SUMMARY OF: PMA # P930039/S130 (BUNDLED WITH P980035/S424)
CAPSUREFIX NOVUS MRI SURESCAN LEAD, MODEL 5076 MRI
MEDTRONIC

EXECUTIVE SUMMARY/BACKGROUND

The Model 5076 MRI lead is identical to the currently marketed 5076 lead (P930039/S009) and has been approved for use with the Advisa DR MRI system (P930039/S107, October 2014). It is a steroid eluting, bipolar, implantable, screw-in, atrial/ventricular, transvenous lead designed for pacing and sensing applications in either the atrium or ventricle. The Advisa SR MRI system has been approved with the 5086MRI leads (P980035/S374 on March 19, 2015). The 5076 lead tip geometry and seal components are identical to that of the 5086 lead.

The approval of the 5086 MRI leads with the Advisa SR MRI system was based on modeling utilizing the Lead Heating Model 1.0, bench test as well as animal validation data. No data where submitted for the 5076 lead in P980035/S374 (March 19, 2015).

Data provided for the 5076 lead resulting in the approval for use with the Advisa DR MRI system (P930039/S107, October 2014) were based on the Lead Heating Model 1.5. A major factor for the approval was the reduction of lead tip heating when the lead is used in a dual lead configuration (tip heats ~ half as much as in the single lead configuration, Q130785 section 7). A comparison of lead heating results obtained from the various Lead Heating Models presented in various submissions (Advisa DR, 5076 for Advisa DR, Evera) raised concerns with regards to the consistency of the results and impact of various assumption made in the transition from LHM 1.0 to LHM 1.5. In a pre-submission discussion the firm was made aware of these concerns via e-mail on March 31, 2015 and responded via e-mail on April 06, 2015. The pre-submission discussion has been taking into account during the review of the submission at hand.

DESCRIPTION OF CHANGES/ REASON FOR SUPPLEMENT

Medtronic is seeking to re-label the 35cm, 45 cm, 52 cm, 58 cm, 65 cm and 85 cm 5076 MRI leads to include the MR Conditional use with the Advisa SR MRI system. It should be noted that these are the same lengths approved for use with the Advisa DR MRI system.

INDICATIONS FOR USE

THE INDICATIONS FOR USE ARE IDENTICAL TO THE PREDICATE DEVICE APPROVED IN OCTOBER 2014 (P930039/S107).

DEVICE DESCRIPTION

The Advisa SR MRI SureScan Pacing System is a MR conditional system that provides Medtronic's pacing features, such as Managed Ventricular Pacing, Rate Drop Response, and Full Automaticity (e.g. Ventricular Capture Management). The Advisa SR MRI system includes a full-featured, single chamber implantable pulse generator (IPG) and is currently approved to be used with the 5086MRI SureScan leads.

The 5076 MRI leads are steroid eluting, bipolar, implantable, screw-in, atrial/ventricular, transvenous leads designed for pacing and sensing applications in either the atrium or ventricle.

PRECLINICAL/BENCH

BIOCOMPATIBILITY/MATERIALS

No biocompatibility, sterilization or packaging data were required since neither the lead nor IPG was modified as a result of this re-labeling request.

ANIMAL STUDIES

No new animal studies were conducted as a result of this re-labeling request.

ELECTRICAL SAFETY/EMC

The key concern in approving the 5076 leads to be used in a single lead configuration (single chamber device) was that the single lead configuration has a substantially higher power deposition at the lead tip than the dual lead configurations (Q130785, section 7, Figure 34).

It should be noted that none of the clinical trials, except the last trial (Evera MRI ICD), included single lead configurations. In the Evera MRI trial single 6935M and 6947M configurations made up about 50% of the systems studied. No issues were reported.

It is acknowledged that the simulations were all performed in the single lead configuration and the additional safety margin obtained from using the dual lead configuration was actually an important factor in approving the 5076 leads with the Advisa DR MRI system. In fact, it was a point of discussion when the Advisa DR MRI system was initially approved with the 5086 MRI lead since the Advisa DR showed in some experimental measurements a 20% increase in heating (P980035/S277, page 1-57) over the Enrythm MRI. The compensating factor was the reduction in heating in the dual lead configuration. From modeling it is known that the 5076 leads heat more than the 5086 leads, as can be seen on page 1-48, Table 7 of this submission. According to the feedback from the firm LHM 1.0 does not have the option to include fluid ingress, an option only available in LHM 1.5 and 2.0. Furthermore, LHM 1.0 cannot be applied to leads other than the 5086 lead since the methodology reportedly is different (body library has changed, coil models have changed, etc.) making it difficult to retroactively generate the LHM 1.0 data for other leads.

