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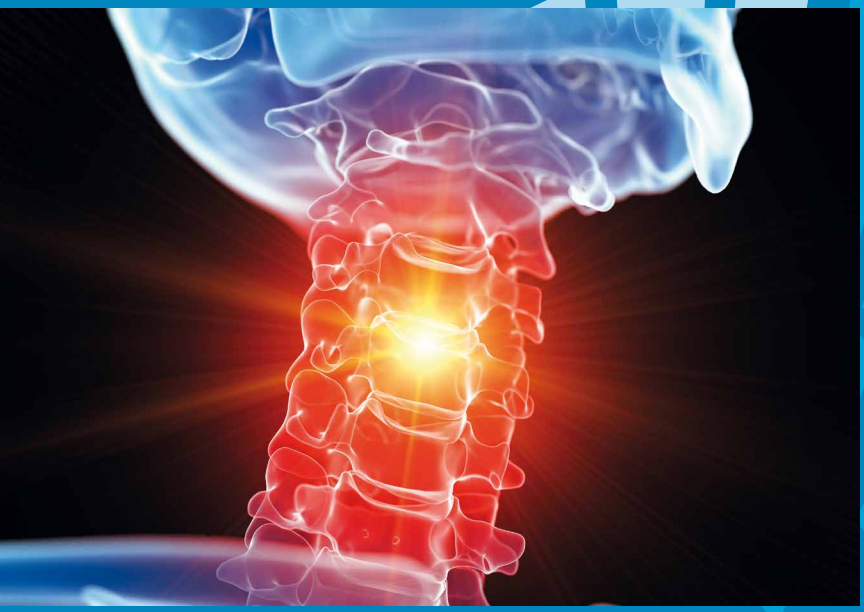


Cervical spine surgery: anterior approach

Patient Information

Introduction

You are set to undergo cervical spine surgery in the near future. This brochure provides further information on the nature of the disorder for which this surgery is carried out and about the operation itself. It also includes an overview of the admission procedure and areas requiring specific attention once you are discharged from hospital. Finally, it includes a number of useful contact data you can refer to after you have been discharged from hospital.

An operation on the cervical spine is executed via the front (anterior approach) or rear (posterior approach) of the neck. This is decided on the basis of the nature of the disorder, the site of the anatomical abnormality vis-à-vis the spinal cord and/or nerve structures and, where applicable, the need to fix one or more vertebrae.

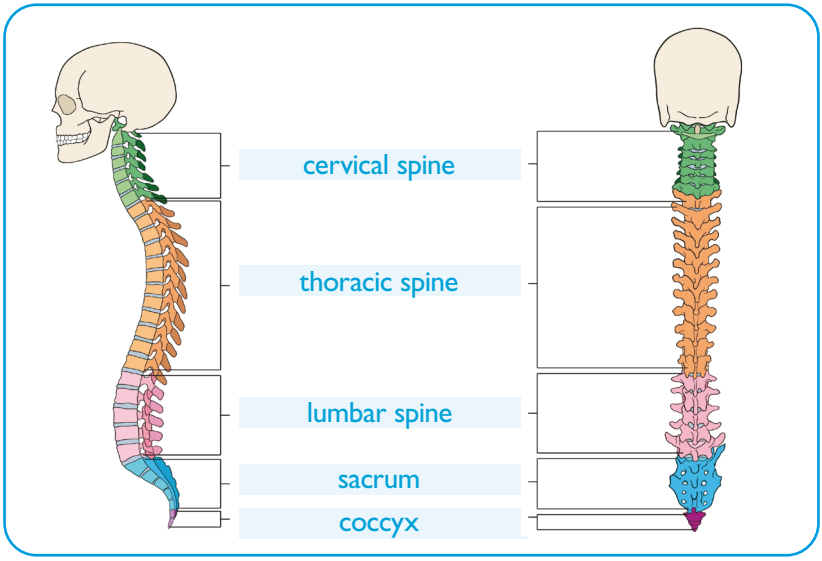
Your surgeon has opted, in consultation with you, for surgery with an anterior approach. This brochure focuses specifically on this type of surgery.

Should you have any questions after reading this brochure, please do not hesitate to contact a doctor or nurse. Being well informed will make you feel more comfortable and less anxious, which will contribute to a smoother recovery process.

CERVICAL SPINE ANATOMY

The spine is made up of individual vertebrae. Going from top to bottom there are seven cervical or neck vertebrae, twelve thoracic or chest vertebrae, and five lumbar vertebrae. The sacrum is located below the lumbar vertebrae and below that the coccyx (see illustration below). The cervical vertebrae support the neck and are directly connected to the back of the skull.

