



# Neurosurgery for mental disorder (NMD)

Explains what NMD is, what the operation is like, possible side effects and alternative surgical treatments. Also covers the law around consent to treatment by NMD.

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## What is NMD?

Neurosurgery for mental disorder (NMD) is the medical term for a type of brain surgery used in **very rare** cases to treat severe and long-lasting mental health problems, when all other treatments have failed.

The aim of the surgery is to destroy small areas of brain tissue that may be contributing to your mental health problems. (See our page [about the operation](#) for more details about how NMD is performed.)

There are very serious risks associated with NMD. Your doctor should only discuss this option with you if you have already tried all other treatment options and found that they haven't helped.

Examples of other treatments you may try before considering NMD are:

- [Talking treatments](#), such as [cognitive behavioural therapy \(CBT\)](#)
- [Medication](#), such as [antidepressants](#)
- [Electroconvulsive therapy \(ECT\)](#)

## What problems can NMD treat?

NMD is not currently recommended by the [National Institute for Health and Care Excellence \(NICE\)](#) for the treatment of mental health problems. This is because there is a lack of evidence of its safety and how effective it is.

However, in very rare cases, NMD is used to treat:

- severe [depression](#)
- severe [anxiety disorders](#)
- severe [obsessive compulsive disorder \(OCD\)](#)

## How effective is NMD?

It's very difficult to know how effective NMD is at treating mental health problems. This is because so few people receive it and different surgical techniques are used.

There are a number of research studies suggesting that it may help to reduce the symptoms of severe [depression](#) and [OCD](#), which haven't been helped by other treatments. However, there is limited research exploring how long these benefits last.

If you think NMD could be the right treatment for you, it is important to speak to your GP and psychiatrist about the benefits and risks of having the treatment.

They may suggest you try other treatments first or they may refer you for an assessment to see whether NMD may be able to help reduce the symptoms you experience. (See our information on [who could be offered NMD](#) for more information.)

### Key facts about NMD

- It cannot be performed without your consent (in England and Wales).
- It is only performed extremely rarely. During 2015 to 2016 only 4 NMD procedures were conducted at the Ninewells hospital in Dundee, which is one of the two treatment centres in the UK.
- It is only offered if all other treatments have failed.

- It is not a cure. Anyone who has NMD is likely to need continued psychiatric support afterwards, even if the surgery is considered to be successful.
- The surgery cannot be reversed.

There are two reversible alternatives to NMD available:

- [deep brain stimulation \(DBS\)](#)
- [vagus nerve stimulation \(VNS\)](#)

## What happens in the operation?

There are four types of NMD techniques :

NMD technique	What it means
Subcaudate tractotomy	Two probes are inserted via small holes made in your forehead, and guided to a part of your brain called the caudate nucleus. A very small part of this target area is then destroyed using an electrical current.
Anterior capsulotomy	Two probes are passed via incisions on each side of the midline on the top of your head into a part of the brain called the internal capsule, which is close to the caudate nucleus. A very small part of this target area is then destroyed using an electrical current.
Anterior cingulotomy	This procedure involves a similar technique to anterior capsulotomy, but targets an area of your brain called the anterior cingulate gyrus.
Limbic leucotomy	This procedure is a combination of anterior cingulotomy and subcaudate tractotomy.

There is little agreement amongst researchers and health professionals as to which of these techniques is the most effective.

The technique that you receive will depend on where you are treated as different [treatment centres](#) are likely to use different techniques. All of these techniques are irreversible.

## About the procedure

Regardless of the NMD technique being performed, the operation is likely to follow this procedure:

1. **Your hair is shaved in small areas** on your scalp where the surgery will be performed.
2. **You are given a general or a local anaesthetic**, depending on the NMD technique being used.
3. **A special apparatus called a stereotactic frame is attached** to your skull through tiny cuts in your scalp. The frame is used to hold the surgical tools in place. ('Stereotactic' means that the tools can be guided precisely in three dimensions, so that the surgery can be very exact.)

