

Sugammadex for prevention of postoperative pulmonary complications

Submission date 22/09/2022	Recruitment status No longer recruiting	<input checked="" type="checkbox"/> Prospectively registered <input checked="" type="checkbox"/> Protocol
Registration date 21/12/2022	Overall study status Ongoing	<input type="checkbox"/> Statistical analysis plan <input type="checkbox"/> Results
Last Edited 01/09/2025	Condition category Surgery	<input type="checkbox"/> Individual participant data <input checked="" type="checkbox"/> Record updated in last year

Plain English summary of protocol

Background and study aims

The aim is to conduct a large clinical trial comparing two drugs used to prevent lung complications and improve recovery from general anaesthesia in patients undergoing major surgery. General anaesthesia for major surgery requires specialised drugs which temporarily paralyse patients' muscles, called neuromuscular blocking agents (NMBAs). At the end of surgery, the NMBA-induced muscle paralysis is reversed with another drug. Despite careful monitoring, incomplete reversal is common, impacting breathing patterns and predisposing to lung complications such as pneumonia. These complications are common, delay patient recovery and increase the risk of death and long-term health problems. Anaesthetists choose between two drugs to reverse muscle paralysis, neostigmine or a newer drug, sugammadex, which reverses paralysis faster and may help to prevent lung complications after surgery. However, this benefit has not yet been proven and must be weighed against two problems with sugammadex. Firstly, it is more expensive than neostigmine, doubling the drug costs of a general anaesthetic. Secondly, there is concern that allergic reactions may become more common over time with widespread use, although these are extremely rare at present.

Who can participate?

Patients aged 50 years and over undergoing major chest or abdominal surgery

What does the study involve?

Each patient who agrees to participate will be randomly allocated to receive either sugammadex or neostigmine for NMBA reversal after surgery. The researchers will follow patients up to find out if using one drug results in faster recovery or lower risk of death than the other. In a subgroup of patients, the researchers will test to find out whether there are any signs that an allergy to sugammadex has developed and could be a problem in a second operation. This will help them to understand the risks and benefits of each drug.

What are the possible benefits and risks of participating?

Participants will be exposed to one of two drugs to reverse neuromuscular paralyzing drugs at the end of surgery. Both drugs are in widespread use in the NHS for this indication, with the decision typically determined by individual anaesthetist preference, and participants would be receiving one or other drug anyway. There is therefore no additional risk to the patient from the

intervention.

The researchers have worked with patient representatives to minimise the burden on participants. Apart from the trial intervention, they aim to keep all other aspects of treatment unchanged from usual care. The researchers will collect only the minimum data required for the study and have outlined elsewhere how this will be kept confidential. They will offer participants a range of contact options for follow-up (e.g. email/telephone/post) in order to minimise the inconvenience involved.

The burden to participants in the allergic sensitisation substudy is greater, as they have a blood sample performed at baseline, and are asked to attend a clinic at 6 weeks to 6 months following surgery for a repeat blood sample, and a skin test if deemed appropriate by an allergy expert. Researchers will be requested, where possible, to take the baseline blood sample from an existing indwelling line (e.g. arterial or central venous line) while the patient is under anaesthesia to minimise any pain or discomfort. The amount of blood being taken (10 ml) is not clinically significant and no adverse effects are anticipated. The blood sample at the follow-up clinic will require venepuncture, but since it will be done by experienced staff and only 10 ml is required, this will be kept to a minimum. The skin test lasts for about 2 hours and involves injections of different concentrations of sugammadex into the skin using very fine needles. Redness, itch and pain are possible, but these are typically minimal and transient and can be treated with antihistamines and paracetamol if required. Patients participating in the allergic sensitisation substudy will be compensated for their time and any transport costs in keeping with NIHR guidance.

In patients undertaking the allergic sensitisation substudy, there is a very small risk of an allergic reaction to the skin test. While this risk is miniscule, it will be mitigated by the test being carried out under the supervision of an allergy expert who is trained in the management of allergic reactions, in a closely monitored environment with all necessary equipment and drugs available to treat an allergic reaction if it were to occur.

Where is the study run from?

University of Warwick (UK)

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

September 2022 to November 2026

Who is funding the study?

