ISRCTN14584801 https://doi.org/10.1186/ISRCTN14584801

The Sheffield one-stop enhanced diabetes care process screening for people with type 2 diabetes and intensified care for those with early nerve damage

Submission date
15/11/2023

Recruitment status
No longer recruiting

Registration date
11/01/2024

Overall study status
Ongoing

Last Edited
14/10/2026

Condition category
Nutritional, Metabolic, Endocrine

[X] Prospectively registered
[_] Protocol
[_] Statistical analysis plan
[_] Results
[_] Individual participant data
[X] Record updated in last year

Plain English summary of protocol

Background and study aims
The aim of this study is to find out if nerve damage in people with type 2 diabetes can be reversed by managing risk factors more intensively. About half of people with type 2 diabetes develop nerve damage resulting in loss of sensation in the feet and legs. This increases the risk of injury leading to foot ulceration. Unfortunately, if foot ulcers get worse this can result in toe or leg amputation. One in four people with nerve damage can also suffer from distressing pain in the feet which responds poorly to treatment. Studies have shown that poor sugar control, high blood pressure, high cholesterol and increasing weight contribute to nerve damage in diabetes. Nerve damage can be prevented or stopped in people with type 1 diabetes with good blood sugar control. However, similar evidence is lacking in type 2 diabetes. There is therefore a clear need to examine if a more intensive multi-factorial risk reduction approach aiming to support patients to achieve satisfactory individual target risk factor levels, will reverse or halt early nerve damage in people suffering from type 2 diabetes.

Who can participate?
Patients with type 2 diabetes aged 18-75 years with an HbA1c of more than 7.6% (60 mmol/mol).

What does the study involve?
The study is split into two parts, Screening and Treatment.
Firstly, people identified by their usual care team as having sub-optimally controlled type 2 diabetes will undergo a screening visit on or following their usual annual diabetes review visit. In addition to performing the usual annual diabetes review visit care processes (foot check, blood pressure, weight and height (to calculate body mass index (BMI), smoking status, a blood sample to measure average blood glucose, kidney function and cholesterol, and a urine sample to check for signs of kidney damages).
Following informed consent, two non-invasive point-of-care tests will be conducted using the DPNCheck and SudoScan devices to check for nerve damage in the patient's feet and hands. If one or both tests are abnormal, further questions about their medical history and that of their

relatives will be asked to check if they are eligible for the treatment part of the study. If nerve damage is detected, the blood sample will also be used to exclude other possible causes of nerve damage. Hip and waist circumference and body composition will also be measured. This will be the end of the involvement in the study for people without early nerve damage.
People identified as having early nerve damage will be invited to a baseline visit to confirm their eligibility for the treatment phase of the trial. Baseline assessments will include a more detailed nerve examination; blood pressure, weight, height, hip, and waist measurements, and body composition will also be repeated to determine their readiness and ability to perform physical activity and they will be supported to complete some health, quality of life and nerve-related questionnaires. Blood and urine samples will be repeated if the baseline visit is performed more than 6 weeks after the screening visit, and an optional skin biopsy sample will also be performed to measure nerve density, the gold standard assessment of small fibre nerve damage.
Eligible participants will be randomly allocated to receive either intensified or usual diabetes care.
Usual care: People in this group will continue to receive usual diabetes care normally given by their GP or practice nurse. This will include regular blood tests and time with the GP and/or practice nurse. As part of the study, they will be asked to wear a continuous glucose monitoring sensor for 2 weeks at baseline, 12 and 24 months, but they will not be able to view the data (it will be blinded).
At the end of the study, people in this group will be notified of their individual risk factors (if any) and referred to their GP for further support to manage their blood glucose levels (HbA1c), blood pressure and cholesterol. They will also be signposted to other relevant services and resources, for example, those relating to Type 2 diabetes structured education (DESMOND), smoking cessation, and exercise, if they have not already accessed these.
Intensified care: People in this group will have frequent in-person and/or telephone contact with diabetes specialist nurses, diabetes dietitians and diabetes doctors to support them to achieve individual blood glucose levels (HbA1c) and manage cardiovascular factors (blood pressure and cholesterol). They will be asked to wear a continuous glucose monitoring sensor throughout the study and be able to view this data, be referred for smoking cessation (if applicable), and attend type 2 diabetes face-to-face and/or online educational programmes and an NHS-recommended exercise programme (light-to-moderate exercise for at least 30 minutes three to five times weekly will be recommended where it is safe to do so. Where this is not possible tailored exercise according to ability will be recommended). Where necessary additional emails/text alerts will be used to support people in this group.
The final visit will take place at 24 months when all study assessments performed at the baseline visit (including the optional skin biopsy) will be repeated in both the standard care and intensive care group. Diabetes blood and urine results will be obtained from their routine annual diabetes screening appointment if performed within 6 weeks of this visit.

