PRODUCT PERFORMANCE REPORT

SUMMARY OF DATA FROM THE MEDTRONIC POST-MARKET REGISTRY

2022

v.1.0 05May2023

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Further, Together

Contents

1 Overview

1.1 Registry Background

Medtronic uses a prospective, long-term multi-center registry to monitor the performance of certain products at selected centers titled the Product Surveillance Registry (PSR). This registry was initially created by Medtronic to monitor the performance of commercially available targeted drug delivery (TDD) and spinal cord stimulation (PSTM) systems. Later on deep brain stimulation (DBS) and sacral neuromodulation (SNM) were added to the registry. This 2022 Product Performance Report (PPR) provides data on the devices followed in the registry. Medtronic also incorporates the findings of Returned Product Analysis (RPA) for devices followed in the registry that are returned to Medtronic.

Depending upon geography, this report may contain information outside approved labeling for the Medtronic commercially available devices. It is recognized that healthcare providers prescribe approved therapies to meet specific patient needs; however, Medtronic only directs the use of its products according to geography-specific, approved labeling.

The registry has collected data from centers across North America, Europe, South America, and Asia. There have been 76 centers that have contributed data for TDD systems, 85 centers for PSTM systems, 64 centers for DBS systems, and 24 centers for SNM systems. Each registry center received Institutional Review Board or Medical Ethics Committee approval of the registry protocol and associated Informed Consent Forms (ICF). Registry patients signed an ICF prior to enrollment. Each registry center followed its standard clinical practice for device system implantation including patient selection, implant methods, and post-implant therapy management. Centers were activated after receipt of the necessary documentation, completion of training, and approval to access the web-based registry system.

1.2 Commitment to Quality

The Medtronic commitment to quality has long been stated in our Mission, "To strive without reserve for the greatest possible reliability and quality in our products; to be the unsurpassed standard of comparison and to be recognized as a company of dedication, honesty, integrity, and service."

In line with this commitment we remain focused on sharing information and appropriate updates with customers on a regular basis. Thus, we are pleased to share the 15th Annual Medtronic Neuromodulation Product Performance Report.

We are proud of our pioneering history at Medtronic and we realize the responsibility that comes with driving innovation in technology. As the first and only company to offer a full line of Spinal Cord Stimulation, Deep Brain Stimulation, Sacral Neuromodulation and Targeted Drug Delivery therapies, we believe that performance reporting is of critical importance as we strive for better performance with every new product and therapy we develop. This report shows the evolution of product performance over time and also reveals advances in therapies that come with this experience and knowledge. Through this sharing of information we can enable physicians to best leverage state-of-the-art therapy delivery and also understand the performance of our devices to best manage patients.

We have tracked 21,234 patients in our ongoing post-market registry. The registry has enrolled 65,738 Neuromodulation system components. Components include pumps, catheters, neurostimulators, leads, and extensions. Data on other events not directly attributed to product performance are also included to provide additional information that may be important for patient management. Although gastric electrical stimulation also involves neurostimulation, the performance of these systems is not included in this report.

We welcome your suggestions on content, format, and any information you may have regarding the performance of Medtronic products. If you have questions or comments, please contact us through the information provided below.

Thank you for your support.

Todd Weaver, PhD, MPH
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Clinical Research, Medical Science and Regulatory Affairs (CMRA)

1.3 Contact Information

We invite our customers to use this telephone number to call with suggestions, inquiries, or specific problems related to our products or this report.

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1.5 Trademarks of Medtronic, Inc.

Therapy	Trademarks
Targeted Drug Delivery	Ascenda™ intrathecal catheter
	SynchroMed™ implantable drug pump
Spinal Cord Stimulation	AnkerStim™
	Intellis™ neurostimulator
	Itrel™ 3 neurostimulator
	Pisces-Octad™ lead
	Pisces-Quad™ lead
	PrimeAdvanced™ neurostimulator
	PrimeAdvanced™ SureScan™ MRI neurostimulator
	Restore™ implantable neurostimulator
	RestoreAdvanced™ neurostimulator
	RestoreAdvanced™ SureScan™ MRI neurostimulator
	RestoreSensor™ neurostimulator
	RestoreSensor™ SureScan™ MRI neurostimulator
	RestoreUltra™ neurostimulator
	RestoreUltra™ SureScan™ MRI neurostimulator
	Resume™ TL lead
	Specify™ lead
	Synergy Versitrel™ neurostimulator
	Synergy™ neurostimulator
	SynergyCompact™ neurostimulator
	SynergyPlus+™ neurostimulator
	Vectris™ SureScan™ lead
	Vanta™ neurostimulator
Deep Brain Stimulation	Activa™ neurostimulator
	Kinetra™ neurostimulator
	Percept™ neurostimulator
	Soletra™ neurostimulator
Sacral Neuromodulation	InterStim™ neurostimulator
	InterStim™ Micro neurostimulator
	InterStim™ SureScan™ MRI Lead
	InterStim X™ neurostimulator

1.6 Glossary

Acronym	Term/Definition
AE	Adverse Event
CEC	Clinical Event Committee
CSF	CerebroSpinal Fluid
CRPS	Complex Regional Pain Syndrome
DBS	Deep Brain Stimulation
FBSS	Failed Back Surgery Syndrome
HLGT	High Level Group Terms
IM	Inflammatory Mass
INS	Implanted Neuro Stimulator
MedDRA	Medical Dictionary for Regulatory Activities
MRI	Magnetic Resonance Imaging
NEC	Not Elsewhere Classified
OCD	Obsessive Compulsive Disorder
PPE	Product Performance Events
PSTM	Pain Stimulation
PSR	Product Surveillance Registry
PTM	Personal Therapy Manager (TDD Therapy)
RPA	Returned Product Analysis
SAE	Serious Adverse Event
SCS	Spinal Cord Stimulation
SNM	Sacral Neuromodulation
SOC	System Organ Class
TDD	Targeted Drug Delivery

2 Methodology

2.1 Event Classification

Events currently collected in the registry include all events that appear or worsen during the registry and are a result of:

- Implanted or external components (device related),
- Implant or modification procedure (procedure related), or
- Infusion or stimulation therapy (therapy related).

Information on all deaths is also collected regardless of their relatedness to the device, implant procedure, and/or therapy.

For centers participating in the PSR protocol, specific therapy relevant events for deep brain stimulation are also collected and include:

- Negative changes in behavior from baseline,
- New or worsening depression from baseline, and
- New or worsened suicidal ideation from baseline, attempted suicide or completed suicide.

For some events related to implanted neuromodulation systems that did not exist in the MedDRA dictionary, Medtronic used their own coding system, and all results were integrated for reporting purposes.

2.1.1 Registry Definitions

In the registry, the events are defined as follows (see Figure 2.1 for the procedure to determine the event types):

- **Adverse Event:** any death or undesirable experience (associated with signs, symptoms, illnesses, or other medical events) occurring to the patient that appears or worsens during the clinical study and is possibly related to the device, procedure, and/or therapy.
- **Device Event:** an issue with any of the implantable or external system components.
- **Therapy Relevant Event:** a therapy specific event type that may or may not be related to the device, procedure, or therapy.

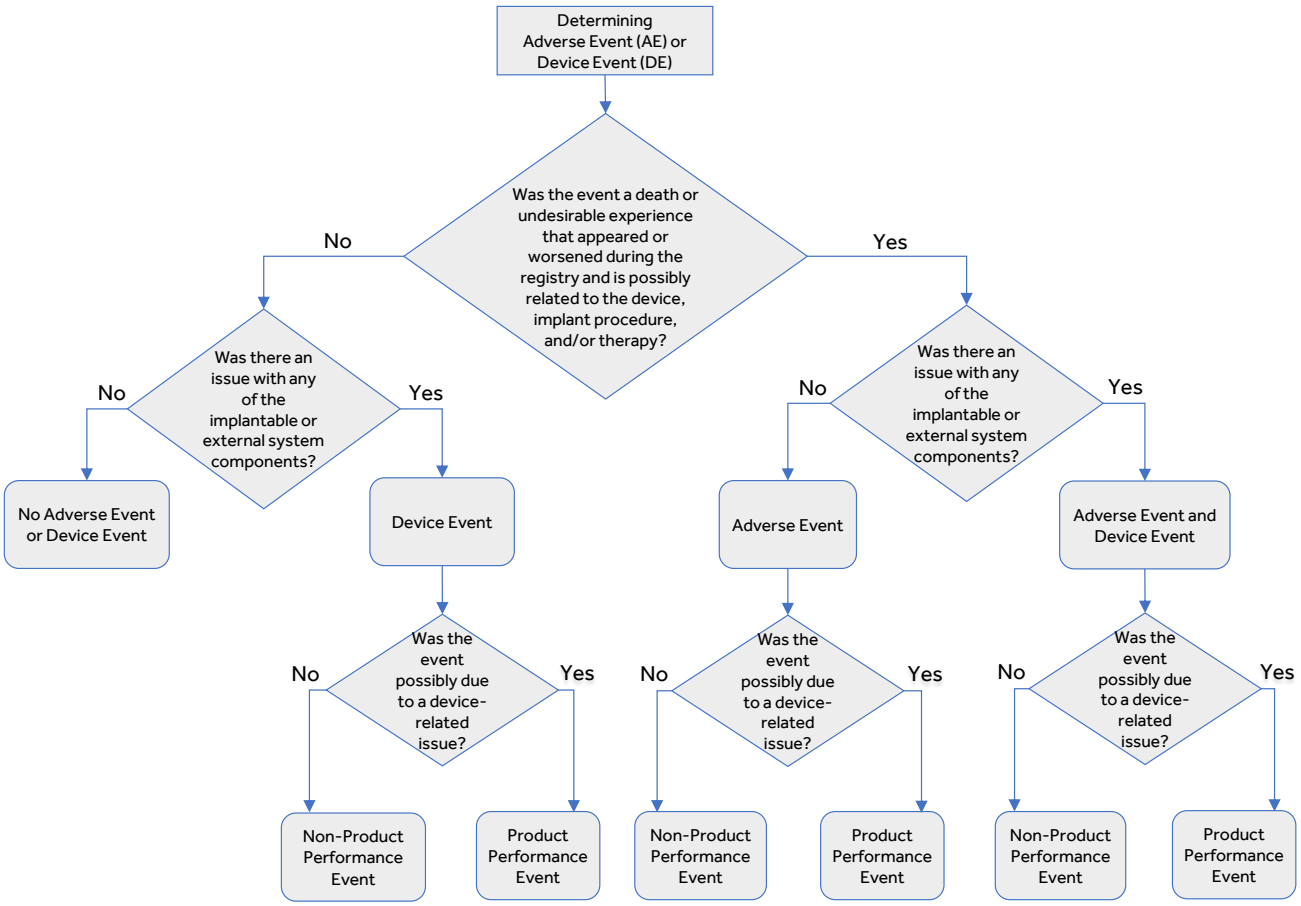


Figure 2.1: Adverse Event/Device Event Flowchart

2.1.2 Product Performance and Non-Product Performance Categorization

For analysis purposes, events collected were collapsed into two categories: product performance events and non-product performance events. All events were reviewed by Medtronic to determine if they were product performance-related (product performance events are events that are possibly due to a device-related issue). A non-product performance related event, or a clinical event not related to product performance, was any undesirable experience (associated with signs, symptoms, illnesses, or other medical events) occurring to the patient, and that appears or worsens during the clinical study. These clinical events not related to product performance possibly resulted from or were related to the implant procedure, or modification between implant and procedure, therapy, or delivery of therapy, and cannot be classified as product performance-related. All clinical events not related to a product performance and reported as a serious adverse event were summarized by MedDRA System Organ Class (SOC) if the event met a patient percentage threshold (0.5% to 1.0%).

2.1.3 Consistency and Accuracy

Consistency and accuracy of event reporting is monitored at four levels: through logic checks built into the study database as center personnel enter information; through review of each event by the study team as it is received by Medtronic; review by the Medical Advisor when necessary; and through routine monitoring at each center per Medtronic standard operating procedures. Monitoring is accomplished through a risk-based approach that aligns with the current FDA guidance on monitoring. Through this approach not every data field is monitored but an emphasis is placed on data related to the primary objective (e.g., events). Clarification and subsequent adjudication of events may be required for, but is not limited to, the following reasons:

- Inconsistency with the protocols,
- Inconsistency with the instructions provided to the centers through training materials,
- Incomplete or inaccurate event description that makes a reported event reason, event reason detail, and the clinical data appear inadequate or inconsistent,
- Medtronic Customer Support and Vigilance Complaint management requirement for additional information, or
- Center personnel initiated corrections or additions.

2.2 Device Survival Analyses

Device performance is expressed in terms of device survival estimates, where "survival" refers to freedom from a product performance event, not the survival of the patient. These survival probabilities are estimated using the Kaplan-Meier method [1]. The estimates are intended to illustrate the probability that a device will survive for a given number of years without a product performance related event.

Active surveillance normally begins at the time of implant and continues until a product performance or censoring event occurs. In some cases in the registry, active surveillance of a device starts after the device was implanted, which is called left truncation [1]. The survival probability of such a device is conditional on survival to the time when the device enters the registry. For the PPR analysis, a statistical method to incorporate data from these retrospectively enrolled devices was applied. Left truncation provides a statistical technique that uses data from existing devices while appropriately adjusting the device survival curves for the time the device was not actively followed in the registry. Thus, in some cases sample sizes may fluctuate from one time interval to the next interval.

Throughout this report, cumulative device survival plots are presented. These figures show the percentage of implanted devices that remain free from product performance-related events at various time points. This survival estimate is a good representation of the probability a device will survive a period of time without a product performance event. For example, a device survival probability of 90% indicates that through the stated follow-up time, the device had a 10% risk of incurring a product performance event since the time of implant.

The survival curves are statistical estimates. As performance experience accumulates, the accuracy of the estimation improves. Confidence intervals are provided as a way to indicate the degree of certainty of the estimates. Greenwood's formula is used to calculate the standard errors, and the log-log method is used to produce the 2-sided 95% confidence bounds [2]. This can be roughly interpreted as meaning that the true survival of the device will fall somewhere in the interval, with 95% probability. When confidence intervals for device models overlap, estimates of survival from product performance-related events may not be different between models. When confidence intervals do not overlap, estimates of survival from product performance-related events may be different between models. Statistical significance may be further evaluated using the Log-rank test or Wilcoxon test as appropriate.

The device survival curves are presented through all continuous time points where there are at least 20 devices, and are cut off at the last 3-month time point where at least 20 total devices were still being followed. Since the survival estimate can become very imprecise with small sample sizes, a minimum of 20 devices must have at least 12 months of follow-up as of the report cut-off date to present a survival curve in this report. Device survival estimates are presented at the device level, not at the system level which involves the combination of two or more devices.

2.3 Returned Product Analysis

Registry devices that are returned to Medtronic are analyzed via a Returned Product Analysis (RPA) process following protocols to confirm proper functioning or identification of root cause for any failure or deficiency. For registry pumps and neurostimulators that are returned, and for which RPA establishes a root cause or finds no anomaly, results reported herein reflect the RPA finding unless otherwise indicated in this report. When available, RPA findings are also used as one of the sources to identify the root cause of failure or deficiency for catheters and leads. In cases where the center does not explant and/or return a device, the physician-reported event reason is used for classification and analysis purposes.

Medtronic uses data from RPA as well as complaint reports from non-returned product for ongoing quality monitoring and improvement efforts. This report presents data from the registry including the results of RPA for returned devices from registry centers and patients. Data from RPA outside the registry centers and patients are not presented in this report.

REFERENCES

1. Klein, John P., Moeschberger, Melvin L. Survival Analysis Techniques for Censored and Truncated Data, New York: Springer-Verlag New York, Inc., 1997.
2. Lee, Elisa T. (2003) Statistical Methods for Survival Data Analysis — 3rd Edition (Wiley Series in Probability and Statistics).

3 Targeted Drug Delivery Systems

3.1 Study Participants

3.1.1 Centers

The targeted drug delivery tables and graphs were generated based on data collected between August 7, 2003 and the report cut-off date of October 31, 2022. Seventy-six centers spanning 13 countries/territories in North America, Europe and South America, enrolled patients and contributed patient data to the targeted drug delivery systems section of this report. Figure 3.1 shows a World Map, in which the countries that enrolled TDD patients are highlighted.

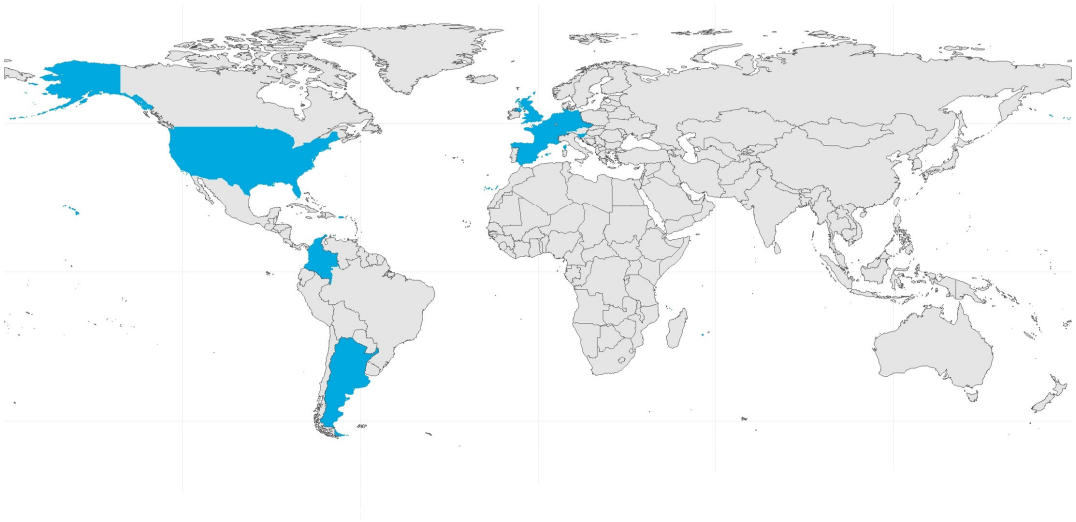


Figure 3.1: Countries with Targeted Drug Delivery Therapy Patients in Registry (Highlighted)

3.1.2 Patients

There were 10,053 total targeted drug delivery system patients enrolled through October 31, 2022. In Table 3.1 and Figure 3.2, 58.8% of patients were implanted with a targeted drug delivery system for treatment of non-malignant pain (pain not related to cancer and its treatment), followed by 21.7% for treatment of spasticity, and 17.3% for treatment of malignant pain (pain

related to cancer). Primary treatment indication is provided by the physician. The sites of pain for the malignant pain patients are presented in Table 3.2, while the sub-indications for the non-malignant pain and the spasticity patients are presented in Table 3.3 and Table 3.4, respectively.

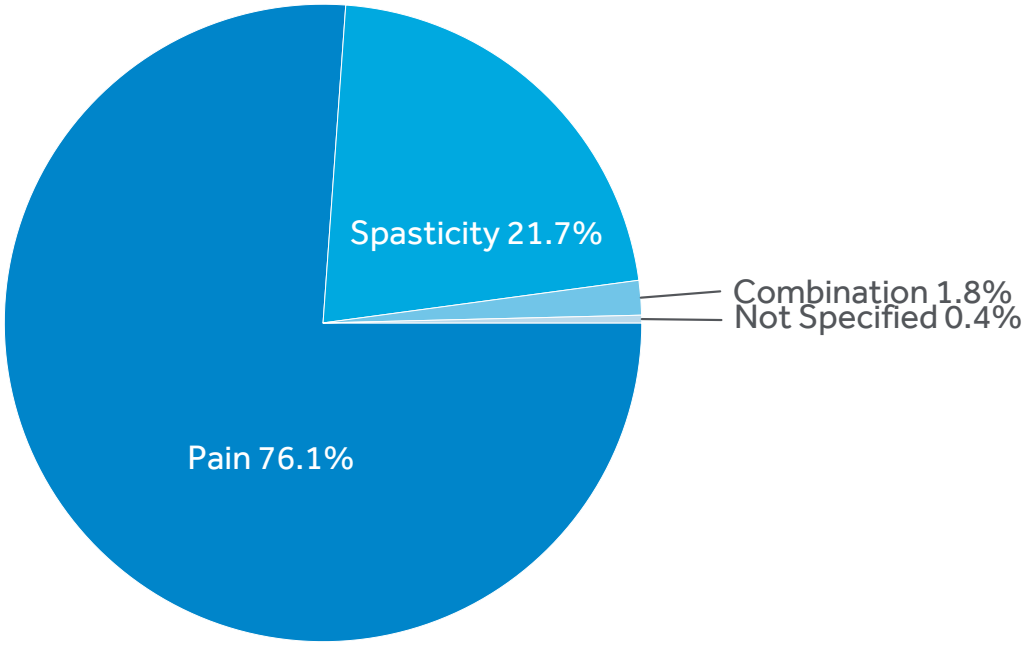


Figure 3.2: Targeted Drug Delivery Primary Treatment Indications

Table 3.1: Targeted Drug Delivery Primary Treatment Indications

Primary Treatment Indication[a]	Enrolled Patients (%)
Pain	**7,654 (76.14%)**
Non-malignant pain	5,911 (58.80%)
Malignant pain	1,742 (17.33%)
Pain, Not specified	1 (0.01%)
Spasticity	**2,184 (21.72%)**
Combination	**176 (1.75%)**
Non-malignant pain & Spasticity	173 (1.72%)
Malignant pain & Chemotherapy	1 (0.01%)
Malignant pain & Spasticity	1 (0.01%)
Non-malignant pain & Chemotherapy	1 (0.01%)
Not Specified[b]	**39 (0.39%)**
Total Patients	**10,053 (100%)**

[a] For approved indications refer to product labeling for your geography.

[b] Includes incomplete data forms at the time of the data snapshot and exited patients where indication was never provided.

Table 3.2: Targeted Drug Delivery Malignant Pain: Site of Pain

Malignant Pain: Site of Pain	N Site (%)
Spine/Back	692 (39.7%)
Abdominal/Visceral	417 (23.9%)
Extremity	312 (17.9%)
Pelvic	240 (13.8%)
Thoracic	193 (11.1%)
Head/Neck	117 (6.7%)
Other	186 (10.7%)
Not Specified	439 (25.2%)
Total Sites of Pain[a]	**2,596**

[a] In 1,744 patients with indications of malignant pain, malignant pain & chemotherapy, and malignant pain & spasticity. Total number of patients is not equal to number of reported sites of pain as patients may have multiple sites of pain.

Table 3.3: Targeted Drug Delivery Non-Malignant Pain: Sub-Indications

Non-Malignant Pain: Sub-Indications	Enrolled Patients (%)
Back Pain with Leg Pain	2,097 (34.5%)
Back Pain without Leg Pain	1,645 (27.0%)
General Neuropathic Condition	246 (4.0%)
CRPS I[a]	193 (3.2%)
Peripheral Neuropathy	83 (1.4%)
Joint Pain/Arthritis	74 (1.2%)
General Nociceptive Condition	57 (0.9%)
CRPS II[a]	37 (0.6%)
Osteoporosis	20 (0.3%)
Other	678 (11.1%)
Not Specified	955 (15.7%)
Total Patients[b]	**6,085**

[a] CRPS is complex regional pain syndrome.

[b] Includes patients with indications of non-malignant pain, non-malignant pain & spasticity, and non-malignant pain & chemotherapy.

Table 3.4: Targeted Drug Delivery Spasticity: Sub-Indications

Spasticity: Sub-Indications	Pediatrics (%) (<18 years)	Adults (%) (>= 18 years)	All Patients (%)
Cerebral Palsy	375 (77.0%)	267 (14.3%)	642 (27.2%)
Multiple Sclerosis	0 (0.0%)	566 (30.3%)	566 (24.0%)
Spinal Cord Injury	9 (1.8%)	370 (19.8%)	379 (16.1%)
Brain Injury	38 (7.8%)	128 (6.8%)	166 (7.0%)
Stroke	1 (0.2%)	97 (5.2%)	98 (4.2%)
Other	20 (4.1%)	213 (11.4%)	233 (9.9%)
Not Specified	44 (9.0%)	230 (12.3%)	274 (11.6%)
Total Patients[a]	**487**	**1,871**	**2,358**

[a] Includes patients with indications of spasticity, non-malignant pain & spasticity, and malignant pain & spasticity.

It is recognized that health care providers prescribe therapies to meet specific patient needs; however, Medtronic only directs the use of its products based on approved labeling. Product labeling varies by geography. Contact a local Medtronic representative for region-specific product labeling.

3.2 Event Summary

Events are reported via database by physicians trained in the PSR. Events are reviewed internally and coded as either a product performance event (e.g. catheter kink, motor stall) or a non-product performance event (e.g. adverse drug reaction, increased muscle tone, and incision site swelling).There were 2,506 product performance events reported between August 7, 2003 and October 31, 2022, in patients with targeted drug delivery systems. These events represent 16.4% of the total reported events (2,506/15,320), which occurred in 1,618 (16.1%) of the 10,053 total patients enrolled, and are presented graphically within this report (e.g. events per patient years as well as survival curves). As an ongoing registry, events not coded at the time of the data snapshot (waiting for further information) will be included in future reports (n=759).

All registry devices that are returned to Medtronic are analyzed via a Returned Product Analysis (RPA) process. If available, RPA findings assist in the classification of the events. Within this report, Table 3.5 and the event tables in the pump and catheter sections differentiate the events by those determined by the RPA process versus those determined by the physician. Please refer to the Methodology section for more information.

There were 2,676 deaths reported for patients with targeted drug delivery systems (see Table 3.12). None of these deaths were reported as a direct result of a product performance event. Early versions of the protocol required events to be reported only when the event required a surgical intervention, resulted in therapy abandonment, or resulted in death. The required event reporting definition was expanded in April 2010 to include all adverse events related to the device, implant procedure, and/or therapy. Table 3.5 includes combined data from these versions of the protocol.

3.2.1 Product Performance Events

Table 3.5: Targeted Drug Delivery System Product Performance Events

Product Performance Events[a]	Event Counts	Events Per 100 Patient Years	Patients with Events (%) N=10,053[b]
RPA Determination	**347**	**0.96**	**317 (3.15%)**
Pump Motor Stall[c]	195	0.54	188 (1.87%)
Laboratory Overinfusion Finding[d]	40	0.11	39 (0.39%)
Corrosion And/Or Gear Wear	28	0.08	28 (0.28%)
Battery High Resistance	11	0.03	11 (0.11%)
Confirmed Overinfusion[e]	11	0.03	5 (0.05%)
Reduced Battery Performance	10	0.03	10 (0.10%)
Reservoir Access Issues Due To Residue	9	0.02	8 (0.08%)
Deformed Pump Tube	8	0.02	7 (0.07%)
Motor Feedthrough Anomaly	8	0.02	8 (0.08%)
No Anomaly Found By RPA	5	0.01	5 (0.05%)
Alarm And/Or Resonator Anomaly	2	0.01	2 (0.02%)
Concave Pump Shield	2	0.01	2 (0.02%)

...continued

Product Performance Events[a]	Event Counts	Events Per 100 Patient Years	Patients with Events (%) N=10,053[b]
Hole In Pump Tube	2	0.01	1 (0.01%)
Other[f]	16	0.04	16 (0.16%)
Physician's Determination	**2,159**	**5.95**	**1,443 (14.35%)**
Catheter Occlusion	488	1.35	434 (4.32%)
Catheter Dislodgement	423	1.17	340 (3.38%)
Catheter Break/Cut	255	0.70	227 (2.26%)
Catheter Kink	244	0.67	216 (2.15%)
Device Malfunction[g]	127	0.35	109 (1.08%)
Pump Motor Stall[h]	101	0.28	83 (0.83%)
Catheter Leakage	84	0.23	77 (0.77%)
Catheter Disconnection At Pump	52	0.14	51 (0.51%)
Catheter Dysfunction	48	0.13	43 (0.43%)
Pump Reservoir Volume Discrepancy	46	0.13	35 (0.35%)
Pump Unable To Enter/Withdraw From Catheter Access Port	46	0.13	40 (0.40%)
Device Difficult To Use	27	0.07	26 (0.26%)
Pump Underinfusion	23	0.06	19 (0.19%)
Device Component Migration	22	0.06	22 (0.22%)
Catheter Related Complication	21	0.06	20 (0.20%)
Catheter Damage	19	0.05	18 (0.18%)
Pump Connector Break/Cut	19	0.05	18 (0.18%)
Device Issue[i]	15	0.04	15 (0.15%)
Catheter Disconnection Between Catheter Segments	11	0.03	10 (0.10%)
Device Connection Issue	8	0.02	8 (0.08%)
Device Damage	8	0.02	7 (0.07%)
Catheter Access Port Issue	6	0.02	6 (0.06%)
Device Breakage	6	0.02	6 (0.06%)
Device Charging Issue	4	0.01	4 (0.04%)
Device Displays Incorrect Message	4	0.01	4 (0.04%)
Medical Device Complication[j]	4	0.01	4 (0.04%)
Medical Device Site Infection	4	0.01	4 (0.04%)
Device Reset Issue	3	0.01	3 (0.03%)
Pump Not Infusing	3	0.01	3 (0.03%)
Catheter Disconnection Issue	2	0.01	2 (0.02%)
Device Infusion Issue	2	0.01	2 (0.02%)
Device Kink	2	0.01	2 (0.02%)
Device Material Corroded	2	0.01	1 (0.01%)
Physician Reported Overinfusion[k]	2	0.01	2 (0.02%)
Pump Inversion	2	0.01	2 (0.02%)

...continued

Product Performance Events[a]	Event Counts	Events Per 100 Patient Years	Patients with Events (%) N=10,053[b]
Other[f]	26	0.07	24 (0.24%)
Total	**2,506**	**6.91**	**1,618 (16.09%)**

[a] Medical Dictionary for Regulatory Activities (MedDRA) Lower-Level Term or Medtronic's coding system term for events that do not exist in the MedDRA dictionary.

[b] The total number of patients with events may not represent the sum of all rows, as a patient may have experienced more than one type of event.

[c] Of the 195 RPA-determined motor stalls, 194 had a pump etiology and 1 had other etiology. Motor stall count does not include temporary motor stalls that may be expected (e.g. due to MRI) and recovered within a 24-hour period. The SynchroMed II pump temporarily stops the rotor of the pump motor and suspend drug infusion for the duration of the MRI exposure for patient safety.

[d] Includes pumps that had a laboratory finding but the patient did not have clinical signs or symptoms consistent with pump overinfusion.

[e] Patient had clinical signs and symptoms consistent with pump overinfusion, pump returned and positive laboratory test.

[f] Composed of event codes with 1 event each.

[g] The majority of these events were attributed to the PTM.

[h] Of the 101 physician-determined motor stalls, 90 had a pump etiology and 11 had a MRI etiology. Of the 11 MRI etiology, 2 pumps were replaced, 3 were reprogrammed, and 6 had no action taken. Motor stall count does not include temporary motor stalls that may be expected (e.g. due to MRI) and recovered within a 24-hour period. The SynchroMed II pump is designed to temporarily stop the rotor of the pump motor and suspend drug infusion for the duration of the MRI exposure for patient safety.

[i] Of the 15 device issues, 12 have an etiology of catheter or other component. The 15 device issues include 8 unable to aspirate catheter, 4 PTM Error Codes, 2 pump alarms, and 1 pump in safe state.

[j] Includes 3 PTM Error Codes, 1 unable to activate PTM, and 1 de-coupled PTM.

[k] Patient had clinical signs and symptoms, but pump not returned and analyzed.

A total of 1,740 (69.4%) of the 2,506 product performance events were related to the catheter only. There were 533 (21.3%) events related to the pump only. There were 167 (6.7%) related to other component (e.g. PTM malfunction) and 66 (2.6%) related to other etiologies (e.g. bend in catheter anchor).Relatedness is reported by the physician.

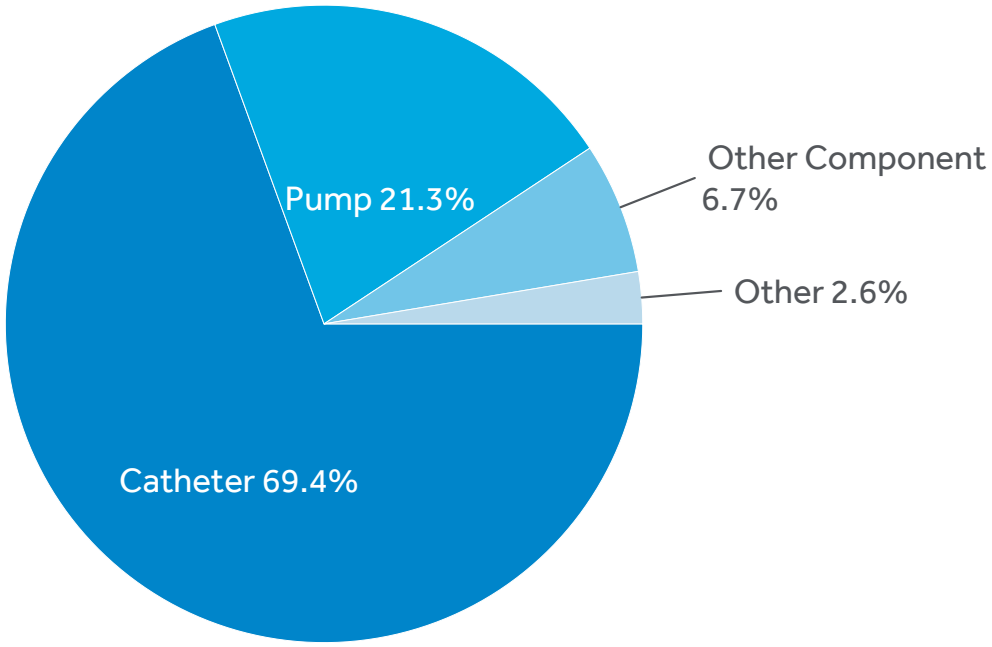


Figure 3.3: Targeted Drug Delivery System Product Performance Events by Relatedness

Table 3.6 describes the interventions completed for product performance events that required action from the health care provider and thereby, may have resulted in an incremental impact to the patient. Survival estimates presented in previous product performance reports included events where no action was taken. To present survival estimates that may better correlate with patient impact, events where no action was taken have been removed from the device survival estimates presented in this 2022 report. The far-left column lists the top five reported PPEs, and all other reported PPEs are listed under Other. The subsequent columns represent the actions taken by the reporting physician.

Table 3.6: TDD Product Performance Events by Intervention

Events by Intervention	Surgical Intervention	Reprogramming	Medical or Non-Surgical Intervention [a]	Therapy Suspension	No Action Taken	Total Events
Catheter Occlusion	445 (91.2%)	12 (2.5%)	16 (3.3%)	6 (1.2%)	9 (1.8%)	**488**
Catheter Dislodgement	372 (87.9%)	9 (2.1%)	8 (1.9%)	2 (0.5%)	32 (7.6%)	**423**
Catheter Break/Cut	242 (94.9%)	1 (0.4%)	5 (2.0%)	1 (0.4%)	6 (2.4%)	**255**
Pump Motor Stall	169 (69.0%)	15 (6.1%)	5 (2.0%)	9 (3.7%)	47 (19.2%)	**245**
Catheter Kink	226 (92.6%)	2 (0.8%)	11 (4.5%)	1 (0.4%)	4 (1.6%)	**244**
Other [b]	486 (63.3%)	32 (4.2%)	149 (19.4%)	5 (0.7%)	96 (12.5%)	**768**
Total	**1,940**	**71**	**194**	**24**	**194**	**2,423**

[a] Medical or Non-Surgical Therapy contains but is not limited to the following actions: medication adjustment based on disease symptoms, imaging (e.g. MRI or X-ray), other specialist referral.

[b] Other represents all reported PPEs that were not in the top five of occurrence.

