royal Standard Place, Nottingham, NG1 6FS, UK; +44(0)207 1048310; leicestersouth.rec@hra.nhs.uk), ref: 21/EM/0074

Study design

Open pragmatic UK multi-centre parallel randomized controlled trial with process evaluation and health economic analysis

Primary study design

Interventional

Secondary study design

Randomised controlled trial

Study setting(s)

Hospital

Study type(s)

Treatment

Participant information sheet

Not available in web format, please use contact details to request a participant information sheet.

Health condition(s) or problem(s) studied

Participants with Chronic Obstructive Pulmonary Disease that have either chronic bronchitis and /or associated bronchiectasis that have self-reported difficulty self-expectorating

Interventions

Participants will be randomised on a 1:1 basis to nebulised 7% sodium chloride plus ACBT or 750mg carbocisteine plus ACBT.

The randomisation system will include allocation concealment and stratification for current smoking status, COPD severity (GOLD class 1 and 2 versus 3 and 4).

The active arm will receive twice daily nebulised 7% sodium chloride + self-administered ACBT chest clearance. The participants are self-administering nebulised 7% sodium chloride and will be allowed to increase the frequency of use up to a maximum of 6 times per day during respiratory tract infections (minimum four times daily where possible).

Participants allocated to the nebulised 7% sodium chloride arm will be instructed to administer a 1 x 4 mL ampoule twice daily for 52 weeks using the nebuliser provided by their local study team. Nebulisation takes less than 10 minutes.

Some patients have bronchospasm with nebulised 7% sodium chloride. If these symptoms develop, treatment with nebulised 2.5mg salbutamol is recommended prior to taking the nebulised 7% sodium chloride. Nebulised 2.5mg salbutamol can also be used post hypertonic sodium chloride if needed.

The comparator arm with carbocisteine will receive oral carbocisteine (750 mg of carbocisteine three times per day for 8 weeks, reducing to 750 mg twice per day over 44 weeks) + self-administered ACBT chest clearance. The dose of carbocisteine is in accordance with the British National Formula (BNF).

Intervention Type

Drug

Phase

Phase III

Drug/device/biological/vaccine name(s)

Nebulised sodium chloride, carbocisteine

Primary outcome measure

Impact of COPD measured using the COPD Assessment Test (CAT) at baseline and one year

Secondary outcome measures

1. Health related quality of life:

1.1. CAT score at baseline and 6 months

1.2. Quality of life assessment using the Leicester Cough Questionnaire and St. George's Respiratory Questionnaire at 6 months and 1 year

2. Exacerbations and time to first exacerbation:

2.1. Number of exacerbations over a one year period requiring antibiotic therapy and/or systemic steroid treatment measured using exacerbation diaries when exacerbation is reported by the patient

2.2. Time to first exacerbation requiring antibiotic therapy and/or systemic steroids over one year measured using exacerbation diaries when exacerbation is reported by the participant

2.3. Proportion of exacerbations needing antibiotic therapy over one year measured using exacerbation diaries when exacerbation is reported by the patient and concomitant medication recording

2.4. Number of upper respiratory tract infections (URTI) over a one year period) assessed using the Wisconsin Upper Respiratory Symptom Survey-24 (WURSS-24)

2.5. Overall and COPD related hospital attendances/admissions over one year measured using healthcare usage questionnaire at baseline, 6 months and 12 months

2.6. Use of nebulised 7% sodium chloride in exacerbations measured using participant reported daily diaries

3. Potential pathogen microorganisms and viruses from sputum samples and combined nose and throat swabs:

3.1. Proportion being infected with a potential pathogenic organism and viruses at 6 months and one year (from sputum samples and combined nose and throat swabs (if taken as part of standard care))

4. Viral transmissibility (household contacts to participant and participant to household contacts) measured using participant reported daily diaries

5. Lung function:

5.1. Forced Expired Volume in 1 second (FEV1), forced vital capacity (FVC) and mid-expiratory flows at 6 months and one year

6. Health economic benefits:

6.1. Cost per Quality Adjusted Life Year (QALY) a) over one year and b) modelled over a lifetime horizon measured using healthcare usage questionnaire at baseline, 6 months and 12 months

7. Adverse effects over one year measured using participant reported daily diaries
8. Adherence with interventions assessed by weekly participant charts and enquired at study appointments over one year

Overall study start date

01/06/2020

Completion date

14/11/2024

Eligibility

Key inclusion criteria

1. Patients ≥ 18 years old
2. Have COPD as the predominant respiratory diagnosis
3. Meet Medical Research Council (MRC) definition of chronic bronchitis, defined epidemiologically as cough and sputum production for ≥ 3 months per year in at least 2 consecutive years and/or have associated bronchiectasis on computed tomography of the chest
4. Self-reported difficulty in expectoration (determined from the medical notes and/or participant). If from the participant, this will be documented in the medical notes

Participant type(s)

Patient

Age group

Adult

Lower age limit

18 Years

Sex

Both

Target number of participants

860

Total final enrolment

206

Key exclusion criteria

Current participant exclusion criteria as of 16/12/2022:

1. Patients that do not have the capacity to consent (determined by clinician or member of the research team)
2. Patients with active malignancy
3. Patients with a solid organ transplant
4. Patients with active tuberculosis
5. Patients who are in end-of-life care
6. Patients who have had treatment with nebulised hypertonic sodium chloride, carbocysteine or any muco-active treatments within the past 7 days*
7. Patients who are established on long-term antibiotic therapy for less than 3 months

8. Patients who have had an exacerbation within the past 14 days requiring treatment with antibiotics and/or steroids**
 9. Known contraindication or intolerance to nebulised 7% sodium chloride or carbocisteine or any hypersensitivity to the active ingredients or the excipients of carbocisteine
 10. Active peptic ulceration; any known hereditary galactose intolerance, Lapp-Lactase deficiency or glucose-galactose malabsorption
 11. Women who are pregnant or currently breastfeeding
 12. Women of childbearing potential*** not taking appropriate contraception****. Contraception must be continued for a minimum of 30 days after the end of the IMP dosing schedule.
 13. Participation in another Clinical Trial of an Investigational Medicinal Product (CTIMP) within the last 30 days
 14. Previous recruitment to the study
 15. Participants indicating that they are unable to comply with the study protocol prior to randomisation including those unable to complete participant questionnaires
- *If participants have been on treatment with nebulised 7% sodium chloride, carbocisteine or any muco-active treatments within the past 7 days, they need to come off these treatments for 7 days and remain clinically stable in order to be eligible for the study
- **14 days from the start of the recent exacerbation
- *** A woman is considered of childbearing potential (WOCBP), i.e. fertile, following menarche and until becoming post-menopausal unless permanently sterile. Permanent sterilisation methods include hysterectomy, bilateral salpingectomy and bilateral oophorectomy. A postmenopausal state is defined as no menses for 12 months without an alternative medical cause. A high follicle-stimulating hormone (FSH) level in the postmenopausal range may be used to confirm a post-menopausal state in women not using hormonal contraception or hormone replacement therapy. However, in the absence of 12 months of amenorrhea, a single FSH measurement is insufficient.
- ****Acceptable contraception in women of childbearing age is a "highly effective" contraceptive measure as defined by the Clinical Trials Facilitation Group and includes combined (oestrogen and progesterone containing) or progesterone-only contraception associated with inhibition of ovulation, or intrauterine device or bilateral tubal occlusion (http://www.hma.eu/fileadmin/dateien/Human_Medicines/01-About_HMA/Working_Groups/CTFG/2014_09_HMA_CTFG_Contraception.pdf).

Previous participant exclusion criteria:

1. Patients that do not have capacity to consent (determined by clinician or member of the research team)
2. Patients with an active malignancy
3. Patients with a solid organ transplant
4. Patients with active tuberculosis
5. Patients who are in end-of-life care
6. Patients who have had treatment with nebulised hypertonic sodium chloride, carbocisteine or any muco-active treatments within the past 30 days*
7. Patients established on long-term antibiotic therapy for less than 3 months
8. Patients who have had an exacerbation within the past 30 days requiring treatment with antibiotics and/or steroids
9. Known contraindication or intolerance to nebulised 7% sodium chloride or carbocisteine or any hypersensitivity to the active ingredients or the excipients of carbocisteine
10. Active peptic ulceration; any known hereditary galactose intolerance, Lapp-Lactase deficiency or glucose galactose malabsorption; patients unable to swallow oral capsules
11. Women who are pregnant or currently breastfeeding
12. Women of childbearing potential** not taking appropriate contraception***. Contraception

must be continued for a minimum of 30 days after the end of the IMP dosing schedule

13. Participation in another Clinical Trial of an Investigational Medicinal Product (CTIMP) within the last 30 days

14. Previous recruitment to the study

15. Participants indicating that they are unable to comply with the study protocol prior to randomisation including those unable to complete participant questionnaires

*If participants have been on treatment with nebulised 7% sodium chloride, carbocisteine or any muco-active treatments within the past 30 days, they need to come off these treatments for 30 days and remain clinically stable in order to be eligible for the study.

** A woman is considered of childbearing potential (WOCBP), i.e. fertile, following menarche and until becoming post-menopausal unless permanently sterile. Permanent sterilisation methods include hysterectomy, bilateral salpingectomy and bilateral oophorectomy. A postmenopausal state is defined as no menses for 12 months without an alternative medical cause. A high follicle stimulating hormone (FSH) level in the postmenopausal range may be used to confirm a post-menopausal state in women not using hormonal contraception or hormonal replacement therapy. However in the absence of 12 months of amenorrhea, a single FSH measurement is insufficient.

***Acceptable contraception in women of childbearing age is a "highly effective" contraceptive measure as defined by the Clinical Trials Facilitation Group and includes combined (oestrogen and progesterone containing) or progesterone-only contraception associated with inhibition of ovulation, or intrauterine device or bilateral tubal occlusion (http://www.hma.eu/fileadmin/dateien/Human_Medicines/01-About_HMA/Working_Groups/CTFG/2014_09_HMA_CTFG_Contraception.pdf).