What are the possible benefits and risks of participating?
There may be no direct benefit to participating in this trial, but we hope it will demonstrate that improved diabetes control is possible with an intensified care approach and that this will halt /reverse early diabetic peripheral neuropathy. People in the routine care group will continue to receive usual diabetes care provided by their GP or practice nurse.
This is a low-risk study. The intensified treatment uses technologies that are proven safe to use in people with diabetes, and glucose control and exercise recommendations will be tailored to the individual. Taking part in this research will require additional visits to the hospital compared to the number of appointments normally attended, particularly for people allocated to the intensive treatment group.

Where is the study run from?
Royal Hallamshire Hospital (UK)

When is the study starting and how long is it expected to run for?
February 2024 to November 2027

Who is funding the study?
Viatris UK Healthcare Ltd (UK)

Who is the main contact?
Dr M. Shaan Goonoo, m.goonoo@nhs.net

Contact information

Type(s)
Public

Contact name
Dr Sharon Caunt

Contact details
Sheffield Teaching Hospitals NHS Foundation Trust
Royal Hallamshire Hospital
Glossop Road
Sheffield
United Kingdom
S10 2JF
+44(0) 114 2265976
sharon.caunt@nhs.net

Type(s)
Scientific

Contact name
Prof Solomon Tesfaye

Contact details
Sheffield Teaching Hospitals NHS Foundation Trust
Royal Hallamshire Hospital
Glossop Road
Sheffield
United Kingdom
S10 2JF
+44 (0)114 271 2204
Solomon.Tesfaye@nhs.net

Type(s)
Scientific

Contact name
Dr Mohummad Shaan Goonoo

ORCID ID

https://orcid.org/0000-0003-2793-309X

Contact details
Diabetes Research Office
M135 M Floor
Royal Hallamshire Hospital
Glossop Road
Sheffield
United Kingdom
S10 2JF
+44 (0)114 271 2568
m.goonoo@nhs.net

Additional identifiers

Integrated Research Application System (IRAS)
325956

Central Portfolio Management System (CPMS)
57408

Study information

Scientific Title
One-stop sCrEening ANd Intensified Care (OCEANIC): protocol for a single-centre, randomised controlled trial of intensive multifactorial intervention in early diabetic peripheral neuropathy in the UK

Acronym
OCEANIC

Study objectives
Treatment with multifactorial risk factor intervention will slow/reverse/stop subclinical diabetic peripheral neuropathy (DPN) in people with type 2 diabetes.

Ethics approval required
Ethics approval required

Ethics approval(s)
Approved 13/10/2023, North West - Greater Manchester Central Research Ethics Committee (2 Redman Place, Stratford, London, E20 1JQ, United Kingdom; +44 (0)207 104 8244; gmcentral.rec@hra.nhs.uk), ref: 23/NW/0301

Primary study design
Interventional

Study design
Randomized; Interventional; Design type: Treatment, Drug, Education or Self-Management, Dietary, Physical

Study type(s)
Treatment

Health condition(s) or problem(s) studied
Diabetic peripheral neuropathy

Interventions
Current interventions as of 21/09/2026:

Screening Visit:
People with type 2 diabetes attending the Sheffield One-Stop Screening Service in both community and hospital settings will be invited and consented to participate in the screening phase of this study. The study screening process will take place within their routine annual diabetes screening appointment and the visit will take approximately 1 hour.