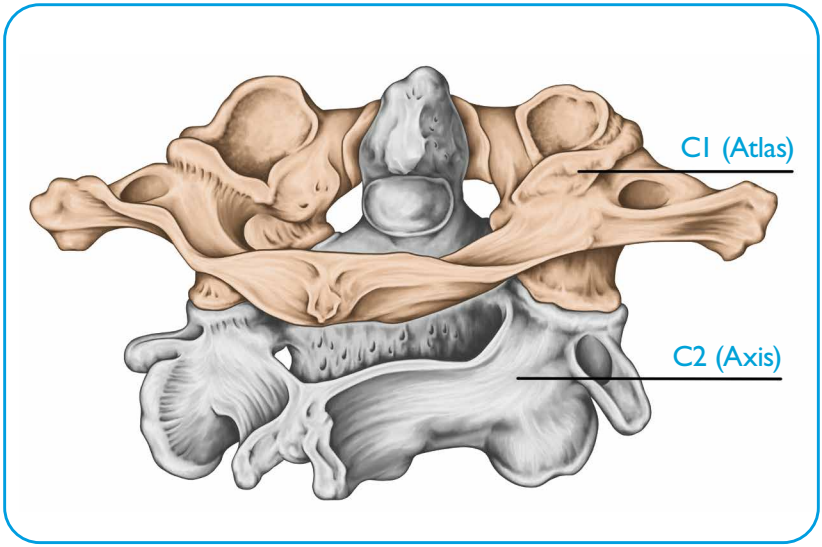
Cervical vertebrae are identified anatomically with the letter C together with the number of the vertebra. There are seven cervical vertebrae in total, numbered from top to bottom with C1 to C7.



Side and rear view of the spine

The first cervical vertebra, C1, is also referred to as 'atlas', after Atlas the mythological figure who carried the firmament on his shoulders. C1 connects the spine to the head, and supports the head. Contrary to other cervical vertebrae, C1 has a ring shaped rather than a body shaped structure. It is a fairly small vertebra.

The second cervical vertebra, C2, is also referred to as the 'axis' vertebra. It is a large cervical vertebra, with an upward protrusion that looks a bit like a tooth (dens axis). The dens forms a joint with the C1 vertebra and facilitates most of the neck motions to the left and right. Breakage of the dens axis is quite common and often a reason for surgery.



C1 (atlas) and C2 (axis), with rear view of the joint between the dens axis and C1 ring that facilitates most of the neck motions/rotation

The third to seventh cervical vertebrae, C3 to C7, have a more consistent structure. Similar to the vertebrae lower down the spine, they consist of a vertebral body and a vertebral arch.

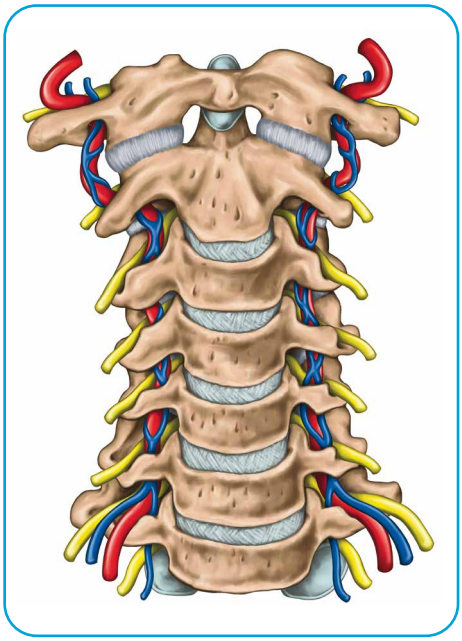
The vertebral arch consists of:

- ✗ two transverse processes
- ✗ four joint surfaces that make contact with the adjacent vertebrae
- ✗ the lamina which protects the rear of the spinal canal
- ✗ a spinous process that protrudes toward the skin and can be felt at the back