3.2.2 Clinical Events Not Related To Product Performance

The clinical events not related to product performance are summarized if:

- The patient was enrolled in the PSR at the time in which the clinical event collection was initiated (n=3,477)
- Categorized as serious adverse events (SAEs, n=399)
- Occurred with a System Organ Class (SOC) threshold $\geq$1% of patients
- Other Considerations
  - Some events are described in high level group terms (HLGT) to provide more specificity, if needed
  - Some therapies will provide therapy relevant events (e.g., Inflammatory Mass, Cerebrospinal Fluid Leaks)

Table 3.7: Targeted Drug Delivery Clinical Events Not Related To Product Performance

Event Type	Number of SAE	Patients with SAE n (%) N=3,477	SAE Per 100 Patient Months	Patients with SAE Requiring Surgical Intervention n (%) N=3,477
General disorders and administration site conditions	**164**	**148 (4.26%)**	**0.17**	**34 (0.98%)**
Therapeutic and nontherapeutic effects (excl toxicity)	110	99 (2.85%)	0.11	8 (0.23%)
Complications associated with device	33	32 (0.92%)	0.03	19 (0.55%)
General system disorders NEC [a]	11	11 (0.32%)	0.01	1 (0.03%)
Administration site reactions	5	5 (0.14%)	0.01	4 (0.12%)
Other[b]	5	5 (0.14%)	0.01	4 (0.12%)
Infections and infestations	**92**	**86 (2.47%)**	**0.10**	**70 (2.01%)**
Infections - pathogen unspecified	76	72 (2.07%)	0.08	63 (1.81%)
Bacterial infectious disorders	15	15 (0.43%)	0.02	8 (0.23%)
Other[b]	1	1 (0.03%)	0.00	0 (0.00%)
Injury, poisoning and procedural complications	**60**	**56 (1.61%)**	**0.06**	**11 (0.32%)**
Procedural related injuries and complications NEC [a]	28	27 (0.78%)	0.03	9 (0.26%)
Overdoses and underdoses NEC [a]	25	23 (0.66%)	0.03	1 (0.03%)
Other[b]	7	7 (0.20%)	0.01	1 (0.03%)
Nervous system disorders	**46**	**44 (1.27%)**	**0.05**	**18 (0.52%)**
Neurological disorders NEC [a]	24	24 (0.69%)	0.02	10 (0.29%)
Neuromuscular disorders	9	9 (0.26%)	0.01	3 (0.09%)
Other[b]	13	13 (0.37%)	0.01	6 (0.17%)
Other SOC Terms (<1.0% Threshold)	**37**	**35 (1.01%)**	**0.04**	**9 (0.26%)**
Total	**399**	**331 (9.52%)**	**0.41**	**134 (3.85%)**

[a] Not Elsewhere Classified.
[b] Composed of high level group term event codes with fewer than 5 events each.

3.2.3 Therapy Relevant Events

3.2.3.1 Cerebrospinal Fluid Leaks

Potential cerebrospinal fluid leak (CSF) events are identified and assessed by Medtronic personnel and the site physician of the case to ascertain the case definition using Table 3.8.

Table 3.8: Cerebrospinal Fluid Leak Event Definition

Case Definition	Ascertainment
Definitive CSF Leak	▪ Observation of clear fluid leaking from the wound, or ▪ Contrast study demonstrates extravasation of dye outside dura, or ▪ Patient with persistent post-operative ***positional*** headache, plus one of the following: – Blood patch or suturing relieves headaches, or – Subcutaneous ***persistent*** fluid collection on the catheter tract, or – Meningeal enhancement on MRI with contrast.
Probable CSF Leak	**Reproducible** post-operative **positional** headache for >14 days with or without report of subcutaneous fluid collection. No contrast study performed or contrast study result inconclusive.
Possible CSF Leak	**Intermittent** post-operative **positional** headache for >14 days without report of subcutaneous fluid collection. No contrast study performed or contrast study result inconclusive.
Not CSF Leak	Acute post-operative non-positional headache lasting less than 14 days.

The potential CSF leak status (N=429) at the time of this analysis is presented in Table 3.9 with a definitive and probable CSF leak rate of 1.4% (142/10,053). The causality of the CSF leak event is dependent on the individual cases.

Table 3.9: Summary of Cerebrospinal Fluid Leak Adjudication

Cases Reviewed	Definitive CSF Leak	Probable CSF Leak	Possible CSF Leak	Not CSF Leak	Unspecified[a]
429	121	21	26	184	77

[a] Unadjudicated due to the timing of the data or due to the site no longer being active.

3.2.3.2 Inflammatory Masses

Inflammatory mass (IM), also sometimes reported as catheter-tip inflammatory mass or an intrathecal granuloma, is a potential complication of intrathecal opioid drug therapy. In order to better quantify the incidence of inflammatory mass, all events were evaluated for a report of inflammatory mass. For these identified cases, the medical records were reviewed by Medtronic personnel together with radiographic images when available. The radiographic images were reviewed to determine if there was evidence of an intradural extramedullary enhancing lesion. The adjudication team assessed each case based upon the case definition and ascertainment guideline presented in Table 3.10. A summary of cases evaluated for IM through the data cut-off is shown in Table 3.11.

Table 3.10: Case Definition and Ascertainment of Inflammatory Mass

Case Definition	Ascertainment
Definitive IM	Surgical and histological verification or clinical symptoms plus contrast enhanced MRI or CT myelogram and resolution of lesion following cessation of drug exposure
Probable IM	No surgical or histological verification, but clinical criteria and enhanced MRI or CT myelogram criteria are present
Possible IM	Medical records document IM, but there is no surgical or histological verification, there are no clinical criteria, and no radiographic data are available
Not IM	Surgical and histological verification that lesion is another disease process rather than IM, or radiographic data do not show an intrathecal lesion

There were a total of 135 suspected cases of inflammatory mass (Table 3.11) that were discerned from evaluation of patient records and reviewed by the adjudication team. Medtronic will continue to evaluate reports of inflammatory mass. Any previously classified case of IM will be re-evaluated if new evidence is received after this report. An analysis of the adjudicated definitive and probable inflammatory mass cases in the PSR from 2003 through October 2022 indicates an incidence of 0.24% (18/7,654) for pain patients and 0.00% (0/2,184) for spasticity patients.

Table 3.11: Summary of Inflammatory Mass Adjudication

Year of Event	Cases Reviewed	Definitive IM	Probable IM	Possible IM	Not IM
2004	4				4
2005	4	1		1	2
2006	7	1	1	2	3
2007	9	1	1	2	5
2008	4		1		3
2009	3	1			2
2010	11		1	1	9
2011	11	1	2	1	7
2012	13			1	12
2013	6			4	2
2014	10			2	8
2015	21	1		6	14
2016	10	1	1	2	6
2017	9			1	8
2018	4	1			3
2019	5	1			4
2020	3	1		1	1
2021	1		1		
2022	0				
Total	**135**	**10**	**8**	**24**	**93**

3.2.4 Patient Deaths

In earlier versions of the protocol, deaths were only assessed for the relatedness to the device product performance. After 2010, death assessments were expanded to also include the relationship to the implant procedure and/or therapy. As of the report cut-off, a total of 2,676 patients in the registry had expired. As with previous reports, no deaths were reported as a direct result of a product performance event. Although, three deaths were assigned by the physician as possibly related to the implant procedure and/or therapy.

Of the three deaths possibly related to the procedure and/or therapy, one death was due to a pulmonary embolism where the treating physician stated that the event could be possibly related to the withdrawal of the intrathecal medications. The patient had experienced a lack of therapy due to a missed refill visit leading to the withdrawal and not to the device malfunctioning. Medtronic Medical Safety assessed this death event as possibly related to the to the lack of therapy. A second death was reported by the treating physician as due to acute respiratory failure possibly related to the procedure and/or therapy. This patient had a history of persistent upper respiratory tract problems, difficulties swallowing and chronic aspiration as the

result of cancer related treatments. Medtronic Medical Safety assessed this death event as possibly related to the surgery/anesthesia during the implant procedure and therapy. The third death was reported by the physician as due to respiratory distress possibly related to the intrathecal medication. This patient had multiple comorbidities with multiple concomitant medications and a decreased level of physical activity. The death records state the cause of death as probable arteriosclerotic cardiovascular disease. Medtronic Medical Safety assessed this event as unassessable due to incomplete information.

Since 2003, a total of 1,405 (52.50%) deaths have been reported in this patient registry study based upon patients receiving therapy for malignant pain, 965 (36.06%) for non-malignant pain, 281 (10.50%) for spasticity, 22 (0.82%) for non-malignant pain & spasticity, 1 (0.04%) for malignant pain & chemotherapy , and 2 (0.07%) for not specified primary indication (see Table 3.12). The percentage is based upon the total patient death events and not based upon the rate of occurrence. **All tables depicted without a patient denominator should not be interpreted using other numbers within this report to calculate event rates**.

Table 3.12: Targeted Drug Delivery System Patient Deaths by Primary Indication

Number of Reports of Death by Primary Indication[a]	N (%) of Deaths
Malignant pain	1,405 (52.50%)
Non-malignant pain	965 (36.06%)
Spasticity	281 (10.50%)
Non-malignant pain & Spasticity	22 (0.82%)
Malignant pain & Chemotherapy	1 (0.04%)
Not Specified	2 (0.07%)
Total	**2,676 (100%)**

[a] For approved indications refer to product labeling for your geography.

3.3 Pumps

From August 7, 2003, to the report cut-off date of October 31, 2022, there were 12,741 pumps followed in the registry. The difference between the total number of patients (n=10,053) versus the total number of pumps is due to the fact that some patients were subsequently re-implanted with a pump multiple times. The aggregate prospective follow-up time for all pumps was 425,367 months (35,447 years). Table 3.13 provides the number and percentage of pumps by model.

3.3.1 SynchroMed II Design Change: Pump Enhancements

Design changes to the SynchroMed II 20 mL and 40 mL pump models were implemented to reduce the likelihood of non-recoverable motor stalls. These changes were released incrementally, allowing for the pumps to be considered in three groups: 1) Pre-Enhancements

(prior to 2016), 2) the Modified Gear Wheel Material and Encapsulated Feedthroughs (GW3/FT) enhancements (released January 2016) and 3) the Applied Diamond Like Coating (GW3/FT/DLC) enhancement (released July 2017). All enhancements were communicated in the August 2017 Medical Device Safety Notification: SynchroMed II Implantable Drug Infusion Pump Design Change Model Numbers 8637-20, 8637-40. For details, please visit https://www.medtronic.com/content/dam/medtronic-com/professional/documents/product-advisories/tdd/synchromed-pump-design-change-august-2017-hcp-letter.pdf. Table 3.13 provides the number and percentage of pumps by model and pump enhancement.

Table 3.13: Targeted Drug Delivery Pump Counts by Model and Pump Enhancement

Model Name	N (%)
SynchroMed II 40 mL	**7,179 (56.35%)**
Pre-Enhancements[a]	4,630 (36.34%)
GW3/FT/DLC Enhancements	2,012 (15.79%)
GW3/FT Enhancements[a]	537 (4.21%)
SynchroMed II 20 mL	**4,376 (34.35%)**
Pre-Enhancements[a]	2,963 (23.26%)
GW3/FT/DLC Enhancements	1,050 (8.24%)
GW3/FT Enhancements[a]	363 (2.85%)
SynchroMed EL 18 mL[a]	**1,146 (8.99%)**
SynchroMed EL 10 mL[a]	**34 (0.27%)**
SynchroMed Classic[a]	**5 (0.04%)**
Other/Unspecified	**1 (0.01%)**
Total	**12,741 (100%)**

[a] No longer manufactured.

The pump product performance-related events by model, pre-SynchroMed II enhancements and SynchroMed II enhancements are summarized in the pump models section. Please visit http://synchromed2enhancements.medtronic.com for specific pump details by serial number.

3.3.2 Pump Events

There were 538 product performance-related events with an underlying reported etiology related to pump function. This includes 533 events with a pump etiology and 5 events with both a pump and other etiology (including device and non-device etiologies). Of these, 459 were the initial product performance event that affected pump survival estimates. For pumps in the registry, the current return rate to Medtronic Returned Product Analysis (RPA) was 29.6% (1,929/6,522). The proportion was based upon the number of registry pumps received by RPA, divided by the sum of the total number of explanted devices and the total number of pumps in patients who have expired. In the 538 pump events, 36.6% (197/538) were assigned as device related by the physician, not returned to Medtronic RPA (see Figure 3.4).

For the purposes of survival analysis, a device's follow-up time is cut off for one of three reasons: 1) the occurrence of a product performance-related event; 2) the occurrence of a censoring event; or 3) the device is event-free and censored at the patient's last follow-up prior to the data cut-off. For pumps:

- 459 had follow up time cut-off due to product performance-related events.
- 9,786 were censored in the survival analysis for the following reasons: patient expired, pump explanted, site termination, patient discontinued, patient lost to follow-up, or therapy suspended.
- 2,496 were free from product performance-related events and censoring events, and were censored at the last follow-up visit prior to the report cut-off.

3.3.3 Pump Models

The following figures and tables represent the SynchroMed II pump characteristics, survival (including 95% confidence intervals), specifications and events by model. Since the survival estimate may become very imprecise with smaller sample sizes, the device survival curves below are truncated when the sample size is less than 20 active devices for each 3-month interval. The survival of SynchroMed EL model was not shown since it has no active devices in the PSR. For information on this model, please refer to the 2017 or earlier reports.

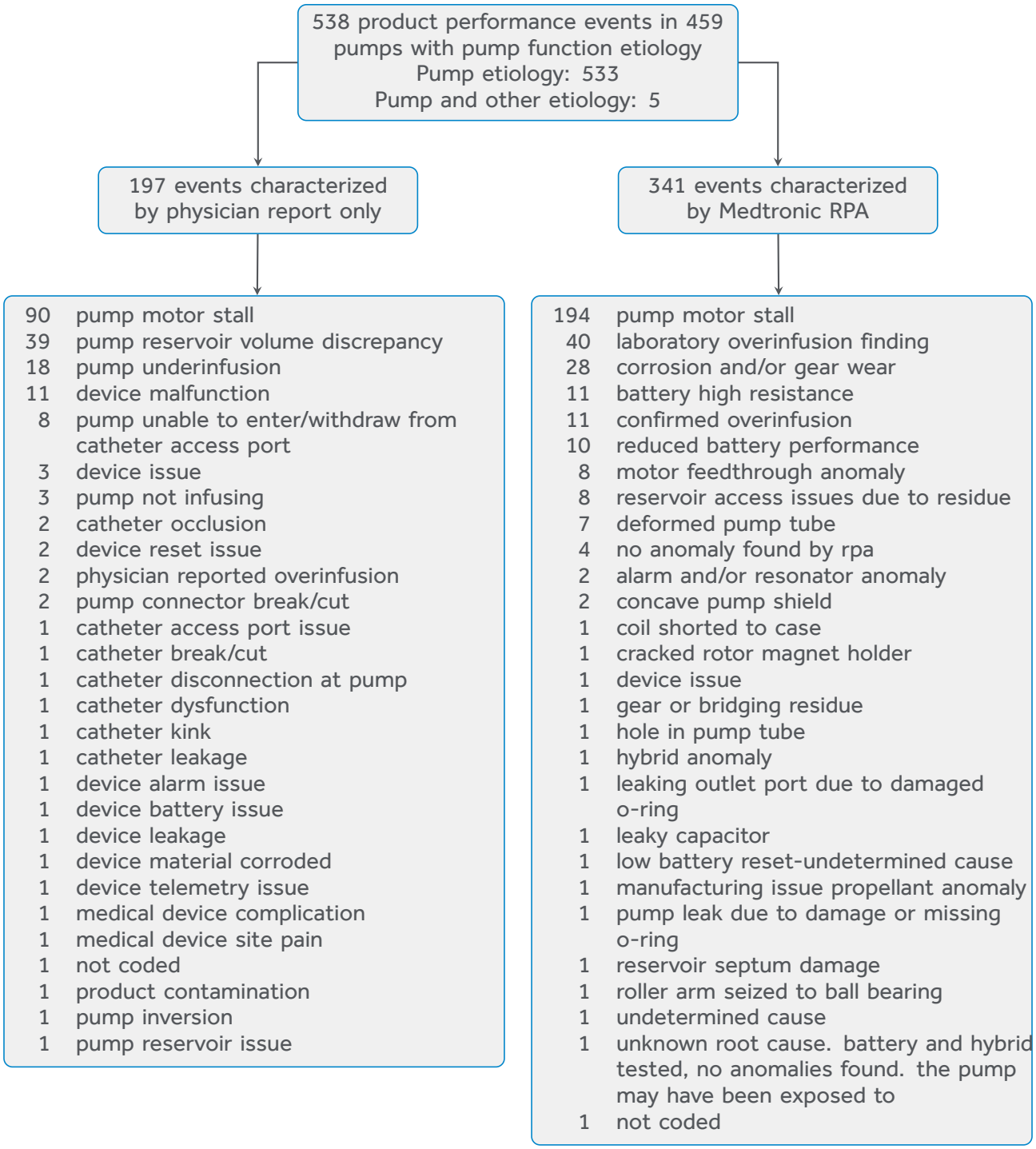
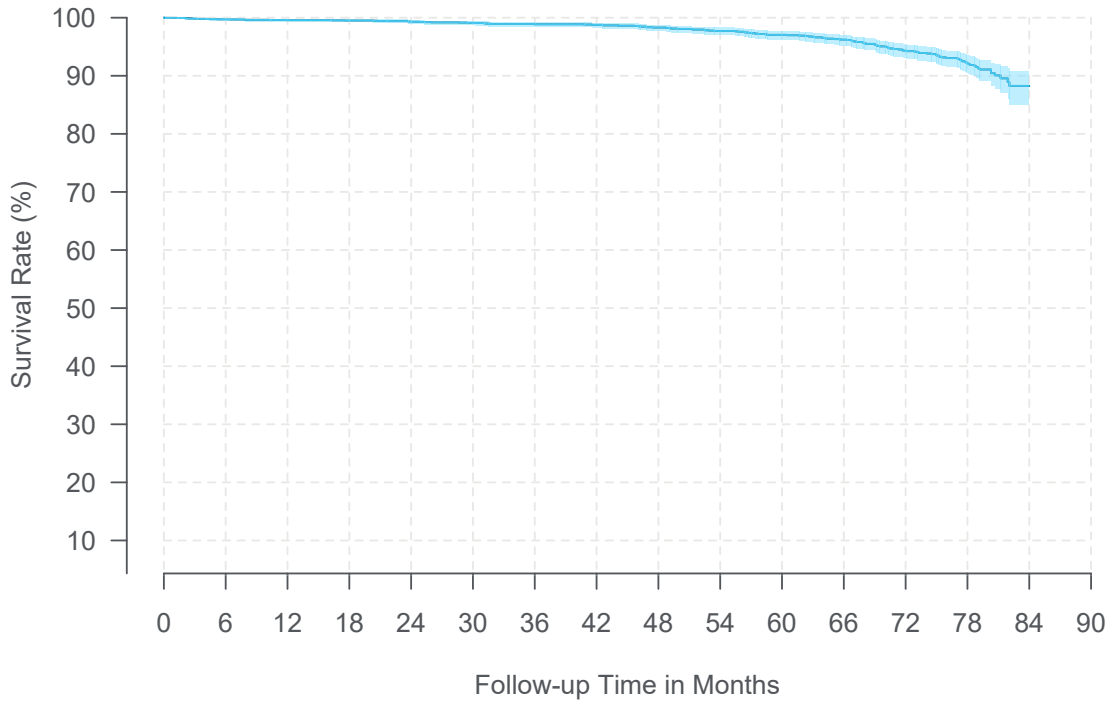


Figure 3.4: Distribution of Pump Function Etiology Product Performance Events

3.3.3.1 Model 8637-20

Model/Name	SynchroMed II 20 mL
FDA Approval Date	September 2003
Pumps Enrolled	4,376
Pumps Currently Active in Study	894
Initial Product Performance Events	128
Median Follow-up Time (Months)	36.6
Cumulative Follow-up Time (Months)	173,127



Time Interval	1 Year	2 Years	3 Years	4 Years	5 Years
Survival (95% CI)	99.6% (99.3%, 99.7%)	99.3% (99.0%, 99.6%)	98.9% (98.4%, 99.2%)	98.3% (97.7%, 98.7%)	97.0% (96.2%, 97.7%)
Sample Size	3,287	2,771	2,258	1,780	1,387

Time Interval	6 Years	7 Years			
Survival (95% CI)	94.3% (93.0%, 95.4%)	88.3% (85.0%, 90.8%)	—	—	—
Sample Size	994	32			

Specification: 8637-20	
Expected battery life[a]	6-7 years
Thickness	0.77 in (19.5 mm)
Diameter	3.4 in (87.5 mm)
Capacity	20.0 mL
Minimal Programmable Flow Rate[b]	0.048 mL/day
Maximum Programmable Flow Rate[b]	24 mL/day
Minimum Rate Infusion Mode[c]	0.006 mL/day

[a] Dependent on flow rate. Designed to shut off at 8 months.

[b] Actual limits depend on pump calibration constant an selected infusion mode.

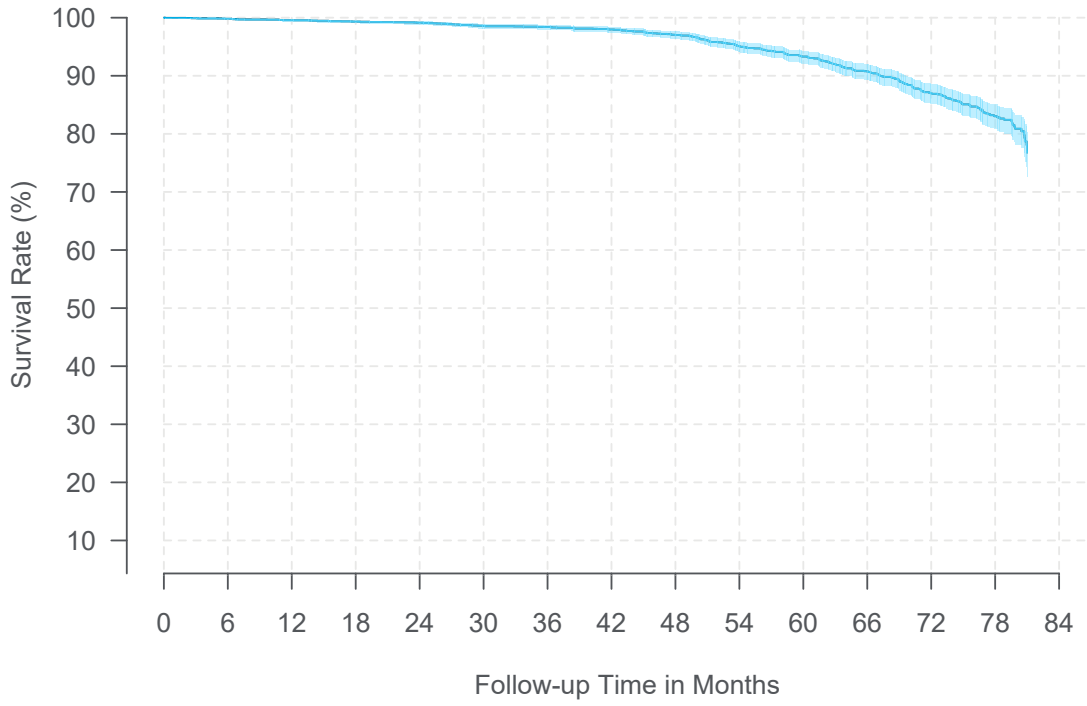
[c] Nontherapeutic (if therapy is to be temporaril discontinued).

Pump Event Summary: SynchroMed II 20 mL	N
RPA Determination	**75**
Pump Motor Stall	39
Laboratory Overinfusion Finding	8
Battery High Resistance	6
Corrosion And/Or Gear Wear	4
Motor Feedthrough Anomaly	3
Reduced Battery Performance	2
Reservoir Access Issues Due To Residue	2
Other[a]	11
Physician's Determination	**53**
Pump Motor Stall	21
Pump Reservoir Volume Discrepancy	10
Device Malfunction	6
Pump Unable To Enter/Withdraw From Catheter Access Port	4
Device Issue	3
Other[a]	9
Total	**128**

[a] Composed of event codes with 1 event each.

3.3.3.2 Model 8637-40

Model/Name	SynchroMed II 40 mL
FDA Approval Date	September 2003
Pumps Enrolled	7,179
Pumps Currently Active in Study	1,604
Initial Product Performance Events	297
Median Follow-up Time (Months)	23.8
Cumulative Follow-up Time (Months)	219,981



Time Interval	1 Year	2 Years	3 Years	4 Years	5 Years
Survival (95% CI)	99.6% (99.4%, 99.7%)	99.1% (98.8%, 99.4%)	98.4% (97.9%, 98.7%)	97.0% (96.3%, 97.6%)	93.3% (92.2%, 94.3%)
Sample Size	4,543	3,596	2,762	2,012	1,458

Time Interval	6 Years	At 81 Months			
Survival (95% CI)	87.0% (85.2%, 88.5%)	76.8% (72.7%, 80.3%)	—	—	—
Sample Size	929	116			

Specification: 8637-40	
Expected battery life[a]	6-7 years
Thickness	1.0 in (26 mm)
Diameter	3.4 in (87.5 mm)
Capacity	40.0 mL
Minimal Programmable Flow Rate[b]	0.048 mL/day
Maximum Programmable Flow Rate[b]	24 mL/day
Minimum Rate Infusion Mode[c]	0.006 mL/day

[a] Dependent on flow rate. Designed to shut off at 84 months.

[b] Actual limits depend on pump calibration constant and selected infusion mode.

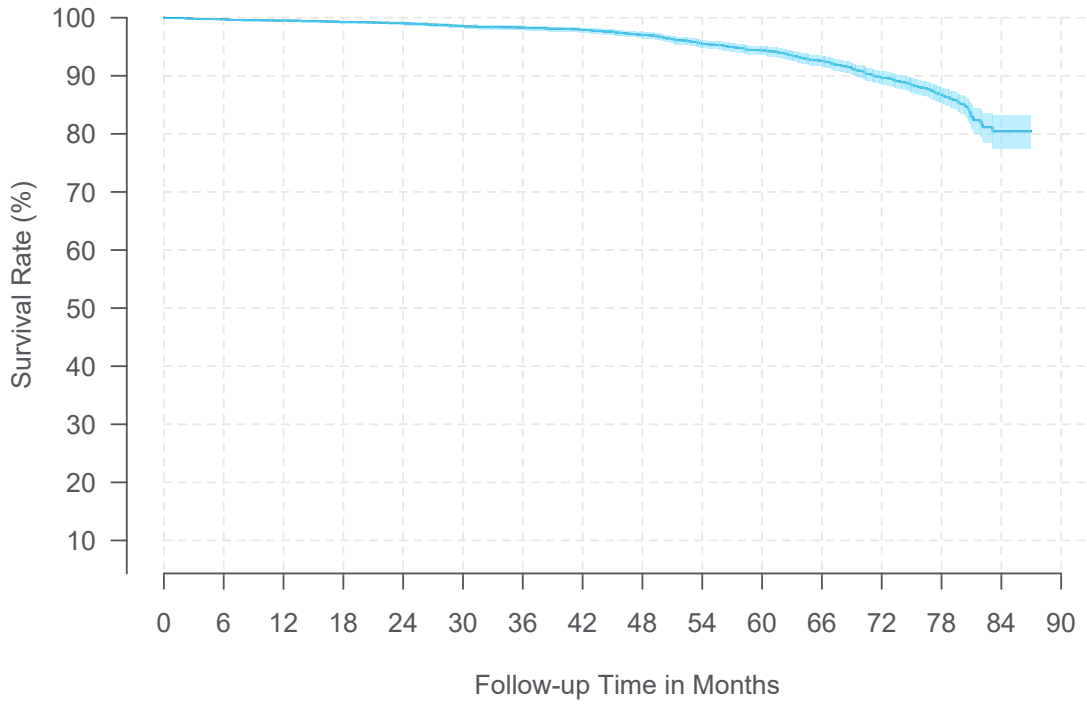
[c] Nontherapeutic (if therapy is to be temporarily discontinued).

Pump Event Summary: SynchroMed II 40 mL	N
RPA Determination	**204**
Pump Motor Stall	132
Laboratory Overinfusion Finding	29
Reduced Battery Performance	7
Corrosion And/Or Gear Wear	6
Deformed Pump Tube	5
Confirmed Overinfusion	4
Reservoir Access Issues Due To Residue	4
Battery High Resistance	3
Motor Feedthrough Anomaly	3
No Anomaly Found By RPA	3
Concave Pump Shield	2
Other[a]	6
Physician's Determination	**93**
Pump Motor Stall	39
Pump Reservoir Volume Discrepancy	21
Pump Underinfusion	10
Pump Unable To Enter/Withdraw From Catheter Access Port	4
Device Malfunction	3
Pump Not Infusing	2
Other[a]	14
Total	**297**

[a] Composed of event codes with 1 event each.

3.3.3.3 SynchroMed II 20 mL and 40 mL: Pre-enhancements

Model/Name	Pre-Enhancements
FDA Approval Date	September 2003
Pumps Enrolled	7,593
Pumps Currently Active in Study	87
Initial Product Performance Events	398
Median Follow-up Time (Months)	34.7
Cumulative Follow-up Time (Months)	293,800



Time Interval	1 Year	2 Years	3 Years	4 Years	5 Years
Survival (95% CI)	99.5% (99.3%, 99.7%)	99.0% (98.7%, 99.3%)	98.3% (97.9%, 98.6%)	97.0% (96.5%, 97.5%)	94.4% (93.5%, 95.1%)
Sample Size	5,294	4,575	3,818	3,158	2,563

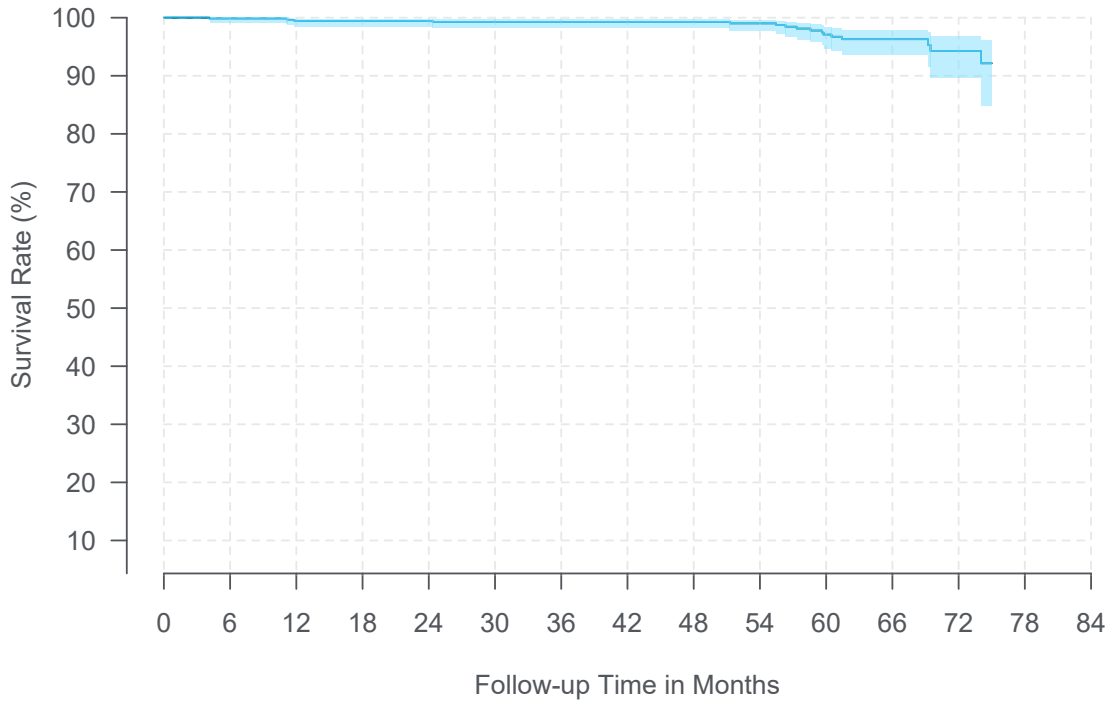
Time Interval	6 Years	7 Years	At 87 Months		
Survival (95% CI)	89.7% (88.5%, 90.8%)	80.4% (77.4%, 83.1%)	80.4% (77.4%, 83.1%)	—	—
Sample Size	1,861	48	24		

Pump Event Summary: SynchroMed II Pre-enhancements	Total
RPA Determination	**263**
Pump Motor Stall	164
Laboratory Overinfusion Finding	35
Corrosion And/Or Gear Wear	10
Battery High Resistance	9
Reduced Battery Performance	9
Deformed Pump Tube	6
Motor Feedthrough Anomaly	6
Confirmed Overinfusion	5
Reservoir Access Issues Due To Residue	4
Alarm And/Or Resonator Anomaly	2
Concave Pump Shield	2
No Anomaly Found By RPA	2
Other[a]	9
Physician's Determination	**135**
Pump Motor Stall	59
Pump Reservoir Volume Discrepancy	28
Pump Unable To Enter/Withdraw From Catheter Access Port	8
Pump Underinfusion	8
Device Malfunction	7
Device Issue	3
Pump Not Infusing	3
Catheter Occlusion	2
Physician Reported Overinfusion	2
Pump Connector Break/Cut	2
Other[a]	13
Total	**398**

[a] Composed of event codes with 1 event each.

3.3.3.4 SynchroMed II 20 mL and 40 mL: GW3/FT Enhancements

Model/Name	GW3/FT Enhancements
FDA Approval Date	September 2015 (GW3)/November 2015 (FT)
Pumps Enrolled	900
Pumps Currently Active in Study	345
Initial Product Performance Events	17
Median Follow-up Time (Months)	46.3
Cumulative Follow-up Time (Months)	35,357



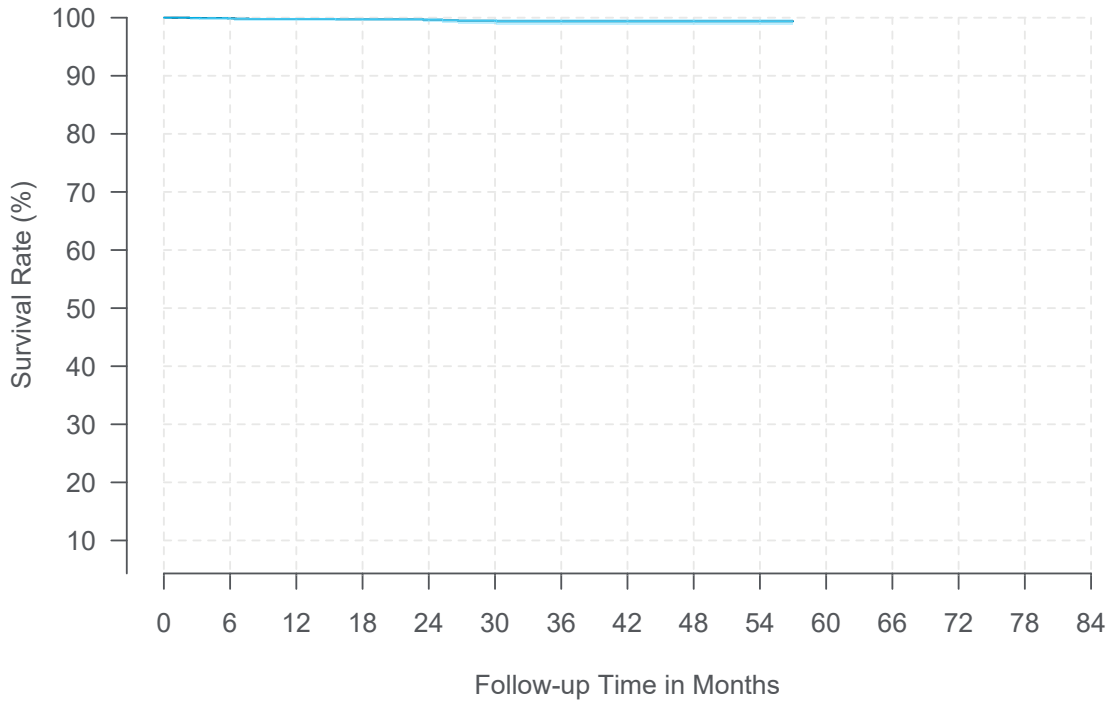
Time Interval	1 Year	2 Years	3 Years	4 Years	5 Years
Survival (95% CI)	99.4% (98.5%, 99.8%)	99.4% (98.5%, 99.8%)	99.3% (98.2%, 99.7%)	99.3% (98.2%, 99.7%)	97.1% (94.7%, 98.4%)
Sample Size	687	576	507	431	270

Time Interval	6 Years	At 75 Months			
Survival (95% CI)	94.3% (89.6%, 96.9%)	92.1% (84.8%, 96.0%)	—	—	—
Sample Size	62	34			

Pump Event Summary: SynchroMed II GW3/FT Enhancements	Total
RPA Determination	**11**
Pump Motor Stall	6
Reservoir Access Issues Due To Residue	2
Laboratory Overinfusion Finding	1
No Anomaly Found By RPA	1
Unknown Root Cause	1
Physician's Determination	**6**
Catheter Access Port Issue	1
Catheter Disconnection At Pump	1
Device Malfunction	1
Pump Motor Stall	1
Pump Reservoir Issue	1
Pump Reservoir Volume Discrepancy	1
Total	**17**

3.3.3.5 SynchroMed II 20 mL and 40 mL: GW3/FT/DLC Enhancements

Model/Name	GW3/FT/DLC Enhancements
FDA Approval Date	April 2017 (DLC)
Pumps Enrolled	3,062
Pumps Currently Active in Study	2,066
Initial Product Performance Events	10
Median Follow-up Time (Months)	17.8
Cumulative Follow-up Time (Months)	63,951



Time Interval	1 Year	2 Years	3 Years	4 Years	At 57 Months
Survival (95% CI)	99.8% (99.5%, 99.9%)	99.6% (99.2%, 99.8%)	99.4% (98.8%, 99.7%)	99.4% (98.8%, 99.7%)	99.4% (98.8%, 99.7%)
Sample Size	1,849	1,216	695	203	23

Pump Event Summary: SynchroMed II GW3/FT/DLC Enhancements	Total
RPA Determination	**5**
Laboratory Overinfusion Finding	1
No Anomaly Found By RPA	1
Pump Leak Due To Damage Or Missing O-Ring	1
Pump Motor Stall[a]	1
Reservoir Septum Damage	1
Physician's Determination	**5**
Pump Reservoir Volume Discrepancy	2
Pump Underinfusion	2
Device Malfunction	1
Total	**10**

[a] Motor stall that occurred within 7 months of implant due to unknown cause.