4. **A small hole is made in your skull** using a special drill.
5. **A very fine probe is put through this hole.** Computer software is used alongside brain imaging technology, such as magnetic resonance imaging (MRI) scanning, to guide the probe precisely to the target area within your brain.
6. When the probe is in the right place, **an electrical current is passed through it.** This generates heat to destroy a very small area of brain tissue at the end of the probe.
7. **The probe and the frame are then removed,** and the cuts in your scalp are stitched and/or glued.

## How soon will I recover after the operation?

Recovery is a slow process, so you'll need to take your rehabilitation gradually in the following weeks and months. Most people are able to tell if the treatment is working and see changes in their mood within the first 9 – 12 months.

It's important to remember that NMD alone is not a cure, but rather it could help to reduce your symptoms so that you are able to benefit from other forms of treatment, such as [talking treatments](#).

## What are the side effects?

The side effects of NMD may differ depending on the type of surgical technique being used. NMD can cause:

- **headaches**, which may be severe and last for several days
- **confusion**
- **nausea**
- **weight gain**
- **apathy** (a lack of emotion, interest or concern)
- [sleeping problems](#)

There is also some evidence that people who have had NMD experience [suicidal feelings](#). However, it is not known whether this is caused by the existing mental health problems or whether it is caused by the physical or emotional impact of the surgery itself.

In addition to this, all brain surgeries carry a risk of causing:

- **seizures**
- **damage to the blood vessels**, which may result in stroke, although this is very rare in NMD
- **pressure in the front of your brain**, caused by fluid produced in the brain tissues as part of the healing process. This can make you feel confused, and can last for up to a month after the operation.

### Could NMD affect my mental capacity or personality?

- **Mental capacity** – there is no evidence that NMD causes any loss of thinking ability. It might actually help you to think more clearly if you experience fewer of the symptoms that had previously made it hard for you to concentrate.
- **Personality** – personality changes following NMD have been reported in some people, but are considered rare.

## Who could be offered NMD?

NMD is extremely rare. Your psychiatrist will only suggest NMD if:

- Your mental health problem has a severe impact on your daily life
- Your mental health problem is long lasting
- You have tried all other treatments and they have failed, including psychiatric [medication](#) and [electroconvulsive therapy \(ECT\)](#).

If you are in this situation, your psychiatrist could offer to refer you to a multidisciplinary team for an assessment.

The team is made up of everyone who would be helping to look after you, including neurosurgeons (who would perform the surgery), psychiatrists, mental health nurses and psychological therapists.

Guidelines from the Royal College of Psychiatrists say that:

- You must be given a thorough assessment by health professionals that specialise in mental health treatment to make sure that NMD is right for you.
- You must be able to provide [informed consent](#) to treatment.
- The surgery should only be performed by neurosurgeons experienced in functional stereostatic surgery within specialist centres.
- You should be given a detailed assessment before and after the surgery.
- You should have a detailed care plan for at least 12 months after the surgery.

## Where is NMD performed?

Assessments can be done at the Maudsley Hospital in London, but there are only two hospitals in the UK where the operation can be performed. These are:

- **(Wales) University Hospital of Wales, Cardiff** – this hospital uses the anterior capsulotomy technique.
- **(Scotland) Ninewells Hospital, Dundee** – this hospital uses anterior cingulotomy for [depression](#) that hasn't been helped by other treatments, and either capsulotomy or cingulotomy for [obsessive compulsive disorder \(OCD\)](#) that hasn't been helped by other treatments.

There are no NMD treatment centres in England, so if you live in England you would have to travel to Wales or Scotland for the operation. It's important to be aware that the law on [consent to treatment with NMD](#) is different in Scotland to England and Wales.

## Who decides if I receive NMD?

The law relating to consent to receiving NMD is different depending on whether you are being treated in Wales or in Scotland (there are no [NMD treatment centres](#) in England).