As per usual diabetes care, the screener will review the patient's previous clinical evaluation and perform a brief physical examination including a foot check, height, weight and blood pressure measurements, and ask about smoking status. Blood and urine samples will be collected to measure average blood glucose, kidney function and cholesterol.
Additional research components of the visit included enhanced nerve checks using two non-invasive point-of-care devices called DPNCheck and SUDOSCAN will also be performed. DPNCheck measures the speed at which nerves transmit impulses. SUDOSCAN measures sweat levels in one's hands and feet by placing hands and feet on metal plates which measure conductance.
If one or both of these tests are abnormal, they will be asked further questions about their medical history and that of their relatives to check if they are eligible for the treatment part of the study. The blood sample will also be used to exclude other possible causes of nerve damage. Additional hip and waist circumference and body composition measurements will also be taken. From the screening cohort of up to 600 people with T2DM, the research team will identify 112 people with poor glucose control (HbA1c>7.6% or 60mmol/l) and abnormal nerve check results indicating early (sub-clinical) neuropathy, and invite them to take part in the treatment phase of the trial.

Baseline Visit:
At the baseline visit, which will take about 2 hours, a member of the study team will answer any questions the participants may have, will confirm eligibility for the treatment phase of the trial, and will ask the participant to sign an informed consent form before undergoing further assessments.
These assessments will include taking blood pressure, weight, and height measurements, determining readiness and ability to perform physical activity, and completing some health and nerve-related questionnaires. We will also carry out some tests to examine the nerves of the feet, including standard clinical tests to 1) check one's ability to feel different sensations, 2) measure cardiac autonomic nerve function, and 3) measure the speed of nerve impulses.
1. Quantitative sensory testing is used to measure how one's nerve endings work in your feet. There are two types of tests, thermal threshold testing to measure responses to changes in temperature and vibration testing to measure responses to vibrations. We will also check one's ability to detect light touch and sharpness; this may be uncomfortable but will not puncture the skin.
2. Cardiac autonomic function tests monitor one's heart rate and rhythm (an ECG) and blood pressure while he/she undertakes some simple breathing exercises both lying down and standing up. It will assess whether the nerves that serve the heart and control the blood

pressure are working correctly.
3. Nerve conduction studies will be performed by a board-certified consultant neurophysiologist at the hospital; this may take place at a separate visit. This will measure how the nerves are conducting the information from the periphery to the brain and from the brain to the muscles, we will use neurophysiologic tests. Attachment of some electrodes and a small electrical current will be applied to assess the ability of the nerves to transmit electrical impulses.
A blood sample will be taken at the baseline visit and final study visits to measure markers of inflammation as predictors of cardiovascular disease events. These samples will be stored for future analysis.
An optional skin biopsy will also be performed at the first visit and last study visit to measure nerve density, the gold standard assessment of small fibre nerve damage. This would involve taking 3 mm (~1/10 inch) circular piece of skin (skin biopsy) from the participant's lower leg after numbing with a local anaesthetic. This procedure is routine practice in dermatology clinics and is deemed to be safe and has a low risk of infection and scarring. Healing usually occurs in 7-10 days.
At or following the baseline visit, a computer program will randomly decide which treatment group of the trial the participant will be in. At the moment, we do not know if early signs of nerve damage in people with type 2 diabetes can be reversed/halted by managing risk factors more intensively. Randomly allocating the participants to intensified care and routine care from their GP will help to compare the different treatments in an equal way.
Due to the nature of the interventions in this trial, participants and investigators will know which treatment group participants have been allocated to. However, every attempt will be made to keep the neurophysiologist performing the Nerve Conduction Studies blinded to the treatment allocation. As this assessment does not depend on treatment allocation, it will not be necessary to unblind the neurophysiologist.
A letter will be sent to participants' GPs notifying them of their participation in the study and confirming treatment group allocation.

Treatment group:
1. Routine care: People in this group will receive usual diabetes care normally given by their GP or practice nurse. This will include regular blood tests and time with the GP and/or practice nurse. As part of the study, participants will be asked to wear a continuous glucose monitoring sensor for 2 weeks at baseline, 12 months, and 24 months, but participants will not be able to view the data (it will be blinded).
2. Intensified care: Participants in this group will have intensive, holistic, individualised, target-driven, multifactorial intervention delivered by Diabetes Specialist Nurses, Diabetes Dietitians and Diabetes Doctors. The research team will support participants in this group to achieve individual blood glucose levels (HbA1c) and manage cardiovascular factors (blood pressure and cholesterol). The participants will be asked to wear a continuous glucose monitoring sensor throughout the study, attend type 2 diabetes face-to-face and/or online educational programmes and an NHS-recommended exercise programme.