3.3.4 Pump Summary

Table 3.14: Targeted Drug Delivery Pump Characteristics

Model/Name	FDA Approval Date	Pumps Enrolled	Pumps Active	Initial Product Performance Events	Median Follow-up Time (Months)	Cumulative Follow-up Time (Months)
SynchroMed II 20 mL	September 2003	4,376	894	128	36.6	173,127
SynchroMed II 40 mL	September 2003	7,179	1,604	297	23.8	219,981
SynchroMed II Pre-enhancements[a]	September 2003	7,593	87	398	34.7	293,800
SynchroMed II GW3/FT enhancements[a]	September 2015 (GW3) November 2015 (FT)	900	345	17	46.3	35,357
SynchroMed II GW3/FT/DLC enhancements[a]	April 2017 (DLC)	3,062	2,066	10	17.8	63,951

[a] For explanation of enhancements see Section 3.3.1.

Table 3.15: Targeted Drug Delivery Pump Survival Probability (95% Confidence Intervals)

Model Name	1 Year	2 Years	3 Years	4 Years	5 Years
SynchroMed II 20 mL	99.6% (99.3%, 99.7%)	99.3% (99.0%, 99.6%)	98.9% (98.4%, 99.2%)	98.3% (97.7%, 98.7%)	97.0% (96.2%, 97.7%)
SynchroMed II 40 mL	99.6% (99.4%, 99.7%)	99.1% (98.8%, 99.4%)	98.4% (97.9%, 98.7%)	97.0% (96.3%, 97.6%)	93.3% (92.2%, 94.3%)
SynchroMed II Pre-Enhancements	99.5% (99.3%, 99.7%)	99.0% (98.7%, 99.3%)	98.3% (97.9%, 98.6%)	97.0% (96.5%, 97.5%)	94.4% (93.5%, 95.1%)
SynchroMed II GW3/FT Enhancements	99.4% (98.5%, 99.8%)	99.4% (98.5%, 99.8%)	99.3% (98.2%, 99.7%)	99.3% (98.2%, 99.7%)	97.1% (94.7%, 98.4%)
SynchroMed II GW3/FT/DLC Enhancements	99.8% (99.5%, 99.9%)	99.6% (99.2%, 99.8%)	99.4% (98.8%, 99.7%)	99.4% (98.8%, 99.7%)	__

Model Name	6 Years	7 Years			
SynchroMed II 20 mL	94.3% (93.0%, 95.4%)	88.3% (85.0%, 90.8%)	__	__	__
SynchroMed II 40 mL	87.0% (85.2%, 88.5%)	__	__	__	__
SynchroMed II Pre-Enhancements	89.7% (88.5%, 90.8%)	80.4% (77.4%, 83.1%)	__	__	__
SynchroMed II GW3/FT Enhancements	94.3% (89.6%, 96.9%)	__	__	__	__
SynchroMed II GW3/FT/DLC Enhancements	__	__	__	__	__

Table 3.16: Targeted Drug Delivery SynchroMed II Pump Events by Enhancements

Pump Event	Pre-Enhancements	GW3/FT Enhancements	GW3/FT/DLC Enhancements
RPA Determination	**263**	**11**	**5**
Pump Motor Stall	164	6	1
Laboratory Overinfusion Finding	35	1	1
Corrosion And/Or Gear Wear	10	0	0
Battery High Resistance	9	0	0
Reduced Battery Performance	9	0	0
Deformed Pump Tube	6	0	0
Motor Feedthrough Anomaly	6	0	0
Reservoir Access Issues Due To Residue	4	2	0
Confirmed Overinfusion	5	0	0
No Anomaly Found By RPA	2	1	1
Alarm And/Or Resonator Anomaly	2	0	0
Concave Pump Shield	2	0	0
Pump Leak Due To Damage Or Missing O-Ring	0	0	1
Reservoir Septum Damage	0	0	1
Unknown Root Cause	0	1	0
Other [a]	9	0	0
Physician's Determination	**135**	**6**	**5**
Pump Motor Stall	59	1	0
Pump Reservoir Volume Discrepancy	28	1	2
Pump Underinfusion	8	0	2
Device Malfunction	7	1	1
Pump Unable To Enter/Withdraw From Catheter Access Port	8	0	0
Device Issue	3	0	0
Pump Not Infusing	3	0	0
Catheter Occlusion	2	0	0
Physician Reported Overinfusion	2	0	0
Pump Connector Break/Cut	2	0	0
Catheter Access Port Issue	0	1	0
Catheter Disconnection At Pump	0	1	0
Pump Reservoir Issue	0	1	0
Other [a]	13	0	0
Total	**398**	**17**	**10**

[a] Composed of event codes with 1 event each for SynchroMed II Pre-Enhancements.

3.4 SynchroMed II Pumps Exposed to On-Label and Off-Label Medications

The purpose of this analysis is to provide additional information regarding the product performance of SynchroMed II pumps exposed to On-Label and Off-Label medications. This report contains information outside the FDA approved labeling for the Medtronic SynchroMed II Infusion System. The long-term drug stability/compatibility and safety and/or efficacy of drugs not listed in the SynchroMed II Infusion System product labeling have not been established in the United States. It is recognized that healthcare providers prescribe therapies to meet specific patient needs; however, Medtronic only directs the use of its products based on

approved regulatory labeling. For the purposes of this report, On-Label and Off-Label determinations have been made based on the United States FDA approved labeling. However, product labeling varies by geography, so please contact your local Medtronic representative (http://www.medtronic.com/us-en/about/locations.html) for region-specific product labeling.

In this registry, patient status updates were obtained at least annually, until discontinuation of therapy, or until the patient was lost to follow-up. Medications within the pump were recorded at least annually. The interim data collection provided a snapshot of medication use at these points in time.

3.4.1 Pump Groups On/Off-Label Categorization

Through October 31, 2022, 9,023 patients (55.8% female, mean/SD age 54.1/17.5 years) have enrolled in the registry and have been implanted with 11,555 SynchroMed II pumps. At least one drug record was available on each of 10,657 pumps; if no drug records were available (n=898 pumps), the pump was excluded from this analysis. 10,657 pumps were categorized as being On- or Off-Label using the following criteria:

- **On-Label:** If a pump has at least one drug record in the registry, and none of the records show Off-Label drug exposure, that pump is considered On-Label even if the complete drug history of that pump is unknown.
  - For pumps used for pain patients, if the drug record has only one drug and it was morphine or ziconotide (or their brand names), and it was not a compounded drug, these pumps were considered On-Label. Note: The classification was based on the name of the drug only, not the reported concentration of the drug.
  - For pumps used for spasticity patients, if the drug record has only one drug, and it is either Lioresal® (bacoflen injection) or Gablofen® (bacoflen injection), that drug record was considered On-Label. Note: The classification was based on the name of the drug only, not the reported concentration of the drug. For this analysis, if only the generic chemical classification, such as baclofen, was entered then the assumption was that the drug is On-Label.
  - Pumps with an On-Label drug history and currently containing preservative free water or preservative free saline, or if previously contained preservative free water/saline and currently containing On-Label drug were considered On-Label.
- **Off-Label:** Any drugs not within the approved indications specified above are considered Off-Label. Additionally, any drug record with more than one drug at a time in the pump (admixture) was considered Off-Label.
  - If a pump had any known exposure to Off-Label drugs (i.e., the Off-Label data have been collected in the registry), that pump was considered Off-Label, regardless of the amount of exposure time.
  - If a pump is filled with a medication that was reported as compounded, that pump was considered Off-Label.

The pumps were not stratified by design change sub-groups (GW3/FT and GW3/FT/DLC) due to the limited follow-up time.

3.4.2 Data Analysis

Survival estimates were calculated using the methods described in the Methodology section of this report. Statistical testing that compared survival curves was performed using a Cox proportional-hazards model. Since the survival estimate may become very imprecise with small sample sizes, Medtronic Neuromodulation's registry truncates device survival curves when the sample size is less than 20 active devices. At this threshold, one device failure yields a 5% decrease in cumulative survival. Additionally, the standard error for this survival estimate is approximately 5% (depending on previous conditional survival estimates), with 95% confidence intervals of approximately ± 10%. Overall, this large variability of 20% around the cumulative survival estimate would greatly reduce the precision for the point estimate.

Pump survival from product performance-related events was calculated and compared for the following groups:

- Total study population: On-Label vs. Off-Label Drugs (including all indications)
- Pain study population: On-Label vs. Off-Label Drugs (including all pain indications)
- Spasticity study population: On-Label vs. Off-Label Drugs (including all spasticity indications)

Additionally, the cumulative failure rate (i.e., the estimated probability that a pump will have a product performance-related event by a given time point) is presented in table and graph formats for each of the sub-groups listed above.

3.4.3 Results

A total of 3,264 (30.6%) SynchroMed II pumps were classified as On-Label where there was no evidence of Off-Label drug/admixture exposure. A total of 7,393 (69.4 %) pumps were classified as Off-Label where there was evidence of pump exposure to an Off-Label drug/admixture. There were a total of 425 reported SynchroMed II pump product performance events during the study observation period. Of the 425 pump product performance events, 422 of those were pump failures. In addition to the 422 pump failures, there were 15 SynchroMed II pumps explanted due to normal battery depletion by the physician, which were returned to Medtronic and had an RPA observation of high battery resistance. For this analysis, these pumps were not considered failures, because they represented normal implant duration (ranging from 5.6 to 6.8 years) with no associated physician or patient complaint.

Three of the 425 pump failure events occurred in pumps with no drug records available. Of the remaining 422 SynchroMed II pump failures, 231 were classified as pump failure due to motor stall (with or without documented motor corrosion). The remaining pump failures were due to events such as inconsistent pump reservoir volume, overinfusion, corrosion and/or gear wear, device malfunction, reduced battery performance, pump underinfusion, and other non-conforming reasons. Overall, the rate of pump failures in this cohort was 3.96% (422/10,657) with a median follow-up of 32.0 months.

For the 231 pump failures due to motor stall, 130 of the events were associated with the patient presenting clinical signs or symptoms of possible drug withdrawal or increasing pain or

spasticity. The other 101 events had no patient reported signs or symptoms associated with the event, but had a physician report of a motor stall occurrence.

Table 3.17: Targeted Drug Delivery Primary Indications by On/Off-Label Pump Groups

Primary Indication[a]	On-Label N=3,264	Off-Label N=7,393
Non-malignant Pain	956 (14.9%)	5,462 (85.1%)
Malignant Pain	46 (2.9%)	1,515 (97.1%)
Spasticity	2,262 (90.3%)	243 (9.7%)
Multiple/Unknown	0 (0.0%)	173 (100.0%)

[a] For approved indications refer to product labeling for your geography.

3.4.3.1 Total Study Population

A total of 3,264 SynchroMed II pumps were classified as On-Label for all therapies, where there was no evidence of Off-Label drug/admixture exposure. A total of 7,393 pumps were classified as Off-Label where there was evidence of pump exposure to an Off-Label drug/admixture. The cumulative survival and failure of the SynchroMed II pump for all indications, stratified by the On-Label or Off-Label pump group, are shown in Figure 3.5 and Figure 3.6 respectively.

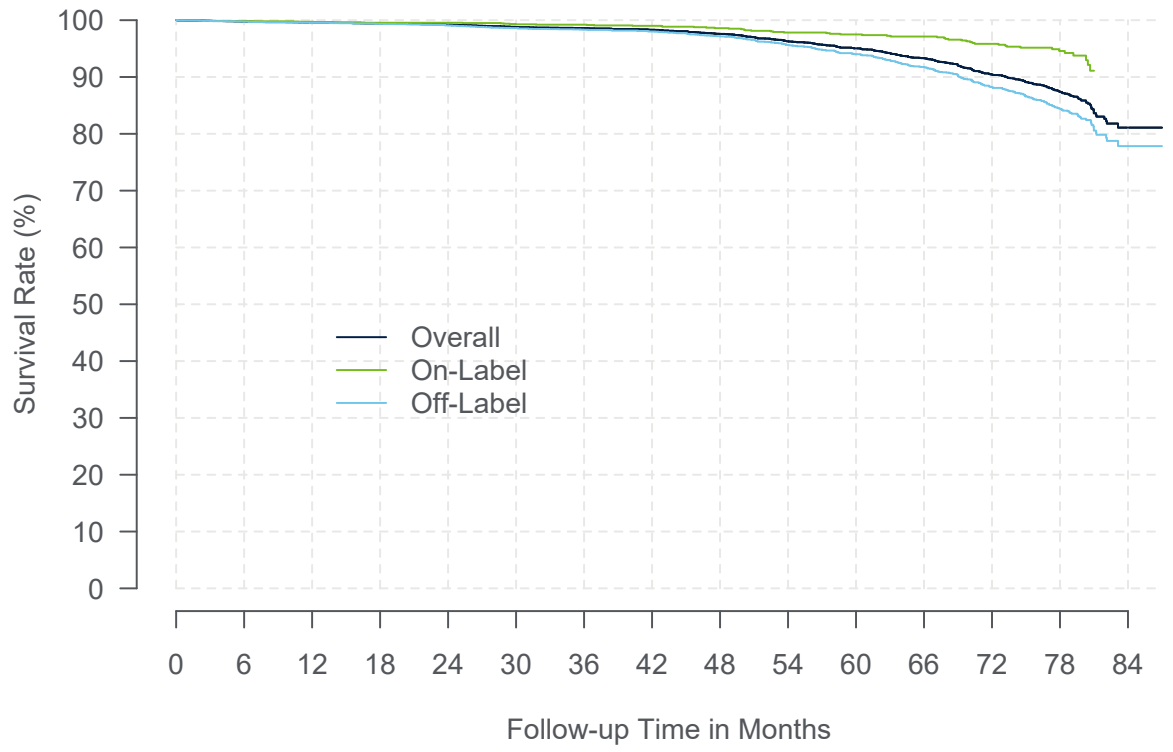


Figure 3.5: SynchroMed II Cumulative Survival (All Therapies)

Table 3.18: Survival Summary Table: All Therapies

Category	Time Interval	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	at 81 Mos	7 Yrs	at 87 Mos
Overall	Survival	99.6%	99.2%	98.6%	97.6%	95.0%	90.4%	83.6%	81.1%	81.1%
	Sample Size	7,662	6,294	4,974	3,761	2,829	1,916	318	48	24
On-Label	Survival	99.7%	99.5%	99.2%	98.6%	97.5%	95.8%	91.1%	__	__
	Sample Size	2,369	1,939	1,523	1,102	832	604	76		
Off-Label	Survival	99.5%	99.1%	98.3%	97.1%	94.0%	88.2%	80.6%	77.8%	77.8%
	Sample Size	5,293	4,355	3,451	2,659	1,997	1,312	242	36	20

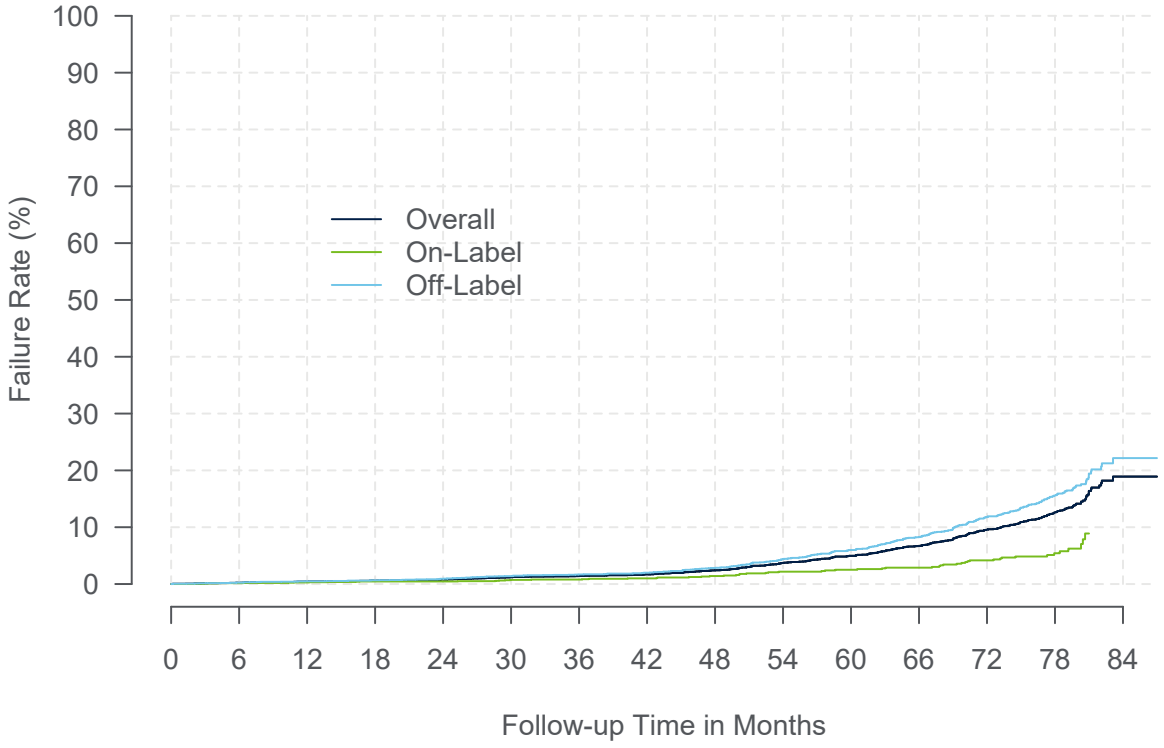


Figure 3.6: SynchroMed II Cumulative Failure (All Therapies)

Table 3.19: Failure Summary Table: All Therapies

Category	Time Interval	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	at 81 Mos	7 Yrs	at 87 Mos
Overall	Failure	0.4%	0.8%	1.4%	2.4%	5.0%	9.6%	16.4%	18.9%	18.9%
	Sample Size	7,662	6,294	4,974	3,761	2,829	1,916	318	48	24
On-Label	Failure	0.3%	0.5%	0.8%	1.4%	2.5%	4.2%	8.9%	—	—
	Sample Size	2,369	1,939	1,523	1,102	832	604	76		
Off-Label	Failure	0.5%	0.9%	1.7%	2.9%	6.0%	11.8%	19.4%	22.2%	22.2%
	Sample Size	5,293	4,355	3,451	2,659	1,997	1,312	242	36	20

3.4.3.2 Pain Study Population

A total of 1,002 SynchroMed II pumps were classified as On-Label for pain therapies, where there was no evidence of Off-Label drug/admixture exposure. A total of 6,977 pumps were classified as Off-Label where there was evidence of pump exposure to an Off-Label drug/admixture. The cumulative survival and failure of the SynchroMed II pump for pain indications, stratified by the On-Label or Off-Label pump group, are shown in Figure 3.7 and Figure 3.8 respectively.

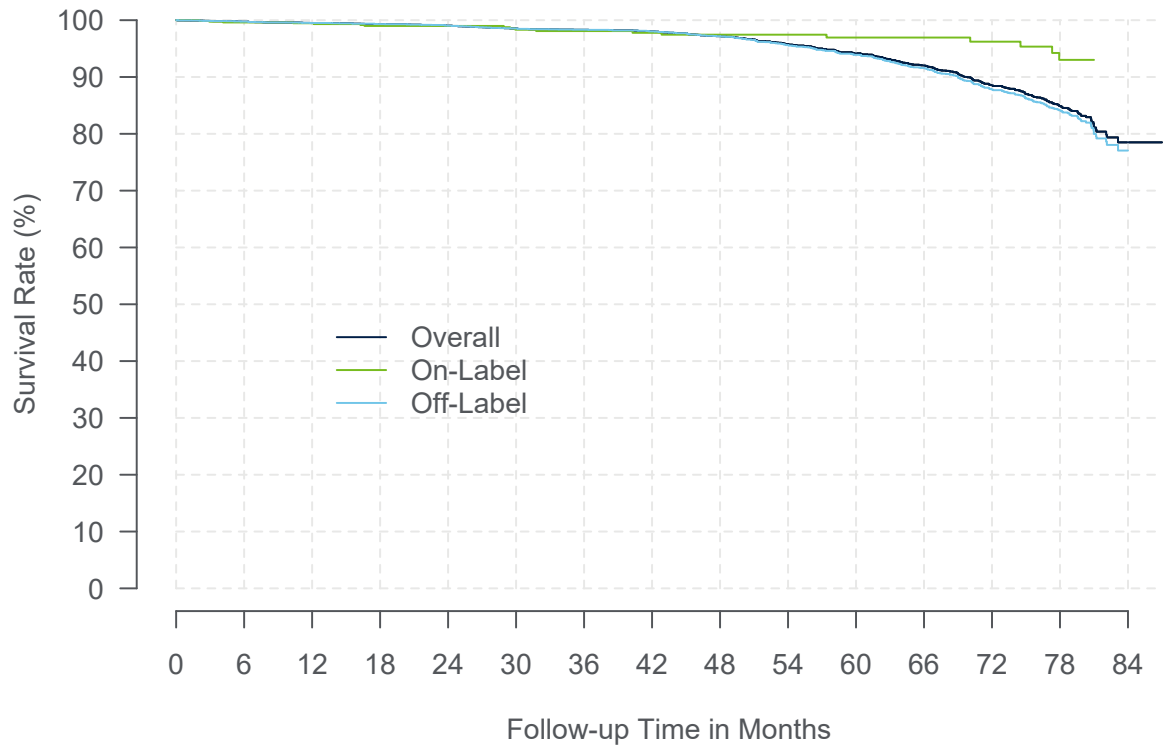


Figure 3.7: SynchroMed II Cumulative Survival (Pain Therapies)

Table 3.20: Survival Summary Table: Pain Therapies

Category	Time Interval	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	at 81 Mos	7 Yrs	at 87 Mos
Overall	Survival	99.5%	99.0%	98.3%	97.2%	94.2%	88.5%	81.1%	78.5%	78.5%
	Sample Size	5,633	4,582	3,593	2,714	2,038	1,337	248	38	21
On-Label	Survival	99.5%	99.0%	98.1%	97.4%	96.9%	96.2%	93.0%	__	__
	Sample Size	675	509	373	246	184	126	25		
Off-Label	Survival	99.5%	99.1%	98.3%	97.1%	93.9%	87.8%	80.0%	77.1%	__
	Sample Size	4,958	4,073	3,220	2,468	1,854	1,211	223	34	

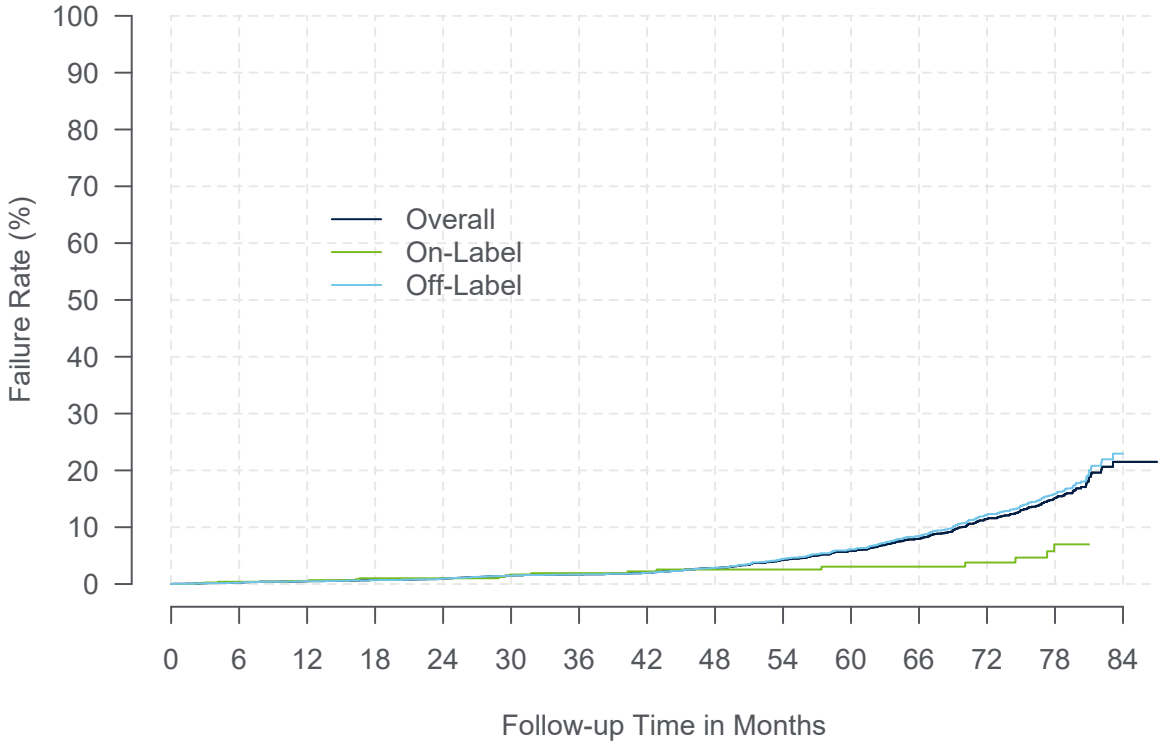


Figure 3.8: SynchroMed II Cumulative Failure (Pain Therapies)

Table 3.21: Failure Summary Table: Pain Therapies

Category	Time Interval	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	at 81 Mos	7 Yrs	at 87 Mos
Overall	Failure	0.5%	1.0%	1.7%	2.8%	5.8%	11.5%	18.9%	21.5%	21.5%
	Sample Size	5,633	4,582	3,593	2,714	2,038	1,337	248	38	21
On-Label	Failure	0.5%	1.0%	1.9%	2.6%	3.1%	3.8%	7.0%	—	—
	Sample Size	675	509	373	246	184	126	25		
Off-Label	Failure	0.5%	0.9%	1.7%	2.9%	6.1%	12.2%	20.0%	22.9%	—
	Sample Size	4,958	4,073	3,220	2,468	1,854	1,211	223	34	

3.4.3.3 Spasticity Study Population

A total of 2,262 SynchroMed II pumps were classified as On-Label for spasticity therapies, where there was no evidence of Off-Label drug/admixture exposure. A total of 243 pumps were classified as Off-Label where there was evidence of pump exposure to an Off-Label drug/admixture. The cumulative survival and failure of the SynchroMed II pump for spasticity indications, stratified by the On-Label or Off-Label pump group, are shown in Figure 3.9 and Figure 3.10 respectively.

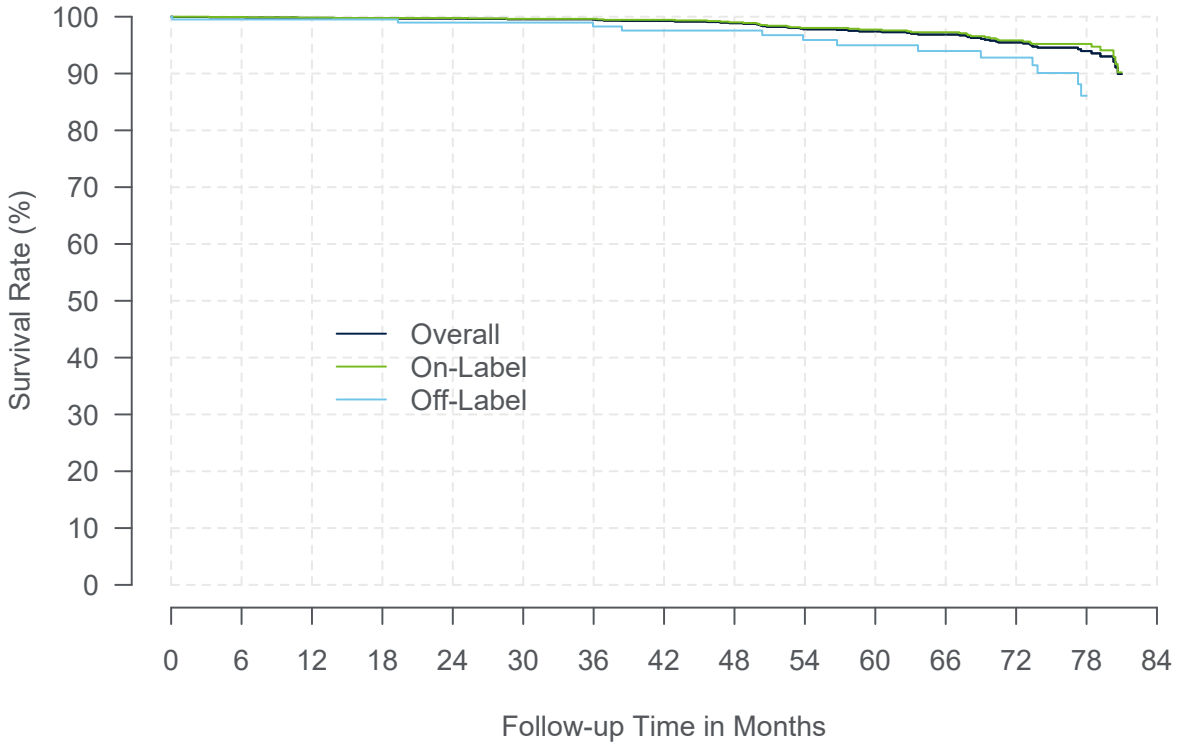


Figure 3.9: SynchroMed II Cumulative Survival (Spasticity Therapies)

Table 3.22: Survival Summary Table: Spasticity Therapies

Category	Time Interval	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	at 78 Mos	at 81 Mos
Overall	Survival	99.8%	99.7%	99.5%	98.9%	97.4%	95.5%	94.0%	89.9%
	Sample Size	1,890	1,599	1,291	980	744	552	252	65
On-Label	Survival	99.8%	99.8%	99.6%	99.0%	97.7%	95.8%	95.2%	90.2%
	Sample Size	1,694	1,430	1,150	856	648	478	218	51
Off-Label	Survival	99.5%	99.0%	98.3%	97.6%	95.0%	92.8%	86.1%	__
	Sample Size	196	169	141	124	96	74	34	

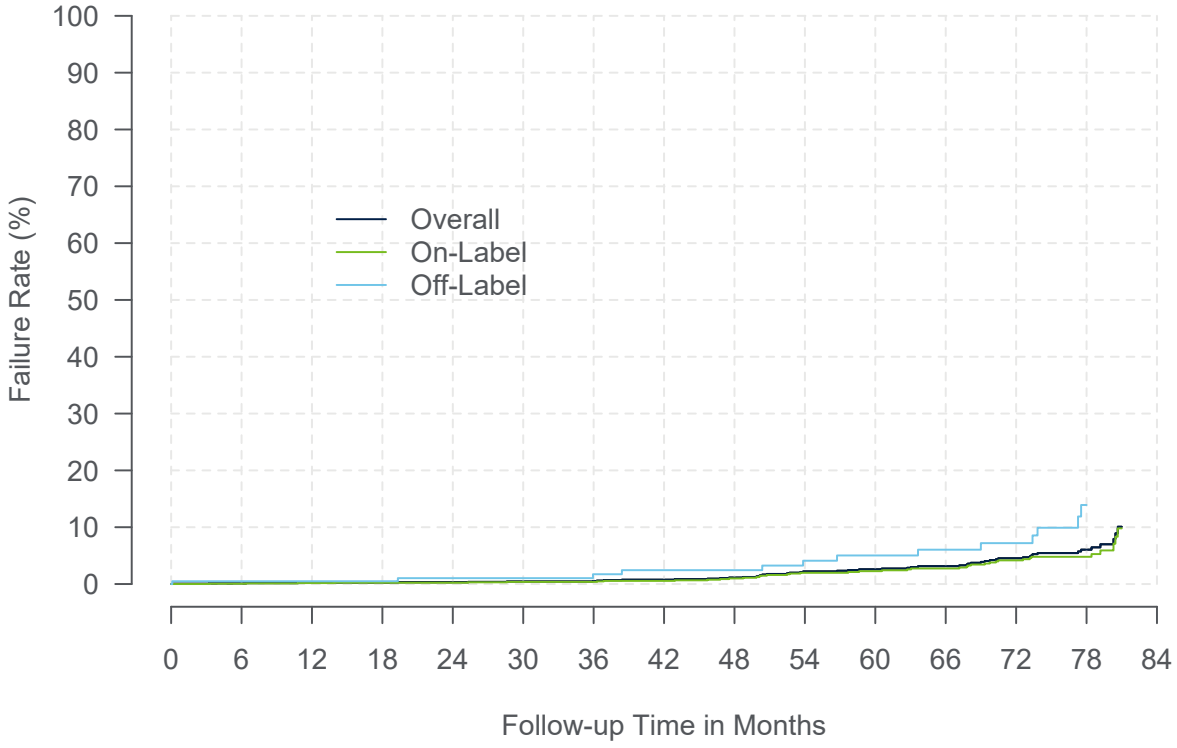


Figure 3.10: SynchroMed II Cumulative Failure (Spasticity Therapies)

Table 3.23: Failure Summary Table: Spasticity Therapies

Category	Time Interval	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs	at 78 Mos	at 81 Mos
Overall	Failure	0.2%	0.3%	0.5%	1.1%	2.6%	4.5%	6.0%	10.1%
	Sample Size	1,890	1,599	1,291	980	744	552	252	65
On-Label	Failure	0.2%	0.2%	0.4%	1.0%	2.3%	4.2%	4.8%	9.8%
	Sample Size	1,694	1,430	1,150	856	648	478	218	51
Off-Label	Failure	0.5%	1.0%	1.7%	2.4%	5.0%	7.2%	13.9%	__
	Sample Size	196	169	141	124	96	74	34	

3.4.4 Overall Summary and Limitations

- Pump failures have been observed in pumps with both On-Label and Off-Label medications used for all indications over the follow-up period.
- Off-Label medication exposure is associated with an overall 2.6 times greater risk of pump failure (95% confidence interval [1.966, 3.395]) compared to On-Label medication exposure for the entire pump population. The rate of pump failure accelerates in the Off-Label group after 48 months of follow-up. At 81 months of follow-up the survival from

pump failure for On-Label pumps was 91.1% compared to a survival of 80.6% for Off-Label pumps.

- The data represent the reported registry experience with a median follow-up time of 32.0 months. The longer-term data are based on a lower number of pumps and are subject to change as more follow-up data are obtained via the registry. Survival curve truncation or plateaus do not imply that the implanted devices will not be adversely impacted beyond the time points of the current data.
- The On-Label pump group was comprised of 69.3% of pumps with Spasticity as the indication (2,262 vs. 1,002: Spasticity versus Pain pumps respectively). While the Off-Label group consisted of 94.4% of pumps with pain indications (6,977 vs. 243: Pain versus Spasticity pumps respectively).
- Medication use was recorded as a snapshot at the time of follow-up. It is possible that some On-Label pumps received Off-Label medications in between follow-up periods. In addition, it is possible that some pumps designated as On-Label received compounded formulation of an On-Label equivalent but was not designated as such in the registry database. The time a pump was exposed to an Off-Label medication was not assessed. It is possible that some Off-Label pumps were exposed only for a brief period of time (e.g. < 6 months).
- The risk of pump failure by type of drug was not assessed. Many Off-Label pumps were exposed to multiple medications over the life span of the pump. This limits the ability to associate a specific drug, compounded drug, drug concentration, or drug combination with increased pump failure risk.

3.5 Catheters

From August 7, 2003, to the report cut-off date of October 31, 2022, there were 11,376 catheters followed in the registry. The total number of catheters was not equal to the total number of pumps (n=12,741) because patients may have undergone pump replacements but used the same catheters, or patients may have been implanted with Medtronic pumps and non-Medtronic catheters which were not registered with Medtronic Device And Registrant Tracking (DART) system. The aggregate prospective follow-up time for all catheters was 420,266 months (35,022 years). Table 3.24 provides the number and percentage of catheters by model.