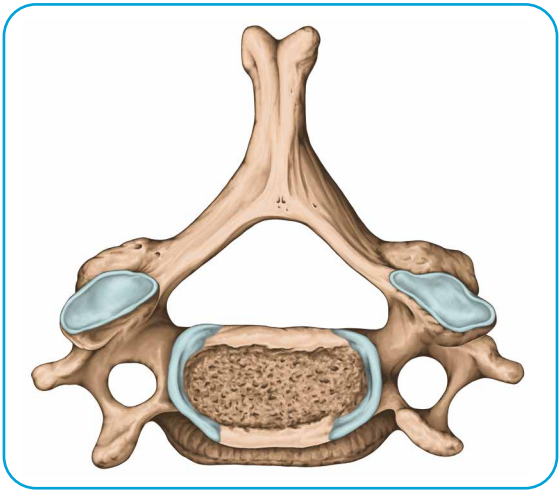
Contrary to the vertebrae lower down the spine, the transverse processes of vertebrae C1-C6 have an opening either side accommodating the arteries (arteria vertebralis) that supply blood to the brain stem and cerebellum.

Together the vertebral body and vertebral arch enclose a circle shaped opening. Stacked together the vertebrae thus create a channel: the spinal canal. The spinal cord runs through this channel in the cervical and thoracic spine.

The spinal cord is a direct continuation of the brain stem and contains all the nerve structures needed for the control and sensory impulses of the torso and limbs. Below the vertebral arch on each vertebra a nerve root protrudes on both sides. These nerve roots originate in the spinal cord. Intervertebral discs between adjacent vertebrae act as a shock absorber and joint. These intervertebral discs consist of a strong outer ring and a soft, gel like, core.



Frontal view of the entire cervical spine, including vertebrae C1 to C7.
An artery runs to the brain stem and cerebellum on both sides of the cervical spine (coloured in red).
The nerves leaving the cervical spine at each level are shown in yellow.



Top view of one of the cervical vertebrae in series C3 to C7 with the different anatomical elements

WHAT ARE THE REASONS FOR SPINAL SURGERY?

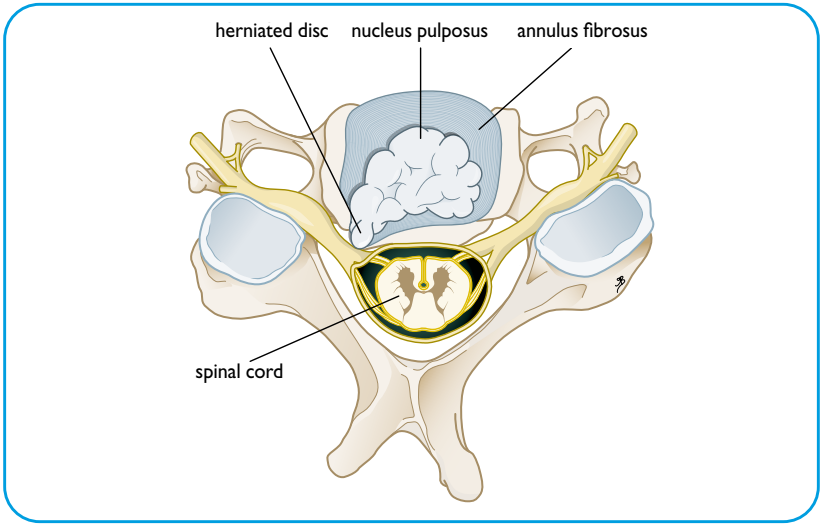
Most surgical interventions on the cervical spine are related to disorders that put pressure on the nerve root or spinal cord. They are usually caused by a herniated disc or bone growth and thickening of the ligaments as a result of wear and tear (degenerative disorders).

Other than that, operations are frequently related to accidents involving broken bones, tumours, inflammatory disease or congenital defects of the cervical spine. These interventions are less standardised and are consequently not covered in this brochure. Obviously surgeons will be happy to provide further information on these kinds of operations.

HERNIATED DISC

Similar to the vertebrae in the lower back, cervical vertebrae are connected by intervertebral discs. They not only act as shock absorbers, but also facilitate the spine's flexibility. An intervertebral disc consists of a soft inner core (nucleus pulposus) surrounded by a tough exterior (annulus fibrosus). Because the intervertebral discs facilitate the spine's flexibility they are under pressure and subject to wear and tear. This can cause a tear in the tough exterior (annulus fibrosus), resulting in the soft core (nucleus pulposus) protruding from the spinal canal. This is referred to as a herniated disc.

Herniated discs in the neck usually occur at levels C5-C6 or C6-C7, although they can also occur at other levels. Because of the close-



ness between the soft nerve structures and the rigid spinal canal, a herniated disc can often put pressure on one of the protruding nerve roots or the spinal cord.

