NATIONAL INSTITUTE FOR HEALTH AND CARE EXCELLENCE

Medical technology consultation document

Senza spinal cord stimulation to treat chronic back and leg pain after failed back surgery

The National Institute for Health and Care Excellence (NICE) is producing guidance on using Senza HF10 to treat chronic back and leg pain following failed back surgery in the NHS in England. The medical technologies advisory committee has considered the evidence submitted and the views of expert advisers.

This document has been prepared for public consultation. It summarises the evidence and views that have been considered, and sets out the draft recommendations made by the committee. NICE invites comments from the public. This document should be read along with the evidence base (see Sources of evidence considered by the committee).

The advisory committee is interested in receiving comments on the following:

- Has all of the relevant evidence been taken into account?
- Are the summaries of clinical effectiveness and resource savings reasonable interpretations of the evidence?
- Are the provisional recommendations sound, and a suitable basis for guidance to the NHS?
- Are there any equality issues that need special consideration and are not covered in the medical technology consultation document?

Note that this document is not NICE's final guidance on Senza SCS to treat chronic back and leg pain after failed back surgery. The recommendations in section 1 may change after consultation. After consultation the committee will meet again to consider the evidence, this document and comments from public consultation. After considering these comments, the committee will prepare its final recommendations which will be the basis for NICE's guidance on the use of the technology in the NHS in England.

For further details, see the Medical Technologies Evaluation Programme process guide and Medical Technologies Evaluation Programme methods guide.

Key dates:

- Closing time and date for comments: 17:00 on Monday 21 May 2018
- Final guidance committee meeting: 22 June 2018

NICE medical technologies guidance addresses specific technologies notified to NICE by sponsors. The 'case for adoption' is based on the claimed advantages of introducing the specific technology compared with current management of the condition. This case is reviewed against the evidence submitted and expert advice. If the case for adopting the technology is supported, then the technology has been found to offer advantages to patients and the NHS. The specific recommendations on individual technologies are not intended to limit use of other relevant technologies which may offer similar advantages.

1 Draft recommendations

1.1 The case for adopting Senza spinal cord stimulation (SCS) as a treatment option for chronic back and leg pain after failed back surgery is supported by the evidence. Senza SCS is as effective as low-frequency SCS in reducing pain and functional disability, but avoids the experience of tingling sensations (paraesthesia).

1.2 Senza SCS should only be considered for patients:

- with residual back and leg pain (at least 50 mm on a 0 mm to 100 mm visual analogue scale) at least 6 months after back surgery despite conventional medical management and
- who have had a successful trial of stimulation as part of a wider assessment by a multidisciplinary team.

1.3 Cost modelling indicates that, over 15 years, Senza SCS has similar costs to low-frequency SCS using either a rechargeable or non-rechargeable device.

1.4 People using Senza SCS for chronic back and leg pain without previous back surgery should have the option to continue treatment until they and their clinicians consider it appropriate to stop.

2 The technology

Description of the technology

2.1 The Senza spinal cord stimulation (SCS) system (Nevro) is a neuromodulation device that delivers electrical impulses to the spinal nerve root. The treatment Senza provides, known as HF10 therapy is a combination of high-frequency (10 kHz) low-amplitude electrical pulses designed to relieve pain and not be felt by the patient and a proprietary programming algorithm. The impulses are delivered by small electrodes, which are surgically placed in the spinal epidural space and are connected to a small, battery-powered pulse generator that is implanted under the skin. The strength, duration and frequency of the electrical pulses can be controlled remotely. Senza SCS is referred to as Senza in the main body of this guidance.

2.2 Senza was CE marked as a class III device in May 2010 and is intended to be used only for patients who have had effective pain relief in a trial of stimulation. Patients who have a Senza device in place should not have shortwave, microwave or therapeutic ultrasound diathermy because of the risk of severe injury or death. They should only be exposed to MRI under conditions outlined in the instructions for use and the full-body MRI conditional label issued in November 2017.