Endpoint Visit:
All participants will be seen by the research team at 24 months to repeat the baseline visit assessments. The 24-month visit will therefore take about 2 hours as all questionnaires, blood samples, (optional) skin biopsy and nerve check assessments performed during the baseline visit will be repeated by the research team. Diabetes blood and urine results will be obtained from their routine annual diabetes screening appointment if performed within 6 weeks of this visit or collected during this visit.

_____

Previous interventions as of 17/09/2026:

Screening Visit:
People with type 2 diabetes attending the Sheffield One-Stop Screening Service in both community and hospital settings will be invited and consented to participate in the screening phase of this study. The study screening process will take place within their routine annual diabetes screening appointment and the visit will take approximately 1 hour.

As per usual diabetes care, the screener will review the patient's previous clinical evaluation and perform a brief physical examination including a foot check, height, weight and blood pressure measurements, and ask about smoking status. Blood and urine samples will be collected to measure average blood glucose, kidney function and cholesterol.
Additional research components of the visit included enhanced nerve checks using two non-invasive point-of-care devices called DPN-Check and SUDOSCAN will also be performed. DPN-Check measures the speed at which nerves transmit impulses. SudoScan measures sweat levels in one's hands and feet by placing hands and feet on metal plates which measure conductance. If one or both of these tests are abnormal, they will be asked further questions about their medical history and that of their relatives to check if they are eligible for the treatment part of the study. The blood sample will also be used to exclude other possible causes of nerve damage. Additional hip and waist circumference and body composition measurements will also be taken. From the screening cohort of up to 600 people with T2DM, the research team will identify 112 people with poor glucose control (HbA1c>7.6% or 60mmol/l) and abnormal nerve check results indicating early (sub-clinical) neuropathy, and invite them to take part in the treatment phase of the trial.

Baseline Visit:
At the baseline visit, which will take about 2 hours, a member of the study team will answer any questions the participants may have, will confirm eligibility for the treatment phase of the trial, and will ask the participant to sign an informed consent form before undergoing further assessments.
These assessments will include taking blood pressure, weight, and height measurements, determining readiness and ability to perform physical activity, and completing some health and nerve-related questionnaires. We will also carry out some tests to examine the nerves of the feet, including standard clinical tests to 1) check one's ability to feel different sensations, 2) measure cardiac autonomic nerve function, and 3) measure the speed of nerve impulses.
1. Quantitative sensory testing is used to measure how one's nerve endings work in your feet. There are two types of tests, thermal threshold testing to measure responses to changes in temperature and vibration testing to measure responses to vibrations. We will also check one's ability to detect light touch and sharpness; this may be uncomfortable but will not puncture the skin.
2. Cardiac autonomic function tests monitor one's heart rate and rhythm (an ECG) and blood pressure while he/she undertakes some simple breathing exercises both lying down and standing up. It will assess whether the nerves that serve the heart and control the blood pressure are working correctly.
3. Nerve conduction studies will be performed by a board-certified consultant neurophysiologist at the hospital; this may take place at a separate visit. This will measure how the nerves are conducting the information from the periphery to the brain and from the brain to the muscles, we will use neurophysiologic tests. Attachment of some electrodes and a small electrical current will be applied to assess the ability of the nerves to transmit electrical impulses.
A blood sample will be taken at the baseline visit and final study visits to measure markers of inflammation as predictors of cardiovascular disease events. These samples will be stored for future analysis.

An optional skin biopsy will also be performed at the first visit and last study visit to measure nerve density, the gold standard assessment of small fibre nerve damage. This would involve taking 3 mm (~1/10 inch) circular piece of skin (skin biopsy) from the participant's lower leg after numbing with a local anaesthetic. This procedure is routine practice in dermatology clinics and is deemed to be safe and has a low risk of infection and scarring. Healing usually occurs in 7-10 days.
At or following the baseline visit, a computer program will randomly decide which treatment group of the trial the participant will be in. At the moment, we do not know if early signs of nerve damage in people with type 2 diabetes can be reversed/halted by managing risk factors more intensively. Randomly allocating the participants to intensified care and routine care from their GP will help to compare the different treatments in an equal way.
Due to the nature of the interventions in this trial, participants and investigators will know which treatment group participants have been allocated to. However, every attempt will be made to keep the neurophysiologist performing the Nerve Conduction Studies blinded to the treatment allocation. As this assessment does not depend on treatment allocation, it will not be necessary to unblind the neurophysiologist.
A letter will be sent to participants' GPs notifying them of their participation in the study and confirming treatment group allocation.