Date of first enrolment

01/05/2021

Date of final enrolment

01/12/2023

Locations

Countries of recruitment

England

Scotland

United Kingdom

Study participating centre

Royal Infirmary of Edinburgh

NHS Lothian

51 Little France Crescent

Edinburgh

United Kingdom

EH16 4SA

Study participating centre
Royal Devon and Exeter Hospital
Royal Devon and Exeter NHS Foundation Trust
Barrack Road
Exeter
United Kingdom
EX2 5DW

Study participating centre
Glasgow Royal Infirmary
NHS Greater Glasgow and Clyde
1055 Great Western Road
Glasgow
United Kingdom
G4 0SF

Study participating centre
University Hospital Wishaw
NHS Lanarkshire
50 Netherton Street
Wishaw
United Kingdom
ML2 0DP

Study participating centre
Freeman Hospital
The Newcastle upon Tyne Hospitals NHS Foundation Trust
Freeman Road
Newcastle-upon-tyne
United Kingdom
NE7 7DN

Study participating centre
Bradford Royal Infirmary
Bradford Teaching Hospitals NHS Foundation Trust
Duckworth Lane
Bradford
United Kingdom
BD9 6RJ

Study participating centre

Royal United Hospital

Royal United Hospitals Bath NHS Foundation Trust
Combe Park
Bath
United Kingdom
BA1 3NG

Study participating centre**Gloucestershire Royal Hospital**

Gloucestershire Hospitals NHS Foundation Trust
Great Western Road
Gloucester
United Kingdom
GL1 3NN

Study participating centre**Raigmore Hospital**

Old Perth Rd
Inverness
United Kingdom
IV2 3UJ

Study participating centre**Birmingham Heartlands Hospital**

Bordesley Green East
Bordesley Green
Birmingham
United Kingdom
B9 5SS

Study participating centre**Birmingham Good Hope Hospital**

Rectory Road
Sutton Coldfield
United Kingdom
B75 7RR

Study participating centre**Princess Royal University Hospital**

Farnborough Common
Orpington

United Kingdom
BR6 8ND

Study participating centre
University Hospitals Hairmyres
218 Eaglesham Rd
East Kilbride
United Kingdom
G75 8RG

Study participating centre
The James Cook University Hospital
Marton Road
Middlesbrough
United Kingdom
TS4 3BW

Study participating centre
Macclesfield District General Hospital
Victoria Road
Macclesfield
United Kingdom
SK10 3BL

Study participating centre
Walsall Manor Hospital
Moat Road
Walsall
United Kingdom
WS2 9PS

Study participating centre
Aberdeen Royal Infirmary
Foresterhill Road
Aberdeen
United Kingdom
AB25 2ZN

Study participating centre

University Hospitals Birmingham NHS Foundation Trust
Queen Elizabeth Hospital
Mindelsohn Way
Edgbaston
Birmingham
United Kingdom
B15 2GW

Study participating centre

Victoria Hospital
Hayfield Road
Kirkcaldy
United Kingdom
KY2 5AH

Sponsor information

Organisation

Accord (United Kingdom)

Sponsor details

Academic and Clinical Central Office for Research and Development (ACCORD)
Research & Governance
University of Edinburgh
Queen's Medical Research Institute
47 Little France Crescent
Edinburgh
Scotland
United Kingdom
EH16 4TJ
+44 (0)131 242 9418
enquiries@accord.scot

Sponsor type

University/education

Website

<https://www.accord.scot/>

ROR

<https://ror.org/01x6s1m65>

Funder(s)

Funder type

Government

Funder Name

Health Technology Assessment Programme

Alternative Name(s)

NIHR Health Technology Assessment Programme, HTA

Funding Body Type

Government organisation

Funding Body Subtype

National government

Location

United Kingdom

Results and Publications

Publication and dissemination plan

The Clinical Study Report (CSR) will be submitted to the Sponsor and REC within 1 year of the end of the study. Where acceptable, a published journal article may be submitted as the CSR. The Chief Investigator will provide the CSR to ACCORD, for review, prior to finalization. The clinical study report may be used for publication and presentation at scientific meetings. Investigators have the right to publish orally or in writing the results of the study. The results of the study, together with other mandated information, will be uploaded to the European clinical trials database within 1 year of the end of the study. The findings will be presented at local, national and international meetings. The PPI group and the British Lung Foundation will help disseminate the results to professionals and affected members of the public and the paper will be submitted for publication in an influential and widely read medical journal with high impact factor.

Intention to publish date

30/06/2026

Individual participant data (IPD) sharing plan

The current data sharing plans for this study are unknown and will be available at a later date

IPD sharing plan summary

Data sharing statement to be made available at a later date

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
HRA research summary			28/06/2023	No	No
Protocol file	version 4	09/08/2022	13/08/2025	No	No