Table 3.24: Targeted Drug Delivery Catheter Counts by Model

Model Name	N (%)
Currently Manufactured[a]	**3,036 (26.7%)**
8780 (US & OUS)	1,498 (13.2%)
8781 (US & OUS)	1,256 (11.0%)
8731SC (OUS)	282 (2.5%)
Revised Catheters	**2,524 (22.2%)**
Revised As Designed[b]	759 (6.7%)
Revised Not As Designed[c]	733 (6.4%)
Ascenda Revised As Designed[d]	528 (4.6%)
Grafted Not As Designed[e]	504 (4.4%)
No Longer Manufactured	**5,404 (47.5%)**
8709	2,918 (25.7%)
8709SC	1,104 (9.7%)
8711	661 (5.8%)
8731	534 (4.7%)
8703W	187 (1.6%)
Other/Unspecified	**412 (3.6%)**
Total	**11,376 (100%)**

[a] Manufactured for designated region; US=United States; OUS =Outside United States.

[b] 8731 catheters repaired with an 8596 proximal or 8598 distal revision kit.

[c] Medtronic non-Ascenda catheters repaired with a Medtronic revision kit, but not for the model it was intended.

[d] 8780 or 8781 Ascenda catheters repaired with the 8782 or 8784 revision kit.

[e] Catheters that involve the ad-hoc assembly of components other than a Medtronic repair kit or brand-new catheter.

3.5.1 Catheter Events

There were 1,751 product performance-related events with an underlying reported etiology related to catheter function. This includes 1,740 events with a catheter etiology and 11 events with both a catheter and other etiology (including device and non-device etiologies). The majority of the events were catheter occlusion (n=480), catheter dislodgement (n=416), catheter break/cut (n=253), or catheter kink (n=241). Of the 1,751 events, 1,500 were the initial product performance event that affected catheter survival estimates.

The catheter product performance-related events are summarized by model in the catheter models section.

For the purposes of survival analysis, a device's follow-up time is cut off for one of three reasons: 1) the occurrence of a product performance-related event; 2) the occurrence of a censoring event; or 3) the device is event-free and censored at the patient's last follow-up prior to the data cut-off. For catheters:

- 1,500 had follow-up time cut-off due to product performance-related events.
- 7,562 were censored in the survival analysis for the following reasons: patient expired, catheter explanted/capped, site termination, patient discontinued, patient lost to follow-up, or therapy suspended.
- 2,314 were free from product performance-related events and censoring events, and were censored at the last follow-up visit prior to the report cut-off.

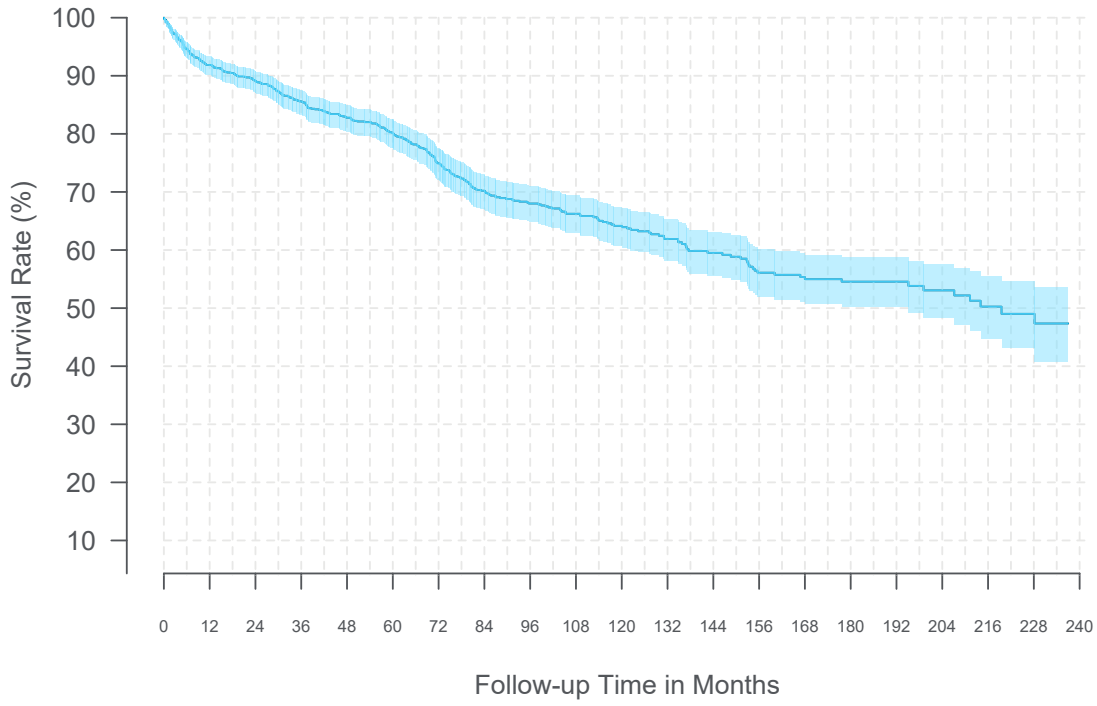
3.5.2 Catheter Models

The figures and tables below represent catheter survival and 95% confidence intervals where at least 20 catheters contributed to each 3-month interval. Survival curves are only shown if more than 20 devices had at least 12 months of follow-up at the time of the report cut-off for each model.

Medtronic catheter repair kits and 2-piece catheters include specially designed connector pins and strain relief sleeves to splice the catheter segments together. Catheters grafted not as designed, by definition, involve the ad-hoc assembly of components other than those from a Medtronic repair kit or brand-new catheter. Medtronic recommends that clinicians follow the labeling for the catheter revision kits.

3.5.2.1 Model 8709

Model/Name	8709/InDura
FDA Approval Date	May 1998
Catheters Enrolled	2,918
Catheters Currently Active in Study	128
Initial Product Performance Events	362
Median Follow-up Time (Months)	17.8
Cumulative Follow-up Time (Months)	100,121



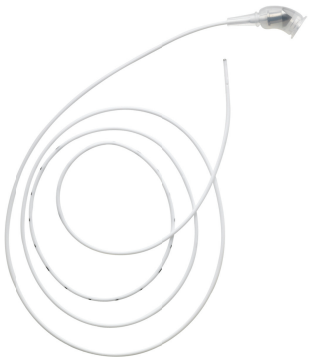
Time Interval	1 Year	2 Years	3 Years	4 Years	5 Years
Survival (95% CI)	91.9% (90.1%, 93.3%)	89.1% (87.2%, 90.8%)	85.6% (83.4%, 87.5%)	82.8% (80.4%, 84.9%)	80.1% (77.6%, 82.4%)
Sample Size	992	937	874	779	666

Time Interval	6 Years	7 Years	8 Years	9 Years	10 Years
Survival (95% CI)	74.9% (72.1%, 77.6%)	70.2% (67.1%, 73.1%)	68.0% (64.8%, 71.0%)	66.2% (62.9%, 69.3%)	64.2% (60.7%, 67.4%)
Sample Size	572	505	422	338	285

Time Interval	11 Years	12 Years	13 Years	14 Years	15 Years
Survival (95% CI)	61.9% (58.3%, 65.3%)	59.5% (55.6%, 63.2%)	56.1% (51.9%, 60.1%)	55.0% (50.7%, 59.1%)	54.6% (50.2%, 58.7%)
Sample Size	227	180	158	145	117

Time Interval	16 Years	17 Years	18 Years	19 Years	At 237 Months
Survival (95% CI)	54.6% (50.2%, 58.7%)	53.1% (48.3%, 57.6%)	50.3% (44.8%, 55.5%)	49.0% (43.1%, 54.6%)	47.4% (40.8%, 53.6%)
Sample Size	84	62	41	29	21

Specification: 8709	
Total Length	89 cm
Outer Diameter (spinal segment)	1.4 mm (4.2 French)
Inner Diameter (spinal segment)	0.53 mm
Catheter Tip Description	Closed with 6 side holes
Catheter Volume	0.0022 mL/cm
Trimmable Segments	Pump end

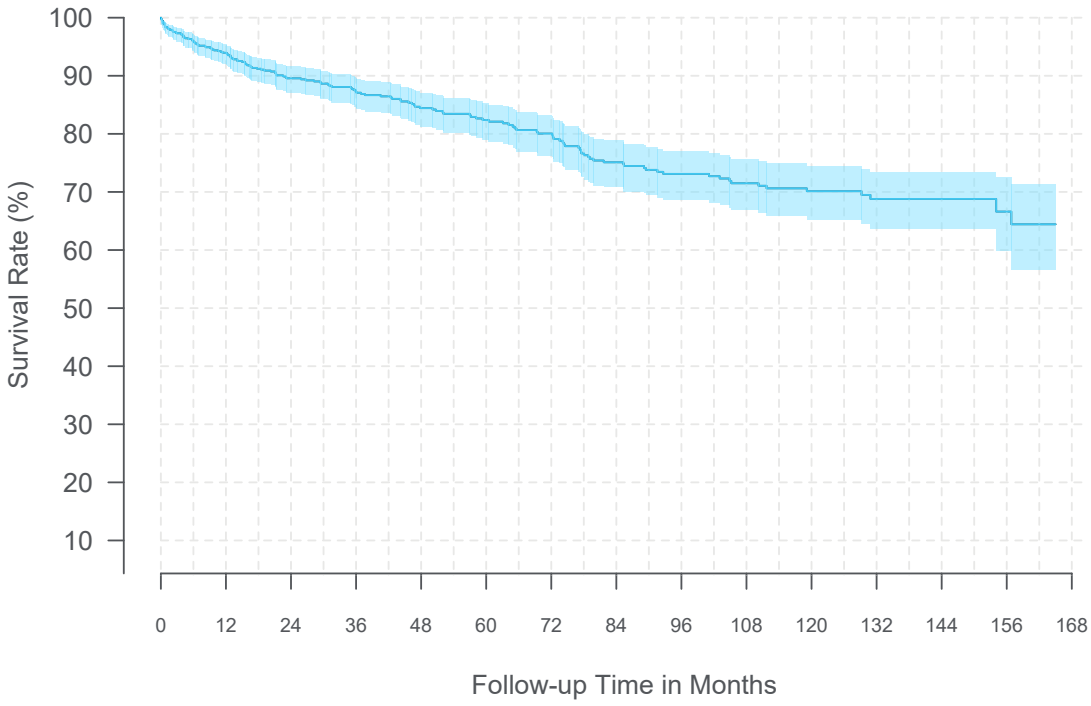


Catheter Event Summary: 8709	N
Catheter Dislodgement	95
Catheter Occlusion	86
Catheter Break/Cut	78
Catheter Kink	31
Catheter Disconnection At Pump	20
Catheter Leakage	16
Pump Connector Break/Cut	10
Catheter Dysfunction	6
Catheter Related Complication	3
Pump Unable To Enter/Withdraw From Catheter Access Port	3
Device Issue	2
Device Malfunction	2
Other[a]	10
Total	**362**

[a] Composed of event codes with 1 event each.

3.5.2.2 Model 8709SC

Model/Name	8709SC/InDura 1P
FDA Approval Date	March 2006
Catheters Enrolled	1,104
Catheters Currently Active in Study	141
Initial Product Performance Events	151
Median Follow-up Time (Months)	28.4
Cumulative Follow-up Time (Months)	48,161

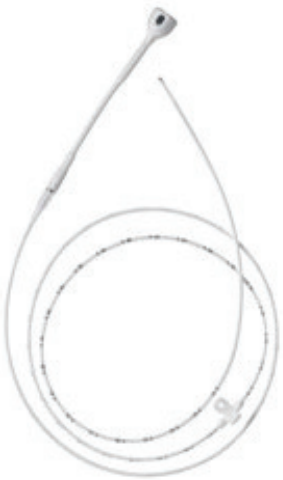


Time Interval	1 Year	2 Years	3 Years	4 Years	5 Years
Survival (95% CI)	94.0% (92.1%, 95.4%)	89.6% (87.1%, 91.6%)	87.3% (84.5%, 89.6%)	84.4% (81.3%, 87.1%)	82.4% (79.0%, 85.3%)
Sample Size	669	520	437	360	297

Time Interval	6 Years	7 Years	8 Years	9 Years	10 Years
Survival (95% CI)	80.0% (76.3%, 83.2%)	75.1% (70.8%, 78.8%)	73.1% (68.6%, 77.0%)	71.5% (66.8%, 75.6%)	70.1% (65.3%, 74.4%)
Sample Size	259	241	195	167	137

Time Interval	11 Years	12 Years	13 Years	At 165 Months	
Survival (95% CI)	68.8% (63.7%, 73.4%)	68.8% (63.7%, 73.4%)	66.6% (59.9%, 72.5%)	64.4% (56.5%, 71.3%)	—
Sample Size	97	60	31	22	

Specification: 8709SC	
Total Length	89 cm
Outer Diameter (spinal segment)	1.4 mm (4.2 French)
Inner Diameter (spinal segment)	0.53 mm
Catheter Tip Description	Closed tip, radiopaque, titanium with 6 side holes
Catheter Volume	0.0022 mL/cm
Trimmable Segments	Pump end

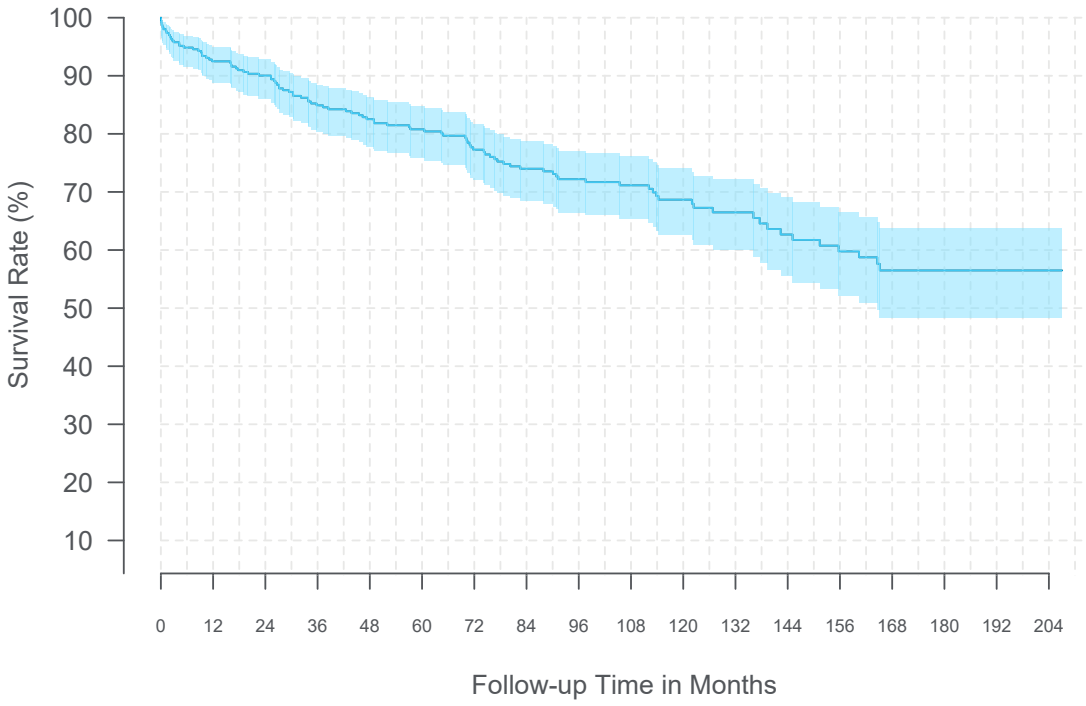


Catheter Event Summary: 8709SC	N
Catheter Occlusion	42
Catheter Break/Cut	34
Catheter Dislodgement	34
Catheter Leakage	8
Catheter Kink	6
Catheter Disconnection At Pump	5
Catheter Dysfunction	5
Catheter Related Complication	3
Pump Unable To Enter/Withdraw From Catheter Access Port	3
Catheter Damage	2
Device Damage	2
Device Malfunction	2
Other[a]	5
Total	**151**

[a] Composed of event codes with 1 event each.

3.5.2.3 Model 8711

Model/Name	8711/InDura
FDA Approval Date	October 1999
Catheters Enrolled	661
Catheters Currently Active in Study	60
Initial Product Performance Events	100
Median Follow-up Time (Months)	31.7
Cumulative Follow-up Time (Months)	32,077



Time Interval	1 Year	2 Years	3 Years	4 Years	5 Years
Survival (95% CI)	92.5% (88.9%, 95.0%)	90.0% (86.1%, 92.9%)	84.9% (80.4%, 88.4%)	82.5% (77.8%, 86.3%)	80.8% (75.9%, 84.8%)
Sample Size	307	286	258	238	225

Time Interval	6 Years	7 Years	8 Years	9 Years	10 Years
Survival (95% CI)	77.3% (72.0%, 81.6%)	74.0% (68.5%, 78.7%)	72.2% (66.5%, 77.1%)	71.1% (65.4%, 76.1%)	68.7% (62.6%, 74.0%)
Sample Size	189	179	148	124	100

Time Interval	11 Years	12 Years	13 Years	14 Years	15 Years
Survival (95% CI)	66.5% (60.0%, 72.1%)	62.7% (55.5%, 69.0%)	59.8% (52.2%, 66.5%)	56.5% (48.4%, 63.8%)	56.5% (48.4%, 63.8%)
Sample Size	76	65	60	44	30

Time Interval	16 Years	17 Years	At 207 Months		
Survival (95% CI)	56.5% (48.4%, 63.8%)	56.5% (48.4%, 63.8%)	56.5% (48.4%, 63.8%)	—	—
Sample Size	27	20	20		

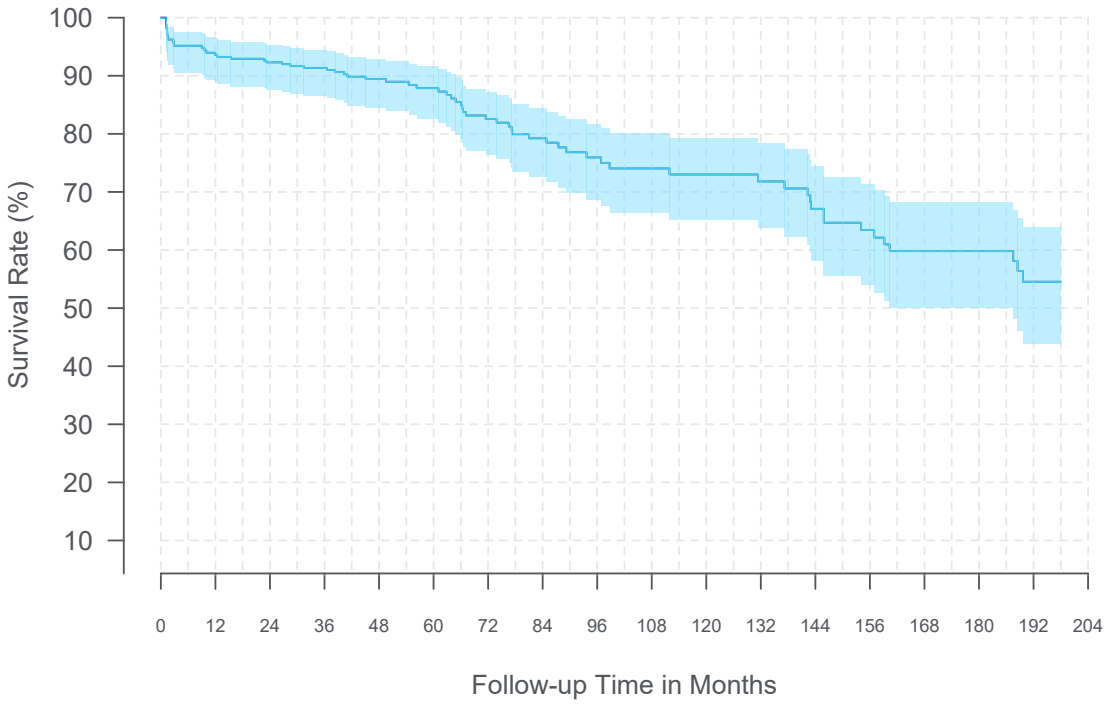
Specification: 8711	
Total Length	104.1 cm
Outer Diameter (spinal segment)	1.4 mm (4.2 French)
Inner Diameter (spinal segment)	0.53 mm
Catheter Tip Description	Closed with 6 side holes
Catheter Volume	0.0022 mL/cm
Trimmable Segments	Spinal and pump ends

Catheter Event Summary: 8711	N
Catheter Occlusion	32
Catheter Break/Cut	19
Catheter Dislodgement	13
Catheter Dysfunction	9
Catheter Kink	8
Catheter Leakage	4
Pump Unable To Enter/Withdraw From Catheter Access Port	4
Catheter Disconnection At Pump	2
Catheter Related Complication	2
Device Issue	2
Other[a]	5
Total	**100**

[a] Composed of event codes with 1 event each.

3.5.2.4 Model 8731

Model/Name	8731
FDA Approval Date	October 2002
Catheters Enrolled	534
Catheters Currently Active in Study	41
Initial Product Performance Events	64
Median Follow-up Time (Months)	32.8
Cumulative Follow-up Time (Months)	24,448



Time Interval	1 Year	2 Years	3 Years	4 Years	5 Years
Survival (95% CI)	93.6% (88.9%, 96.4%)	92.3% (87.6%, 95.3%)	91.4% (86.6%, 94.5%)	89.4% (84.5%, 92.9%)	87.9% (82.6%, 91.6%)
Sample Size	262	305	255	198	150

Time Interval	6 Years	7 Years	8 Years	9 Years	10 Years
Survival (95% CI)	82.6% (76.4%, 87.2%)	79.2% (72.6%, 84.4%)	75.9% (68.8%, 81.7%)	74.0% (66.5%, 80.1%)	73.0% (65.3%, 79.3%)
Sample Size	134	107	82	71	65

Time Interval	11 Years	12 Years	13 Years	14 Years	15 Years
Survival (95% CI)	71.8% (63.8%, 78.4%)	67.1% (58.2%, 74.5%)	63.4% (54.1%, 71.4%)	59.8% (50.1%, 68.2%)	59.8% (50.1%, 68.2%)
Sample Size	60	55	49	47	40

Time Interval	16 Years	At 198 Months			
Survival (95% CI)	54.5% (44.0%, 64.0%)	54.5% (44.0%, 64.0%)	—	—	—
Sample Size	27	23			

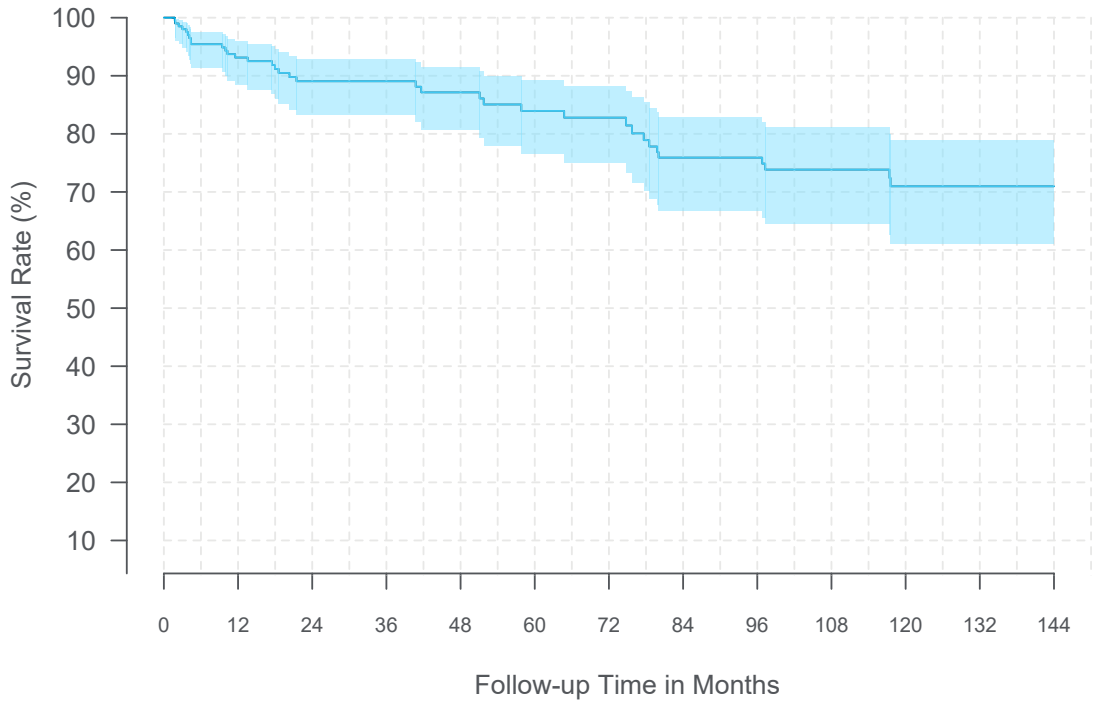
Specification: 8731	
Total Length	104.1 cm
Outer Diameter (spinal segment)	1.4 mm (4.2 French)
Inner Diameter (spinal segment)	0.53 mm
Catheter Tip Description	Closed tip, radiopaque, titanium with 6 side holes
Catheter Volume	2.22 mL/cm
Trimmable Segments	Spinal end

Catheter Event Summary: 8731	N
Catheter Occlusion	24
Catheter Dislodgement	19
Catheter Break/Cut	5
Catheter Kink	4
Catheter Disconnection At Pump	3
Catheter Related Complication	3
Catheter Dysfunction	2
Other[a]	4
Total	**64**

[a] Composed of event codes with 1 event each.

3.5.2.5 Model 8731SC

Model/Name	8731SC
FDA Approval Date	March 2006
Catheters Enrolled	282
Catheters Currently Active in Study	63
Initial Product Performance Events	38
Median Follow-up Time (Months)	37.9
Cumulative Follow-up Time (Months)	12,658



Time Interval	1 Year	2 Years	3 Years	4 Years	5 Years
Survival (95% CI)	93.1% (88.5%, 96.0%)	89.1% (83.3%, 92.9%)	89.1% (83.3%, 92.9%)	87.1% (80.7%, 91.5%)	83.9% (76.5%, 89.2%)
Sample Size	155	117	99	87	75

Time Interval	6 Years	7 Years	8 Years	9 Years	10 Years
Survival (95% CI)	82.8% (75.1%, 88.3%)	75.9% (66.8%, 82.9%)	75.9% (66.8%, 82.9%)	73.8% (64.5%, 81.1%)	71.0% (61.0%, 78.8%)
Sample Size	63	81	75	63	47

Time Interval	11 Years	12 Years			
Survival (95% CI)	71.0% (61.0%, 78.8%)	71.0% (61.0%, 78.8%)	—	—	—
Sample Size	27	20			

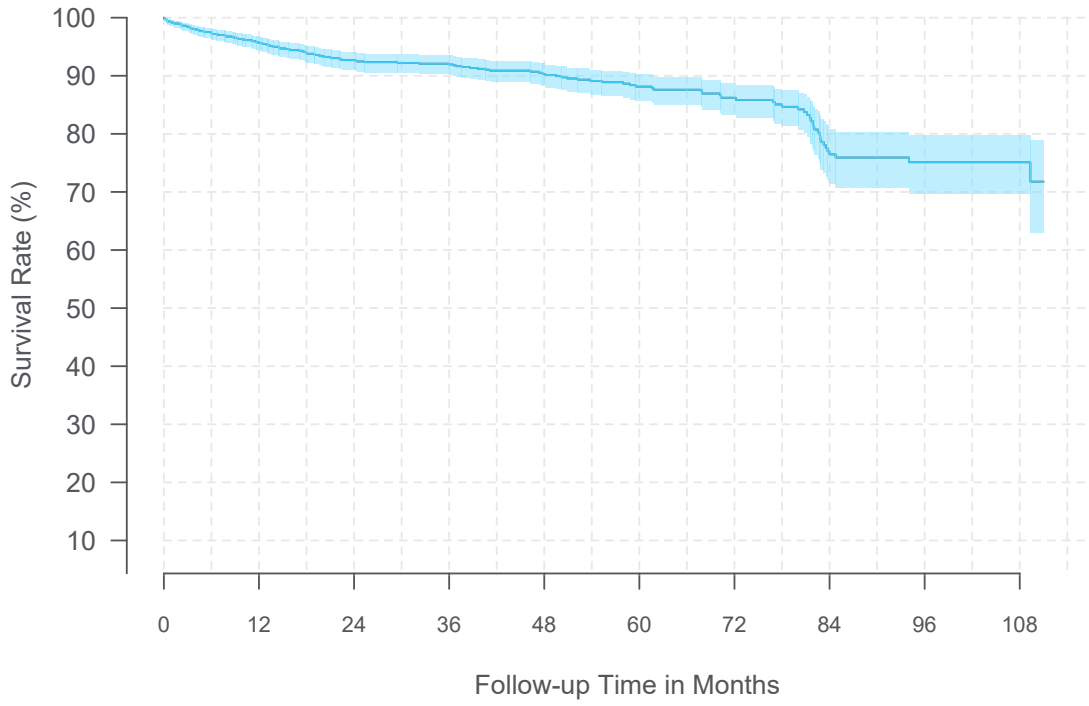
Specification: 8731SC	
Total Length	104.1 cm
Outer Diameter (spinal segment)	1.4 mm (4.2 French)
Inner Diameter (spinal segment)	0.53 mm
Catheter Tip Description	Closed with 6 side holes
Catheter Volume	0.0022 mL/cm
Trimmable Segments	Spinal and pump ends

Catheter Event Summary: 8731SC	N
Catheter Occlusion	14
Catheter Dislodgement	8
Catheter Kink	4
Pump Unable To Enter/Withdraw From Catheter Access Port	4
Catheter Dysfunction	3
Catheter Leakage	2
Other[a]	3
Total	**38**

[a] Composed of event codes with 1 event each.

3.5.2.6 Model 8780

Model/Name	8780/Ascenda
FDA Approval Date	May 2012
Catheters Enrolled	1,498
Catheters Currently Active in Study	641
Initial Product Performance Events	139
Median Follow-up Time (Months)	30.6
Cumulative Follow-up Time (Months)	55,106



Time Interval	1 Year	2 Years	3 Years	4 Years	5 Years
Survival (95% CI)	95.7% (94.4%, 96.7%)	92.7% (91.0%, 94.1%)	92.1% (90.3%, 93.5%)	90.3% (88.3%, 92.1%)	88.1% (85.6%, 90.2%)
Sample Size	1,019	801	640	472	336

Time Interval	6 Years	7 Years	8 Years	9 Years	At 111 Months
Survival (95% CI)	86.2% (83.3%, 88.7%)	76.5% (71.3%, 80.8%)	75.1% (69.7%, 79.7%)	75.1% (69.7%, 79.7%)	71.8% (62.9%, 78.9%)
Sample Size	230	139	82	25	21

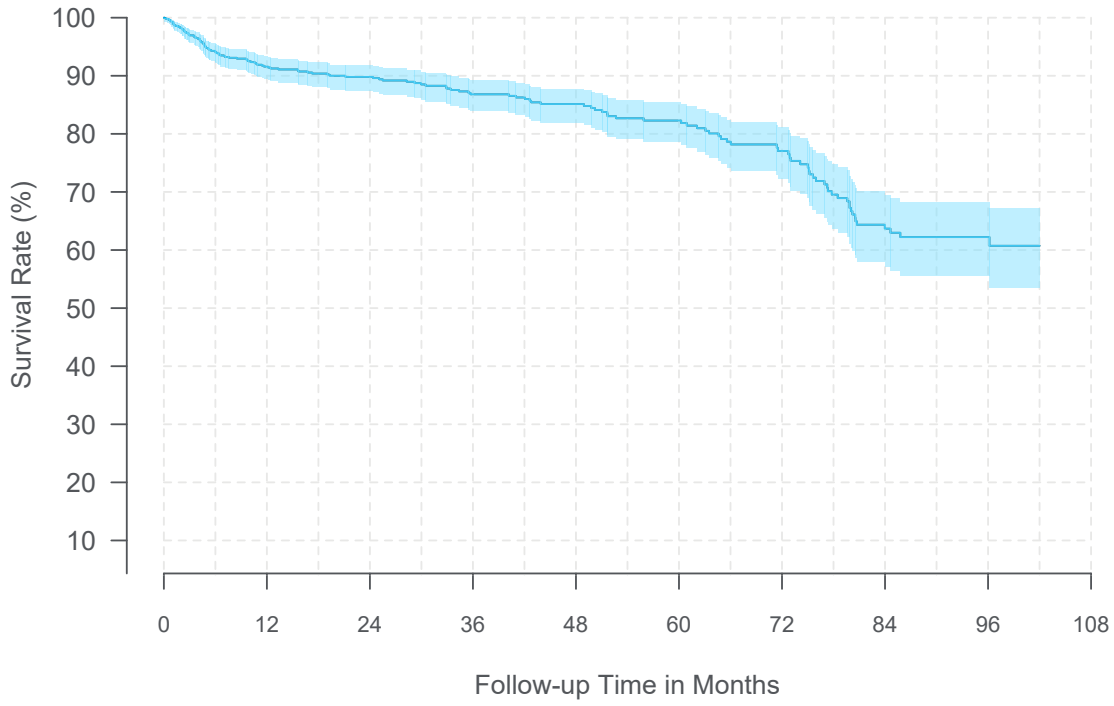
Specification: 8780	
Total Length	114 cm
Outer Diameter (spinal segment)	1.2 mm (4.0 French)
Inner Diameter (spinal segment)	0.5 mm
Catheter Tip Description	Closed with 6 side holes
Catheter Volume	0.0022 mL/cm
Trimmable Segments	Connector end of the spinal segment

Catheter Event Summary: 8780	N
Catheter Occlusion	55
Catheter Kink	27
Catheter Dislodgement	18
Catheter Break/Cut	15
Catheter Damage	7
Catheter Leakage	4
Pump Unable To Enter/Withdraw From Catheter Access Port	4
Catheter Disconnection At Pump	2
Catheter Dysfunction	2
Other[a]	5
Total	**139**

[a] Composed of event codes with 1 event each.

3.5.2.7 Model 8781

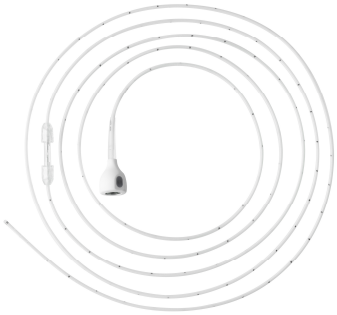
Model/Name	8781/Ascenda
FDA Approval Date	May 2012
Catheters Enrolled	1,256
Catheters Currently Active in Study	379
Initial Product Performance Events	149
Median Follow-up Time (Months)	12.7
Cumulative Follow-up Time (Months)	33,238



Time Interval	1 Year	2 Years	3 Years	4 Years	5 Years
Survival (95% CI)	91.6% (89.5%, 93.3%)	89.8% (87.4%, 91.8%)	86.8% (83.9%, 89.2%)	85.1% (82.0%, 87.8%)	82.3% (78.6%, 85.4%)
Sample Size	568	440	347	265	191

Time Interval	6 Years	7 Years	8 Years	At 102 Months	
Survival (95% CI)	77.1% (72.3%, 81.1%)	63.7% (57.2%, 69.5%)	62.2% (55.5%, 68.2%)	60.7% (53.5%, 67.2%)	—
Sample Size	135	93	42	25	

Specification: 8781	
Total Length	140 cm
Outer Diameter (spinal segment)	1.2 mm (4.0 French)
Inner Diameter (spinal segment)	0.5 mm
Catheter Tip Description	Closed with 6 side holes
Catheter Volume	0.0022 mL/cm
Trimmable Segments	Catheter connector ends of the spinal and pump segments

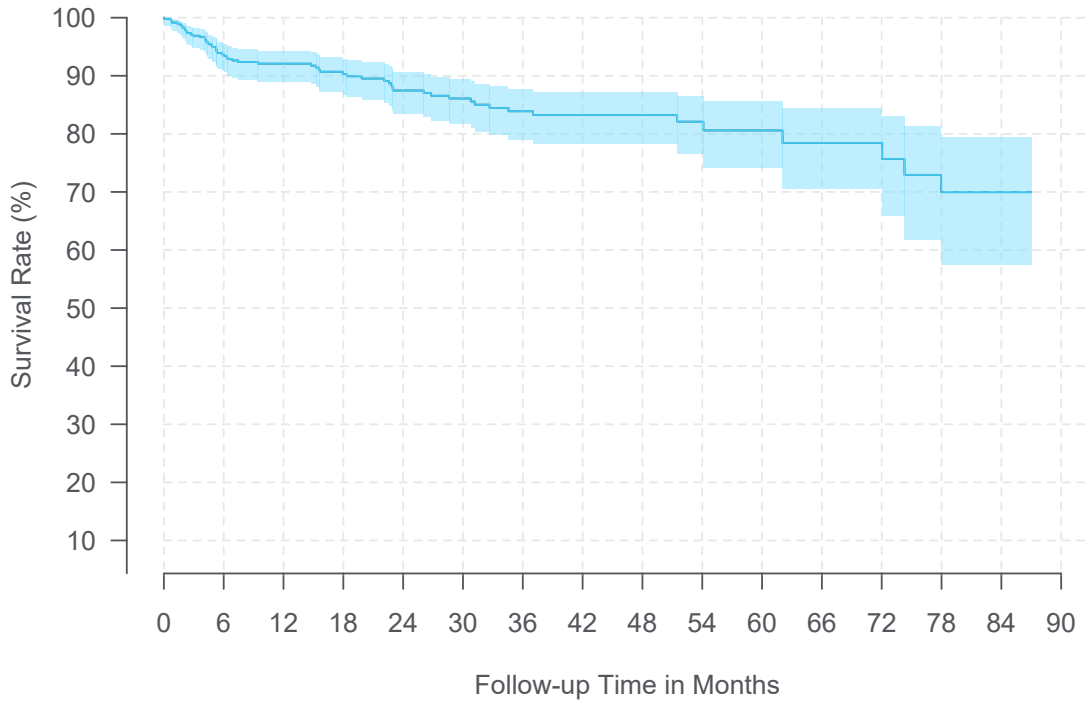


Catheter Event Summary: 8781	N
Catheter Kink	54
Catheter Occlusion	35
Catheter Dislodgement	34
Catheter Break/Cut	6
Catheter Dysfunction	4
Catheter Leakage	4
Catheter Disconnection At Pump	3
Device Malfunction	2
Pump Reservoir Volume Discrepancy	2
Other[a]	5
Total	**149**

[a] Composed of event codes with 1 event each.