Health Technology Assessment Programme (UK)

Who is the main contact?

SINFONIA@warwick.ac.uk

Contact information

Type(s)

Public

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Scientific

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Principal investigator

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Additional identifiers

Clinical Trials Information System (CTIS)
Nil known

Integrated Research Application System (IRAS)
1006043

Protocol serial number
21021JS-AS, IRAS 1006043, CPMS 54659

Study information

Scientific Title
Sugammadex for prevention of postoperative pulmonary complications

Acronym
SINFONIA

Study objectives

Primary objective:

To determine whether sugammadex is superior to neostigmine after elective or emergency major abdominal or non-cardiac thoracic surgery in terms of days alive and out of hospital at 30 days (DAH30).

Secondary objectives:

1. To determine whether sugammadex is superior to neostigmine after elective or emergency major abdominal or non-cardiac thoracic surgery in terms of patient-centred clinical outcomes.
2. To determine the cost-effectiveness of sugammadex compared with neostigmine.
3. To estimate the rate of allergic sensitisation after a single exposure to sugammadex in a sub-group of participants.

Ethics approval required

Old ethics approval format

Ethics approval(s)

Approved 20/12/2022, East Midlands - Nottingham 2 Research Ethics Committee (Equinox House, City Link, Nottingham, NG2 4LA, UK; +44 (0)207 104 8169, (0)2071048035, (0)20 71048016; nottingham2.rec@hra.nhs.uk), ref: 22/EM/0231

Study design

Single-blind randomized controlled parallel group trial

Primary study design

Interventional

Study type(s)

Treatment

Health condition(s) or problem(s) studied

Elective or emergency major abdominal or non-cardiac thoracic surgery

Interventions

Current interventions as of 04/04/2025:

This randomised trial will compare the effectiveness of two drugs for the reversal of neuromuscular blocking agents at the end of anaesthesia to prevent postoperative pulmonary complications and thus recovery after major surgery.

Participants will be randomised on a 1:1 basis to receive either sugammadex or neostigmine. Randomisation will be undertaken through a simple and secure web-based randomisation system that has been established by the programming team at Warwick Clinical Trials Unit.

Sugammadex:

Participants randomised to the sugammadex arm should receive an intravenous bolus of sugammadex (2-4 mg/kg) for reversal of neuromuscular blockade around the end of the surgery. Within these parameters, the precise dose and timing are left to the discretion of the treating anaesthetist. If deemed necessary by the treating anaesthetist, patients allocated to the sugammadex treatment group may be administered a second dose of sugammadex. The maximum total dose of sugammadex (whether one or two doses are used) should not exceed

8mg/kg. A third or subsequent dose of sugammadex, or any dose of neostigmine administered, will be outside the trial intervention and will constitute a protocol deviation for monitoring purposes. If the dose of sugammadex administered is outside the specified range, reasons for this will be collected.

Neostigmine:

Participants randomised to the neostigmine arm should receive an intravenous bolus of neostigmine (30-70 mcg/kg) for reversal of neuromuscular blockade around the end of surgery, with co-administration of glycopyrrolate at an appropriate dose to prevent muscarinic side effects (for example 200 mcg per 1mg of neostigmine). The precise dose and timing are left to the discretion of the treating anaesthetist. If deemed necessary by the treating anaesthetist, patients allocated to the neostigmine treatment group may be administered a second dose. The maximum total dose of neostigmine (whether one or two doses are used) should not exceed 5mg neostigmine or 70 mcg/kg, whichever is less. A third or subsequent dose of neostigmine, or any dose of sugammadex administered, will be outside the trial intervention and will constitute a protocol deviation for monitoring purposes. If the dose of neostigmine administered is outside the specified range, reasons for this will be collected.

Following the surgery patients in both arms will follow this schedule. On Day 1 they will undertake a standard questionnaire to evaluate their recovery. On Day 7 they will be checked for any postoperative pulmonary complications that have occurred within the 7 days since surgery, Day 30 they will be checked for hospital readmission and mortality by review of medical records, and if necessary by telephone contact by site research staff with the participant or their General Practitioner. Participants will be contacted by telephone and/or by email at 30 days post-surgery (or as close as possible) and 180 days (or as close as possible) by site research staff to collect data on health resource use based on participant diary and quality of life using EQ-5D-5L.

