Background to sacral nerve stimulators (SNS)

A sacral nerve stimulator is an active implanted medical device which aims to improve bladder or bowel function in patients with urinary retention, overactive bladder symptoms and/or chronic faecal incontinence [1]. This urinary/ bowel control is achieved via the transmission of electrical signals to the sacral nerves [2]. The most commonly implanted SNS systems are the Medtronic Interstim and Interstim II. Components of these systems are described below and illustrated in *Figure 1*.

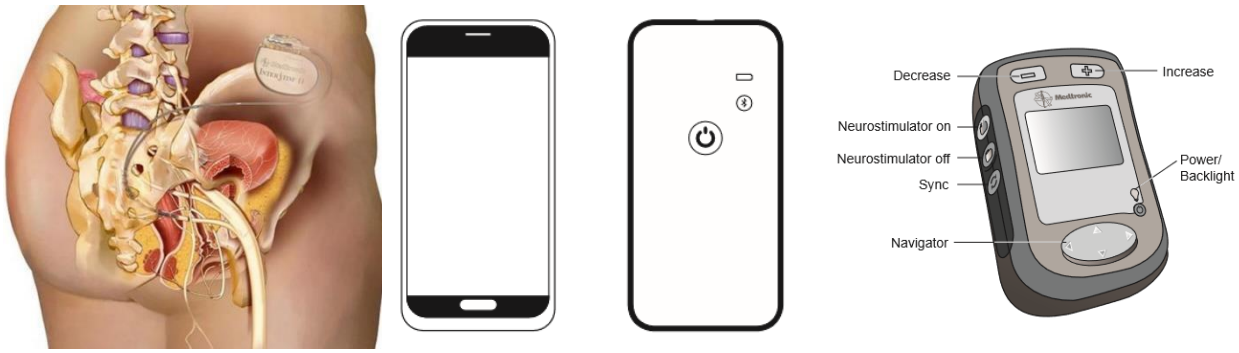

Figure 1: Interstim system components. Left: Example schematic of implanted SNS illustrating its location within the body. Centre: HH90 Handset and TM90 Communicator. Right: InterStim iCon Model 3037 Patient Programmer.

- **Lead** – this is a fine wire, containing four separate electrodes that can each be stimulated individually or in various combinations to tailor the neuromodulation therapy to the individual's needs.
- **Pulse generator** – this is the small battery that drives the system. It generally needs replaced every 6-7 years.
- **Programmer** – this is the small remote control that allows the patient to adjust the SNS device themselves and for them to turn it off and on. These are MR Unsafe and must not be taken into the MR Environment. Instructions on how to operate each type of programmer are provided in the latest manufacturer guidelines.

Risks of undergoing an MRI scan with an implanted SNS device

If the MR Conditions are followed then the risk of an adverse event is minimal. If performing a risk-benefit analysis to scan off-label, the following risks should be considered regarding the scanning of neurostimulation devices [3]:

- Motion, dislocation and torquing of the implanted pulse generator may be felt as tugging and/or vibration of the neurostimulator and may result in patient discomfort and/or permanent patient injury.
- Changes to the neurostimulator program (e.g. re-set) may require reprogramming of the device by the clinician or device specialist.

- Damage to the neurostimulator components that may be caused by static or pulsed magnetic fields may result in explant or replacement and thus the potential for abandoned leads within the body.
- Voltages and currents in the neurostimulator lead induced by pulsed gradient magnetic fields and/or pulsed radiofrequency (RF) fields may stimulate or shock the patient.
- The electromagnetic RF field can cause heating of the device, in particular at the lead-electrode site, which may result in tissue damage and/or permanent patient injury. This heating effect is strongly affected by the electrode configuration, the type of RF coil and the specific absorption rate (SAR).
- Image artefact caused by magnetic inhomogeneity and patient movement.

Off-label MRI scanning of the neurostimulator or abandoned leads could result in serious patient injury and/or damage to the implant. Off-label MR scanning should follow MHRA published guidelines in which suitable risk/benefit analysis should be performed.

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