Neuromodulation

Spinal cord stimulation (SCS) or dorsal root ganglion stimulation (DRG)

We have given you this factsheet because our multidisciplinary team (MDT - a team of medical experts and health professionals) have agreed that neuromodulation in the form of spinal cord stimulation (SCS) or dorsal root ganglion stimulation (DRG) is a suitable treatment option for you.

This factsheet explains what neuromodulation is, how it works and what the procedure involves so you know what to expect. We hope it helps to answer some of the questions you may have. If you have any further questions or concerns, please contact us using the details at the end of this factsheet.

What is neuromodulation?

Neuromodulation involves implanting an electrical device (known as a stimulator) in the body (next to specific nerves or the spinal cord) to alter nerve activity and treat chronic pain conditions.

There are different types of neuromodulation. This factsheet focuses specifically on the following two types of neuromodulation which involve having a stimulator implanted near the spinal cord:

- **spinal cord stimulation (SCS)**
  - percutaneous (a minimally invasive surgical procedure)
  - paddle (an open surgical procedure)
- **dorsal root ganglion stimulation (DRG)**
  - percutaneous (a minimally invasive surgical procedure that involves stimulating one specific nerve root known as the ‘dorsal root ganglion’)

Your neurosurgeon (a doctor specialising in disorders affecting the central nervous system (brain and spinal cord) and the peripheral nervous system) will advise which of these types is most suitable for you.

How does neuromodulation work?

Depending on which type of neuromodulation your neurosurgeon has recommended you have, you may have a **spinal cord stimulator** or a **dorsal root ganglion stimulator**.

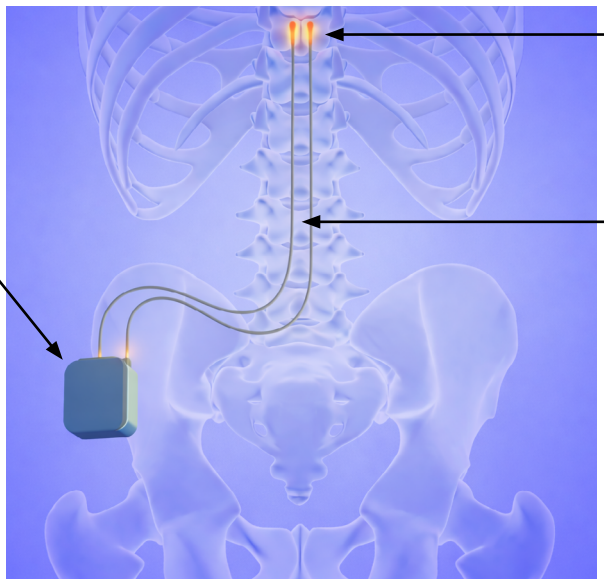
Both stimulators are made up of:

- one or two thin insulated leads (known as electrodes) that are surgically implanted near the spinal cord
- a small battery that lies under the surface of the skin (usually in the buttock area)

The battery sends electrical impulses into the leads which alter pain signals as they travel to the brain. This helps to reduce pain, which can help to improve your:

- sleep
- level of activity
- overall quality of life

Please see the spinal cord stimulation diagram below for more information.



Are there different types of stimulation?

Both stimulators have various settings which provide different types of stimulation. These settings are controlled using a handheld controller.

Depending on your condition, your stimulation may be:

- silent (you won't feel the stimulation working)
- tingling (you may feel a mild tingling or a 'pins and needles' sensation in the area of your body that is causing you pain)
- a combination of silent and tingling

We will arrange a clinic appointment for you to discuss which type of stimulation is likely to be most effective in treating your pain before your procedure.

We will also arrange a device programming appointment for you after your procedure. During this appointment, we will go through your stimulator's settings and explain how to control these using your handheld controller.

Is neuromodulation suitable for everyone?

Neuromodulation is **not** suitable for everyone. It does not improve widespread or non-specific pain without a defined cause. If you experience either of these types of pain, your pain team will discuss what other pain management options are available for you.

What will happen before the procedure?

Once our multidisciplinary team (MDT) have agreed that neuromodulation (SCS or DRG) is a suitable treatment option for you, we will add you to our surgical waiting list.

Please note that the current wait time for the neuromodulation procedure is typically 12 to 18 months. To ensure equal and fair access for everyone waiting for the procedure, we cannot expedite (speed up) the date of your procedure. We will contact you by telephone in due course to arrange a date for your procedure. We will then send you a letter confirming this date. **Please let us know if you change address or your mobile or telephone number changes while you are waiting for your procedure.**

While you are waiting for your procedure, we will ask you to attend a number of pre-procedure appointments.