Pressure on a protruding nerve root usually results in pain radiating into area that receives sensory impulses from the corresponding nerve. It is referred to as radicular pain, which often radiates from the neck down into the hand. It may also cause loss of feeling, numbness or tingling in the area covered by the nerve. Severe nerve root compression may lead to loss of strength in the muscle groups that are controlled by the corresponding nerve.

A herniated disc in the neck can also put pressure on the spinal cord, particularly if it is extensive or midline. This is often more serious than nerve root compression and can lead to dysfunction of the spinal cord.

Such cases are referred to as myelopathy. These symptoms often manifest themselves in the arms and legs, resulting in problems walking, instability, sensory complaints or a reduction in fine motor skills. Severe cases can even lead to problems when urinating or passing stools.

A herniated disc can repair itself spontaneously after a few weeks or months. In many instances it is initially a case of wait and see and the problem will resolve itself spontaneously. Loss of strength or signs of myelopathy, however, are usually reasons for surgical intervention in the short term. If there is no cause for alarm, but the pain is persistent, it may be decided after the initial waiting period to resort to surgery after all to treat the herniated disc. Examples of a conservative approach include (temporary) adjustment of day to day activities, painkillers or physiotherapy. If the pain is too severe it may be decided to resort to an epidural infiltration procedure, during which an anaesthetic and cortisone are injected into the site of the nerve root.

DEGENERATIVE DISORDERS

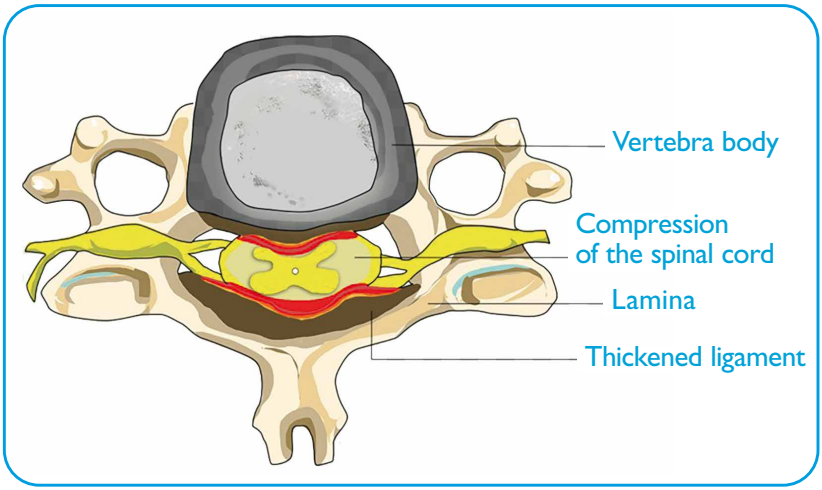
As we get older degenerative disorders gradually start to occur in many parts of the body. These abnormalities are a form of wear and tear and will consequently get worse as we age. They tend to occur in places subject to a lot of movement and pressure such as the knees, hips, shoulders, etc.

In the spine these degenerative disorders mainly manifest themselves in the lower back and lower cervical vertebrae (C5 to C7). In anatomical terms degenerative disorders of the spine usually affect the intervertebral discs, the joints between vertebrae and the ligaments that interconnect the vertebrae.

Wear and tear causes extra bone growth, thickening of the ligaments and swelling of the joint structures. This leads to narrowing of the spinal canal or the site where the nerve root protrudes. The results are similar to those associated with a herniated disc, i.e. compression of the nerve roots or spinal cord.

Contrary to a herniated disc, degenerative disorders will not spontaneously improve in structural or radiological terms. Complaints caused by nerve root compression can in some cases improve spontaneously. There is no definitive explanation for this. It is probably due to inflammation of the nerve root during an acute phase, which then gradually settles down. This means that the pain can be alleviated even though there are still signs of compression on the scans.

Signs of myelopathy or loss of strength in the arms or hands with degenerative disorders of the neck will also lead to surgical intervention sooner rather than later.



PLANNING OF ADMISSION TO HOSPITAL

If a decision is made to proceed with an anterior cervical operation, you will be referred to the anaesthesia unit for a preoperative examination.

You will have to complete a questionnaire in preparation for this consultation, which relates to potential allergies and other disorders, your lifestyle and previous operations you may have had. It would be useful to take a summary of any medication you are taking and results of recent blood, heart or lung examinations to the consultation so that the anaesthetist can check them. Finally, if you have a blood group card, you should also take that with you. It is important that you visit the anaesthesia unit before your admission to ensure that this process runs as smoothly as possible.