3.5.2.8 Ascenda Revised As Designed

Model/Name	Ascenda Revised As Designed
FDA Approval Date	May 2012
Catheters Enrolled	528
Catheters Currently Active in Study	261
Initial Product Performance Events	59
Median Follow-up Time (Months)	16.9
Cumulative Follow-up Time (Months)	12,781



Time Interval	1 Year	2 Years	3 Years	4 Years	5 Years
Survival (95% CI)	92.1% (89.0%, 94.3%)	87.5% (83.4%, 90.6%)	83.9% (79.1%, 87.7%)	83.3% (78.3%, 87.2%)	80.6% (74.2%, 85.6%)
Sample Size	292	204	138	79	41

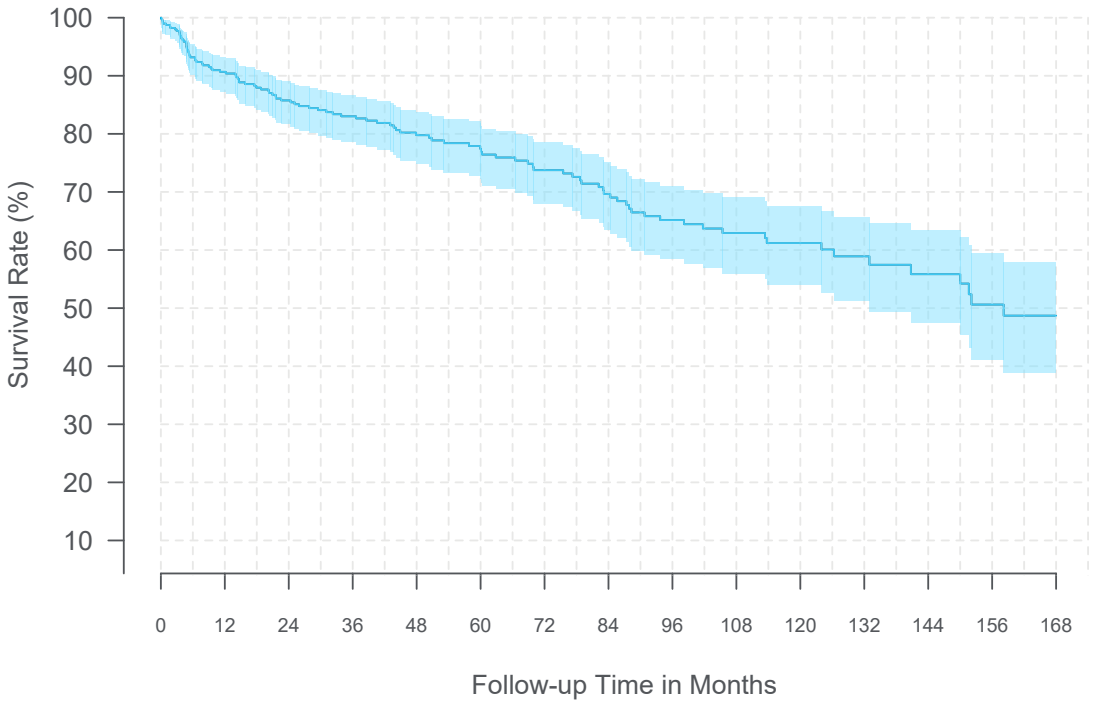
Time Interval	6 Years	7 Years	At 87 Months		
Survival (95% CI)	78.4% (70.6%, 84.4%)	70.0% (57.5%, 79.4%)	70.0% (57.5%, 79.4%)	—	—
Sample Size	28	24	23		

Catheter Event Summary: Ascenda RAD	N
Catheter Occlusion	18
Catheter Dislodgement	14
Catheter Kink	14
Catheter Break/Cut	3
Device Component Migration	3
Other[a]	7
Total	**59**

[a] Composed of event codes with 1 event each.

3.5.2.9 Grafted Not As Designed

Model/Name	Grafted Not As Designed
FDA Approval Date	NA
Catheters Enrolled	504
Catheters Currently Active in Study	99
Initial Product Performance Events	108
Median Follow-up Time (Months)	39.0
Cumulative Follow-up Time (Months)	24,939



Time Interval	1 Year	2 Years	3 Years	4 Years	5 Years
Survival (95% CI)	90.7% (87.3%, 93.2%)	85.8% (81.7%, 89.0%)	83.0% (78.6%, 86.6%)	79.8% (74.9%, 83.8%)	77.4% (72.2%, 81.8%)
Sample Size	312	262	226	181	157

Time Interval	6 Years	7 Years	8 Years	9 Years	10 Years
Survival (95% CI)	73.8% (68.1%, 78.6%)	69.6% (63.4%, 75.0%)	65.2% (58.5%, 71.0%)	62.9% (56.0%, 69.1%)	61.2% (54.0%, 67.6%)
Sample Size	131	114	92	80	58

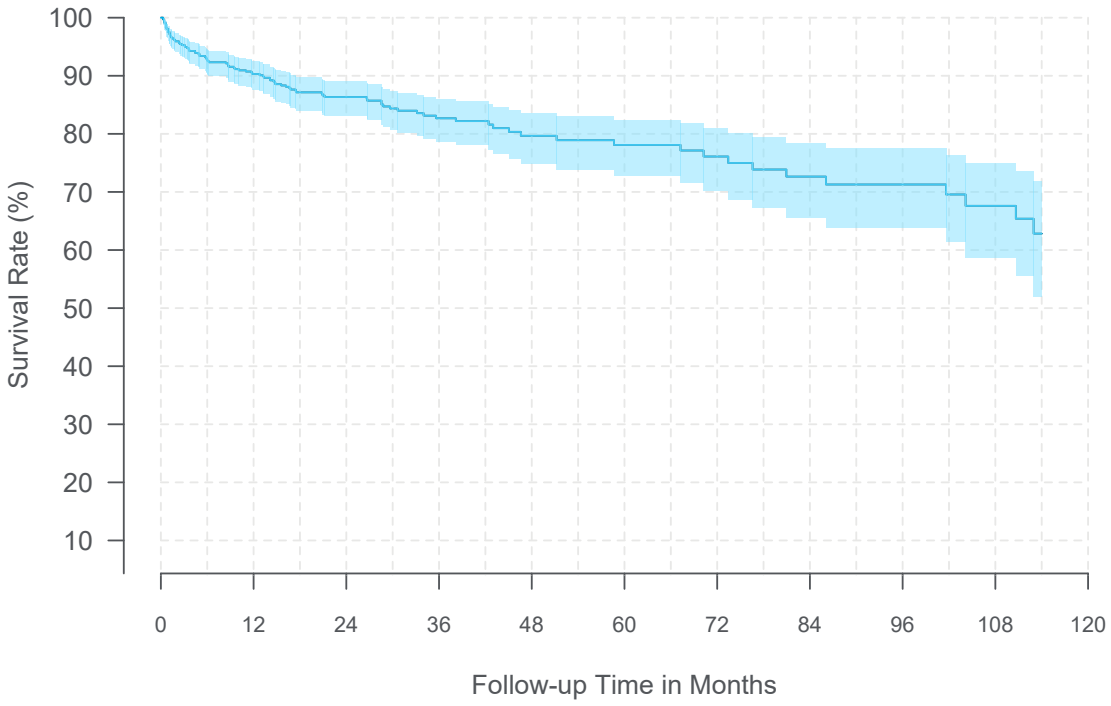
Time Interval	11 Years	12 Years	13 Years	14 Years	
Survival (95% CI)	58.9% (51.3%, 65.8%)	55.8% (47.4%, 63.4%)	50.6% (41.1%, 59.4%)	48.7% (38.8%, 57.9%)	—
Sample Size	41	33	26	20	

Catheter Event Summary: Grafted Not As Designed	N
Catheter Occlusion	31
Catheter Dislodgement	27
Catheter Break/Cut	14
Catheter Kink	8
Catheter Leakage	7
Pump Unable To Enter/Withdraw From Catheter Access Port	4
Catheter Dysfunction	3
Catheter Related Complication	3
Catheter Damage	2
Device Malfunction	2
Other[a]	7
Total	**108**

[a] Composed of event codes with 1 event each.

3.5.2.10 Revised As Designed

Model/Name	Revised As Designed
FDA Approval Date	October 2002
Catheters Enrolled	759
Catheters Currently Active in Study	379
Initial Product Performance Events	104
Median Follow-up Time (Months)	18.4
Cumulative Follow-up Time (Months)	20,675



Time Interval	1 Year	2 Years	3 Years	4 Years	5 Years
Survival (95% CI)	90.3% (87.6%, 92.5%)	86.3% (83.1%, 89.0%)	82.7% (78.7%, 86.0%)	79.7% (74.9%, 83.6%)	78.1% (72.9%, 82.4%)
Sample Size	424	290	178	112	92

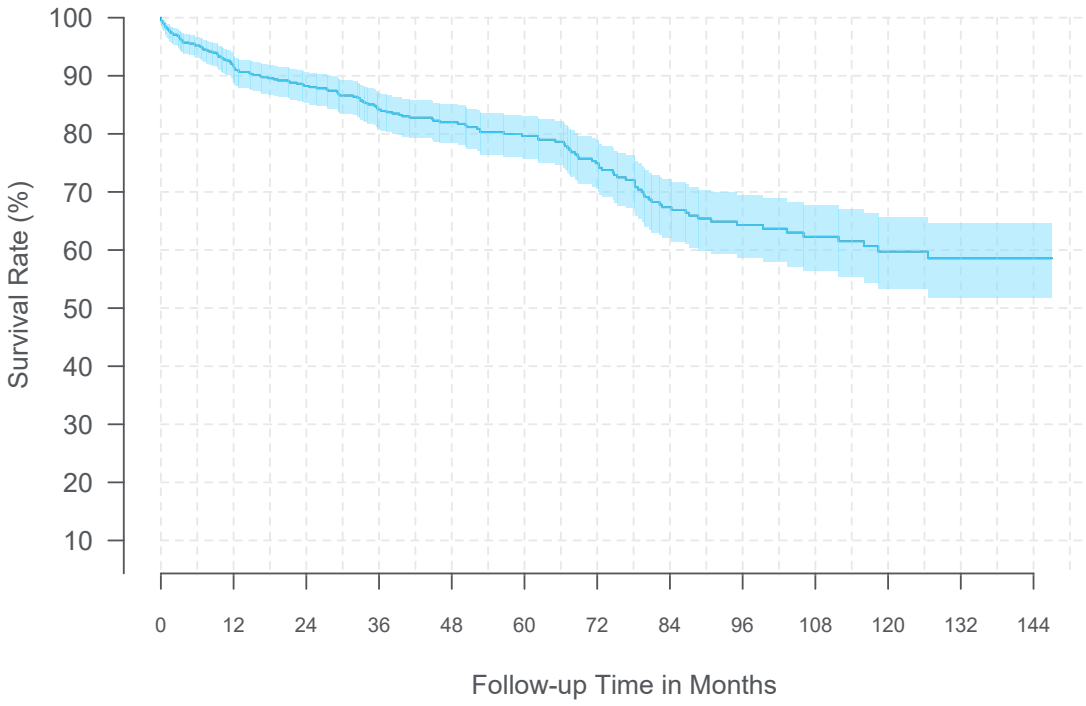
Time Interval	6 Years	7 Years	8 Years	9 Years	At 114 Months
Survival (95% CI)	76.1% (70.2%, 81.0%)	72.6% (65.6%, 78.5%)	71.3% (63.8%, 77.5%)	67.6% (58.7%, 75.0%)	62.8% (52.0%, 71.8%)
Sample Size	68	54	47	31	21

Catheter Event Summary: Revised As Designed	N
Catheter Dislodgement	54
Catheter Occlusion	24
Catheter Kink	7
Device Component Migration	7
Catheter Break/Cut	3
Catheter Leakage	3
Catheter Dysfunction	2
Pump Unable To Enter/Withdraw From Catheter Access Port	2
Other[a]	2
Total	**104**

[a] Composed of event codes with 1 event each.

3.5.2.11 Revised Not As Designed

Model/Name	Revised Not As Designed
FDA Approval Date	NA
Catheters Enrolled	733
Catheters Currently Active in Study	136
Initial Product Performance Events	151
Median Follow-up Time (Months)	41.1
Cumulative Follow-up Time (Months)	35,750



Time Interval	1 Year	2 Years	3 Years	4 Years	5 Years
Survival (95% CI)	91.5% (89.0%, 93.5%)	88.2% (85.3%, 90.6%)	84.2% (80.8%, 87.0%)	82.0% (78.4%, 85.1%)	79.6% (75.8%, 83.0%)
Sample Size	518	452	375	307	246

Time Interval	6 Years	7 Years	8 Years	9 Years	10 Years
Survival (95% CI)	74.9% (70.4%, 78.9%)	67.4% (62.1%, 72.1%)	64.3% (58.7%, 69.4%)	62.3% (56.3%, 67.7%)	59.7% (53.3%, 65.6%)
Sample Size	189	145	107	83	60

Time Interval	11 Years	12 Years	At 147 Months		
Survival (95% CI)	58.6% (51.9%, 64.7%)	58.6% (51.9%, 64.7%)	58.6% (51.9%, 64.7%)	—	—
Sample Size	43	24	21		

Catheter Event Summary: Revised Not As Designed	N
Catheter Occlusion	55
Catheter Dislodgement	24
Catheter Break/Cut	17
Catheter Kink	17
Catheter Leakage	10
Pump Unable To Enter/Withdraw From Catheter Access Port	5
Catheter Disconnection At Pump	4
Device Component Migration	4
Catheter Dysfunction	3
Catheter Related Complication	2
Other[a]	10
Total	**151**

[a] Composed of event codes with 1 event each.

3.5.3 Catheter Summary

Table 3.25: Targeted Drug Delivery Catheter Characteristics

Model/Name	FDA Approval Date	Catheters Enrolled	Catheters Active	Initial Product Performance Events	Median Follow-up Time (Months)	Cumulative Follow-up Time (Months)
8709	May 1998	2,918	128	362	17.8	100,121
8709SC	March 2006	1,104	141	151	28.4	48,161
8711	October 1999	661	60	100	31.7	32,077
8731	October 2002	534	41	64	32.8	24,448
8731SC	March 2006	282	63	38	37.9	12,658
8780	May 2012	1,498	641	139	30.6	55,106
8781	May 2012	1,256	379	149	12.7	33,238
Ascenda Revised As Designed	May 2012	528	261	59	16.9	12,781
Grafted Not As Designed	NA	504	99	108	39.0	24,939
Revised As Designed	October 2002	759	379	104	18.4	20,675
Revised Not As Designed	NA	733	136	151	41.1	35,750

Table 3.26: Targeted Drug Delivery Catheter Survival Probability (95% Confidence Intervals)

Model Name	1 Year	2 Years	3 Years	4 Years	5 Years
8709	91.9% (90.1%, 93.3%)	89.1% (87.2%, 90.8%)	85.6% (83.4%, 87.5%)	82.8% (80.4%, 84.9%)	80.1% (77.6%, 82.4%)
8709SC	94.0% (92.1%, 95.4%)	89.6% (87.1%, 91.6%)	87.3% (84.5%, 89.6%)	84.4% (81.3%, 87.1%)	82.4% (79.0%, 85.3%)
8711	92.5% (88.9%, 95.0%)	90.0% (86.1%, 92.9%)	84.9% (80.4%, 88.4%)	82.5% (77.8%, 86.3%)	80.8% (75.9%, 84.8%)
8731	93.6% (88.9%, 96.4%)	92.3% (87.6%, 95.3%)	91.4% (86.6%, 94.5%)	89.4% (84.5%, 92.9%)	87.9% (82.6%, 91.6%)
8731SC	93.1% (88.5%, 96.0%)	89.1% (83.3%, 92.9%)	89.1% (83.3%, 92.9%)	87.1% (80.7%, 91.5%)	83.9% (76.5%, 89.2%)
8780	95.7% (94.4%, 96.7%)	92.7% (91.0%, 94.1%)	92.1% (90.3%, 93.5%)	90.3% (88.3%, 92.1%)	88.1% (85.6%, 90.2%)
8781	91.6% (89.5%, 93.3%)	89.8% (87.4%, 91.8%)	86.8% (83.9%, 89.2%)	85.1% (82.0%, 87.8%)	82.3% (78.6%, 85.4%)
Ascenda Revised As Designed	92.1% (89.0%, 94.3%)	87.5% (83.4%, 90.6%)	83.9% (79.1%, 87.7%)	83.3% (78.3%, 87.2%)	80.6% (74.2%, 85.6%)
Grafted Not As Designed	90.7% (87.3%, 93.2%)	85.8% (81.7%, 89.0%)	83.0% (78.6%, 86.6%)	79.8% (74.9%, 83.8%)	77.4% (72.2%, 81.8%)
Revised As Designed	90.3% (87.6%, 92.5%)	86.3% (83.1%, 89.0%)	82.7% (78.7%, 86.0%)	79.7% (74.9%, 83.6%)	78.1% (72.9%, 82.4%)
Revised Not As Designed	91.5% (89.0%, 93.5%)	88.2% (85.3%, 90.6%)	84.2% (80.8%, 87.0%)	82.0% (78.4%, 85.1%)	79.6% (75.8%, 83.0%)

Model Name	6 Years	7 Years	8 Years	9 Years	10 Years
8709	74.9% (72.1%, 77.6%)	70.2% (67.1%, 73.1%)	68.0% (64.8%, 71.0%)	66.2% (62.9%, 69.3%)	64.2% (60.7%, 67.4%)
8709SC	80.0% (76.3%, 83.2%)	75.1% (70.8%, 78.8%)	73.1% (68.6%, 77.0%)	71.5% (66.8%, 75.6%)	70.1% (65.3%, 74.4%)
8711	77.3% (72.0%, 81.6%)	74.0% (68.5%, 78.7%)	72.2% (66.5%, 77.1%)	71.1% (65.4%, 76.1%)	68.7% (62.6%, 74.0%)
8731	82.6% (76.4%, 87.2%)	79.2% (72.6%, 84.4%)	75.9% (68.8%, 81.7%)	74.0% (66.5%, 80.1%)	73.0% (65.3%, 79.3%)
8731SC	82.8% (75.1%, 88.3%)	75.9% (66.8%, 82.9%)	75.9% (66.8%, 82.9%)	73.8% (64.5%, 81.1%)	71.0% (61.0%, 78.8%)
8780	86.2% (83.3%, 88.7%)	76.5% (71.3%, 80.8%)	75.1% (69.7%, 79.7%)	75.1% (69.7%, 79.7%)	__
8781	77.1% (72.3%, 81.1%)	63.7% (57.2%, 69.5%)	62.2% (55.5%, 68.2%)	__	__
Ascenda Revised As Designed	78.4% (70.6%, 84.4%)	70.0% (57.5%, 79.4%)	__	__	__
Grafted Not As Designed	73.8% (68.1%, 78.6%)	69.6% (63.4%, 75.0%)	65.2% (58.5%, 71.0%)	62.9% (56.0%, 69.1%)	61.2% (54.0%, 67.6%)
Revised As Designed	76.1% (70.2%, 81.0%)	72.6% (65.6%, 78.5%)	71.3% (63.8%, 77.5%)	67.6% (58.7%, 75.0%)	__
Revised Not As Designed	74.9% (70.4%, 78.9%)	67.4% (62.1%, 72.1%)	64.3% (58.7%, 69.4%)	62.3% (56.3%, 67.7%)	59.7% (53.3%, 65.6%)

Model Name	11 Years	12 Years	13 Years	14 Years	15 Years
8709	61.9% (58.3%, 65.3%)	59.5% (55.6%, 63.2%)	56.1% (51.9%, 60.1%)	55.0% (50.7%, 59.1%)	54.6% (50.2%, 58.7%)
8709SC	68.8% (63.7%, 73.4%)	68.8% (63.7%, 73.4%)	66.6% (59.9%, 72.5%)	__	__
8711	66.5% (60.0%, 72.1%)	62.7% (55.5%, 69.0%)	59.8% (52.2%, 66.5%)	56.5% (48.4%, 63.8%)	56.5% (48.4%, 63.8%)
8731	71.8% (63.8%, 78.4%)	67.1% (58.2%, 74.5%)	63.4% (54.1%, 71.4%)	59.8% (50.1%, 68.2%)	59.8% (50.1%, 68.2%)
8731SC	71.0% (61.0%, 78.8%)	71.0% (61.0%, 78.8%)	__	__	__
8780	__	__	__	__	__
8781	__	__	__	__	__
Ascenda Revised As Designed	__	__	__	__	__
Grafted Not As Designed	58.9% (51.3%, 65.8%)	55.8% (47.4%, 63.4%)	50.6% (41.1%, 59.4%)	48.7% (38.8%, 57.9%)	__
Revised As Designed	__	__	__	__	__
Revised Not As Designed	58.6% (51.9%, 64.7%)	58.6% (51.9%, 64.7%)	__	__	__

Model Name	16 Years	17 Years	18 Years	19 Years	
8709	54.6% (50.2%, 58.7%)	53.1% (48.3%, 57.6%)	50.3% (44.8%, 55.5%)	49.0% (43.1%, 54.6%)	__
8709SC	__	__	__	__	__
8711	56.5% (48.4%, 63.8%)	56.5% (48.4%, 63.8%)	__	__	__
8731	54.5% (44.0%, 64.0%)	__	__	__	__
8731SC	__	__	__	__	__
8780	__	__	__	__	__
8781	__	__	__	__	__
Ascenda Revised As Designed	__	__	__	__	__
Grafted Not As Designed	__	__	__	__	__
Revised As Designed	__	__	__	__	__
Revised Not As Designed	__	__	__	__	__

4 Spinal Cord Stimulation Systems

4.1 Study Participants

4.1.1 Centers

The spinal cord stimulation tables and graphs were generated based on data collected between June 2004 and the report cut-off date of October 31, 2022. Eighty-five centers, in North America, Europe and South America, enrolled patients and contributed patient data to the spinal cord stimulation systems section of this report. Figure 4.1 shows a World Map and highlights the countries that enrolled spinal cord stimulation patients.

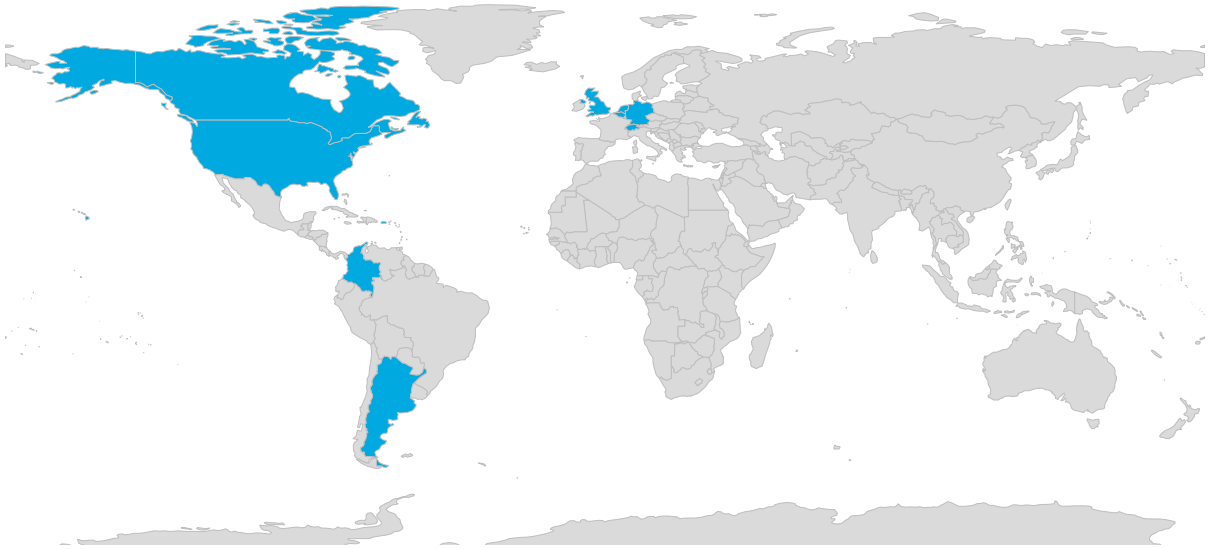


Figure 4.1: Countries with Spinal Cord Stimulation Patients in Registry (Highlighted)

4.1.2 Patients

Of the 6,328 spinal cord stimulation patients enrolled, 45.5% were implanted for the treatment of chronic back and leg pain, 25.8% were implanted for the treatment of other primary indications, 18.1% were implanted for the treatment of trunk and limb pain, 10.0% were implanted for the treatment of complex regional pain syndrome (CRPS), and 0.6% were implanted for indications that were not specified in the database (see Figure 4.2 and Table 4.1).

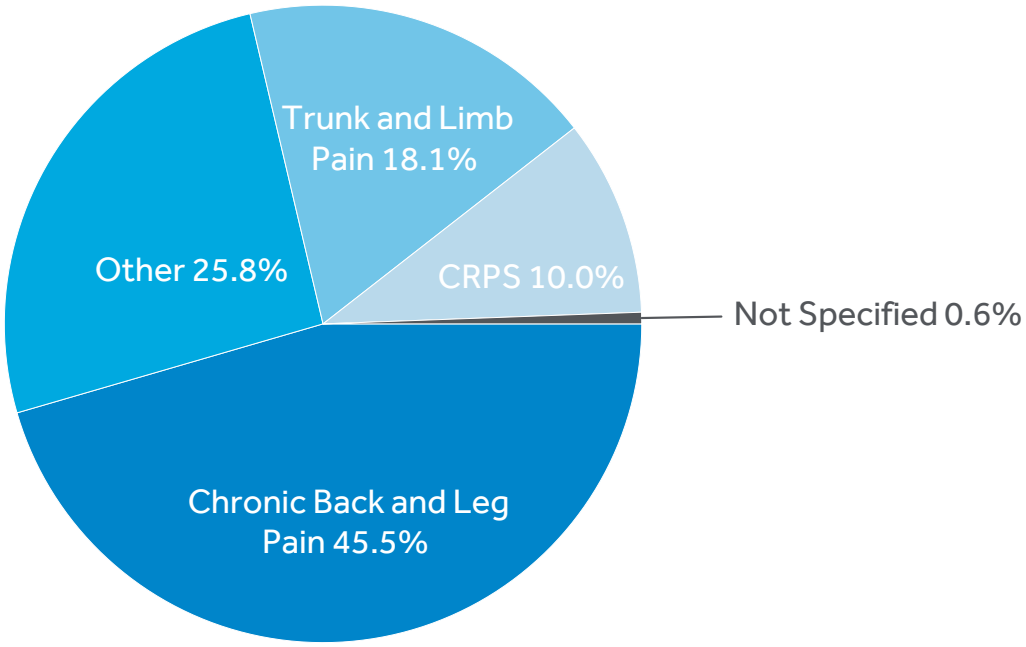


Figure 4.2: Spinal Cord Stimulation Primary Treatment Indications

Table 4.1: Spinal Cord Stimulation Primary Treatment Indications

Primary Treatment Indication[a]	Enrolled Patients (%)
Chronic Back and Leg Pain	**2,879 (45.50%)**
Post Surgical Back and/or Leg Pain[b]	2,118 (33.47%)
Combination Back and Leg Pain	739 (11.68%)
Arachnoiditis	22 (0.35%)
Other Primary Indication	**1,634 (25.82%)**
Other Chronic Pain	862 (13.62%)
Cervical Pain	89 (1.41%)
Chronic Cluster Headache	70 (1.11%)
Traumatic Nerve Injury	56 (0.88%)
Diabetic Neuropathy	45 (0.71%)
Post Herpetic Neuralgia	18 (0.28%)
Angina	10 (0.16%)
Facial Pain	10 (0.16%)
Epidural Fibrosis	4 (0.06%)
Post Herniorrhaphy Pain	3 (0.05%)
Other	467 (7.38%)
Trunk and Limb Pain	**1,148 (18.14%)**
Radicular Pain Syndrome	860 (13.59%)
Degenerative Disc Disease	288 (4.55%)
CRPS	**630 (9.96%)**
CRPS I	489 (7.73%)
CRPS II	141 (2.23%)
Not Specified	**37 (0.58%)**
Total Patients	**6,328 (100%)**

[a] For approved indications refer to product labeling for your geography.

[b] Contains Failed Back Surgery Syndrome (FBSS), Post Laminectomy Pain, Multiple Back Operations and Unsuccessful Disc Surgery.

It is recognized that healthcare providers prescribe therapies to meet specific patient needs; however, Medtronic only directs the use of its products based on approved labeling. Product labeling varies by geography. Contact a local Medtronic representative (http://www.medtronic.com/us-en/about/locations.html) for region-specific product labeling.

4.2 Event Summary

There were 1,970 product performance events reported between June 2004 and October 31, 2022, in patients with spinal cord stimulation systems. These events represent 35.5% of the

total reported events (1,970/5,549), occurred in 956 (15.1%) of the 6,328 total patients enrolled, and are presented graphically within this report (e.g. events per patient years as well as survival curves). In addition, there were 3,521 non-product performance events that were collected to understand patient experience (clinical signs and symptoms) with the spinal cord stimulation systems. As an ongoing registry, events not coded at the time of the data snapshot (waiting on further information) will be included in future reports (n=58).

Any registry devices that are returned to Medtronic are analyzed via a Returned Product Analysis (RPA) process. If available, RPA findings assist in the classification of the events. Within this report, Table 4.2 differentiates the events by those determined by the RPA process versus those determined by the physician. Please refer to the Methodology section for more information.

There were 266 deaths reported for patients followed in the PSR with spinal cord stimulation systems, none of which were reported as a direct result of a product performance event.

4.2.1 Product Performance Events

Table 4.2: Spinal Cord Stimulation System Product Performance Events

Product Performance Events[a]	Event Counts	Events Per 100 Patient Years	Patients with Events (%) N=6,328[b]
RPA Determination	**4**	**0.02**	**4 (0.06%)**
Broken Bond Wire	1	0.01	1 (0.02%)
Grommet Loose	1	0.01	1 (0.02%)
Medical Device Complication [c]	1	0.01	1 (0.02%)
No Anomaly Found By RPA	1	0.01	1 (0.02%)
Physician's Determination	**1,966**	**11.93**	**953 (15.06%)**
Lead Migration/Dislodgement	820	4.98	433 (6.84%)
High Impedance	497	3.02	226 (3.57%)
Device Malfunction[d]	105	0.64	92 (1.45%)
Neurostimulator Unable To Recharge [e]	104	0.63	96 (1.52%)
Lead Fracture	99	0.60	65 (1.03%)
Low Impedance	56	0.34	26 (0.41%)
Device Stimulation Issue[f]	53	0.32	31 (0.49%)
Device Breakage[g]	42	0.25	38 (0.60%)
Device Charging Issue	27	0.16	22 (0.35%)
Extension Fracture	18	0.11	12 (0.19%)
Device Electrical Impedance Issue	17	0.10	11 (0.17%)
Therapeutic Product Ineffective	13	0.08	12 (0.19%)
Extension Migration	12	0.07	8 (0.13%)
Device Connection Issue	8	0.05	6 (0.09%)
Device Lead Damage	7	0.04	5 (0.08%)
Antenna Cable Breakage	6	0.04	6 (0.09%)
Device Overheating	6	0.04	6 (0.09%)

...continued

Product Performance Events[a]	Event Counts	Events Per 100 Patient Years	Patients with Events (%) N=6,328[b]
Medical Device Complication[h]	6	0.04	2 (0.03%)
Medical Device Site Pain	5	0.03	4 (0.06%)
Neurostimulator Migration	5	0.03	5 (0.08%)
Device Difficult To Program	4	0.02	4 (0.06%)
Device Failure[i]	4	0.02	3 (0.05%)
Inadequate Lead Connection	4	0.02	2 (0.03%)
Device Battery Issue	3	0.02	2 (0.03%)
Device Computer Software Issue	3	0.02	3 (0.05%)
Device Damage	3	0.02	3 (0.05%)
Device Telemetry Issue	3	0.02	3 (0.05%)
Device Use Issue	3	0.02	2 (0.03%)
Electric Shock Sensation	3	0.02	2 (0.03%)
Premature Battery Depletion	3	0.02	3 (0.05%)
Back Pain	2	0.01	2 (0.03%)
Device Loosening	2	0.01	2 (0.03%)
Medical Device Site Erosion	2	0.01	1 (0.02%)
Medical Device Site Warmth	2	0.01	2 (0.03%)
Device Difficult To Use	1	0.01	1 (0.02%)
Device End Of Service	1	0.01	1 (0.02%)
Device Image Display Error	1	0.01	1 (0.02%)
Device Issue	1	0.01	1 (0.02%)
Device Kink	1	0.01	1 (0.02%)
Device Material Deterioration	1	0.01	1 (0.02%)
Device Reset Issue	1	0.01	1 (0.02%)
Device Temperature Issue	1	0.01	1 (0.02%)
Device Wireless Communication Issue	1	0.01	1 (0.02%)
Eschar	1	0.01	1 (0.02%)
Extradural Abscess	1	0.01	1 (0.02%)
Headache	1	0.01	1 (0.02%)
Inappropriate Device Programming	1	0.01	1 (0.02%)
Lead Insulation Failure	1	0.01	1 (0.02%)
Medical Device Site Erythema	1	0.01	1 (0.02%)
Pain	1	0.01	1 (0.02%)
Pain In Extremity	1	0.01	1 (0.02%)
Scar Pain	1	0.01	1 (0.02%)
Sensory Disturbance	1	0.01	1 (0.02%)
Total	**1,970**	**11.95**	**956 (15.11%)**

[a] Medical Dictionary for Regulatory Activities (MedDRA) Lower-Level Term or Medtronic's coding system term for events that do not exist in the MedDRA dictionary.

[b] The total number of patients with events may not represent the sum of all rows, as a patient may have experienced more than one type of event.
[c] One event without a device diagnosis but has RPA finding. RPA finding is described as a problem with the functionality of the INS that appears to be related to the hybrid; however, the exact cause of the problem could not be determined.
[d] There were 4307 patients that used rechargeable SCS neurostimulators in the registry. A total of 2.2% (96/4307) of patients with a rechargeable SCS neurostimulator experienced a neurostimulator unable to recharge event.
[e] Includes recharging components, charging and other technical related issues.
[f] Device stimulation issue reported by physician as being caused by neurostimulator (n=3), lead (n=47) or programming (n=3).
[g] Includes external components.
[h] Includes a combination of mechanical and electrical observations.
[i] Device failure includes 3 events for lead failure, and 1 extension failure.

A total of 1,436 (72.9%) of the 1,970 product performance events were related to the Lead, 105 (5.3%) were related to the Neurostimulator, 47 (2.4%) were related to the Extension, 55 (2.8%) were related to Multiple Etiologies (which includes events where at least one device and one non-device etiology was indicated), and 327 (16.6%) were related to Other Etiologies, including: 218 (11.1%) were related to other component, 53 (2.7%) were related to recharging process, 26 (1.3%) were related to programming/stimulation, 16 (0.8%) were related to incisional site/device tract, 8 (0.4%) were related to surgery/anesthesia, 1 (0.1%) was related to MRI, and 5 (0.3%) were related to other etiology. Relatedness is determined by the physician.