Occupational therapy and psychology assessments
We may ask you to attend a few assessment appointments, including an occupational therapy assessment and/or a psychology assessment. We will discuss these with you in more detail, if appropriate.

These assessments will help us to predict how responsive or effective a stimulator will be at treating your pain.

We will also use these assessments after your procedure to measure the effectiveness of SCS or DRG at treating your pain.

Neuromodulation education session
We will arrange a neuromodulation education session for you. This appointment will be with a member of our neuromodulation clinical nurse specialist (CNS) team.

During this appointment, we will:
- discuss the stimulator with you in more detail
- explain how to manage your pain with help from the stimulator
- explain the possible risks and complications to help manage your expectations

Consent
We will arrange a separate consent appointment for you with your neurosurgeon. At this appointment, your neurosurgeon will explain the procedure to you again in detail and answer any questions you may have.

The procedure is usually performed via a percutaneous (minimally invasive) approach that involves small incisions (cuts). However, in some cases, it may be performed via an open surgical approach which involves larger incisions. Your neurosurgeon will discuss this with you during this appointment and will advise which surgical approach is most suitable for you. If you are happy to proceed with the procedure, they will then ask you to sign a consent form.

SCS trial
In some cases, we may recommend a trial of SCS before proceeding with a permanent stimulator. This is because not everyone's pain responds to SCS.

The trial involves implanting a stimulator that is connected to a **temporary external** battery for a period of 7 to 14 days. After the agreed time, we will arrange a clinic appointment for you, where we will:
- disconnect the temporary external battery
- discuss how effective you have found the stimulator at treating your pain
- decide whether to implant the permanent internal battery

The decision about whether an SCS trial is appropriate for you is made on an individual basis by our MDT. We will advise you in advance if you need to have an SCS trial. We will also arrange an education session for you closer to the time of your procedure, where we will explain what the SCS trial involves in more detail.

For more information about what will happen during the trial and the permanent implantation procedure, see the 'What will happen during the procedure?' section on page 5.

How should I prepare for the procedure?

Pre-operative assessment

Before your procedure, we will arrange for you to come to hospital for a pre-operative assessment.

During this appointment, we will:

- perform blood tests
- perform an electrocardiogram (a heart tracing test)
- take a full set of observations to check your blood pressure, pulse, oxygen levels, temperature and breathing rate
- measure your height and weight
- take swabs from your nose and groin to check for MRSA (a bacteria that usually lives harmlessly on the skin but can cause a serious infection if it gets inside the body)

We will also:

- explain the procedure to you and answer any questions you may have
- advise when to stop eating and drinking before your procedure
- advise if you need to temporarily stop taking any medications before your procedure
- give you an antiseptic skin wash solution to use and explain how to use it (you will need to wash your whole body and hair before your procedure in this solution to help prevent infections occurring after your procedure)

We have included the guidance below for you to refer to.

Eating and drinking

You must not eat anything for at least **six hours** before your procedure. In many cases, we will ask you to fast (not eat anything) overnight before your procedure.

You can continue to drink water or clear fluids (fluids you can see through) up until **two hours** before your procedure.

Medication

You will need to stop taking any blood-thinning medications (for example, aspirin, clopidogrel or apixaban) at least one week before your procedure. If you are unsure whether you are taking any blood-thinning medications, please contact our neuromodulation CNS team.

Sedation and general anaesthetic

The trial and permanent procedure will both be performed under either sedation (a medication that relaxes you and makes you sleepy) or general anaesthetic (a medication that sends you to sleep). Which type of anaesthetic we give you will depend on the procedure you are having and your personal circumstances. We will discuss this with you in clinic before your procedure.

An anaesthetist (a specialist doctor) will meet with you before your procedure to explain what having sedation or a general anaesthetic involves, including the benefits and risks, and to answer any questions you may have.

- **If you are having a general anaesthetic**, the anaesthetist will usually give this to you as an injection through a cannula (a small, plastic tube) into a vein in your arm or hand before your procedure. In rare cases, they may give this to you as a gas that you breathe in through a mask (this is usually only used if it's difficult to find a vein in your arm).

- **If you are having sedation**, the anaesthetist will give you a sedative and local anaesthetic (numbing medication) injection via a cannula into a vein in your arm or hand before your procedure.

What will happen during the procedure?

The trial and permanent procedure will both be performed in an operating theatre by a neurosurgeon.

Once the anaesthetic or sedation has taken effect, we will position you face down on your tummy on a theatre or operating table. We will then clean the area on your back with some antiseptic solution. We will then inject some additional local anaesthetic into your skin at the planned surgical site to numb the area (this will help to control your pain during and after the procedure).