Treatment group:
1. Routine care: People in this group will receive usual diabetes care normally given by their GP or practice nurse. This will include regular blood tests and time with the GP and/or practice nurse. As part of the study, participants will be asked to wear a continuous glucose monitoring sensor for 2 weeks at baseline, 12 months, and 24 months, but participants will not be able to view the data (it will be blinded).
2. Intensified care: Participants in this group will have intensive, holistic, individualised, target-driven, multifactorial intervention delivered by Diabetes Specialist Nurses, Diabetes Dietitians and Diabetes Doctors. The research team will support participants in this group to achieve individual blood glucose levels (HbA1c) and manage cardiovascular factors (blood pressure and cholesterol). The participants will be asked to wear a continuous glucose monitoring sensor throughout the study, attend type 2 diabetes face-to-face and/or online educational programmes and an NHS-recommended exercise programme.

Endpoint Visit:
All participants will be seen by the research team at 24 months to repeat the baseline visit assessments. The 24-month visit will therefore take about 2 hours as all questionnaires, blood samples, (optional) skin biopsy and nerve check assessments performed during the baseline visit will be repeated by the research team. Diabetes blood and urine results will be obtained from their routine annual diabetes screening appointment if performed within 6 weeks of this visit or collected during this visit.

Previous interventions:

Screening Visit:
People with type 2 diabetes attending the Sheffield One-Stop Screening Service in both community and hospital settings will be invited and consented to participate in the screening phase of this study. The study screening process will take place within their routine annual diabetes screening appointment and the visit will take approximately 1 hour.

As per usual diabetes care, the screener will review the patient's previous clinical evaluation and perform a brief physical examination including a foot check, height, weight and blood pressure measurements, and ask about smoking status. Blood and urine samples will be collected to measure average blood glucose, kidney function and cholesterol.
Additional research components of the visit included enhanced nerve checks using two non-invasive point-of-care devices called DPN-Check and SUDOSCAN will also be performed. DPN-Check measures the speed at which nerves transmit impulses. SudoScan measures sweat levels in one's hands and feet by placing hands and feet on metal plates which measure conductance. If one or both of these tests are abnormal, they will be asked further questions about their medical history and that of their relatives to check if they are eligible for the treatment part of the study. The blood sample will also be used to exclude other possible causes of nerve damage. Additional hip and waist circumference and body composition measurements will also be taken. From the screening cohort, the research team will identify 167 people with type 2 diabetes and poor glucose control (HbA1c>8.5% or 69mmol/l) and abnormal nerve check results indicating early (sub-clinical) neuropathy, and invite them to take part in the treatment phase of the trial.

Baseline Visit:
At the baseline visit, which will take about 2 hours, a member of the study team will answer any questions the participants may have, will confirm eligibility for the treatment phase of the trial, and will ask the participant to sign an informed consent form before undergoing further assessments.
These assessments will include taking blood pressure, weight, and height measurements, determining readiness and ability to perform physical activity, and completing some health and nerve-related questionnaires. We will also carry out some tests to examine the nerves of the feet, including standard clinical tests to 1) check one's ability to feel different sensations, 2) measure cardiac autonomic nerve function, and 3) measure the speed of nerve impulses.
1. Quantitative sensory testing is used to measure how one's nerve endings work in your feet. There are two types of tests, thermal threshold testing to measure responses to changes in temperature and vibration testing to measure responses to vibrations. We will also check one's ability to detect light touch and sharpness; this may be uncomfortable but will not puncture the skin.
2. Cardiac autonomic function tests monitor one's heart rate and rhythm (an ECG) and blood pressure while he/she undertakes some simple breathing exercises both lying down and standing up. It will assess whether the nerves that serve the heart and control the blood pressure are working correctly.
3. Nerve conduction studies will be performed by a board-certified consultant neurophysiologist at the hospital; this may take place at a separate visit. This will measure how the nerves are conducting the information from the periphery to the brain and from the brain to the muscles, we will use neurophysiologic tests. Attachment of some electrodes and a small electrical current will be applied to assess the ability of the nerves to transmit electrical impulses.
A blood sample will be taken at the baseline visit and final study visits to measure markers of inflammation as predictors of cardiovascular disease events. These samples will be stored for future analysis.
An optional skin biopsy will also be performed at the first visit and last study visit to measure nerve density, the gold standard assessment of small fibre nerve damage. This would involve taking 3 mm (~1/10 inch) circular piece of skin (skin biopsy) from the participant's lower leg after numbing with a local anaesthetic. This procedure is routine practice in dermatology clinics and is deemed to be safe and has a low risk of infection and scarring. Healing usually occurs in 7-10 days.
At or following the baseline visit, a computer program will randomly decide which treatment group of the trial the participant will be in. At the moment, we do not know if early signs of nerve damage in people with type 2 diabetes can be reversed/halted by managing risk factors