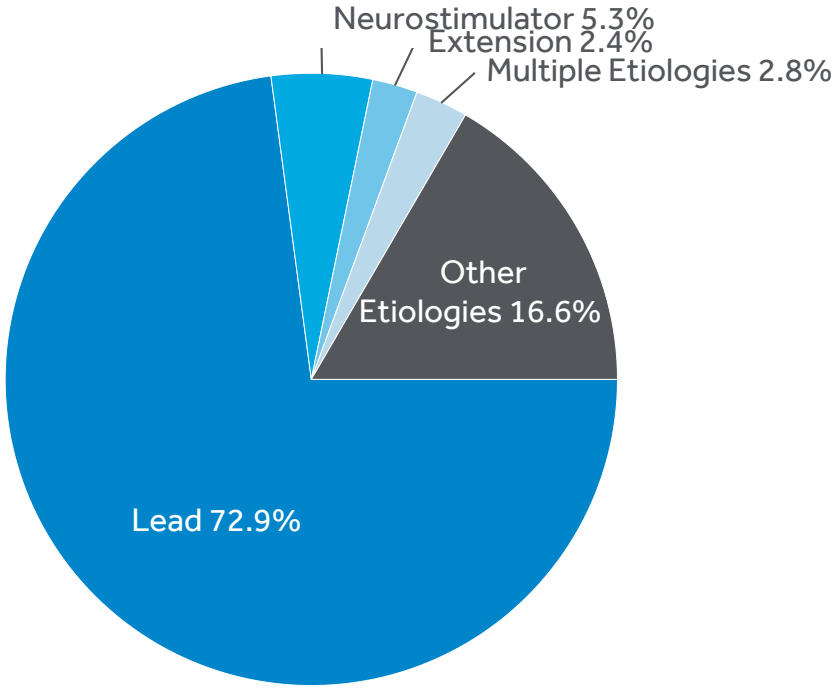


Figure 4.3: Spinal Cord Stimulation System Product Performance Events by Relatedness

Table 4.3 and Table 4.4 describe the interventions taken for reported impedance events. In 26.2% and 21.4% of the high and low impedance events, respectively, the action taken was a surgical intervention. However, impedance could be used as a diagnostic measurement and may not result in any intervention or clinical impact. The majority of events required no intervention or device reprogramming only (71.0% for high impedance and 76.8% for low impedance).

Table 4.3: Spinal Cord Stimulation System High Impedance Events by Intervention

Intervention	N (%) of High Impedance Events
Reprogramming	222 (44.7%)
Device Surgical Intervention	129 (26.0%)
Therapy Suspension	8 (1.6%)
Other Intervention	6 (1.2%)
Other Surgical Intervention	1 (0.2%)
No Action Taken	131 (26.4%)
Total	**497 (100%)**

Table 4.4: Spinal Cord Stimulation System Low Impedance Events by Intervention

Intervention	N (%) of Low Impedance Events
Reprogramming	26 (46.4%)
Device Surgical Intervention	11 (19.6%)
Other Intervention	1 (1.8%)
Other Surgical Intervention	1 (1.8%)
No Action Taken	17 (30.4%)
Total	**56 (100%)**

Table 4.5 describes the interventions taken for reported lead migration/dislodgement events; 76.7% of them led a surgical intervention, and 12.1% were reprogramming.

Table 4.5: Spinal Cord Stimulation System Lead Migration/Dislodgement Events by Intervention

Intervention	N (%) of Lead Migration/Dislodgement Events
Device Surgical Intervention	587 (71.6%)
Reprogramming	99 (12.1%)
Other Surgical Intervention	42 (5.1%)
Therapy Suspension	19 (2.3%)
Other Intervention	15 (1.8%)
Medical or Non-Surgical Therapy	3 (0.4%)
Medication	2 (0.2%)
No Action Taken	53 (6.5%)
Total	**820 (100%)**

Table 4.6 describes the interventions completed for product performance events that required action from the health care provider and thereby, may have resulted in an incremental impact to the patient. Survival estimates presented in previous product performance reports included events where no action was taken. To present survival estimates that may better correlate with patient impact, events where no action was taken have been removed from the device survival estimates presented in this 2022 report. The far-left column lists the top five reported product performance events (PPEs), and all other reported PPEs are listed under Other. The subsequent columns represent the actions taken by the reporting physician.

Table 4.6: Spinal Cord Stimulation System Product Performance Events by Intervention

Events by Intervention	Surgical Intervention	Reprogramming	Therapy Suspension	Medical or Non-Surgical Intervention [a]	No Action Taken	Total Events
Lead Migration/Dislodgement	629 (76.7%)	99 (12.1%)	19 (2.3%)	20 (2.4%)	53 (6.5%)	**820**
High Impedance	130 (26.2%)	222 (44.7%)	8 (1.6%)	6 (1.2%)	131 (26.4%)	**497**
Lead Fracture	95 (96.0%)	0 (0.0%)	2 (2.0%)	0 (0.0%)	2 (2.0%)	**99**
Neurostimulator Unable To Recharge	36 (34.6%)	5 (4.8%)	4 (3.8%)	55 (52.9%)	4 (3.8%)	**104**
Device Malfunction	21 (20.0%)	9 (8.6%)	3 (2.9%)	62 (59.0%)	10 (9.5%)	**105**
Other [b]	170 (49.3%)	49 (14.2%)	9 (2.6%)	78 (22.6%)	39 (11.3%)	**345**
Total	**1,081**	**384**	**45**	**221**	**239**	**1,970**

[a] Medical or Non-Surgical Therapy contains but is not limited to the following actions: medication adjustment based on disease symptoms, imaging (e.g. MRI or X-ray), other specialist referral.

[b] Other represents all reported PPEs that were not in the top five of occurrence.

4.2.2 Clinical Events Not Related To Product Performance

The clinical events not related to product performance are summarized if:

- Enrolled in the PSR since 2013
- Categorized as serious adverse events (SAEs, N=127)
- Occurred with a System Organ Class (SOC) threshold $\geq$1% of patients

- Other Considerations
  - Some events are described in high level group terms (HLGT) to provide more specificity, if needed
  - Some therapies will provide therapy relevant events

Table 4.7: Spinal Cord Stimulation System Clinically Relevant Serious Adverse Events

Event Type	Number of SAE	Patients with SAE n (%) N=3,437	SAE Per 100 Patient Months	Patient with SAE Requiring Surgical Intervention n (%) N=3,437
Infections and infestations	**60**	**58 (1.69%)**	**0.06**	**42 (1.22%)**
Infections - pathogen unspecified	52	50 (1.45%)	0.05	39 (1.13%)
Bacterial infectious disorders	7	7 (0.20%)	0.01	3 (0.09%)
Other[a]	1	1 (0.03%)	0.00	0 (0.00%)
Other SOC Terms (≤1.0% Threshold)	**67**	**58 (1.69%)**	**0.07**	**42 (1.22%)**
Total	**127**	**109 (3.17%)**	**0.13**	**78 (2.27%)**

[a] Composed of high level group term event codes with fewer than 5 events each.

4.2.3 Patient Deaths

In earlier versions of the protocol, deaths were only assessed for the relatedness to the device product performance. After 2010, death assessments were expanded to also include the relationship to the implant procedure and/or therapy. As of the report cut-off, a total of 266 patients in the registry had expired. As with previous reports, no deaths were reported as a direct result of a product performance event.

Since 2010, a total of 83 (31.2%) deaths have been reported in this patient registry study based upon patients receiving therapy for post surgical back and/or leg pain, 56 (21.1%) for other chronic pain, 37 (13.9%) for radicular pain syndrome, 30 (11.3%) for combination back and leg pain, 15 (5.6%) for CRPS I, 13 (4.9%) for degenerative disc disease, 3 (1.1%) for CRPS II, 2 (0.8%) for diabetic neuropathy, 2 (0.8%) for post herpetic neuralgia, 1 (0.4%) for angina, 1 (0.4%) for cervical pain, 1 (0.4%) for chronic cluster headache, 1 (0.4%) for traumatic nerve injury, and 21 (7.9%) for other indications. The percentage is based upon the total patient death events and not based upon the rate of occurrence. **All tables depicted without a patient denominator should not be interpreted using other numbers within this report to calculate event rates**.

Table 4.8: Spinal Cord Stimulation System Patient Deaths by Primary Indication

Number of Reports of Death by Primary Indication[a]	N (%) of Deaths
Post Surgical Back and/or Leg Pain [b]	83 (31.2%)
Other Chronic Pain	56 (21.1%)
Radicular Pain Syndrome	37 (13.9%)
Combination Back and Leg Pain	30 (11.3%)
CRPS I	15 (5.6%)
Degenerative Disc Disease	13 (4.9%)
CRPS II	3 (1.1%)
Diabetic Neuropathy	2 (0.8%)
Post Herpetic Neuralgia	2 (0.8%)
Angina	1 (0.4%)
Cervical Pain	1 (0.4%)
Chronic Cluster Headache	1 (0.4%)
Traumatic Nerve Injury	1 (0.4%)
Other [c]	21 (7.9%)
Total	**266 (100%)**

[a] For approved indications refer to product labeling for your geography.

[b] Contains Failed Back Surgery Syndrome (FBSS), Post Laminectomy Pain and Multiple Back Operations.

[c] Includes specific free-text entries of the following nature: Radiculopathy, Lumbosacral Neuritis,Peripheral Neuropathy, Occipital Neuralgia, Raynaud's Disease, Bilateral Lower Legs and Feet, Post Hemangioma Surgery Complication, Headache, Arteriopathie, Vascular Pain, Leg Pain after Accident.

4.3 Neurostimulators

From June 2004 to the report cut-off date of October 31, 2022, there were 6,983 neurostimulators followed in the registry. The difference between the total number of patients (n=6,328) versus neurostimulators is due to the fact that some patients were subsequently re-implanted. The aggregate prospective follow-up time for all spinal cord neurostimulators was 192,005 months (16,000 years). Table 4.9 provides the number and percentage of neurostimulators by model.

Table 4.9: Spinal Cord Stimulation Neurostimulator Counts by Model

Model Name	N (%)
Currently manufactured	**5,256 (75.27%)**
RestoreSensor SureScan MRI (97714)	1,382 (19.79%)
Intellis with AdaptiveStim (97715)	1,281 (18.34%)
PrimeAdvanced SureScan MRI (97702)	785 (11.24%)
PrimeAdvanced (37702)	668 (9.57%)
RestoreSensor (37714)	377 (5.40%)
RestoreAdvanced (37713)	357 (5.11%)
Itrel 4 (37703)	135 (1.93%)
RestoreAdvanced SureScan MRI (97713)	116 (1.66%)
RestoreUltra SureScan MRI (97712)	93 (1.33%)
Intellis LT (97716)	41 (0.59%)
Vanta	20 (0.29%)
Itrel 4 (37704)	1 (0.01%)
No longer manufactured	**1,718 (24.60%)**
RestoreULTRA (37712)	581 (8.32%)
Synergy (7427)	460 (6.59%)
Restore (37711)	448 (6.42%)
Itrel 3 (7425)	96 (1.37%)
RestorePrime (37701)	56 (0.80%)
Synergy Versitrel (7427V)	53 (0.76%)
SynergyPlus (7479)	17 (0.24%)
SynergyCompact (7479B)	7 (0.10%)
Other/Unspecified	**9 (0.13%)**
Total	**6,983 (100%)**

4.3.1 Neurostimulator Events

There were 118 product performance-related events with an underlying reported etiology related to spinal cord neurostimulator function. This includes 105 events with a neurostimulator etiology and 13 events with both a neurostimulator and other etiology (including device and non-device etiologies). Of these, 90 were the initial product performance event that affected neurostimulator survival estimates. For spinal cord neurostimulators in the registry, the current return rate to Medtronic Returned Product Analysis (RPA) was 18.5% (396/2,135). The proportion was based upon the number of registry spinal cord neurostimulators received by RPA, divided by the sum of the total number of explanted devices and the total number of neurostimulators in patients who have expired. In the 118 spinal cord neurostimulator events, 96.6 % (114/118) were assigned as device related by the physician, not returned to Medtronic RPA (see Table 4.10).

Table 4.10: Spinal Cord Stimulation Neurostimulator Product Performance Events by Determination

Product Performance Events	N (%)
RPA Determination	**4 (3.4%)**
Broken Bond Wire	1 (0.8%)
Grommet Loose	1 (0.8%)
Medical Device Complication	1 (0.8%)
No Anomaly Found By RPA	1 (0.8%)
Physician's Determination	**114 (96.6%)**
High Impedance	28 (23.7%)
Device Malfunction	25 (21.2%)
Neurostimulator Unable To Recharge	24 (20.3%)
Lead Migration/Dislodgement	10 (8.5%)
Device Charging Issue	5 (4.2%)
Device Stimulation Issue	3 (2.5%)
Low Impedance	3 (2.5%)
Neurostimulator Migration	3 (2.5%)
Medical Device Site Warmth	2 (1.7%)
Premature Battery Depletion	2 (1.7%)
Therapeutic Product Ineffective	2 (1.7%)
Device Battery Issue	1 (0.8%)
Device Breakage	1 (0.8%)
Device Issue	1 (0.8%)
Device Overheating	1 (0.8%)
Device Telemetry Issue	1 (0.8%)
Extension Migration	1 (0.8%)
Pain	1 (0.8%)
Total	**118 (100%)**

For the purposes of survival analysis, a device's follow-up time is cut-off for one of three reasons: 1) the occurrence of a product performance-related event; 2) the occurrence of a censoring event; or 3) the device is event-free and censored at the patient's last follow-up prior to the data cut-off. For neurostimulators:

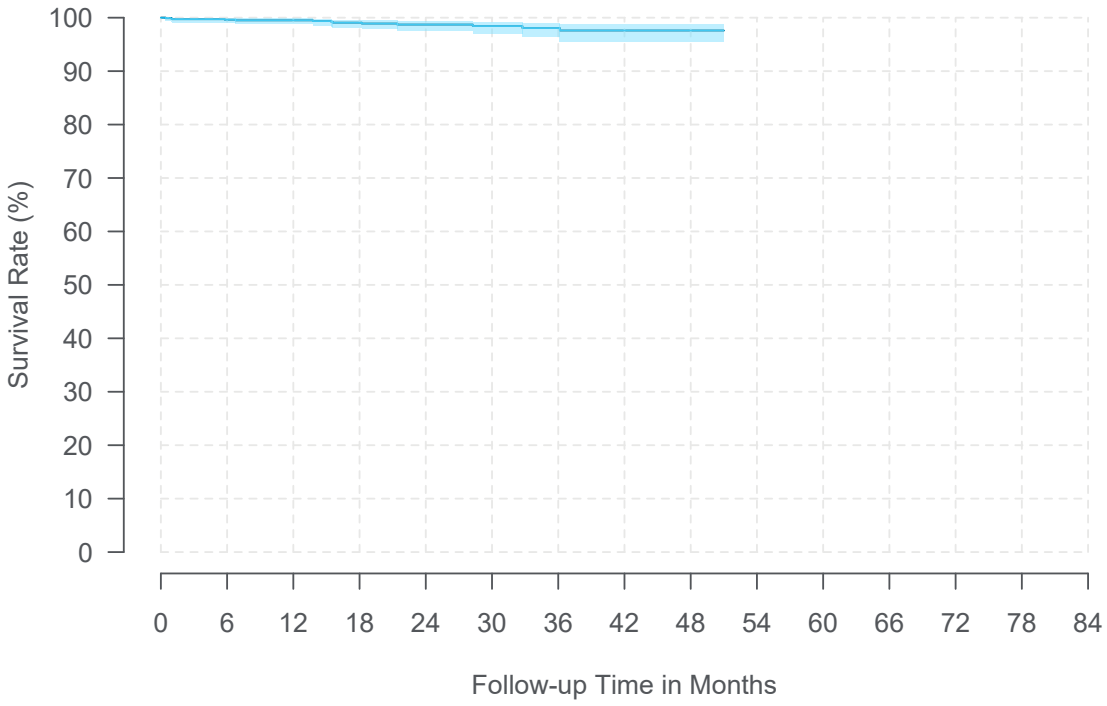
- 90 had follow-up time cut-off due to product performance-related events.
- 5,328 were censored in the survival analysis for the following reasons: patient expired, neurostimulator explanted, patient discontinued, therapy suspended, or site discontinued participation in the registry.
- 1,565 were free from product performance-related events and censoring events, and were censored at the last follow-up visit prior to the report cut-off.

4.3.2 Neurostimulator Models

The following figures and tables represent spinal cord neurostimulator survival and 95% confidence intervals where at least 20 spinal cord neurostimulators contributed to each 3-month interval. The survival of Itrel 4 (model 37704) and Vanta are not shown due to insufficient follow-up data.

4.3.2.1 Model Intellis with AdaptiveStim

Model Name	Intellis with AdaptiveStim (model 97715)
FDA Approval Date	September 2017
Neurostimulators Enrolled	1,281
Neurostimulators Currently Active in Study	887
Initial Product Performance Events	13
Median Follow-up Time (Months)	17.0
Cumulative Follow-up Time (Months)	24,254



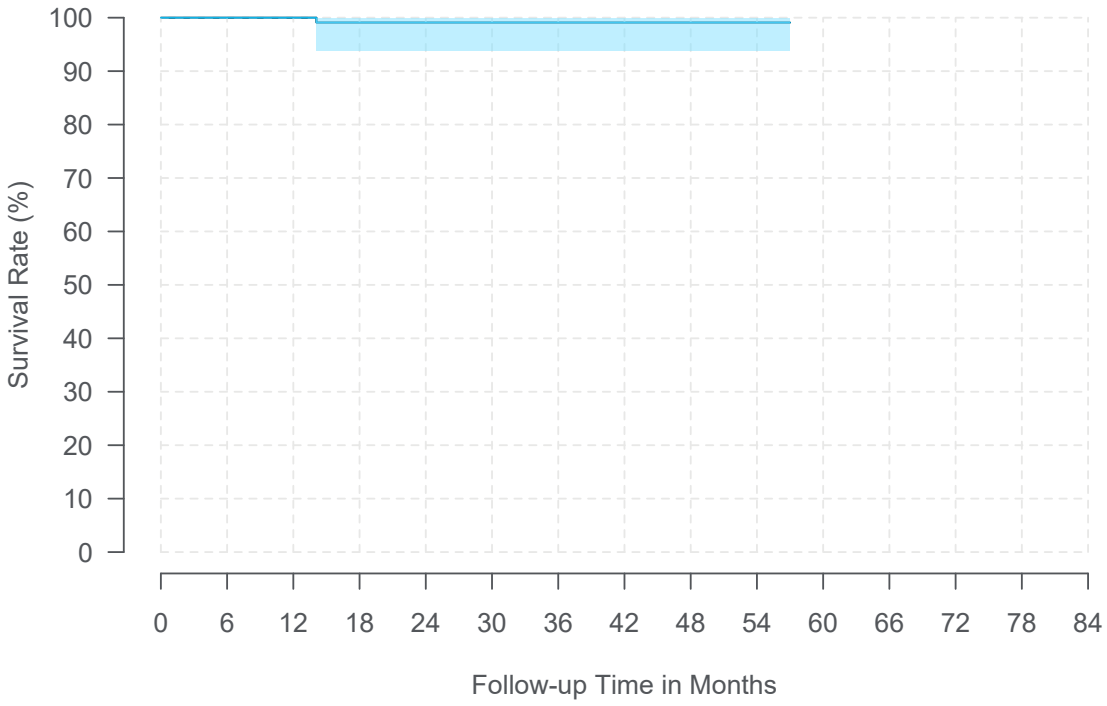
Time Interval	1 Year	2 Years	3 Years	4 Years	At 51 Months
Survival (95% CI)	99.5% (98.8%, 99.8%)	98.7% (97.6%, 99.3%)	98.1% (96.4%, 99.0%)	97.6% (95.5%, 98.7%)	97.6% (95.5%, 98.7%)
Sample Size	744	454	214	52	35

Specification: Intellis with AdaptiveStim	
Height	57.1mm (2.2in)
Width	47.2mm (1.9in)
Thickness Case	6.3 mm (0.2 in)
Thickness Connector	9.1 mm (0.4 in)
Volume	13.9 cc
Battery Type	Rechargeable
Expected Battery Life	9 years before ERI
Maximum Electrodes	16
Amplitude	0 - 100 mA
Rate Range	40 - 1200 Hz
Pulse Width	60 - 1000 µsec
Groups	1 - 3
Programs	12
Implant Depth	≤ 3 cm

Neurostimulator Event Summary: Intellis with AdaptiveStim	N
Device malfunction	4
High impedance	4
Device charging issue	1
Device overheating	1
Lead migration/dislodgement	1
Neurostimulator migration	1
Therapeutic product ineffective	1
Total	**13**

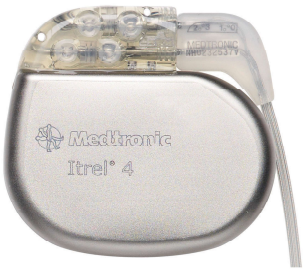
4.3.2.2 Model Itrel 4

Model Name	Itrel 4 (model 37703)
FDA Approval Date	May 2012
Neurostimulators Enrolled	135
Neurostimulators Currently Active in Study	41
Initial Product Performance Events	1
Median Follow-up Time (Months)	30.2
Cumulative Follow-up Time (Months)	4,596



Time Interval	1 Year	2 Years	3 Years	4 Years	At 57 Months
Survival (95% CI)	100.0% (NA)	99.1% (93.8%, 99.9%)	99.1% (93.8%, 99.9%)	99.1% (93.8%, 99.9%)	99.1% (93.8%, 99.9%)
Sample Size	114	82	58	36	24

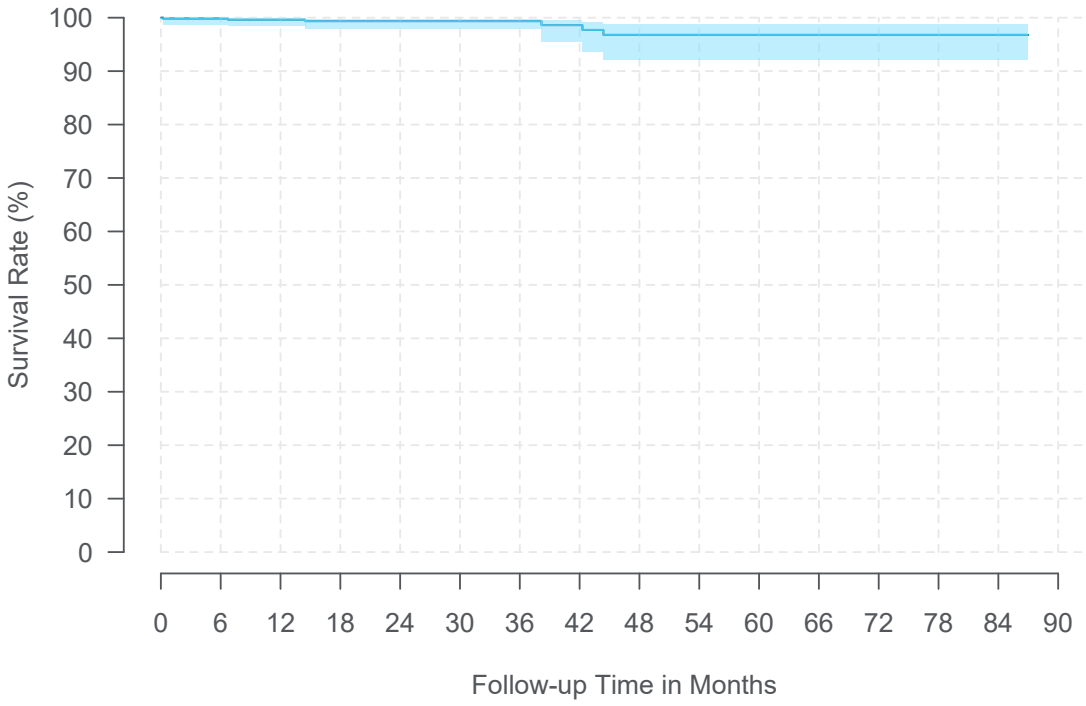
Specification: Itrel 4	
Height	2.2 in (55 mm)
Width	2.4 in (60 mm)
Thickness	0.4 in (11 mm)
Volume	28 cc
Battery type	Non-Rechargeable
Expected Battery life	Depends on settings and use
Maximum Electrodes	4
Amplitude	0 - 10.5 V
Rate	2 - 130 Hz
Pulse Width	60 - 450 µsec
Groups	1
Programs	1
Implant Depth	≤ 4 cm



Neurostimulator Event Summary: Itrel 4	N
High impedance	1
Total	**1**

4.3.2.3 Model PrimeAdvanced

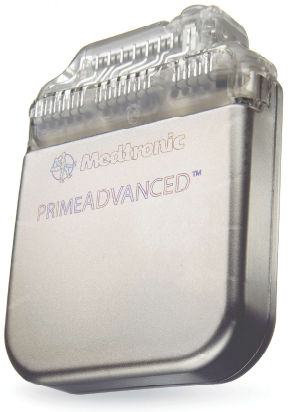
Model Name	PrimeAdvanced (model 37702)
FDA Approval Date	July 2006
Neurostimulators Enrolled	668
Neurostimulators Currently Active in Study	14
Initial Product Performance Events	6
Median Follow-up Time (Months)	16.0
Cumulative Follow-up Time (Months)	15,767



Time Interval	1 Year	2 Years	3 Years	4 Years	5 Years
Survival (95% CI)	99.6% (98.5%, 99.9%)	99.3% (97.9%, 99.8%)	99.3% (97.9%, 99.8%)	96.8% (92.0%, 98.7%)	96.8% (92.0%, 98.7%)
Sample Size	393	238	143	95	66

Time Interval	6 Years	7 Years	At 87 Months		
Survival (95% CI)	96.8% (92.0%, 98.7%)	96.8% (92.0%, 98.7%)	96.8% (92.0%, 98.7%)	—	—
Sample Size	40	24	22		

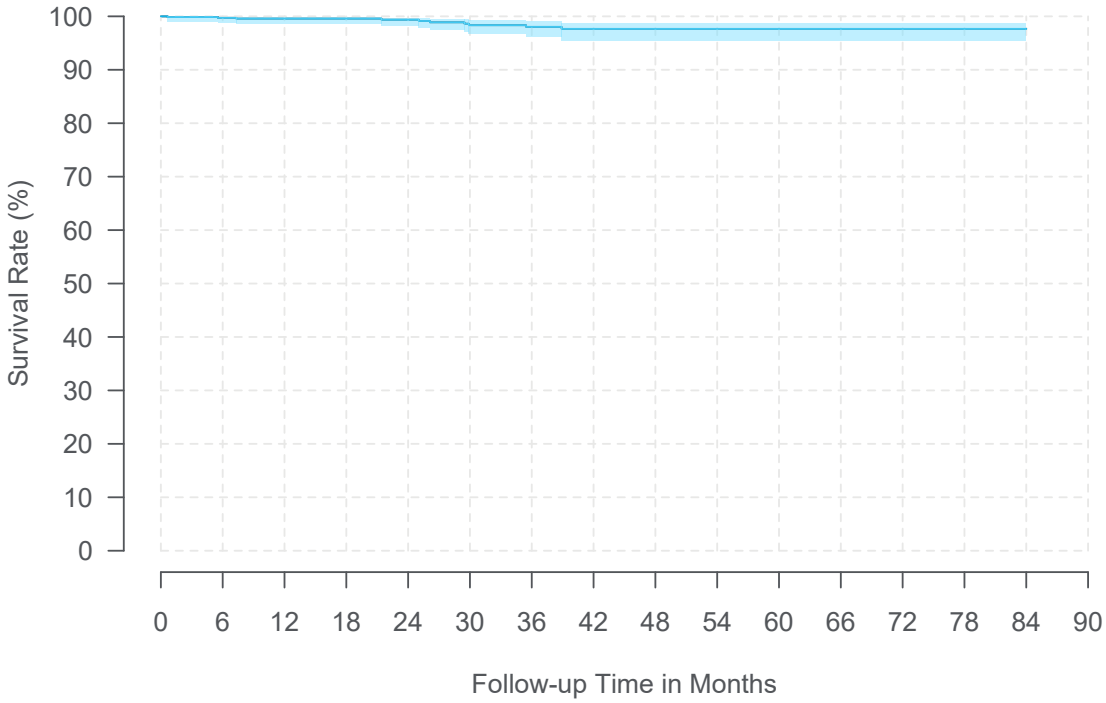
Specification: PrimeAdvanced	
Height	2.6 in (65 mm)
Width	1.9 in (49 mm)
Thickness	0.6 in (15 mm)
Volume	39 cc
Battery type	Non-Rechargeable
Expected Battery life	Depends on settings and use
Maximum Electrodes	16
Amplitude	0 - 10.5 V
Rate	2 - 130 Hz
Pulse Width	60 - 450 µsec
Groups	26
Programs	32
Implant Depth	≤ 4 cm



Neurostimulator Event Summary: PrimeAdvanced	N
Device malfunction	2
High impedance	2
Device stimulation issue	1
Low impedance	1
Total	**6**

4.3.2.4 Model PrimeAdvanced SureScan MRI

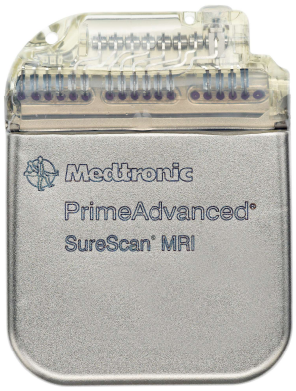
Model Name	PrimeAdvanced SureScan MRI (model 97702)
FDA Approval Date	March 2013
Neurostimulators Enrolled	785
Neurostimulators Currently Active in Study	223
Initial Product Performance Events	10
Median Follow-up Time (Months)	27.2
Cumulative Follow-up Time (Months)	24,884



Time Interval	1 Year	2 Years	3 Years	4 Years	5 Years
Survival (95% CI)	99.6% (98.7%, 99.9%)	99.4% (98.3%, 99.8%)	98.0% (96.2%, 99.0%)	97.7% (95.5%, 98.8%)	97.7% (95.5%, 98.8%)
Sample Size	605	442	300	173	105

Time Interval	6 Years	7 Years			
Survival (95% CI)	97.7% (95.5%, 98.8%)	97.7% (95.5%, 98.8%)	—	—	—
Sample Size	53	23			

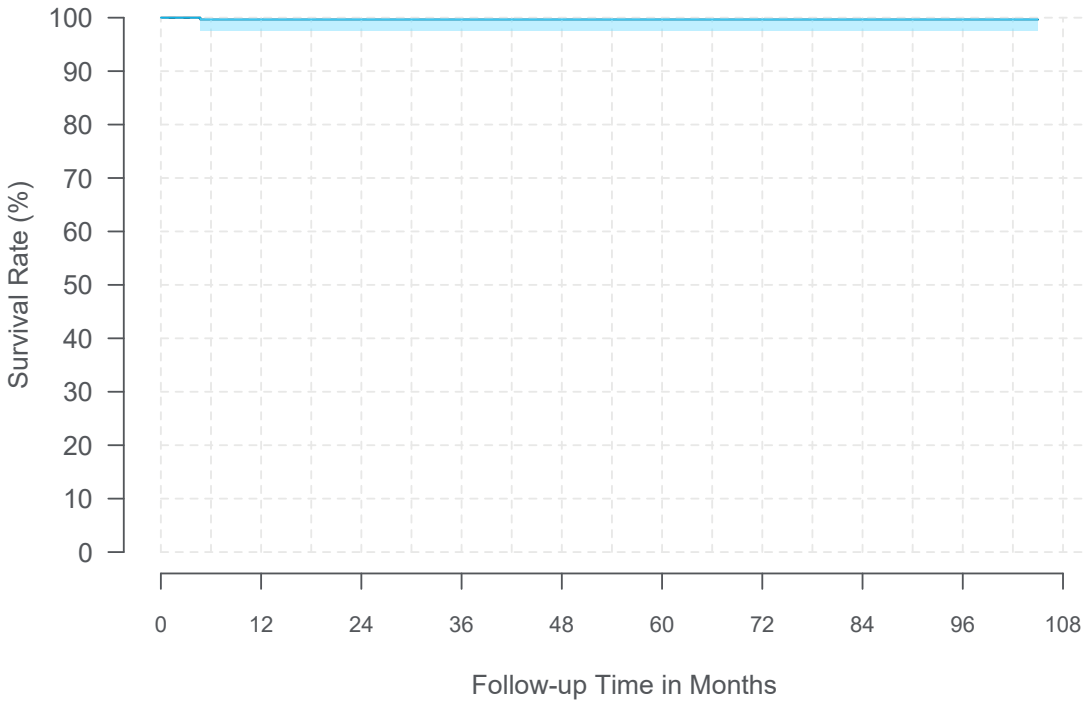
Specification: PrimeAdvanced SureScan MRI	
Height	2.6 in (65 mm)
Width	1.9 in (49 mm)
Thickness	0.6 in (15 mm)
Volume	39 cc
Battery type	Non-Rechargeable
Expected Battery life	Depends on settings and use
Maximum Electrodes	16
Amplitude	0 - 10.5 V
Rate	3 - 130 Hz
Pulse Width	60 - 450 µsec
Groups	26
Programs	32
Implant Depth	≤ 4 cm



Neurostimulator Event Summary: PrimeAdvanced SureScan MRI	N
High impedance	6
Premature battery depletion	2
Lead migration/dislodgement	1
Neurostimulator unable to recharge	1
Total	**10**

4.3.2.5 Model RestoreAdvanced

Model Name	RestoreAdvanced (model 37713)
FDA Approval Date	July 2006
Neurostimulators Enrolled	357
Neurostimulators Currently Active in Study	2
Initial Product Performance Events	1
Median Follow-up Time (Months)	22.0
Cumulative Follow-up Time (Months)	11,327



Time Interval	1 Year	2 Years	3 Years	4 Years	5 Years
Survival (95% CI)	99.7% (97.6%, 100%)	99.7% (97.6%, 100%)	99.7% (97.6%, 100%)	99.7% (97.6%, 100%)	99.7% (97.6%, 100%)
Sample Size	238	170	115	84	62

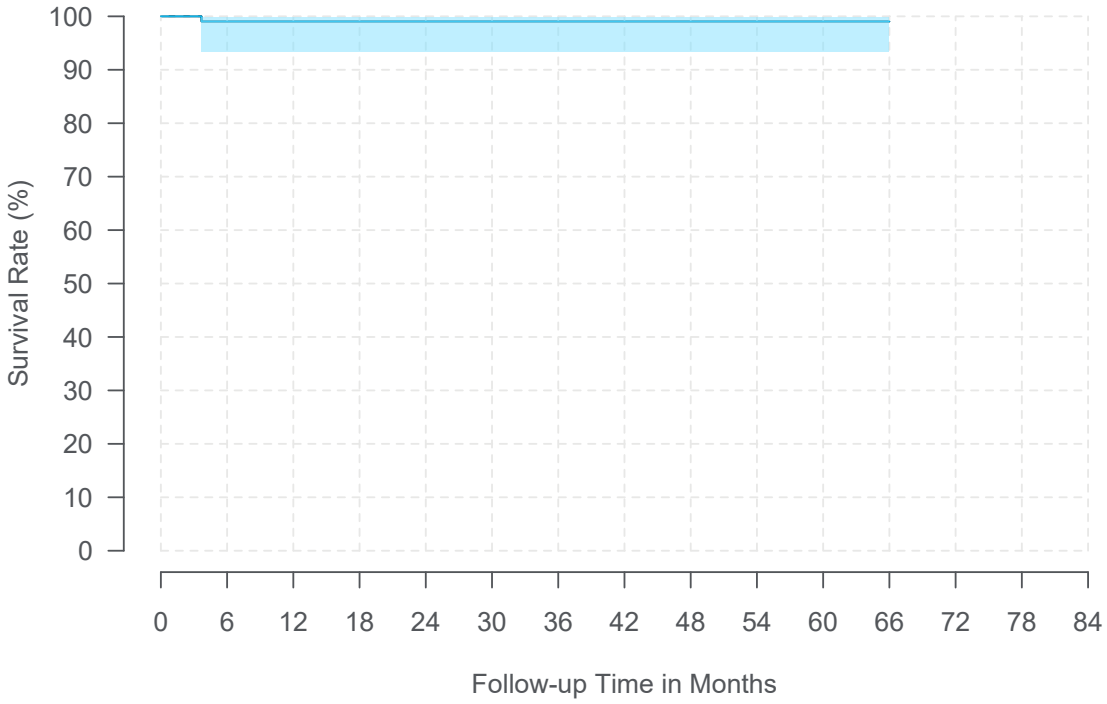
Time Interval	6 Years	7 Years	8 Years	At 105 Months	
Survival (95% CI)	99.7% (97.6%, 100%)	99.7% (97.6%, 100%)	99.7% (97.6%, 100%)	99.7% (97.6%, 100%)	—
Sample Size	49	35	29	20	