Previous interventions:

This randomised trial will compare the effectiveness of two drugs for the reversal of neuromuscular blocking agents at the end of anaesthesia to prevent postoperative pulmonary complications and thus recovery after major surgery.

Participants will be randomised on a 1:1 basis to receive either sugammadex or neostigmine. Randomisation will be undertaken through a simple and secure web-based randomisation system that has been established by the programming team at Warwick Clinical Trials Unit.

Sugammadex:

Participants randomised to the sugammadex arm will receive an intravenous bolus of sugammadex (2-4 mg/kg) for reversal of neuromuscular blockade around the end of the surgery. Within these parameters, the precise dose and timing are left to the discretion of the treating anaesthetist. If deemed necessary by the treating anaesthetist, patients allocated to the sugammadex treatment group may be administered a second dose of sugammadex, up to a maximum total dose of 8 mg/kg. A third or subsequent dose of sugammadex, or any dose of neostigmine administered, will be outside the trial intervention and will constitute a protocol deviation for monitoring purposes.

Neostigmine:

Participants randomised to the neostigmine arm will receive an intravenous bolus of neostigmine (30-70 mcg/kg) for reversal of neuromuscular blockade around the end of surgery, with co-administration of glycopyrrolate at an appropriate dose to prevent muscarinic side effects (for example 200 mcg per 1 mg of neostigmine). The precise dose and timing are left to the discretion of the treating anaesthetist. If deemed necessary by the treating anaesthetist,

patients allocated to the neostigmine treatment group may be administered a second dose, up to a maximum total dose of 5 mg neostigmine (or 70 mcg/kg, whichever is less). A third or subsequent dose of neostigmine, or any dose of sugammadex administered, will be outside the trial intervention and will constitute a protocol deviation for monitoring purposes.

Following the surgery patients in both arms will follow this schedule. On Day 1 they will undertake a standard questionnaire to evaluate their recovery. On Day 7 they will be checked for any postoperative pulmonary complications that have occurred within the 7 days since surgery, Day 30 they will be checked for hospital readmission and mortality by review of medical records, and if necessary by telephone contact by site research staff with the participant or their General Practitioner. Participants will be contacted by telephone and/or by email at 30 days post-surgery (or as close as possible) and 180 days (or as close as possible) by site research staff to collect data on health resource use based on participant diary and quality of life using EQ-5D-5L.

Intervention Type

Drug

Phase

Phase III

Drug/device/biological/vaccine name(s)

Sugammadex sodium, neostigmine methylsulfate, glycopyrronium bromide, glycopyrronium bromide and neostigmine metilsulfate

Primary outcome(s)

Days alive and out of hospital at 30 days following surgery (DAH30), captured via questions on case report form (CRF): 'Patient still alive at 30 days' – 'Since their initial discharge after surgery, has the patient been readmitted to hospital', if yes space provided to add dates, captured on the day 30 post Op form.

Key secondary outcome(s))

1. Postoperative Pulmonary Complications (PPCs) within 7 days after surgery, captured via questions on CRF: 'Post-operative pulmonary complications' – list of these with Yes/No captured on the day 7 post Op form
2. Mortality at 30 and 180 days after surgery, captured via questions on CRFs:
 - 2.1. Patient still alive at 30 days – captured on day 30 post op form
 - 2.2. Patient still alive at 180 days – captured on day 180 post op form
 - 2.3. If no date of death – captured on day 30/180 post op form
3. Quality of recovery on the first post-operative day, measured using QoR-15 on day 1 post op form
4. Health-related quality of life at 7, 30 and 180 days measured using EQ-5D-5L at baseline, day 7 post op, day 30 post op and day 180 post op
5. Allergic reaction within 24 hours after administration of IMP (clinician defined), captured via question on CRF - In the 24 hours following administration of the IMP, has the patient had an allergic reaction? – collected on day 1 post-op form
6. Health resource use during the 180 days after surgery, captured via questions on CRFs, Details of hospital stay (including critical care admissions and re-admissions) Details of community and outpatient visits, captured on both day 30 and day 180 post-op forms
7. Rate of allergic sensitisation to sugammadex (for the allergic sensitisation sub-study only), captured via a CRF – there will be a Final adjudication panel with overall outcome of allergy testing – captured on the Sub-Study Form with the following options:

- 7.1. Evidence of clinically relevant sensitisation
- 7.2. No evidence of clinically relevant sensitisation (all test modalities negative OR a single positive test followed by a negative drug provocation test)
- 7.3. Low certainty of clinically relevant sensitisation (equivocal results)
- 7.4. Unable to confirm whether clinically relevant sensitisation present (testing not completed)

Completion date

01/11/2026

Eligibility

Key inclusion criteria

- 1. Patients presenting for elective or emergency major abdominal or non-cardiac thoracic surgery
- 2. Age \geq 50 years
- 3. Planned use of rocuronium or vecuronium for neuromuscular blockade
- 4. Planned reversal of neuromuscular blockade at the end of surgery

Participant type(s)

Patient

Healthy volunteers allowed

No

Age group

Adult

Lower age limit

50 years

Sex

All

Key exclusion criteria

- 1. Known allergy to sugammadex, neostigmine or glycopyrrolate
- 2. Lack of written informed consent for trial participation
- 3. Planned invasive mechanical ventilation before or after surgery
- 4. Previous participation in SINFONIA trial
- 5. Clinician refusal (with reason)

Date of first enrolment

15/02/2023

Date of final enrolment

01/11/2025

Locations

Countries of recruitment

United Kingdom

England

Northern Ireland

Scotland

Wales

Study participating centre

Aberdeen Royal Infirmary

Foresterhill Road

Aberdeen

United Kingdom

AB25 2ZN

Study participating centre

Aneurin Bevan University Health Board

Lodge Road

Caerleon

Newport

United Kingdom

NP18 3XQ

Study participating centre

Belfast City Hospital

51 Lisburn Rd

Belfast

United Kingdom

BT9 7AB

Study participating centre

Freeman Hospital

Freeman Road

High Heaton

Newcastle upon Tyne

United Kingdom

NE7 7DN

Study participating centre

Golden Jubilee National Hospital

Agamemnon Street

Clydebank
United Kingdom
G81 4DY

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

Study participating centre
Leeds Teaching Hospitals
Great George Street
Leeds
United Kingdom
LS1 3EX

Study participating centre
North Bristol NHS Trust
Southmead Hospital
Southmead Road
Westbury-on-trym
Bristol
United Kingdom
BS10 5NB

Study participating centre
University Hospital Birmingham
Queen Elizabeth Hospital
Edgbaston
Birmingham
United Kingdom
B15 2TH

Study participating centre
Royal London Hospital
Whitechapel Road
London
United Kingdom
E1 1FR

Study participating centre

Royal Victoria Hospital

274 Grosvenor Road

Belfast

United Kingdom

BT12 6BA

Study participating centre

The Royal Victoria Infirmary

Queen Victoria Road

Newcastle upon Tyne

United Kingdom

TS1 4LP

Study participating centre

St. Bartholomews Hospital

West Smithfield

London

United Kingdom

EC1A 7BE

Study participating centre

Vale University Health Board

Heath Park

Cardiff

United Kingdom

CF14 4XW

Study participating centre

Whipps Cross Hospital

Whipps Cross Road

London

United Kingdom

E11 1NR

Study participating centre

Bronglais General Hospital

Bronglais Hospital

Caradoc Road
Aberystwyth
United Kingdom
SY23 1ER

Study participating centre

Conquest Hospital

The Ridge
St. Leonards-on-sea
United Kingdom
TN37 7RD

Study participating centre

Craigavon Area Hospital

Lurgan Rd
Craigavon
United Kingdom
BT63 5QQ

Study participating centre

University Hospitals Plymouth NHS Trust

Derriford Hospital
Derriford Road
Derriford
Plymouth
United Kingdom
PL6 8DH

Study participating centre

East Surrey Hospital

Canada Avenue
Redhill
United Kingdom
RH1 5RH

Study participating centre

Eastbourne District General Hospital

Kings Drive
Eastbourne
United Kingdom
BN21 2UD

Study participating centre
Forth Valley Royal Hospital
Stirling Road
Larbert
United Kingdom
FK5 4WR