Once the area is completely numb, your neurosurgeon will make an incision (cut) in your back at the planned site near your spinal cord and implant the stimulator leads. We will then perform an x-ray (a procedure that uses radiation to produce images of the inside of the body) to ensure the leads are in the correct position. Depending on the level of sedation you are under, you may be aware of what is going on around you. The anaesthetist will be with you throughout the procedure and will increase your sedation as necessary. If you have any concerns at any point, please let us know.

After the x-ray has confirmed the leads are in the correct position, your neurosurgeon will:

- secure the leads in place
- make another cut under your skin (usually in the upper buttock area) to form a pocket for the battery
- place the battery in the pocket under your skin
- connect the leads to the battery
- close your wounds with staples or stitches (any staples or stitches that are not absorbable will need to be removed seven days after your procedure - see separate aftercare advice factsheet and your discharge letter for more information about this)

How long will the procedure take?

The procedure usually takes between one and two hours.

What will happen after the procedure?

After your procedure, we will take you to our recovery room where you will gradually wake up from the sedation or general anaesthetic. You will stay in the recovery room until you are more awake and stable (this usually takes between one and two hours). During this time, we will monitor you regularly to check that you are recovering well, and your pain is controlled.

Most people will usually be able to go home two to three hours after their procedure, as long as they are feeling well. Occasionally, we may recommend that some people stay in hospital for a few days to recover. We will advise you when it is safe for you to go home.

After having sedation or a general anaesthetic, you must have a responsible adult to take you home and stay with you overnight.

For 24 hours after having sedation or a general anaesthetic you must **not**:
- drive
- drink alcohol
- operate machinery
- sign important documents

Before you leave hospital, we will give you a separate aftercare advice factsheet which contains information on what to expect after your procedure and how to recover well at home.

Are there any risks or complications?

Neuromodulation is generally a safe procedure, but as with all surgical procedures there are some possible risks and complications. These complications may occur at the time of the procedure or years later.

Surgical complications

Possible surgical complications include:
- infection at the site of the staples or stitches
- pain or discomfort at the surgical site
- bleeding or a haematoma (a collection of blood) at the surgical site
- issues with wound healing
- spinal fluid leak (if this happens, this can cause a very rare neurological injury known as a ‘dural puncture headache’)
- sedation or general anaesthetic complications (an anaesthetist will discuss these with you before your procedure)

In some cases, we may not be able to effectively place the leads. If this happens, we will either wake you up from the procedure without implanting the stimulator or we will proceed with implanting a different stimulator made by another manufacturer (if discussed and agreed with you during the consent process).

Device complications

Possible device complications include:
- failure of SCS or DRG therapy (this is where your primary pain does not respond to the treatment)
- lead migration (this is where the stimulator leads move out of their correct position, affecting pain relief to the targeted area)
- the stimulator not working correctly (hardware malfunction)
- new, chronic, persistent pain at the battery site (usually the buttock) and/or the lead insertion site
- overstimulation causing unwanted symptoms, such as heavy legs, headaches or general body aches (this can often be addressed by lowering the level of stimulation on the handheld controller)

- removal of the stimulator due to failure of therapy or deep, persistent infection (please note that part of the stimulator may remain in your body permanently if it is technically too difficult to remove it or there is a risk of injuring your spinal cord or nerves)
- magnetic resonance imaging (MRI) incompatibility (depending on the type of stimulator you have, you may not be able to have an MRI scan after your procedure as some stimulators are not MRI safe)

Please note that this is not a complete list of all the possible risks and complications. If we offer you a stimulator, we will discuss all the possible risks and complications with you in detail before your procedure, including your individual risk.

Will I receive any follow-up care?

We will arrange a follow-up appointment for you with our neuromodulation CNS team two weeks after your procedure. For more information about this, please see the separate aftercare advice factsheet we have given you.

If you have any urgent surgery-related concerns after your procedure, please contact us using the details below.

Contact us

If you have any further questions or concerns, please contact us.

Neuromodulation clinical nurse specialist (CNS) team
Telephone: **07799 861000** (Monday to Friday, 8am to 5pm)
Email: **neuromodulation@uhs.nhs.uk**

For any non-medical queries (for example, rescheduling an appointment), please contact our SCS coordinator on **023 8120 5186** (Monday to Friday, 9am to 3pm).

Useful links

National Institute for Health and Care Excellence (NICE)
Spinal cord stimulation for chronic pain of neuropathic or ischaemic origin
www.nice.org.uk/guidance/ta159

The British Pain Society
Stimulating the spinal cord to help with pain - information for patients
www.britishpainsociety.org/static/uploads/resources/files/book_scs_patient.pdf

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For help preparing for your visit, arranging an interpreter or accessing the hospital, please visit **www.uhs.nhs.uk/additionalsupport**

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