- [the law in England and Wales](#)
- [the law in Scotland](#)

## The law in England and Wales

In England and Wales NMD is covered by section 57 of the [Mental Health Act](#), which applies to all voluntary patients and everyone who is currently [detained under section](#). This law says that you can only be given NMD if all four of the following statements are true:

- You consent (agree) to the treatment.
- A second opinion appointed doctor (SOAD) and two other people appointed by the Care Quality Commission in England, or the Healthcare Inspectorate Wales, certify that:
  - you have the capacity to consent, AND
  - you do consent.
- The SOAD also certifies that it is appropriate for you to receive this treatment.
- The SOAD has consulted with two other professionals concerned with your treatment, one of which must be a nurse.

Your consent must be given free from undue pressure and with sufficient knowledge of the purpose, likelihood of success, risks and alternatives of the treatment.

### Could it ever be performed without my consent?

**No.** In England and Wales, NMD cannot be performed without your consent, even if you lack the capacity to consent. The Mental Capacity Act may not be used to authorise a treatment which comes under section 57 of the Mental Health Act.

For more information about mental health law in England and Wales, see our legal pages on [consent to treatment](#), [sectioning](#), the [Mental Health Act](#) and the [Mental Capacity Act](#).

## The law in Scotland

Procedures performed in Scotland, including NMD, come under the provisions of the Mental Health (Care and Treatment) (Scotland) Act 2003. They are overseen by the [Mental Welfare Commission for Scotland](#), which provides independent clinical assessments for all patients.

In Scotland whether or not NMD can be carried out depends on whether you have the mental capacity to consent to it.

If you have capacity to consent, and do:

- A designated medical practitioner and two lay people, appointed by the Mental Welfare Commission, have confirmed that you are capable of consenting to the treatment, and do consent.
- The medical practitioner must also confirm that it will be beneficial for you.

If you don't have capacity to consent:

- A designated medical practitioner and two lay people, appointed by the Mental Welfare Commission, have confirmed that you are not capable of consenting to the treatment but you do not object to it.
- The medical practitioner must also confirm that it is in your best interests to have the treatment.
- The Court of Session (the Supreme Court in Scotland) has made an order authorising the treatment.

In Scotland, NMD can only be carried out if all the following are true:

- A designated medical practitioner, appointed by the Mental Welfare Commission, has given an independent opinion that it will be beneficial for you.
- Two lay people appointed by the Commission have certified whether or not you are capable of consenting.
- If you are capable of consenting, you do give your consent; **OR if you are not capable of consenting, you do not object to the treatment.**

## How do I decide whether to have NMD?

Deciding whether or not to have NMD can be really difficult. It is important to think what the risks and benefits are for you of having the treatment.

If NMD is recommended, you (or someone you trust or an advocate) might want to ask your doctor:

- What is the reason for suggesting NMD?
- How could NMD help me?
- Could it make me feel worse afterwards?
- What are the risks and side effects?
- Have I been offered every other available treatment?
- What treatment will I be offered in addition to, and after, NMD?
- What will happen when I go into hospital and how long will I have to stay?
- How long will it take me to recover and see an improvement after the surgery?

## What alternatives are there?

There are two surgical alternatives to NMD. Unlike NMD, they do not cause permanent damage to brain tissue (this means they can be reversed). These are:

- [deep brain stimulation \(DBS\)](#)
- [vagus nerve stimulation \(VNS\)](#)

## Deep brain stimulation (DBS)

### What is DBS?

DBS is a type of brain surgery. It has been used as a treatment for:

- severe [depression](#) that has not been helped by other treatments
- long-term [OCD](#) that has not been helped by other treatments
- movement disorders such as Parkinson's disease

The [National Institute for Health and Care Excellence \(NICE\)](#) has produced clinical guidelines for the use of DBS in Parkinson's disease, but not for [depression](#) or [OCD](#). This is because there is a lack of evidence on how safe or effective DBS is at treating mental health problems.

### How does DBS work?

If you have DBS, you will be given a local or a general anaesthetic. A stereotactic frame is used to implant electrodes (insulated wires that conduct electricity) in your brain, but, instead of destroying the cells, the electrodes are left in place and used to stimulate a small area of your brain.

Wires lead just under your skin from your brain to a stimulator (similar to a pacemaker), which is set in your chest wall, and is programmed to deliver electrical stimulation.