2.3 The company also offers a newer system called Senza II, which delivers the same HF10 therapy. Senza II is intended for use in patients with a low BMI who need a smaller device. It has not been considered as part of this evaluation.

2.4 The cost of Senza, as stated in the company's submission, is £16,648 (excluding VAT). This includes electrodes, leads, an implantable pulse generator (with rechargeable battery), a remote control and a battery charger.

2.5 The claimed benefits in the case for adoption presented by the company are that compared with low-frequency SCS, Senza is associated with:

- clinically superior pain relief, as well as better clinical and functional outcomes, for most people with back or leg pain
- no paraesthesia, so treatment can be continued during sleep and while driving or operating machinery
- sustained and long-term improvement in pain relief and function, which may reduce the need for pain medication and follow-up attendance at pain clinics
- no need for paraesthesia mapping during implantation, which allows for shorter and more predictable procedure times.

Current management

2.6 NICE technology appraisal guidance on spinal cord stimulation recommends SCS as a treatment option for adults with chronic pain of neuropathic origin that continues for at least 6 months despite conventional medical management (including pharmacological treatment, physiotherapy and psychological support) who have had a successful trial of stimulation as part of a wider assessment by a multidisciplinary team. SCS is not recommended for adults with chronic pain of ischaemic origin, except in the context of research. The devices considered in the guidance deliver low-frequency SCS. A review of the guidance in 2013 concluded that more recent evidence (including evidence on Senza) would be unlikely to change the recommendations, so the guidance was placed on the static list.

2.7 NICE has also produced related guidance on neuropathic pain in adults in non-specialist settings and on low back pain and sciatica in over 16s.

3 Evidence

Summary of clinical evidence

3.1 The evidence for Senza considered by the external assessment centre (EAC) comprised 9 studies in adults with chronic neuropathic pain, 3 of which became available during the first consultation. These were:

- 2 randomised controlled trials comparing Senza and low-frequency SCS (Senza-RCT [Kapural et al. 2015 and 2016] and De Andres et al. 2017)
- 1 before-and-after study (Tiede et al. 2013)
- 5 single-arm observational studies (Al-Kaisy et al. 2014, Russo et al. 2016, Rapcan et al. 2015, Al-Kaisy et al. 2017a and Al-Kaisy et al. 2017b)
- 1 retrospective chart review (Van Buyten et al. 2017).

For full details of the clinical evidence, see section 3 of the assessment report and the supplementary EAC report.

Main points from the EAC's analysis of the clinical evidence

3.2 The EAC considered 3 studies to be the most relevant to the decision problem and provided the best quality evidence: Senza-RCT, De Andres et al. 2017 and Van Buyten et al. 2017. The 2 randomised controlled trials reported conflicting findings about the benefits of HF10 therapy delivered by Senza compared with low-frequency SCS. Van Buyten et al. (2017) is a retrospective chart review that reported the rates and reasons for removing SCS devices in 4 centres which had done 955 implantations (155 of which were Senza) in 822 patients.

3.3 The remaining 6 studies were single-arm observational studies, the results of which were generally supportive of the benefits of HF10 therapy delivered by Senza that were reported in Senza-RCT. The highest quality of these was Al-Kaisy et al. (2014), which reported results up to 2 years

after Senza implantation. The EAC concluded that the evidence to support the claimed benefits of the superiority of Senza compared with low-frequency SCS was uncertain. It also noted the lack of long-term outcome studies and the absence of a sham control.

Summary of economic evidence

3.4 The company's economic model was based on a published cost-effectiveness study (Annemans et al. 2014) comparing Senza separately with conventional medical management, reoperation and low-frequency SCS devices (both rechargeable and non-rechargeable). The model, which was also used to inform NICE technology appraisal guidance on spinal cord stimulation (Simpson et al. 2008), was a 2-stage decision analytic model that used a decision tree for the first 6 months, followed by a Markov state transition model with a 15-year time horizon. For full details of the economic evidence see section 4 of the assessment report and section 7 of the EAC advice document on the consultation comments.