more intensively. Randomly allocating the participants to intensified care and routine care from their GP will help to compare the different treatments in an equal way.
Due to the nature of the interventions in this trial, participants and investigators will know which treatment group participants have been allocated to. However, every attempt will be made to keep the neurophysiologist performing the Nerve Conduction Studies blinded to the treatment allocation. As this assessment does not depend on treatment allocation, it will not be necessary to unblind the neurophysiologist.
A letter will be sent to participants' GPs notifying them of their participation in the study and confirming treatment group allocation.

Treatment group:
1. Routine care: People in this group will receive usual diabetes care normally given by their GP or practice nurse. This will include regular blood tests and time with the GP and/or practice nurse. As part of the study, participants will be asked to wear a continuous glucose monitoring sensor for 2 weeks at baseline, 12 months, and 24 months, but participants will not be able to view the data (it will be blinded).
2. Intensified care: Participants in this group will have intensive, holistic, individualised, target-driven, multifactorial intervention delivered by Diabetes Specialist Nurses, Diabetes Dietitians and Diabetes Doctors. The research team will support participants in this group to achieve individual blood glucose levels (HbA1c) and manage cardiovascular factors (blood pressure and cholesterol). The participants will be asked to wear a continuous glucose monitoring sensor throughout the study, attend type 2 diabetes face-to-face and/or online educational programmes and an NHS-recommended exercise programme.

Endpoint Visit:
All participants will be seen by the research team at 24 months to repeat the baseline visit assessments. The 24-month visit will therefore take about 2 hours as all questionnaires, blood samples, (optional) skin biopsy and nerve check assessments performed during the baseline visit will be repeated by the research team. Diabetes blood and urine results will be obtained from their routine annual diabetes screening appointment if performed within 6 weeks of this visit or collected during this visit.

Intervention Type
Mixed

Primary outcome(s)
Nerve damage is measured using sural nerve action potential (SNAP; obtained by conventional electrophysiology) at baseline and 24 months

Key secondary outcome(s)
Current key secondary outcome(s) as of 18/09/2026:

A) Neuropathy outcomes
1. Change from baseline to 24 months, comparing intensive treatment and control groups, in sural nerve conduction velocity, peroneal nerve conduction velocity and amplitude, tibial nerve conduction velocity and amplitude, composite Z-scores of NCS parameters (tibial, peroneal, sural, superficial peroneal and medial tibial plantar nerves), DPNCheck SNCV and SNAP, SUDOSCAN feet ESC, warm and cold detection thresholds, heart rate response to deep breathing (HRDB), IENFD and SSR parameters
2. The sensitivity and specificity of each POCD, either individually or in combination, versus DPN diagnosis based on gold-standard composite score (NCS and autonomic function)

3. Change from baseline to 24 months, comparing conventional cardiac autonomic neuropathy assessments to COMPMASS-31 questionnaire measuring participant's perceived symptom burden and assessing risk of cardiovascular disease and mortality
4. Change from baseline to 24 months, comparing intensive treatment and control groups, in blood concentrations of NfL, other nerve-related biomarkers and pro-inflammatory cytokines

B) Patient Reported Outcomes: Change from baseline to 24 months
1. Distress (PAID-20)
2. Quality of life: generic (EQ-5D-5L), ADDQoL, SF-12, Norfolk QOL-DN
3. Hospital Anxiety and Depression Scale (HADS)
4. Addenbrooke's Cognitive Examination (ACE-III) questionnaire (Optional)