Study participating centre
Good Hope Hospital
Rectory Road
Sutton Coldfield
United Kingdom
B75 7RR

Study participating centre
Heartlands Hospital
Bordesley Green East
Bordesley Green
Birmingham
United Kingdom
B9 5ST

Study participating centre
Hinchingbrooke Hospital
Hinchingbrooke Park
Huntingdon
United Kingdom
PE29 6NT

Study participating centre
Liverpool Women's Hospital Cdc
Liverpool Womens Hospital
Crown Street
Liverpool
United Kingdom
L8 7SS

Study participating centre

Manchester Royal Royal Infirmary

Cobbett House
Oxford Road
Manchester
United Kingdom
M13 9WL

Study participating centre

Newham General Hospital

Glen Road
London
United Kingdom
E13 8SL

Study participating centre

Norfolk and Norwich University Hospital

Colney Lane
Colney
Norwich
United Kingdom
NR4 7UY

Study participating centre

North Manchester General Hospital

Delaunays Road
Crumpsall
Manchester
United Kingdom
M8 5RB

Study participating centre

Peterborough City Hospital

Edith Cavell Campus
Bretton Gate
Bretton
Peterborough
United Kingdom
PE3 9GZ

Study participating centre

Pinderfields Hospital

Aberford Road
Wakefield
United Kingdom
WF1 4DG

Study participating centre**Raigmore Hospital**

Old Perth Rd
Inverness
United Kingdom
IV2 3UJ

Study participating centre**Rotherham General Hospital**

Moorgate Road
Rotherham
United Kingdom
S60 2UD

Study participating centre**Royal Berkshire Hospital**

Royal Berkshire Hospital
London Road
Reading
United Kingdom
RG1 5AN

Study participating centre**Royal Infirmary of Edinburgh at Little France**

51 Little France Crescent
Old Dalkeith Road
Edinburgh
Lothian
United Kingdom
EH16 4SA

Study participating centre**Royal Liverpool University Hospital NHS Trust**

Royal Liverpool University Hospital
Prescot Street

Liverpool
United Kingdom
L7 8XP

Study participating centre
The Royal Oldham Hospital
Rochdale Road
Oldham
United Kingdom
OL1 2JH

Study participating centre
Scarborough General Hospital
Woodlands Drive
Scarborough
United Kingdom
YO12 6QL

Study participating centre
Solihull Hospital
Lode Lane
Solihull
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B91 2JL

Study participating centre
Sunderland Royal Hospital
Kayll Road
Sunderland
United Kingdom
SR4 7TP

Study participating centre
University Hospital Hairmyres
Eaglesham Road
East Kilbride
United Kingdom
G75 8RG

Study participating centre
Ysbyty Maelor Wrexham
Croesnewydd Road
Wrexham Technology Park
Wrexham
United Kingdom
LL13 7TD

Study participating centre
Wythenshawe Hospital
Southmoor Road
Wythenshawe
Manchester
United Kingdom
M23 9LT

Study participating centre
York Hospital
Wigginton Road
York
United Kingdom
YO31 8HE

Sponsor information

Organisation
Belfast Health and Social Care Trust

ROR
<https://ror.org/02tdmfk69>

Funder(s)

Funder type
Government

Funder Name
Health Technology Assessment Programme

Alternative Name(s)

Funding Body Type

Government organisation

Funding Body Subtype

National government

Location

United Kingdom

Results and Publications

Individual participant data (IPD) sharing plan

The data sharing plans for the current study are unknown and will be made available at a later date. Any data transfer will be in accordance with the University of Warwick SOPs and will require data sharing/processing agreements to be in place.

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?
Protocol article		28/08/2025	01/09/2025	Yes	No
HRA research summary			28/06/2023	No	No
Protocol file	version 3.0	18/10/2023	05/03/2024	No	No
Protocol file	version 4.0	02/10/2024	04/04/2025	No	No
Study website	Study website	11/11/2025	11/11/2025	No	Yes