EAC's analysis of the economic evidence

3.5 The EAC considered Annemans et al. (2014) to be of high quality and the company's cost model to be of good methodological quality. It was therefore initially satisfied with the reported results and sensitivity analyses. However, the publication of Van Buyten et al. (2017) during the first consultation provided additional explant data to refine the cost model. The EAC estimated the value for 'explantation rate for any reason' used in the cost model by extrapolating the data available from Van Buyten et al. for explantations because of inadequate pain relief. For further details see the EAC supplementary report.

3.6 Many of the costs in the model, including the acquisition costs for Senza and its comparators, were adjusted for inflation from the original values in the Annemans et al. study. The EAC considered it inappropriate to inflate drug prices in this way because they are subject to a wide range of non-inflationary factors. The EAC explored this further with 4 hypothetical

scenarios to assess how different drug costs affect the cost consequences of using Senza.

3.7 The main drivers of the cost modelling results were acquisition costs, explantation rates and device lifespan, particularly for non-rechargeable SCS devices, which need to be replaced around every 4 years. The company's base-case results showed that, over 15 years, Senza could lead to cost savings of £4,795 compared with rechargeable low-frequency SCS devices and £7,755 compared with non-rechargeable low-frequency SCS devices.

4 Committee discussion

Clinical effectiveness

4.1 The committee considered the clinical evidence and noted the conflicting results from the 2 randomised controlled trials (Senza-RCT and De Andres et al. 2017). The committee noted that Senza-RCT demonstrated statistically significantly better pain reduction using HF10 therapy delivered by Senza compared with low-frequency SCS, but in De Andres et al. there was no significant difference between the 2 treatments in this regard. The committee agreed with the EAC that the clinical-effectiveness evidence was uncertain, but concluded that there was no evidence to suggest that Senza is clinically inferior to low-frequency SCS. The expert advisers explained that the low-frequency SCS devices used in the studies work in the same way as those used in standard clinical practice in the NHS.

4.2 The committee noted weaknesses in both randomised controlled trials, including the potential for bias and concerns about the relevance of the results to patients in the NHS. It also noted that current studies are limited to 2-years' follow-up. A clinical expert explained that 3-year outcomes data will soon be available, and the ultimate intention is to collect 5-year follow-up data. The committee considered that long-term outcomes data

would be particularly important, given that Senza and other similar devices have a lifespan of at least 10 years.

Avoiding paraesthesia

4.3 People having low-frequency SCS often experience paraesthesia (or tingling sensations), but this is not the case with high-frequency SCS (such as with Senza). The clinical experts explained that this accounts for some differences in the implantation procedure. Paraesthesia mapping is routinely done only when implanting low-frequency SCS devices, and this can increase procedural time and complexity. Furthermore, the experts explained that paraesthesia continues throughout the use of low-frequency SCS devices and that this can impair day-to-day living. For example, intense paraesthesia may be distracting enough to interrupt sleep or prevent tasks such as driving or operating machinery. However, the committee heard that some patients (usually those who have had low-frequency SCS for a long time) find the presence of paraesthesia reassuring, because it confirms that the device is still working. The committee concluded that paraesthesia after SCS device implantation is an important issue that should be discussed with patients before choosing a device.

Patient selection

4.4 The committee noted that most of the higher quality evidence for the clinical benefits of Senza is in people who have had failed back surgery and who mainly have chronic back or leg pain. The clinical experts agreed that this is the largest patient group who may benefit from Senza, but they highlighted other groups who may also benefit (such as people for whom surgery is either not possible or unlikely to be successful, and people with neuropathic pain of other causes or complex regional pain syndrome). However, the committee concluded that there is limited evidence available for Senza in these patient groups. It noted that more evidence about the potential role of Senza in these difficult clinical circumstances would be beneficial.