During the consultation someone will run through the questionnaire with you. Your general health will be checked, the type of anaesthesia and pain management, and any potential risks will be discussed with you. You will also be advised which medication you can or cannot take prior to the operation.

If necessary additional examinations may be carried out. If these examinations cannot be done immediately, you will be given an appointment for them.

Once the anaesthetist gives their approval your admission date will be confirmed, usually in writing.

YOUR ADMISSION TO THE WARD

Usually you will be admitted to the ward in the afternoon on the day before, or on the morning of the operation.

We would ask that you only bring essential items to the hospital because storage space is at a premium on the ward. Valuable items should be left at home.

It is advisable to bring the following:

- ✔ Any medication you are currently taking in its original packaging, which the nursing staff will look after on your behalf.
- ✔ Comfortable clothing allowing free movement during exercises on the ward and to go home in.
- ✔ Nightwear, dressing gown
- ✔ Sturdy, enclosed slippers or sports shoes
- ✔ Toiletries, towels and face cloths
- ✔ Razor
- ✔ Books and/or magazines
- ✔ Loose change, for example, to buy magazines
- ✔ Charger for your mobile phone
- ✔ Insurance certificate

Preparation for the operation

- Shaving: the nurse may have to shave the hair in your neck because your skin has to be as smooth as possible to ensure that it is properly disinfected before the operation.
- Shower before the operation using ordinary soap. The nurse will be able to assist you.
- The following drinks are ok up to 2 hours before the operation:
  - water
  - smooth fruit juice
  - carbohydrate drinks
  - carbonated drinks
  - tea or black coffee
- Six hours before the operation you must stop taking in any solid foods or drinks other than those mentioned above. Ask the nurse or ward doctor when the operation should normally start in order to avoid it having to be postponed.

Just before the operation:

- You will be given a hospital gown.
- Remove jewellery, glasses, contact lenses, make-up, dentures, hearing aids, piercings and, where applicable, a wig, place them in the cabinet in your room and give the key to the nurse.
- The nurse will check that you have an identification tag around your wrist.
- The nurse will tell you which medication you can still take before the operation (with a sip of water).
- You will then be taken to the operating theatre.

CERVICAL SPINE SURGERY PROCEDURE WITH ANTERIOR APPROACH

All cervical spine operations are carried out under general anaesthetic. Once the anaesthetist has put you under anaesthetic, the surgeon will move your head and neck into the correct position to operate on. During an anterior approach operation you will remain on your back, usually with the head slightly tilted backwards.

You will always be given antibiotics as a preventive measure with a neck operation. If implants are used, they are often administered for 24 hours.

The incision site is marked at the left or right side of the neck. In some cases the incision will be on the same side as the anatomical abnormality. In other cases, however, it may be better to start the operation via the opposite side. Radiographic images will be used to determine the exact incision site.

Upon completion of the disinfection process and implementation of a sterile field the operation will start. Access will be gained to the cervical spine. Once the spine is reached, the surgeon will use radiographic images to check that the correct vertebra or intervertebral disc is in view. Generally, one or more intervertebral discs (discectomy) or a vertebral body (corpectomy) will be removed so that abnormal bone growth or a herniated disc can be removed. This part of the operation is carried out using optical enlargement. This is when the pressure is released from the spinal cord and protruding nerve roots.

Once the decompression process has been completed an implant (cage) or bone graft will usually be inserted in place of the removed intervertebral disc or vertebral body. This prevents the spine from collapsing

and aims to promote the fusion of the vertebrae that were operated on. Your surgeon may decide to remove a piece of bone from your hip for this purpose. If that's the case you will also have an incision there.

If the surgeon considers it necessary, a small plate may be attached at the front of the spine to reinforce the structure. The different layers in the wound will then be re-attached and a wound drain inserted. This is a thin tube connected to a Redon bottle, which collects any surplus blood or secretions from the wound once the skin has been re-attached.

The anaesthetist will then wake you up and you will be taken to the recovery room (PAZA or post-anaesthesia care unit).

In some cases a neck brace may be fitted after the operation. Your surgeon will discuss this with you.

AFTER THE OPERATION

After the operation you will be kept in the recovery room (PAZA or post-anaesthesia care unit) for a few hours for observation and subsequently taken back to the ward.

We would ask that during your admission you tell us if you are in pain or suffering persistent pain despite having been given painkillers. Pain management is very important for your recovery. It reduces the risk of complications and ensures a smoother recovery process.