One of the key concerns of the reviewer in the transition from the LHM 1.0 to LHM 1.5 was the potential loss of safety margin. The firm has tried to capture the clinical reality by attributing probability distributions to various input variables of the simulation process. For example, the firm utilizes 19 body models in LHM 1.5 (page 1-215) whereas LHM 1.0 utilized 22 body models (M110016/M003, page 2-34). LHM 1.5 uses a total of seven RF coil models (page 1-70) whereas LHM 1.0 only utilized data from the GE Echo speed coil. Results for LHM 1.0 seemed to indicate that this coil results in a 20% increased heating. The firm provides various rationales on page 1-225 why the modeling changes are appropriate.

The impact of changes introduced by transitioning from LHM 1.0 to LHM 1.5 is a function of lead length, potentially a function of lead family. For example, the predicted power dropped to 76, 97 and 64% for the 45, 52 and 58 cm leads of the 5086 MRI lead family. It was not clear what exactly drove the unequal change. Since the LHM 1.0 cannot be applied to the 5076 lead family or for that matter any leads except the 5086 leads, the reviewer was forced to look at the LHM 1.5 results only.

The reviewer believes that the firm has appropriately captured the clinical reality. However, in some cases the reviewer would have biased the calculations towards a more conservative outcome. For example, the firm indicated on page 1-225 that it changed the human library to include the male models in the probability calculations, based on the fact that male and female patients undergo MRI scans, even though the female models have shown to give higher heating (about 20% in LHM 1.0). The LHM 1.5 WCFL (100% occurrence of fluid ingress) seems to compensate for the difference between LHM 1.0 and LHM 1.5 and the reviewer combined the WCFL entry of Table 7 with the results of the acute and chronic PCT change vs power studies to evaluate the safety risk.

The reviewer considered two safety aspects: (a) the ability to deliver therapy during the MRI scan with a 5V, 1 msec pulse and (b) impact of a small chronic change in pacing capture threshold.

a) The highest power lever is 325 mW for the 85 cm lead. From the acute PCT changes vs power, one might expect an acute pacing capture threshold change between 0.5 and 1.5V. Acute changes must be low enough such that pacing is guaranteed during the MRI scan. The MRI conditions of use require the capture threshold to be less than 2 V, so even if the acute change is 1.5 V, the threshold would be well below the 5V utilized during the MR scan. The changes in PCT in the animal study are based on a 0.4 msec pulse width providing an additional safety margin since the pulse width during the MRI scan is set to 1 msec. The firm predicts the probability of a pacing capture threshold exceeding 4V (see Table 8, WCFL entry) to be 1:240,000; indicating a very low risk.
b) Even in the worst case scenario, utilizing the upper bound of the chronic PCT changes vs. power and the upper limit of 325 mW, the chronic change in PCT is 0.5 V or below. In fact, the firm estimates it to be 1:780 for patients with a 85 cm lead. It should be noted that less than 0.2% of the patient population (see page 1-69) has this type of lead.

The firm furthermore indicates (page 1-51) that about 11% of pacemaker patients have a single chamber device and that approximately 1% of the pacemaker patients would be critically harmed if the pacemaker would cease to deliver therapy. One can therefore conclude that the primary impact on single chamber pacemaker patient would be a reduction in battery life. The firm estimates the impact to be approximately 20% for a pacing dependent patient that is eligible to undergo an MRI. Based on the information provided, the reviewer is of the

opinion that even in the worst case scenario the benefit substantially exceeds the risk.

MECHANICAL SAFETY

No data were reviewed since data submission was not required for the re-labeling effort.

SOFTWARE

Software was not modified as part of the relabeling effort

CLINICAL DATA

No clinical data were required for this re-labeling effort.

CONCLUSION

Given the above arguments and an internal discussion conducted on May 26, 2015 I recommend approval of the submission.