Specification: RestoreAdvanced	
Height	2.6 in (65 mm)
Width	1.9 in (49 mm)
Thickness	0.6 in (15 mm)
Volume	39 cc
Battery type	Rechargeable
Expected Battery life	9 years
Maximum Electrodes	16
Amplitude	0 - 10.5 V
Rate	2 - 130 Hz
Pulse Width	60 - 450 µsec
Groups	26
Programs	32
Implant Depth	≤ 1 cm

Neurostimulator Event Summary: RestoreAdvanced	N
Medical device complication	1
Total	**1**

4.3.2.6 Model RestoreAdvanced SureScan MRI

Model Name	RestoreAdvanced SureScan MRI (model 97713)
FDA Approval Date	March 2013
Neurostimulators Enrolled	116
Neurostimulators Currently Active in Study	24
Initial Product Performance Events	2
Median Follow-up Time (Months)	33.6
Cumulative Follow-up Time (Months)	4,239



Time Interval	1 Year	2 Years	3 Years	4 Years	5 Years
Survival (95% CI)	99.0% (93.4%, 99.9%)	99.0% (93.4%, 99.9%)	99.0% (93.4%, 99.9%)	99.0% (93.4%, 99.9%)	99.0% (93.4%, 99.9%)
Sample Size	89	71	54	36	26

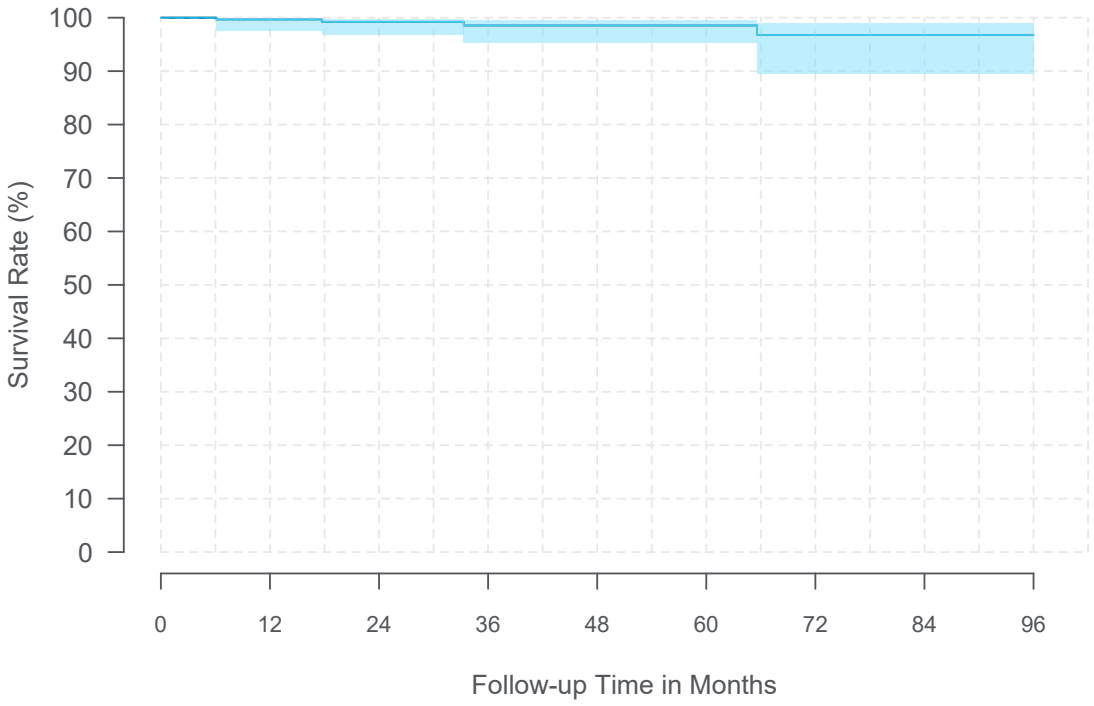
Time Interval	At 66 Months				
Survival (95% CI)	99.0% (93.4%, 99.9%)	—	—	—	—
Sample Size	20				

Specification: RestoreAdvanced SureScan MRI	
Height	2.6 in (65 mm)
Width	1.9 in (49 mm)
Thickness	0.6 in (15 mm)
Volume	39 cc
Battery type	Rechargeable
Expected Battery life	9 years
Maximum Electrodes	16
Amplitude	0 - 10.5 V
Rate	2 - 130 Hz
Pulse Width	60 - 450 µsec
Groups	26
Programs	32
Implant Depth	≤ 1 cm

Neurostimulator Event Summary: RestoreAdvanced SureScan MRI	N
Device malfunction	1
Neurostimulator unable to recharge	1
Total	**2**

4.3.2.7 Model RestoreSensor

Model Name	RestoreSensor (model 37714)
FDA Approval Date	November 2011
Neurostimulators Enrolled	377
Neurostimulators Currently Active in Study	20
Initial Product Performance Events	5
Median Follow-up Time (Months)	23.2
Cumulative Follow-up Time (Months)	12,047



Time Interval	1 Year	2 Years	3 Years	4 Years	5 Years
Survival (95% CI)	99.7% (97.7%, 100%)	99.2% (96.9%, 99.8%)	98.5% (95.3%, 99.6%)	98.5% (95.3%, 99.6%)	98.5% (95.3%, 99.6%)
Sample Size	258	185	135	92	65

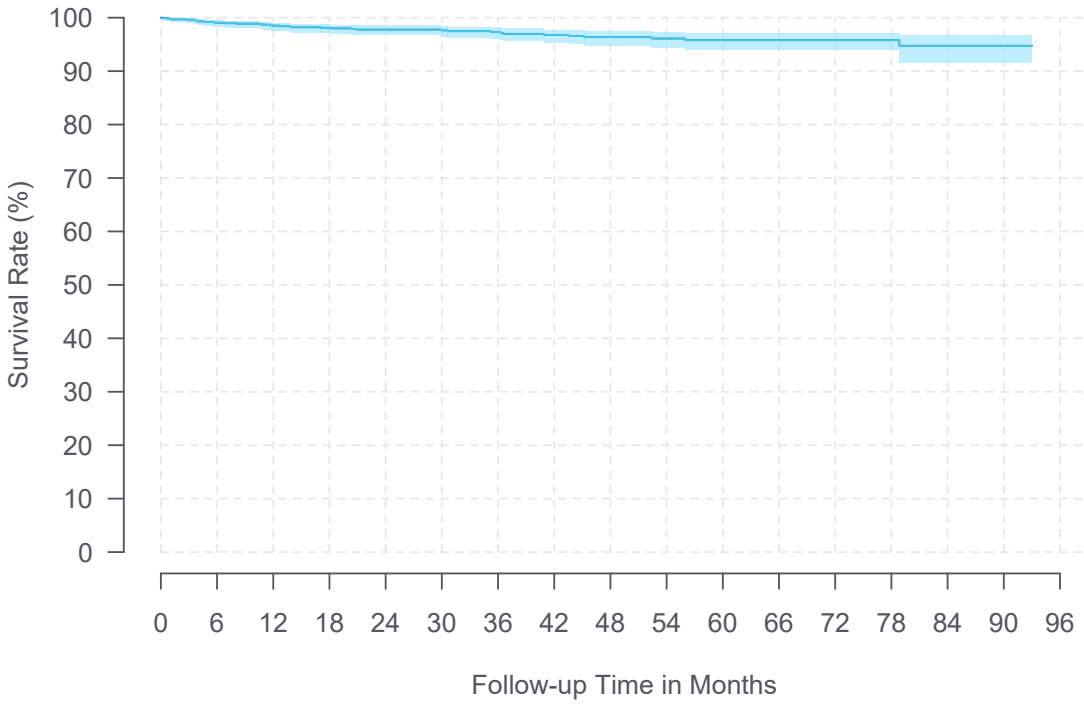
Time Interval	6 Years	7 Years	8 Years		
Survival (95% CI)	96.8% (89.6%, 99.0%)	96.8% (89.6%, 99.0%)	96.8% (89.6%, 99.0%)	—	—
Sample Size	43	31	21		

Specification: RestoreSensor	
Height	2.1 in (54 mm)
Width	2.1 in (54 mm)
Thickness	0.4 in (9 mm)
Volume	22 cc
Battery type	Rechargeable
Expected Battery life	9 years
Maximum Electrodes	16
Amplitude	0 - 10.5 V
Rate	2 - 1200 Hz
Pulse Width	60 - 1000 µsec
Groups	8
Programs	16
Implant Depth	≤ 1 cm

Neurostimulator Event Summary: RestoreSensor	N
Neurostimulator unable to recharge	3
Device issue	1
Device malfunction	1
Total	**5**

4.3.2.8 Model RestoreSensor SureScan MRI

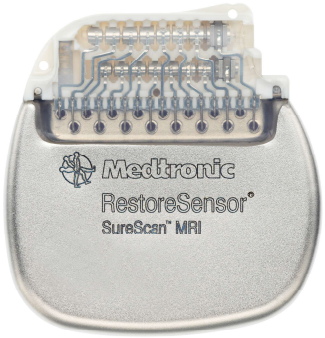
Model Name	RestoreSensor SureScan MRI (model 97714)
FDA Approval Date	March 2013
Neurostimulators Enrolled	1,382
Neurostimulators Currently Active in Study	278
Initial Product Performance Events	36
Median Follow-up Time (Months)	29.4
Cumulative Follow-up Time (Months)	48,075



Time Interval	1 Year	2 Years	3 Years	4 Years	5 Years
Survival (95% CI)	98.5% (97.6%, 99.1%)	97.8% (96.7%, 98.5%)	97.3% (96.1%, 98.2%)	96.4% (94.8%, 97.5%)	95.8% (94.0%, 97.1%)
Sample Size	1,042	790	575	419	263

Time Interval	6 Years	7 Years	At 93 Months		
Survival (95% CI)	95.8% (94.0%, 97.1%)	94.7% (91.5%, 96.8%)	94.7% (91.5%, 96.8%)	—	—
Sample Size	142	63	23		

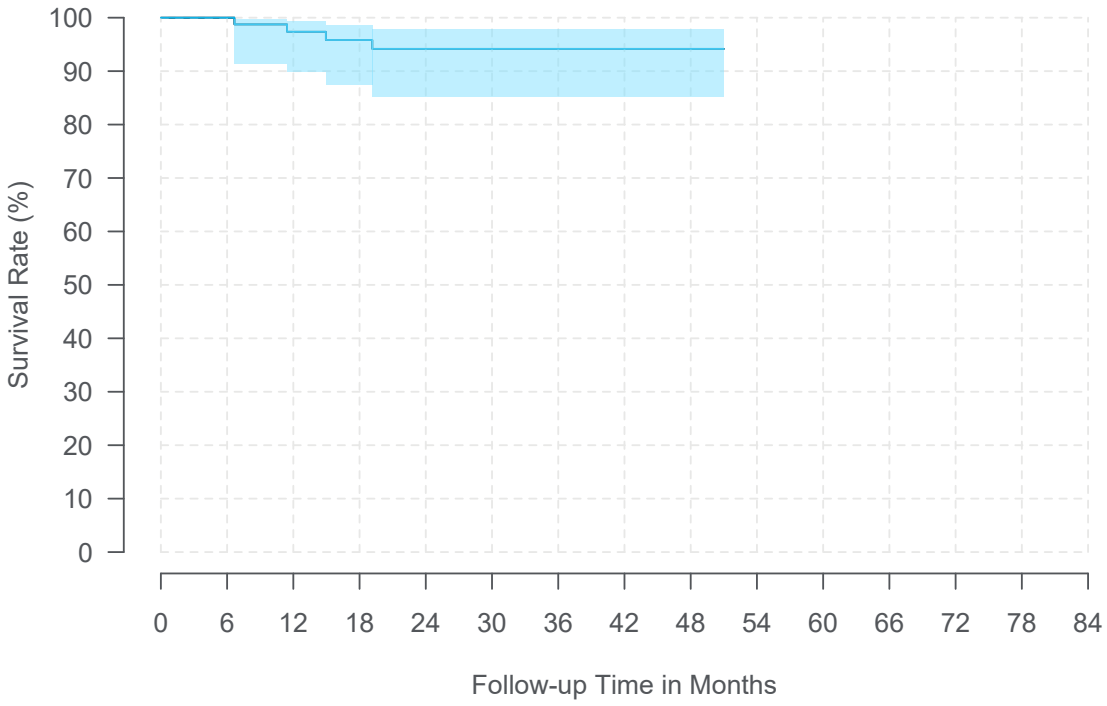
Specification: RestoreSensor SureScan MRI	
Height	54 mm (2.1 in)
Width	54 mm (2.1 in)
Thickness	9 mm (0.4 in)
Volume	22 cc
Battery type	Rechargeable
Expected Battery life	9 years
Maximum Electrodes	16
Amplitude	0 - 10.5 V
Rate	2 - 1200 Hz
Pulse Width	60 - 1000 µsec
Groups	8
Programs	16
Implant Depth	≤ 1 cm



Neurostimulator Event Summary: RestoreSensor SureScan MRI	N
Neurostimulator unable to recharge	11
Device malfunction	7
Lead migration/dislodgement	6
High impedance	2
Low impedance	2
Neurostimulator migration	2
Device battery issue	1
Device breakage	1
Device stimulation issue	1
Grommet loose	1
Medical device site warmth	1
Pain	1
Total	**36**

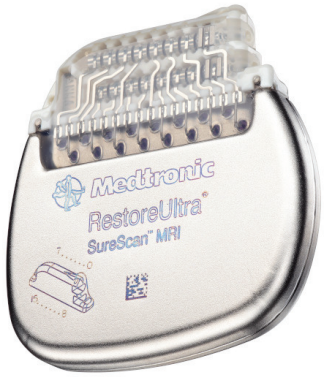
4.3.2.9 Model RestoreUltra SureScan MRI

Model Name	RestoreUltra SureScan MRI (model 97712)
FDA Approval Date	March 2013
Neurostimulators Enrolled	93
Neurostimulators Currently Active in Study	34
Initial Product Performance Events	4
Median Follow-up Time (Months)	28.5
Cumulative Follow-up Time (Months)	2,917



Time Interval	1 Year	2 Years	3 Years	4 Years	At 51 Months
Survival (95% CI)	97.4% (89.8%, 99.3%)	94.2% (85.1%, 97.8%)	94.2% (85.1%, 97.8%)	94.2% (85.1%, 97.8%)	94.2% (85.1%, 97.8%)
Sample Size	68	51	38	22	22

Specification: RestoreUltra SureScan MRI	
Height	2.1 in (54 mm)
Width	2.1 in (54 mm)
Thickness	0.4 in (10 mm)
Volume	22 cc
Battery type	Rechargeable
Expected Battery life	9 years
Maximum Electrodes	16
Amplitude	0 - 10.5 V
Rate	2 - 1200 Hz
Pulse Width	60 - 1000 µsec
Groups	8
Programs	16
Implant Depth	≤ 1 cm



Neurostimulator Event Summary: RestoreUltra SureScan MRI	N
Extension migration	1
Neurostimulator unable to recharge	1
No anomaly found by rpa	1
Therapeutic product ineffective	1
Total	**4**

4.3.3 Neurostimulator Summary

Table 4.11: Spinal Cord Stimulation Primary Cell Neurostimulator Characteristics

Model Name	FDA Approval Date	Neurostimulators Enrolled	Neurostimulators Active	Initial Product Performance Events	Median Follow-up Time (Months)	Cumulative Follow-up Time (Months)
Itrel 4 (model 37703)	May 2012	135	41	1	30.2	4,596
PrimeAdvanced (model 37702)	July 2006	668	14	6	16.0	15,767
PrimeAdvanced SureScan MRI (model 97702)	March 2013	785	223	10	27.2	24,884

Table 4.12: Spinal Cord Stimulation Primary Cell Neurostimulator Survival Probability (95% Confidence Intervals)

Model Name	1 Year	2 Years	3 Years	4 Years	5 Years
Itrel 4 (model 37703)	100.0% (NA)	99.1% (93.8%, 99.9%)	99.1% (93.8%, 99.9%)	99.1% (93.8%, 99.9%)	__
PrimeAdvanced (model 37702)	99.6% (98.5%, 99.9%)	99.3% (97.9%, 99.8%)	99.3% (97.9%, 99.8%)	96.8% (92.0%, 98.7%)	96.8% (92.0%, 98.7%)
PrimeAdvanced SureScan MRI (model 97702)	99.6% (98.7%, 99.9%)	99.4% (98.3%, 99.8%)	98.0% (96.2%, 99.0%)	97.7% (95.5%, 98.8%)	97.7% (95.5%, 98.8%)

Model Name	6 Years	7 Years			
Itrel 4 (model 37703)	__	__	__	__	__
PrimeAdvanced (model 37702)	96.8% (92.0%, 98.7%)	96.8% (92.0%, 98.7%)	__	__	__
PrimeAdvanced SureScan MRI (model 97702)	97.7% (95.5%, 98.8%)	97.7% (95.5%, 98.8%)	__	__	__

Table 4.13: Spinal Cord Stimulation Rechargeable Neurostimulator Characteristics

Model Name	FDA Approval Date	Neurostimulators Enrolled	Neurostimulators Active	Device Events	Median Follow-up Time (Months)	Cumulative Follow-up Time (Months)
Intellis with AdaptiveStim (model 97715)	September 2017	1,281	887	13	17.0	24,254
RestoreAdvanced (model 37713)	July 2006	357	2	1	22.0	11,327
RestoreAdvanced SureScan MRI (model 97713)	March 2013	116	24	2	33.6	4,239
RestoreSensor (model 37714)	November 2011	377	20	5	23.2	12,047
RestoreSensor SureScan MRI (model 97714)	March 2013	1,382	278	36	29.4	48,075
RestoreUltra SureScan MRI (model 97712)	March 2013	93	34	4	28.5	2,917

Table 4.14: Spinal Cord Stimulation Rechargeable Neurostimulator Survival Probability (95% Confidence Intervals)

Model Name	1 Year	2 Years	3 Years	4 Years	5 Years
Intellis with AdaptiveStim (model 97715)	99.5% (98.8%, 99.8%)	98.7% (97.6%, 99.3%)	98.1% (96.4%, 99.0%)	97.6% (95.5%, 98.7%)	—
RestoreAdvanced (model 37713)	99.7% (97.6%, 100%)	99.7% (97.6%, 100%)	99.7% (97.6%, 100%)	99.7% (97.6%, 100%)	99.7% (97.6%, 100%)
RestoreAdvanced SureScan MRI (model 97713)	99.0% (93.4%, 99.9%)	99.0% (93.4%, 99.9%)	99.0% (93.4%, 99.9%)	99.0% (93.4%, 99.9%)	99.0% (93.4%, 99.9%)
RestoreSensor (model 37714)	99.7% (97.7%, 100%)	99.2% (96.9%, 99.8%)	98.5% (95.3%, 99.6%)	98.5% (95.3%, 99.6%)	98.5% (95.3%, 99.6%)
RestoreSensor SureScan MRI (model 97714)	98.5% (97.6%, 99.1%)	97.8% (96.7%, 98.5%)	97.3% (96.1%, 98.2%)	96.4% (94.8%, 97.5%)	95.8% (94.0%, 97.1%)
RestoreUltra SureScan MRI (model 97712)	97.4% (89.8%, 99.3%)	94.2% (85.1%, 97.8%)	94.2% (85.1%, 97.8%)	94.2% (85.1%, 97.8%)	—

Model Name	6 Years	7 Years	8 Years		
Intellis with AdaptiveStim (model 97715)	—	—	—	—	—
RestoreAdvanced (model 37713)	99.7% (97.6%, 100%)	99.7% (97.6%, 100%)	99.7% (97.6%, 100%)	—	—
RestoreAdvanced SureScan MRI (model 97713)	—	—	—	—	—
RestoreSensor (model 37714)	96.8% (89.6%, 99.0%)	96.8% (89.6%, 99.0%)	96.8% (89.6%, 99.0%)	—	—
RestoreSensor SureScan MRI (model 97714)	95.8% (94.0%, 97.1%)	94.7% (91.5%, 96.8%)	—	—	—
RestoreUltra SureScan MRI (model 97712)	—	—	—	—	—

4.4 Leads

From June 2004 to the report cut-off date of October 31, 2022, there were 11,198 leads followed in the registry. The difference between the total number of leads (n=11,198) versus the number of neurostimulators (n=6,983) is due to the fact that some patients were subsequently re-implanted with a lead or were implanted with more than one lead. The aggregate prospective follow-up time for all leads was 344,437 months (28,703 years). A lead is a set of thin wires with a protective coating and electrodes near the tip (percutaneous lead) or on a paddle (surgical lead). Table 4.15 provides the number and percentage of leads by model.

Table 4.15: Spinal Cord Stimulation Lead Counts by Model

Model Name	N (%)
Currently manufactured	**10,234 (91.4%)**
Vectris SureScan MRI 1x8 Compact (977A2)	4,602 (41.1%)
1x8 Compact (3778)	2,168 (19.4%)
Pisces Standard (3487A)	992 (8.9%)
1x8 Standard (3777)	838 (7.5%)
Pisces Plus (3888)	455 (4.1%)
Specify 5-6-5 (39565)	294 (2.6%)
AnkerStim Lead (Approved in Europe, 09100)	201 (1.8%)
Pisces Compact (3887)	200 (1.8%)
1x8 SC (3776)	188 (1.7%)
Vectris SureScan MRI 1x8 Subcompact (977A1)	144 (1.3%)
Specify SureScan MRI 5-6-5 (977C1)	77 (0.7%)
Specify SureScan MRI 2x8 (977C2)	43 (0.4%)
Specify 2x8 (39286)	32 (0.3%)
No longer manufactured	**686 (6.1%)**
Specify (3998)	157 (1.4%)
Pisces Z Standard (3890)	143 (1.3%)
Pisces Z Compact (3891)	130 (1.2%)
Resume TL (3986A)	108 (1.0%)
Resume II (3587A)	58 (0.5%)
2x4 Hinged Specify (3999)	54 (0.5%)
Pisces Z Plus (3892)	25 (0.2%)
On-Point (3987A)	9 (0.1%)
SymMix (3982A)	2 (0.0%)
Other/Unspecified	**278 (2.5%)**
Total	**11,198 (100%)**

Percutaneous leads composed 88.3% (9,885/11,198) of leads in the registry, including 42.4% (4,746/11,198) in the Vectris SureScan lead family, 28.5% (3,194/11,198) in the Pisces-Octad lead family, 14.7% (1,647/11,198) in the Pisces-Quad lead family, and 2.7% (298/11,198) in the Pisces-

Quad LZ lead family; 7.4% (834/11,198) of leads were surgical leads; and 4.3% (479/11,198) of leads were designated as "Other" or were unspecified in the database.

4.4.1 Lead Events

There were 1,464 product performance-related events with an underlying reported etiology related to lead function. This includes 1,436 events with a lead etiology and 28 events with both a lead and other etiology (including device and non-device etiologies). Of these, 1,072 were the initial product performance event that affected lead survival estimates; the majority were lead migration/dislodgement (n=647), high impedance (n=238), lead fracture (n=84), device stimulation issue (n=42), and low impedance (n=29). There were 984 events in 9,885 (10.0%) percutaneous leads, 47 events in 834 (5.6%) surgical leads, and 41 events occurred in leads with unknown/other model numbers.

For the purposes of survival analysis, a device's follow-up time is cut-off for one of three reasons: 1) the occurrence of a product performance-related event; 2) the occurrence of a censoring event; or 3) the device is event-free and censored at the patient's last follow-up prior to the data cut-off. For leads:

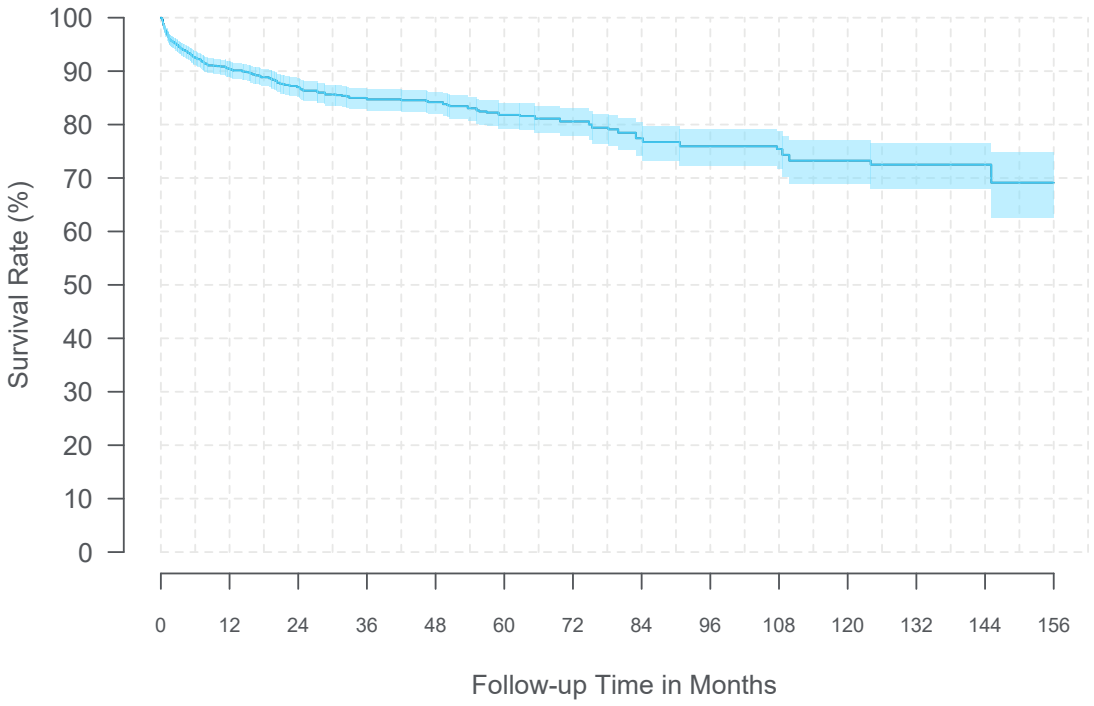
- 1,072 had follow-up time cut-off due to product performance-related events.
- 7,600 were censored in the survival analysis for the following reasons: patient expired, lead explanted, patient discontinued, therapy suspended, or site discontinued participation in the registry.
- 2,526 were free from product performance-related events and censoring events, and were censored at the last follow-up visit prior to the report cut-off.

4.4.2 Lead Models

The following figures and tables represent spinal cord lead survival and 95% confidence intervals where at least 20 spinal cord leads contributed to each 3-month interval.

4.4.2.1 Model 1x8 Compact

Model Name	1x8 Compact (model 3778)
FDA Approval Date	April 2005
Leads Enrolled	2,168
Leads Currently Active in Study	101
Initial Product Performance Events	265
Median Follow-up Time (Months)	17.9
Cumulative Follow-up Time (Months)	68,373



Time Interval	1 Year	2 Years	3 Years	4 Years	5 Years
Survival (95% CI)	90.4% (88.9%, 91.8%)	87.0% (85.1%, 88.6%)	84.7% (82.6%, 86.6%)	84.2% (82.0%, 86.1%)	81.8% (79.3%, 84.1%)
Sample Size	1,210	801	601	455	378

Time Interval	6 Years	7 Years	8 Years	9 Years	10 Years
Survival (95% CI)	80.6% (77.8%, 83.0%)	77.4% (74.1%, 80.4%)	75.9% (72.3%, 79.1%)	75.4% (71.7%, 78.7%)	73.2% (69.0%, 77.0%)
Sample Size	291	218	177	146	110

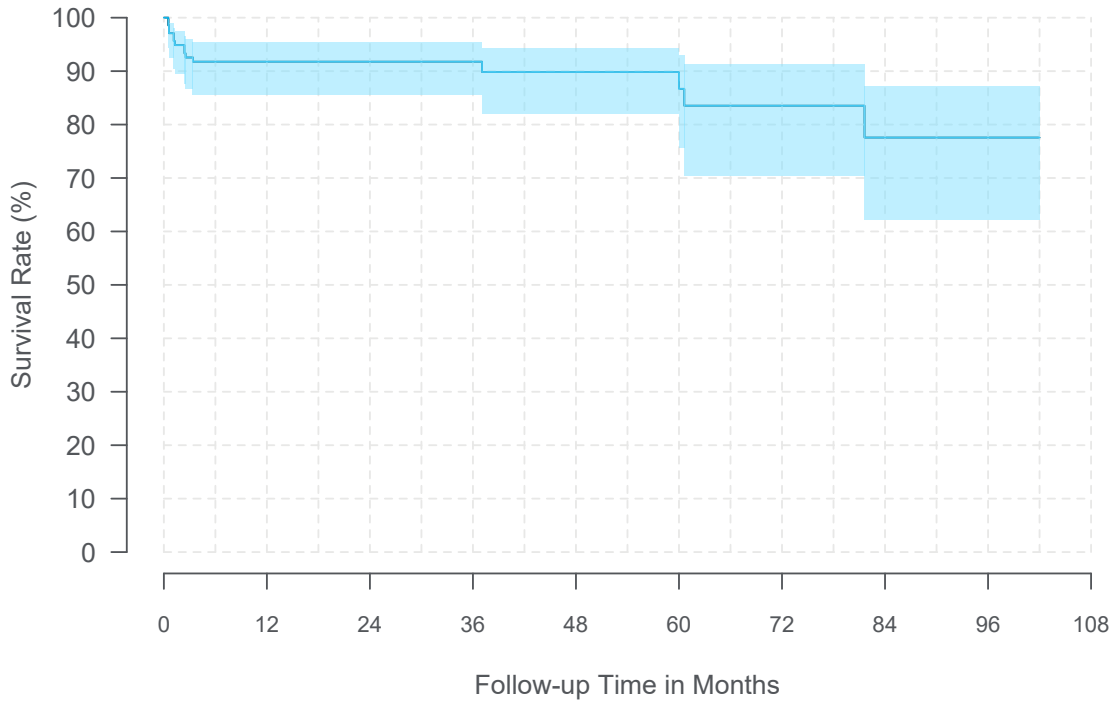
Time Interval	11 Years	12 Years	13 Years		
Survival (95% CI)	72.5% (68.0%, 76.5%)	72.5% (68.0%, 76.5%)	69.1% (62.6%, 74.8%)	—	—
Sample Size	71	44	21		

Specification: 1x8 Compact	
Lead Type	Percutaneous
Lead	
Length (cm)	45, 60, 75
Diameter (mm)	1.3
Electrode	
Number	8
Shape	Cylindrical
Length (mm)	3.0
Individual Surface Area (mm^2)	12.0
Inter-Electrode Spacing: Edge to Edge (mm)	4.0
Array Length (mm)	52.0

Lead Event Summary: 1x8 Compact	N
Lead migration/dislodgement	205
High impedance	27
Lead fracture	19
Device stimulation issue	6
Device malfunction	2
Low impedance	2
Medical device complication	2
Medical device site erosion	2
Total	**265**

4.4.2.2 Model 1x8 SC

Model Name	1x8 SC (model 3776)
FDA Approval Date	November 2005
Leads Enrolled	188
Leads Currently Active in Study	13
Initial Product Performance Events	17
Median Follow-up Time (Months)	15.0
Cumulative Follow-up Time (Months)	5,565



Time Interval	1 Year	2 Years	3 Years	4 Years	5 Years
Survival (95% CI)	91.8% (85.6%, 95.4%)	91.8% (85.6%, 95.4%)	91.8% (85.6%, 95.4%)	89.8% (82.0%, 94.4%)	86.7% (75.6%, 93.0%)
Sample Size	86	64	49	37	27

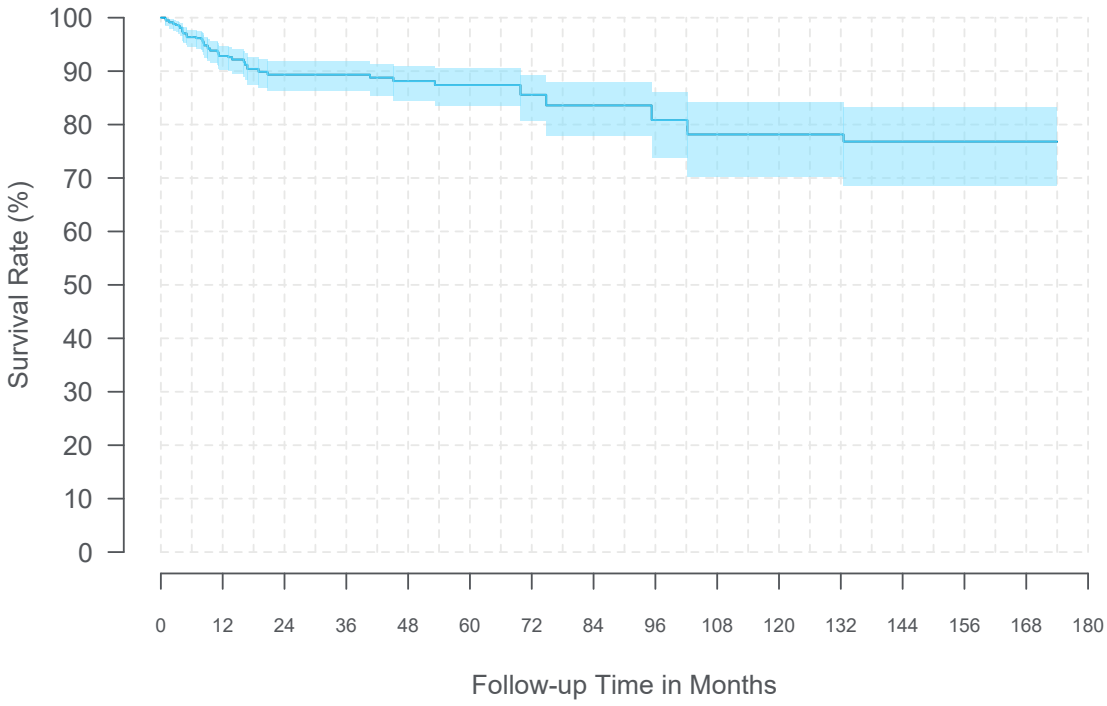
Time Interval	6 Years	7 Years	8 Years	At 102 Months	
Survival (95% CI)	83.5% (70.4%, 91.2%)	77.6% (62.3%, 87.3%)	77.6% (62.3%, 87.3%)	77.6% (62.3%, 87.3%)	—
Sample Size	22	23	24	21	

Specification: 1x8 SC	
Lead Type	Percutaneous
Lead	
Length (cm)	45, 60, 75
Diameter (mm)	1.3
Electrode	
Number	8
Shape	Cylindrical
Length (mm)	3.0
Individual Surface Area (mm^2)	12.0
Inter-Electrode Spacing: Edge to Edge (mm)	1.5
Array Length (mm)	35.0

Lead Event Summary: 1x8 SC	N
Lead migration/dislodgement	12
High impedance	3
Device stimulation issue	1
Lead fracture	1
Total	**17**

4.4.2.3 Model 1x8 Standard

Model Name	1x8 Standard (model 3777)
FDA Approval Date	April 2005
Leads Enrolled	838
Leads Currently Active in Study	57
Initial Product Performance Events	71
Median Follow-up Time (Months)	16.4
Cumulative Follow-up Time (Months)	24,810



Time Interval	1 Year	2 Years	3 Years	4 Years	5 Years
Survival (95% CI)	92.8% (90.3%, 94.7%)	89.3% (86.2%, 91.8%)	89.3% (86.2%, 91.8%)	88.1% (84.5%, 91.0%)	87.4% (83.4%, 90.5%)
Sample Size	443	287	186	129	105

Time Interval	6 Years	7 Years	8 Years	9 Years	10 Years
Survival (95% CI)	85.6% (80.7%, 89.3%)	83.6% (77.9%, 87.9%)	80.8% (73.9%, 86.1%)	78.1% (70.3%, 84.2%)	78.1% (70.3%, 84.2%)
Sample Size	89	72	58	72	66