C) Biomedical markers: Change from baseline to 24 months
1. Blood pressure: systolic, diastolic, heart rate (mmHg, BPM)
2. Low-density lipoprotein cholesterol (LDL-C) (mmol/L)
3. High-density lipoprotein cholesterol (HDL-C) (mmol/L)
4. Total cholesterol (TC) (mmol/L)
5. Triglycerides (TG) (mmol/L)
6. Glycated haemoglobin (HbA1c) (% and mmol/mol)
7. Fasting blood glucose (FBG) (mmol/L)
8. Difference in time in range (TIR) (3.9–10 mmol/L) and time below range (TBR) (<3.9 mmol/L and <3.0 mmol/L)
9. Difference in glucose variability (SD and CV)
10. Estimated glomerular filtration rate (eGFR) (mL/min/1.73 m^2)
11. Urine albumin:creatinine ratio (uACR)
12. Diabetic retinopathy grading using the Early Treatment Diabetic Retinopathy Study (ETDRS) grading system
13. Plasma or serum levels of neuronal biomarkers (not limited to NfL) (ng/L)
14. Plasma or serum levels of biomarkers of inflammation (not limited to IL-6, TNF-α) (unit dependent on biomarker)

D) Anthropometrics: Change from baseline to 24 months
1. Weight (kg)
2. Body Mass Index (BMI) (kg/m^2)
3. Body Roundness Index (BRI)
4. Body composition

———

Previous key secondary outcome(s):

1. Small- and large-fibre dysfunction measured using skin intraepidermal nerve density, peripheral neurological examination, and quantitative sensory testing at baseline and 24 months
2. The diagnostic accuracy of the point-of-care devices (DPN-Check and Sudoscan) of diabetic peripheral neuropathy will be measured against the gold standard SNAP at baseline and 24 months
3. Cardiometabolic risk factors and quality of life are measured using patient-related outcomes, biomedical markers, and anthropometric parameters at baseline and 24 months

Completion date
21/11/2027

Eligibility

Key inclusion criteria

Current key inclusion criteria as of 17/09/2026:

For screening:
1. Up to 600 people with T2DM
2. Age 18-75 years
3. HbA1c >7.6% (60 mmol/mol) if measured within the past 2 months

For the trial:
1. People with T2DM
2. Aged 18–75 years
3. HbA1c >7.6% (60 mmol/mol) at screening visit
4. Abnormal DPNCheck sural nerve amplitude and/or conduction velocity for age (based on age-adjusted normative values) and/or abnormal feet electrochemical skin conductance (ESC) using SUDOSCAN
5. Detectable DPNCheck sural nerve action potential (SNAP) >1 mV
6. Willing and able to comply with the study schedule and available for the full treatment duration
7. Able to give written informed consent

Previous key inclusion criteria as of 17/08/2026:

For screening:
1. People with T2D
2. Age 18-75 years
3. HbA1c >7.6% (60 mmol/mol) if measured within the past 2 months

For the trial:
1. People with T2D
2. Age 18-75 years
3. HbA1c >7.6% (60 mmol/mol) at screening visit
4. Normal/mildly abnormal mTCNS
5. Have detectable DPNCheck SA (>1 mV)
6. Abnormal DPN-Check SNCV or amplitude for age (based on age-related normative values)
7. Willing and able to comply with the study schedule and be available for the treatment duration
8. Able to give written informed consent

Previous key inclusion criteria:

For screening:
1. People with T2D
2. Age 18-75 years
3. HbA1c >8.0% (64 mmol/mol)

For the trial:
1. People with T2D
2. Age 18-75 years
3. HbA1c >8.5% (69 mmol/mol)
4. Normal/mildly abnormal mTCNS

5. Have detectable DPNCheck SA (>1 mV)
6. Abnormal DPN-Check SNCV or amplitude for age (based on age-related normative values)
7. Willing and able to comply with the study schedule and be available for the treatment duration
8. Able to give written informed consent

———

Previous key inclusion criteria as of 25/08/2026:

For screening:
1. People with T2D
2. Age 18-75 years
3. HbA1c >7.6% (60 mmol/mol) if measured within the past 2 months

For the trial:
1. People with T2DM
2. Aged 18–75 years
3. HbA1c >7.6% (60 mmol/mol) at screening visit
4. Abnormal DPNCheck sural nerve amplitude and/or conduction velocity for age (based on age-adjusted normative values) and/or abnormal feet electrochemical skin conductance (ESC) using SUDOSCAN
5. Detectable DPNCheck sural nerve action potential (SNAP) >1 mV
6. Willing and able to comply with the study schedule and available for the full treatment duration
7. Able to give written informed consent

Previous key inclusion criteria as of 17/08/2026:

For screening:
1. People with T2D
2. Age 18-75 years
3. HbA1c >7.6% (60 mmol/mol) if measured within the past 2 months

For the trial:
1. People with T2D
2. Age 18-75 years
3. HbA1c >7.6% (60 mmol/mol) at screening visit
4. Normal/mildly abnormal mTCNS
5. Have detectable DPNCheck SA (>1 mV)
6. Abnormal DPN-Check SNCV or amplitude for age (based on age-related normative values)
7. Willing and able to comply with the study schedule and be available for the treatment duration
8. Able to give written informed consent

Previous key inclusion criteria:

For screening:
1. People with T2D
2. Age 18-75 years
3. HbA1c >8.0% (64 mmol/mol)

For the trial:
1. People with T2D

2. Age 18-75 years
3. HbA1c >8.5% (69 mmol/mol)
4. Normal/mildly abnormal mTCNS
5. Have detectable DPNCheck SA (>1 mV)
6. Abnormal DPN-Check SNCV or amplitude for age (based on age-related normative values)
7. Willing and able to comply with the study schedule and be available for the treatment duration
8. Able to give written informed consent

Participant type(s)
Patient

Healthy volunteers allowed
No

Age group
Mixed

Lower age limit
18 Years

Upper age limit
75 Years

Sex
All

Total final enrolment
112

Key exclusion criteria
Current key exclusion criteria as of 21/09/2026:

For the trial:
1. Diagnosis with other forms of diabetes (e.g., type 1 diabetes, monogenic diabetes (MODY), gestational diabetes or latent autoimmune diabetes in adults (LADA)
2. Housebound
3. Serious illness or event with life-expectancy <1 year or other significant illness which, in the opinion of a study clinician, precludes involvement
4. Active psychotic illness
5. Current pregnancy, or actively trying to conceive
6. Other causes of sensorimotor or autonomic neuropathy (e.g. autoimmune disease vitamin B12 deficiency, chemotherapy-induced peripheral neuropathy, untreated thyroid conditions or alcohol-related neuropathy)
7. Requirement for renal replacement therapy
8. Planned major surgery over the duration of the trial
9. Alcohol/substance abuse
10. Patients taking part in any other clinical trials or observational research that will interfere with the delivery of this trial protocol or overburden the patient
11. Unwilling or unable to give informed consent to participate in the study

12. Any other conditions, which, in the opinion of the Investigator would make the patient unsuitable for inclusion, or could interfere with the patient participating in or completing the study

_____

Previous key exclusion criteria:

For the trial:
1. Diagnosis with other forms of diabetes (e.g., type 1 diabetes, monogenic diabetes (MODY), gestational diabetes or latent autoimmune diabetes in adults (LADA)
2. Housebound
3. Serious illness or event with life-expectancy <1 year or other significant illness which, in the opinion of a study clinician, precludes involvement
4. Active psychotic illness
5. Current pregnancy, or actively trying to conceive
6. Other causes of sensorimotor or autonomic neuropathy (e.g., autoimmune disease)
7. Requirement for renal replacement therapy
8. Planned major surgery over the duration of the trial
9. Alcohol/substance abuse
10. Patients taking part in any other clinical trials or observational research that will interfere with the delivery of this trial protocol or overburden the patient
11. Unwilling or unable to give informed consent to participate in the study
12. Any other conditions, which, in the opinion of the Investigator would make the patient unsuitable for inclusion, or could interfere with the patient participating in or completing the study

Date of first enrolment
02/02/2024

Date of final enrolment
02/05/2026

Locations

Countries of recruitment
United Kingdom

England

Study participating centre
Royal Hallamshire Hospital
Glossop Road
Sheffield
England
S10 2JF

Study participating centre
Northern General Hospital
Herries Road
Sheffield
England
S5 7AU

Study participating centre
The White House Surgery
1 Fairfax Rise
Sheffield
England
S2 1SL

Sponsor information

Organisation
Sheffield Teaching Hospitals NHS Foundation Trust

ROR
https://ror.org/018hjpz25

Funder(s)

Funder type
Industry

Funder Name
Viatris

Results and Publications

Individual participant data (IPD) sharing plan
The datasets generated and/or analysed during the current study will be available upon reasonable request submitted in writing to the study Chief Investigator: Prof Solomon Tesfaye (Solomon.Tesfaye@nhs.net).

IPD sharing plan summary
Available on request