In most cases you will be able to sit up again immediately after the operation and be allowed to move around on the day of the operation. This will usually be under the supervision of a physiotherapist, who will also tell you how to treat your neck correctly during the first few weeks following the operation.

Radiographic images are usually taken one or two days after the operation. The wound drain will generally be removed one or two days after the operation upon advice from the surgeon.

If there were no complications with the operation you will normally be able to leave the hospital quite quickly. Obviously the exact timing of your discharge may vary depending upon the complexity of the operation and the subsequent recovery process.

When you are discharged from hospital the doctor will provide you with the following:

- A letter for your GP containing a brief, preliminary report of the operation and your stay in hospital.
- A letter addressed to you detailing any medication you may have to take (e.g. painkillers). If you also have to take other medication we will provide you with a small amount of this medication so you don't have to go to the pharmacy on the day you are discharged
- A prescription for the pharmacy (if necessary).
- A letter detailing your check-up appointment with the surgeon who treated you. Where necessary, this may be preceded by a medical imaging appointment in order to check your recovery process. This usually happens about six weeks after your discharge from hospital.

POTENTIAL COMPLICATIONS AND AREAS OF SPECIFIC ATTENTION FOLLOWING YOUR DISCHARGE FROM HOSPITAL

Anterior interventions on the spine are quite common and in most cases without complications. The following is a summary of the main areas of discomfort and complications following this type of operation. A full summary of any possible (rare) complications is not included in this brochure.

Because the operation is carried out near the spinal cord and protruding nerve roots, the most serious risk is associated with damage of the nerve structures resulting in neurological complications. In the most severe cases this could lead to paralysis, but this is extremely rare. The risk associated with a herniated disc operation is estimated at less than 1%.

Similar to other operations on the spine, some bleeding in the operating site may be possible. With an anterior operation this may put pressure on the spinal cord and lead to neurological complications if the bleeding occurs near the nerve structures. With this type of operations subsequent bleeding may also occur near the access point, i.e. in front of the spine, resulting in pressure on the trachea (windpipe) and breathing difficulties. Although the risk of this type of subsequent bleeding is rare (less than 5%), it usually requires another operation quite urgently in order to remove the excess blood.

With anterior operations on the spine the trachea and oesophagus have to be moved to one side temporarily in order to gain access to the spine. As a result more than half of all patients will have problems

swallowing or perceive ‘a lump in the throat’ during the first few days after the operation. This discomfort will usually disappear after one to two weeks. Only in 5% of patients will it still be noticeable after six months. Injury of the trachea or oesophagus is a serious complication usually requiring another operation, but fortunately this is extremely rare.

Because the vocal chords and associated nerve system are located in front of the spine, there may also be a degree of dysfunction in this area after anterior surgery. It may lead to hoarseness (10% of patients), but this is usually temporary. Permanent dysfunction of the vocal chords, resulting in hoarseness or voice changes, occurs in less than 5% of patients.

An operation, particularly one involving implants, is always associated with a risk of infection. With anterior cervical operations this risk is low and estimated at less than 1%.

In the long term there is a risk of the implants not growing in and the bone not healing correctly. This may lead to permanent neck problems and in certain cases may require another operation.

WHEN SHOULD YOU MAKE CONTACT?

As mentioned earlier in this brochure, serious complications are very rare.

However, you should contact our department in the following instances:

- ✔ New or worsening signs of neurological complications :
  - loss of strength in the arms or legs
  - loss of feeling or abnormal sensations in the arms or legs
  - problems walking, feeling of instability
  - problems urinating or passing stools
- ✔ Worsening pain in the neck, arms or legs
- ✔ Wound problems (e.g. secretions, blood loss, swelling, redness, opening of wound edges)
- ✔ Fever during the first 3 weeks after the operation
- ✔ Swallowing problems or hoarseness getting worse

Obviously you can always contact us should you be worried for any other reason.

The hospital has a 24/7 emergency service for spinal problems, which is manned even at night and at weekends. In the event of acute problems, you can go directly to our A&E department.

USEFUL CONTACT DATA

Doctor on call for spinal problems (via central switchboard)	tel. 016 33 22 11
A&E UZ Leuven Gasthuisberg Campus	tel. 016 34 39 00
Neurosurgery Department	tel. 016 34 45 20
Orthopaedics Department	tel. 016 33 81 10
Neurosurgery Secretariat	tel. 016 34 42 90
Orthopaedics Secretariat	tel. 016 33 88 27

NOTES

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