With both [depression](#) and [OCD](#) you might find DBS helpful while the stimulation is turned on, but your problems could return when it is turned off.

### What are the side effects of DBS?

Possible side effects are:

- wound infection after the operation
- complications if the equipment goes wrong, such as problems with the stimulator
- complications as a result of the surgery such as bleeding in the brain and seizures
- an increase in symptoms of [depression](#) and [anxiety](#)
- [hypomania](#)

Some people have reported experiencing [suicidal feelings](#) after DBS but this is thought to be quite rare and it is not known whether it is caused by the surgery itself or the mental health problems that they are having treatment for. Also, having the DBS implants means that you cannot be treated with [electroconvulsive therapy \(ECT\)](#).

### Where is DBS performed?

DBS is performed in Southmead Hospital, Bristol, as well as the [NMD centre in Dundee](#).

## Vagus nerve stimulation (VNS)

### What is VNS?

VNS is a type of brain surgery, used in rare cases to treat:

- severe [depression](#) that hasn't been helped by other treatments
- epilepsy (a neurological disorder that can cause seizures)

There is some research that shows that VNS can help to reduce the symptoms of severe depression hasn't been helped by other treatments.

However, VNS is not currently recommended by the National Institute for Health and Care Excellence (NICE) for the treatment of mental health problems because there is not enough research on its safety and how effective it is.

### How does VNS work?

A device called a generator is implanted in your chest, with electrodes connected to the vagus nerve in your neck area. The device sends timed pulses to your vagus nerve, which has branches from many organs of your body to your brain. The procedure is carried out under general or local anaesthetic.

### What are the side effects of VNS?

Possible side effects are:

- coughing
- headaches
- neck pain
- sore throat difficulties breathing
- changes in your voice



Reducing the intensity or the frequency of the electrical pulses from the generator implanted in your chest may help to reduce the side effects that you experience.

### Where is VNS performed?

VNS is more widely available than DBS, but it is still only offered in specialist centres by experienced staff. As it's used most commonly to treat epilepsy, VNS may be more likely to be performed in centres where there is a specialist epilepsy clinic.

## Useful contacts

### Mind's services

- **Helplines** – all our helplines provide information and support by phone and email. Our Blue Light Infoline is just for emergency service staff, volunteers and their families.
  - Mind's Infoline – 0300 123 3393, [info@mind](mailto:info@mind)
  - Mind's Legal Line – 0300 466 6463, [legal@mind](mailto:legal@mind)
  - Blue Light Infoline – 0300 303 5999, [bluelightinfo@mind](mailto:bluelightinfo@mind)
- **Local Minds** – there are over 140 local Minds across England and Wales which provide services such as [talking treatments](#), [peer support](#), and [advocacy](#). [Find your local Mind here](#), and contact them directly to see how they can help.
- **Elefriends** is a supportive online community for anyone experiencing a mental health problem. See our [Elefriends page](#) for details.

### Who else could help?

#### Care Quality Commission

National Customer Services: 03000 616161

[cqc.org.uk](http://cqc.org.uk)

Inspects health care services and protects the rights of people receiving treatment under the [Mental Health Act](#).

#### Healthcare Inspectorate Wales

029 2092 8850

[hiw.org.uk](http://hiw.org.uk)

The independent inspectorate and regulator of all healthcare in Wales.

#### Mental Welfare Commission for Scotland

0131 313 8777 or 0800 389 6809

[mwscot.org.uk](http://mwscot.org.uk)

Provides information on the law relating to mental health treatment in Scotland.

#### National Institute for Health and Care Excellence (NICE)

[nice.org.uk](http://nice.org.uk)

Provides guidelines for treatment within the NHS, including [guidance on vagus nerve stimulation \(VNS\)](#).

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**OCD-UK**

0845 120 3778

[ocduk.org](http://ocduk.org)

Organisation supporting people with [obsessive compulsive disorder \(OCD\)](#). Provides information about neurosurgery for mental disorder as a treatment for OCD.

© Mind February 2018

To be revised in 2021.

References are available on request.