Mode of action

4.5 The clinical experts advised that HF10 therapy delivered by Senza uses different physiological mechanisms to low-frequency SCS, but these are not yet fully understood.

NHS considerations

4.6 The clinical experts explained that because paraesthesia mapping is not needed when using Senza, implantation procedure times may be shorter and more predictable compared with those for low-frequency SCS devices. The committee concluded that these factors had not been quantified in the published studies and so were not included in the cost modelling, but it agreed that it was plausible that using Senza may allow for better planning of procedure times (thereby potentially increasing the number of procedures per operating list).

4.7 The clinical experts explained that when first adopting Senza in their services, the company provided trained experts to attend procedures and support clinicians until competence had been achieved. This was confirmed by the company representatives who attended the meeting.

4.8 The clinical experts also explained that there may be further time savings when using Senza at follow-up appointments because, in their experience, programming is easier and less time-consuming than with low-frequency SCS devices.

Charging the device

4.9 Based on NHS Supply Chain purchase data, the committee concluded that the most used low-frequency SCS devices in the NHS are rechargeable. The clinical experts explained that although Senza is also rechargeable, it needs to be charged more often that most low-frequency SCS devices (for 30 to 45 minutes each day). The committee concluded that recharging is an important factor that should be discussed with patients before choosing a device.

Cost savings

4.10 The committee noted that the company's cost model replicated that used to inform NICE technology appraisal guidance on spinal cord stimulation, and that the model has also been subjected to peer review before being published elsewhere. It agreed with the EAC that supplementation of the model with data from Van Buyten et al. (2017) was appropriate.

4.11 The committee noted that the model assumed a time horizon of 15 years. This is appropriate for a long-term condition, but the clinical outcomes data are currently limited to 2 years after implantation. Nonetheless, it noted the EAC's conclusions from a technical evaluation that the claimed lifespan of Senza is plausible. Clinical experts also explained that they had seen no evidence in their own clinical practices to suggest that the effectiveness of Senza diminishes over time.

4.12 The committee noted the uncertainties in the cost model associated with the use of drug costs adjusted for inflation. The EAC explained that accurately estimating the cost of drug management in the relevant patient groups would be difficult.

4.13 Having acknowledged that the acquisition costs of Senza and the comparators were an important driver of the cost modelling results, the committee noted that these had also been adjusted for inflation from the cost model used to inform NICE technology appraisal guidance on spinal cord stimulation. Acquisition costs in the model were assumed to be:

- Senza: £16,648, with a lifespan of 10 years.
- Non-rechargeable low-frequency SCS device: £11,281, with a lifespan of 4 years.
- Rechargeable low-frequency SCS device: £17,422, with a lifespan of 10 years.

The EAC confirmed that these are an accurate reflection of current device costs.

4.14 The committee noted the results of the EAC's updated cost model (which included explantation data from Van Buyten et al. 2017), which showed that:

- Over 15 years, compared with using a non-rechargeable low-frequency SCS device, Senza is cost incurring by £351 per patient (£23.40 per year).
- Over 15 years, compared with using a rechargeable low-frequency SCS device, Senza is cost saving by £2,292 per patient (£152.80 per year).

The committee concluded that, despite the uncertainties in the cost model and the extrapolations made over the 15-year time horizon, it is unlikely that using Senza will incur additional overall costs compared with using low-frequency SCS devices.

Peter Groves
Chair, medical technologies advisory committee
April 2018

5 Committee members and NICE project team

Committee members

This topic was considered by the medical technology advisory committee which is a standing advisory committee of NICE.

Committee members are asked to declare any interests in the technology to be appraised. If it is considered there is a conflict of interest, the member is excluded from participating further in that evaluation.

The minutes of each committee meeting, which include the names of the members who attended and their declarations of interests, are posted on the NICE website.

NICE project team

Each medical technologies guidance topic is assigned to a team consisting of 1 or more health technology analysts (who act as technical leads for the topic) and a technical adviser or senior technical analyst.

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