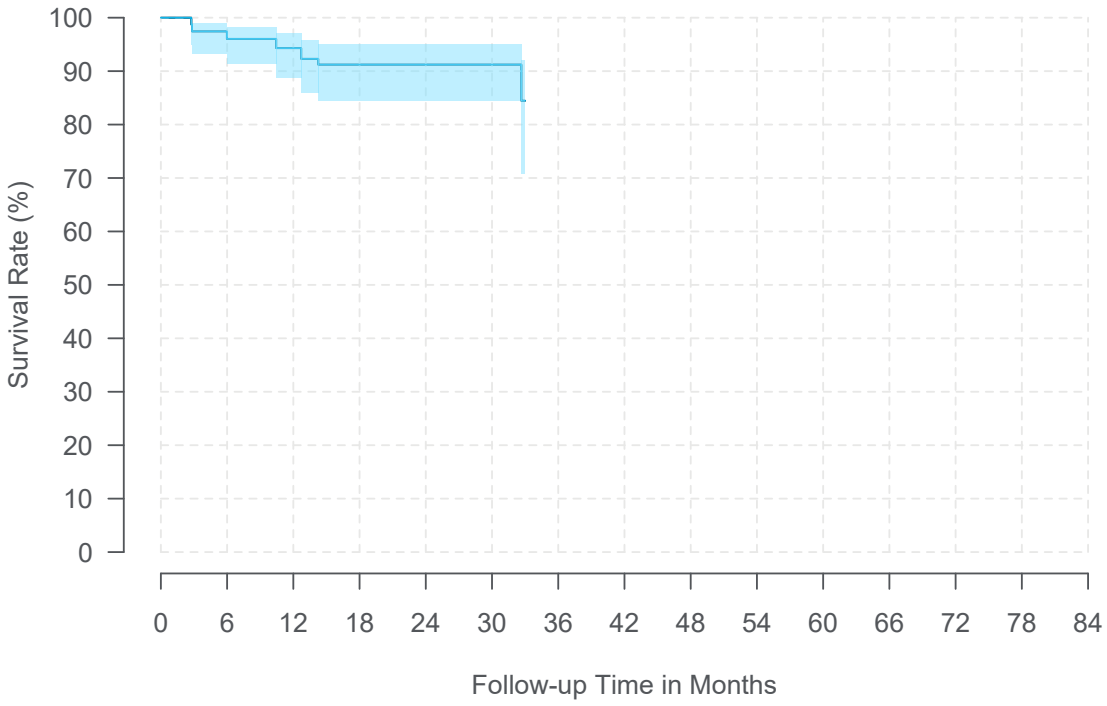
Time Interval	11 Years	12 Years	13 Years	14 Years	At 174 Months
Survival (95% CI)	78.1% (70.3%, 84.2%)	76.8% (68.5%, 83.2%)	76.8% (68.5%, 83.2%)	76.8% (68.5%, 83.2%)	76.8% (68.5%, 83.2%)
Sample Size	58	49	40	27	23

Specification: 1x8 Standard	
Lead Type	Percutaneous
Lead	
Length (cm)	45, 60, 75
Diameter (mm)	1.3
Electrode	
Number	8
Shape	Cylindrical
Length (mm)	3.0
Individual Surface Area (mm^2)	12.0
Inter-Electrode Spacing: Edge to Edge (mm)	6.0
Array Length (mm)	66.0

Lead Event Summary: 1x8 Standard	N
Lead migration/dislodgement	41
High impedance	14
Device stimulation issue	7
Lead fracture	3
Device lead damage	2
Device malfunction	2
Low impedance	2
Total	**71**

4.4.2.4 Model AnkerStim

Model Name	AnkerStim (model 09100)
FDA Approval Date	NA
Leads Enrolled	201
Leads Currently Active in Study	142
Initial Product Performance Events	13
Median Follow-up Time (Months)	12.6
Cumulative Follow-up Time (Months)	3,165



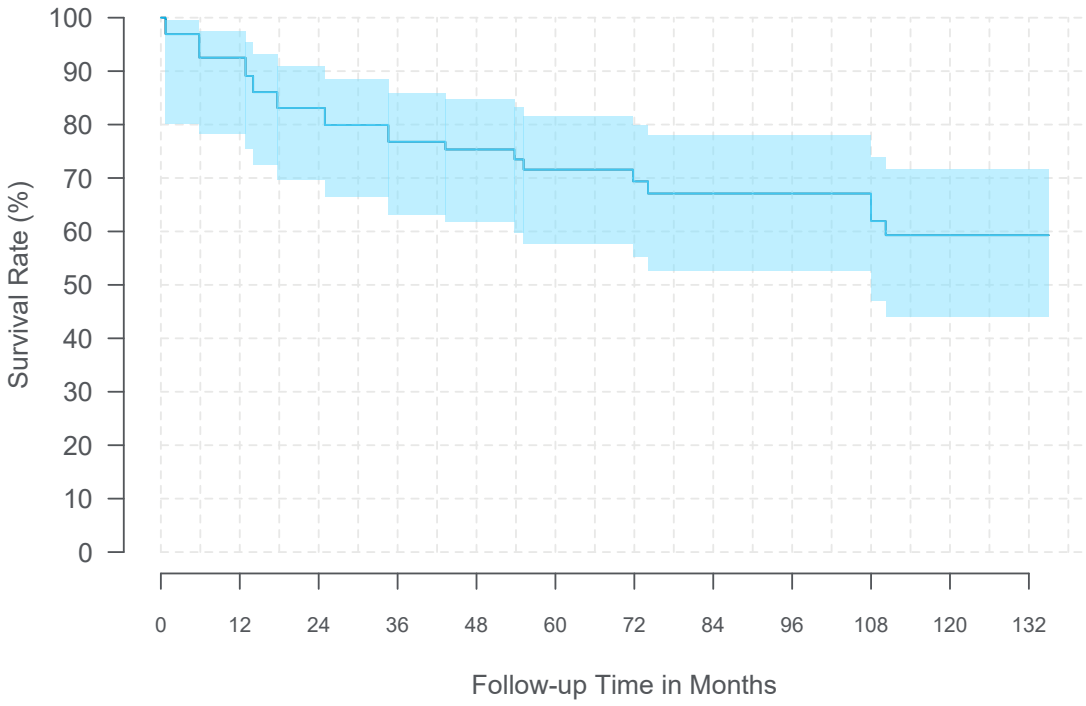
Time Interval	1 Year	2 Years	At 33 Months
Survival (95% CI)	94.3% (88.9%, 97.1%)	91.2% (84.5%, 95.1%)	84.5% (70.9%, 92.1%)
Sample Size	101	54	22

Specification: AnkerStim	
Lead Type	Percutaneous
Lead	
Length (cm)	60
Diameter (mm)	1.3
Electrode	
Number	4
Shape	Cylindrical
Length (mm)	6.0
Individual Surface Area (mm)	24.5
Inter-Electrode Spacing: Edge to Edge (mm)	12.0
Array Length (mm)	60.0

Lead Event Summary: AnkerStim	N
Lead migration/dislodgement	5
High impedance	4
Lead fracture	2
Medical device complication	2
Total	**13**

4.4.2.5 Model Pisces Compact

Model Name	Pisces Compact (model 3887)
FDA Approval Date	January 1997
Leads Enrolled	200
Leads Currently Active in Study	26
Initial Product Performance Events	25
Median Follow-up Time (Months)	22.5
Cumulative Follow-up Time (Months)	7,666



Time Interval	1 Year	2 Years	3 Years	4 Years	5 Years
Survival (95% CI)	92.5% (78.3%, 97.6%)	83.1% (69.7%, 90.9%)	76.8% (63.2%, 85.9%)	75.3% (61.8%, 84.7%)	71.6% (57.7%, 81.6%)
Sample Size	51	54	49	43	37

Time Interval	6 Years	7 Years	8 Years	9 Years	10 Years
Survival (95% CI)	69.4% (55.2%, 79.8%)	67.1% (52.7%, 78.0%)	67.1% (52.7%, 78.0%)	61.9% (46.9%, 73.8%)	59.3% (44.1%, 71.7%)
Sample Size	31	26	24	23	24

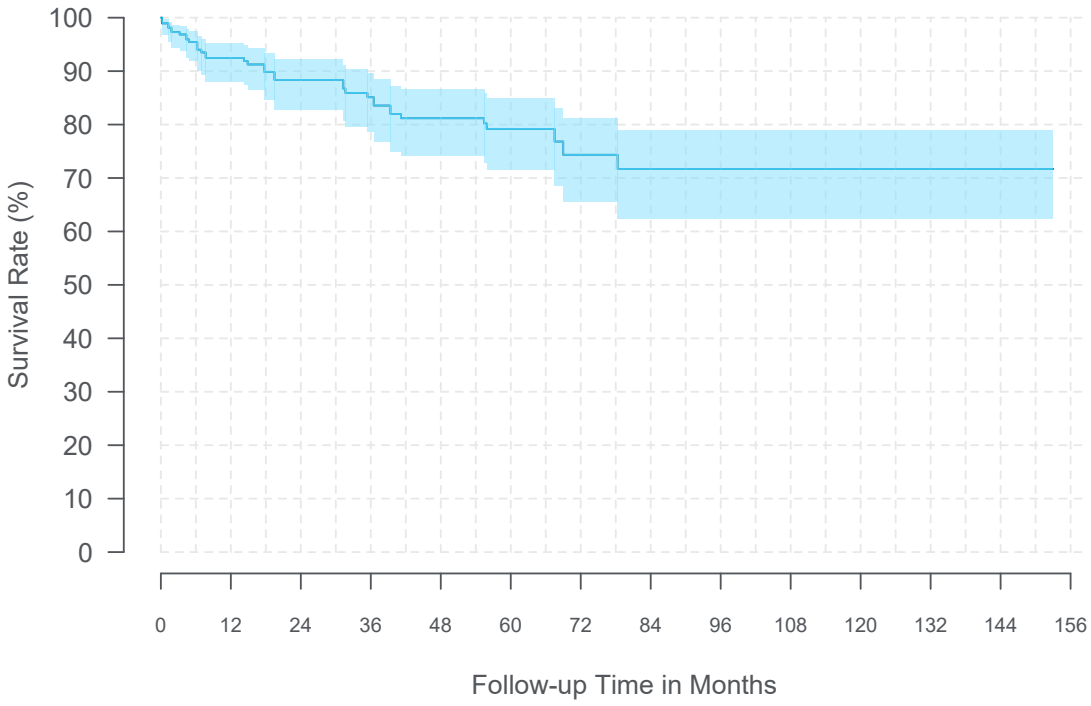
Time Interval	11 Years	At 135 Months			
Survival (95% CI)	59.3% (44.1%, 71.7%)	59.3% (44.1%, 71.7%)	—	—	—
Sample Size	20	20			

Specification: Pisces Compact	
Lead Type	Percutaneous
Lead	
Length (cm)	28, 33, 45, 56
Diameter (mm)	1.3
Electrode	
Number	4
Shape	Cylindrical
Length (mm)	3.0
Individual Surface Area (mm^2)	12.0
Inter-Electrode Spacing: Edge to Edge (mm)	4.0
Array Length (mm)	24.0

Lead Event Summary: Pisces Compact	N
Lead fracture	9
Lead migration/dislodgement	9
High impedance	4
Device stimulation issue	2
Device lead damage	1
Total	**25**

4.4.2.6 Model Pisces Plus

Model Name	Pisces Plus (model 3888)
FDA Approval Date	November 1992
Leads Enrolled	455
Leads Currently Active in Study	44
Initial Product Performance Events	44
Median Follow-up Time (Months)	14.9
Cumulative Follow-up Time (Months)	12,490



Time Interval	1 Year	2 Years	3 Years	4 Years	5 Years
Survival (95% CI)	92.5% (88.1%, 95.3%)	88.3% (82.8%, 92.2%)	85.1% (78.7%, 89.7%)	81.2% (74.1%, 86.5%)	79.2% (71.6%, 85.0%)
Sample Size	163	115	108	89	72

Time Interval	6 Years	7 Years	8 Years	9 Years	10 Years
Survival (95% CI)	74.3% (65.6%, 81.2%)	71.7% (62.4%, 79.0%)	71.7% (62.4%, 79.0%)	71.7% (62.4%, 79.0%)	71.7% (62.4%, 79.0%)
Sample Size	55	46	43	35	35

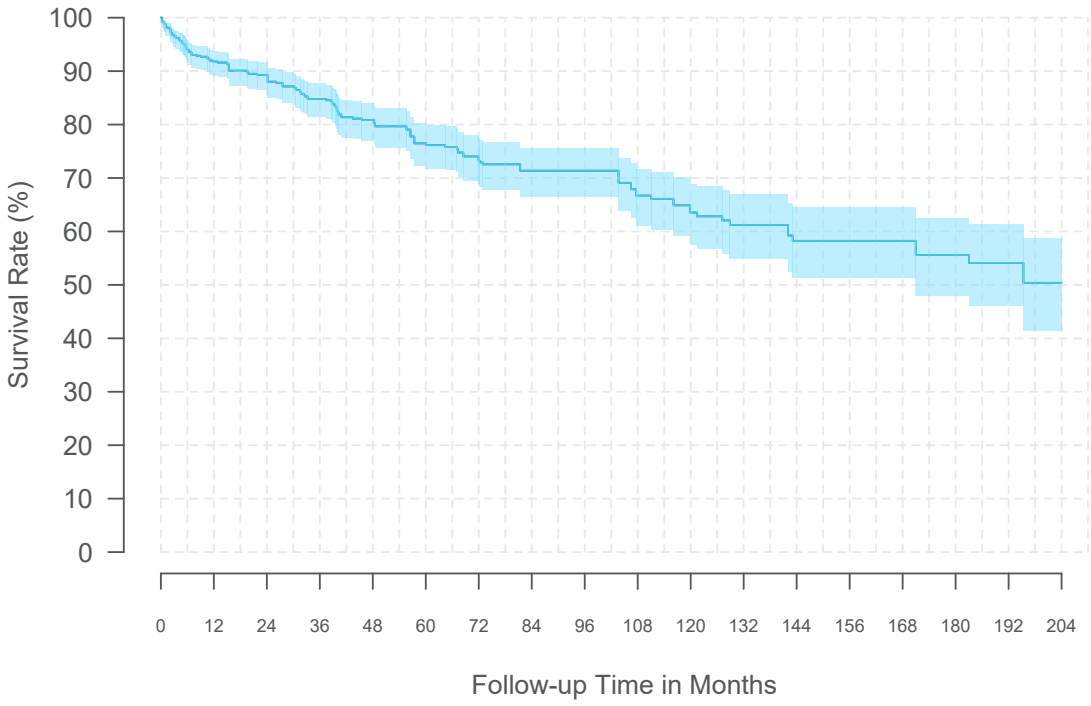
Time Interval	11 Years	12 Years	At 153 Months		
Survival (95% CI)	71.7% (62.4%, 79.0%)	71.7% (62.4%, 79.0%)	71.7% (62.4%, 79.0%)	—	—
Sample Size	31	24	23		

Specification: Pisces Plus	
Lead Type	Percutaneous
Lead	
Length (cm)	28, 33, 45, 56
Diameter (mm)	1.3
Electrode	
Number	4
Shape	Cylindrical
Length (mm)	6.0
Individual Surface Area (mm^2)	24.0
Inter-Electrode Spacing: Edge to Edge (mm)	12.0
Array Length (mm)	60.0

Lead Event Summary: Pisces Plus	N
Lead migration/dislodgement	31
High impedance	10
Device stimulation issue	2
Lead fracture	1
Total	**44**

4.4.2.7 Model Pisces Standard

Model Name	Pisces Standard (model 3487A)
FDA Approval Date	May 1988
Leads Enrolled	992
Leads Currently Active in Study	55
Initial Product Performance Events	166
Median Follow-up Time (Months)	31.1
Cumulative Follow-up Time (Months)	42,088



Time Interval	1 Year	2 Years	3 Years	4 Years	5 Years
Survival (95% CI)	91.8% (89.2%, 93.8%)	89.3% (86.4%, 91.6%)	84.8% (81.4%, 87.6%)	80.8% (77.0%, 84.1%)	76.5% (72.2%, 80.2%)
Sample Size	511	422	358	281	231

Time Interval	6 Years	7 Years	8 Years	9 Years	10 Years
Survival (95% CI)	73.3% (68.7%, 77.4%)	71.4% (66.5%, 75.6%)	71.4% (66.5%, 75.6%)	66.7% (61.1%, 71.7%)	63.5% (57.5%, 68.9%)
Sample Size	198	166	133	112	93

Time Interval	11 Years	12 Years	13 Years	14 Years	15 Years
Survival (95% CI)	61.2% (54.8%, 67.0%)	58.2% (51.3%, 64.6%)	58.2% (51.3%, 64.6%)	58.2% (51.3%, 64.6%)	55.6% (48.0%, 62.5%)
Sample Size	67	58	54	45	40

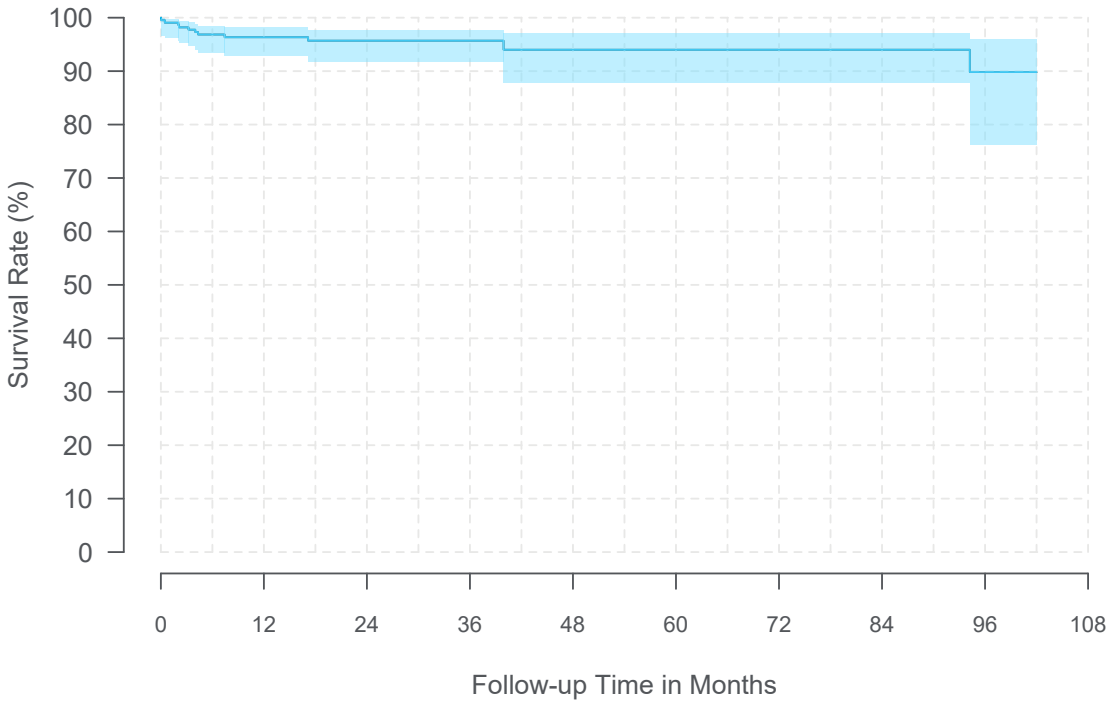
Time Interval	16 Years	17 Years			
Survival (95% CI)	54.1% (46.1%, 61.4%)	50.4% (41.4%, 58.7%)	—	—	—
Sample Size	31	21			

Specification: Pisces Standard	
Lead Type	Percutaneous
Lead	
Length (cm)	28, 33, 45, 56
Diameter (mm)	1.3
Electrode	
Number	4
Shape	Cylindrical
Length (mm)	3.0
Individual Surface Area (mm^2)	12.0
Inter-Electrode Spacing: Edge to Edge (mm)	6.0
Array Length (mm)	30.0

Lead Event Summary: Pisces Standard	N
High impedance	69
Lead migration/dislodgement	53
Device stimulation issue	17
Low impedance	15
Lead fracture	9
Inadequate lead connection	2
Device lead damage	1
Total	**166**

4.4.2.8 Model Specify 5-6-5

Model Name	Specify 5-6-5 (model 39565)
FDA Approval Date	June 2007
Leads Enrolled	294
Leads Currently Active in Study	32
Initial Product Performance Events	11
Median Follow-up Time (Months)	22.5
Cumulative Follow-up Time (Months)	8,507



Time Interval	1 Year	2 Years	3 Years	4 Years	5 Years
Survival (95% CI)	96.3% (92.8%, 98.2%)	95.7% (91.8%, 97.8%)	95.7% (91.8%, 97.8%)	94.0% (87.9%, 97.1%)	94.0% (87.9%, 97.1%)
Sample Size	163	116	71	46	35

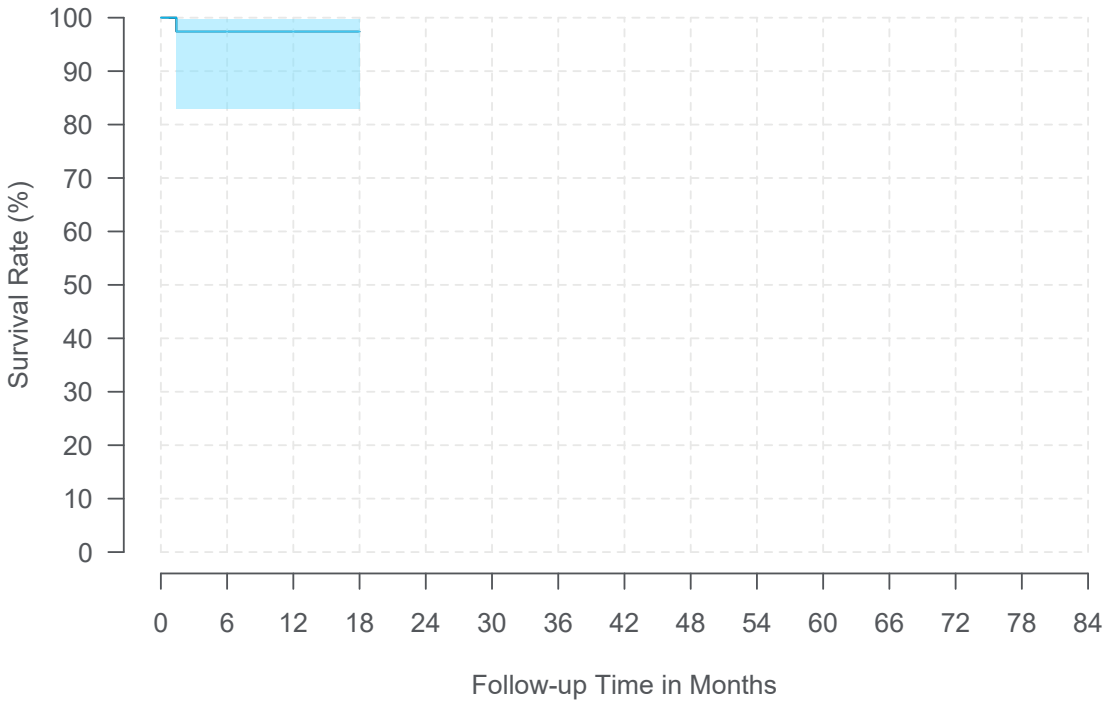
Time Interval	6 Years	7 Years	8 Years	At 102 Months	
Survival (95% CI)	94.0% (87.9%, 97.1%)	94.0% (87.9%, 97.1%)	89.8% (76.1%, 95.9%)	89.8% (76.1%, 95.9%)	—
Sample Size	30	22	21	20	

Specification: Specify 5-6-5	
Lead Type	Surgical
Lead	
Length (cm)	30, 65
Diameter (mm)	1.3
Electrode	
Number	16
Shape	Rectangular
Length (mm)	4.0
Width (mm)	1.5
Individual Surface Area (mm^2)	6.0
Longitudinal Spacing: Edge to Edge (mm)	4.5
Lateral Spacing: Edge to Edge (mm)	1.0
Array Length (mm)	49.0
Array Width (mm)	7.5
Paddle	
Length (mm)	64.2
Width (mm)	10.0
Thickness (mm)	7.5

Lead Event Summary: Specify 5-6-5	N
Lead migration/dislodgement	9
Lead fracture	1
Lead insulation failure	1
Total	**11**

4.4.2.9 Model Specify SureScan MRI 2x8

Model Name	Specify SureScan MRI 2x8 (model 977C2)
FDA Approval Date	February 2016
Leads Enrolled	43
Leads Currently Active in Study	21
Initial Product Performance Events	2
Median Follow-up Time (Months)	17.1
Cumulative Follow-up Time (Months)	902



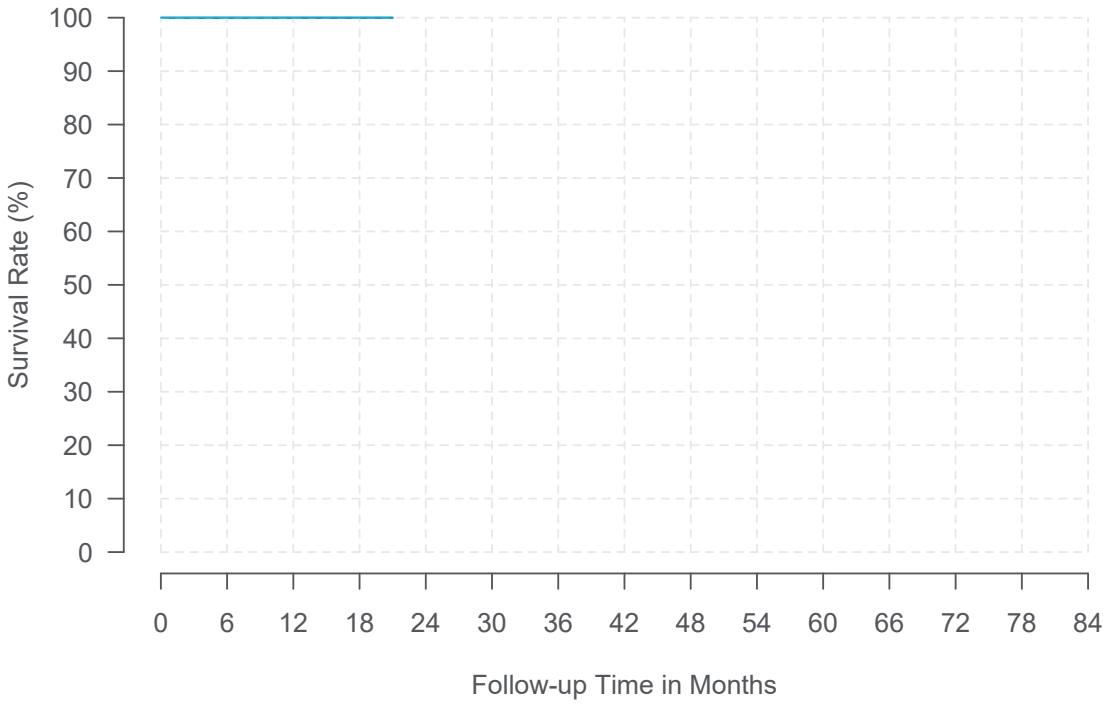
Time Interval	1 Year	At 18 Months
Survival	97.4%	97.4%
(95% CI)	(83.0%, 99.6%)	(83.0%, 99.6%)
Sample Size	26	21

Specification: Specify SureScan MRI 2x8	
Lead	
Length (cm)	65, 90
Diameter (mm)	1.3
Electrode	
Number	16
Shape	Rectangular
Size (width x length)	1.5 mm x 4.0 mm
Stimulating area (mm^2)	6.0
Inter-Electrode Spacing: Edge to Edge	NA
In-line spacing (mm)	1.0
Row spacing (mm)	1.0
Lead paddle length (mm)	56.4

Lead Event Summary: Specify SureScan MRI 2x8	N
High impedance	1
Lead migration/dislodgement	1
Total	**2**

4.4.2.10 Model Specify SureScan MRI 5-6-5

Model Name	Specify SureScan MRI 5-6-5 (model 977C1)
FDA Approval Date	February 2016
Leads Enrolled	77
Leads Currently Active in Study	25
Initial Product Performance Events	2
Median Follow-up Time (Months)	12.5
Cumulative Follow-up Time (Months)	1,297



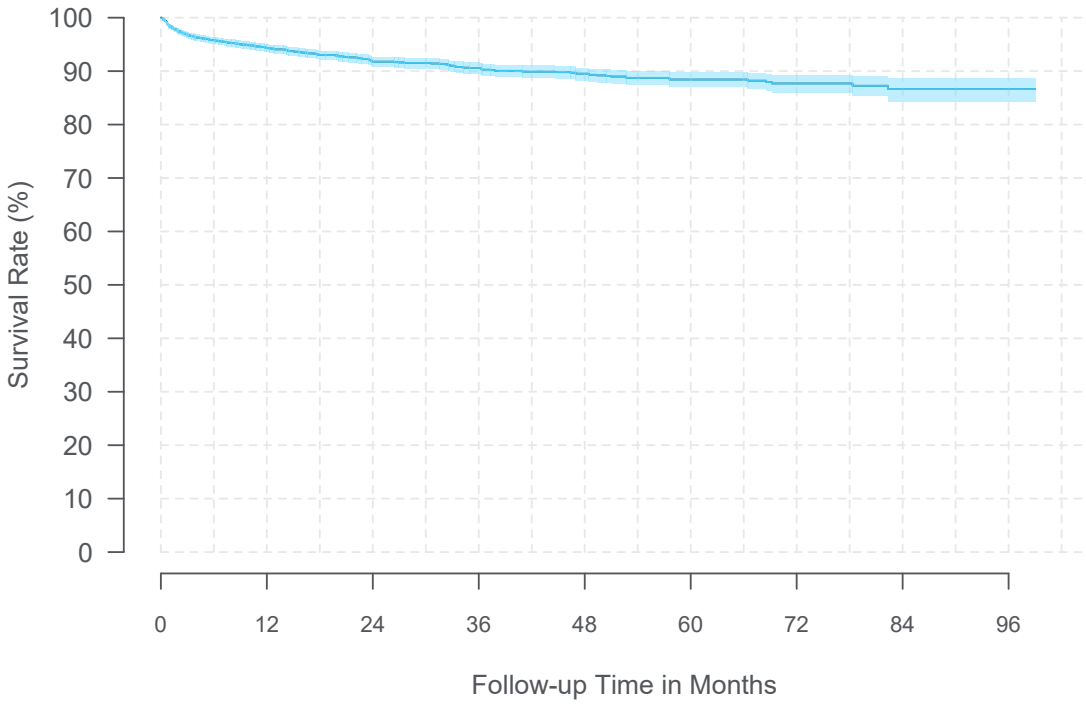
Time Interval	1 Year	At 21 Months
Survival	100.0%	100.0%
(95% CI)	(NA)	(NA)
Sample Size	40	23

Specification: Specify SureScan MRI 5-6-5	
Lead	
Length (cm)	65, 90
Diameter (mm)	1.3
Electrode	
Number	16
Shape	Rectangular
Size (width x length)	1.5 mm x 4.0 mm
Stimulating area (mm^2)	6.0
Inter-Electrode Spacing: Edge to Edge	NA
In-line spacing (mm)	4.5
Row spacing (mm)	1.0
Lead paddle length (mm)	64.2

Lead Event Summary: Specify SureScan MRI 5-6-5	N
High impedance	2
Total	**2**

4.4.2.11 Model Vectris SureScan MRI 1x8 Compact

Model Name	Vectris SureScan MRI 1x8 Compact (model 977A2)
FDA Approval Date	March 2013
Leads Enrolled	4,602
Leads Currently Active in Study	1,876
Initial Product Performance Events	342
Median Follow-up Time (Months)	23.3
Cumulative Follow-up Time (Months)	130,139



Time Interval	1 Year	2 Years	3 Years	4 Years	5 Years
Survival (95% CI)	94.4% (93.6%, 95.0%)	91.8% (90.8%, 92.7%)	90.6% (89.5%, 91.6%)	89.5% (88.3%, 90.6%)	88.4% (87.0%, 89.7%)
Sample Size	2,986	2,109	1,390	865	535

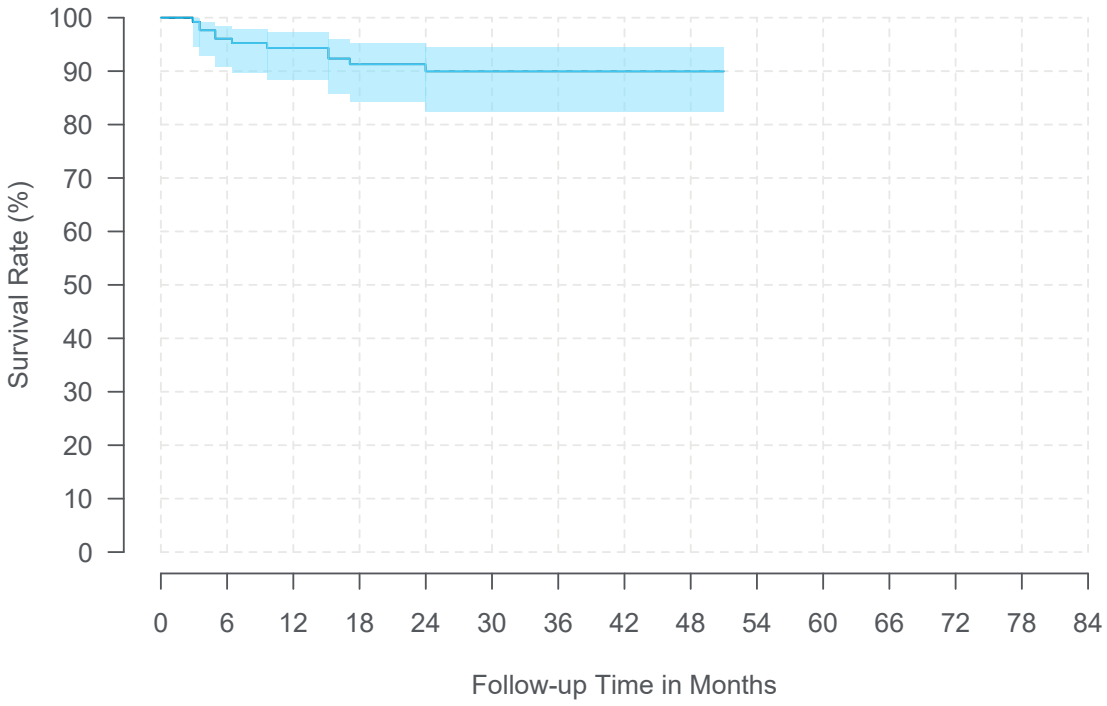
Time Interval	6 Years	7 Years	8 Years	At 99 Months	
Survival (95% CI)	87.7% (86.0%, 89.2%)	86.6% (84.3%, 88.6%)	86.6% (84.3%, 88.6%)	86.6% (84.3%, 88.6%)	—
Sample Size	295	134	46	32	

Specification: Vectris SureScan MRI 1x8 Compact	
Lead Type	Percutaneous
Lead	
Length (cm)	60, 75, 90
Diameter (mm)	1.3
Electrode	
Number	8
Shape	Cylindrical
Length (mm)	3.0
Individual Surface Area (mm^2)	12.0
Inter-Electrode Spacing: Edge to Edge (mm)	4.0
Array Length (mm)	52.0

Lead Event Summary: Vectris SureScan MRI 1x8 Compact	N
Lead migration/dislodgement	243
High impedance	62
Lead fracture	23
Device electrical impedance issue	6
Low impedance	3
Device charging issue	2
Device malfunction	1
Medical device site pain	1
Therapeutic product ineffective	1
Total	**342**

4.4.2.12 Model Vectris SureScan MRI 1x8 Subcompact

Model Name	Vectris SureScan MRI 1x8 Subcompact (model 977A1)
FDA Approval Date	March 2013
Leads Enrolled	144
Leads Currently Active in Study	33
Initial Product Performance Events	11
Median Follow-up Time (Months)	23.3
Cumulative Follow-up Time (Months)	4,153



Time Interval	1 Year	2 Years	3 Years	4 Years	At 51 Months
Survival (95% CI)	94.3% (88.5%, 97.3%)	90.0% (82.4%, 94.4%)	90.0% (82.4%, 94.4%)	90.0% (82.4%, 94.4%)	90.0% (82.4%, 94.4%)
Sample Size	96	67	53	30	30

Specification: Vectris SureScan MRI 1x8 Subcompact	
Lead Type	Percutaneous
Lead	
Length (cm)	60, 75, 90
Diameter (mm)	1.3
Electrode	
Number	8
Shape	Cylindrical
Length (mm)	3.0
Individual Surface Area (mm^2)	12.0
Inter-Electrode Spacing: Edge to Edge (mm)	1.5
Array Length (mm)	34.5

Lead Event Summary: Vectris SureScan MRI 1x8 Subcompact	N
Lead migration/dislodgement	7
Lead fracture	3
High impedance	1
Total	**11**

4.4.3 Lead Summary

Table 4.16: Spinal Cord Stimulation Percutaneous Lead Characteristics

Model Name	FDA Approval Date	Leads Enrolled	Leads Active	Initial Product Performance Events	Median Follow-up Time (Months)	Cumulative Follow-up Time (Months)
1x8 Compact (model 3778)	April 2005	2,168	101	265	17.9	68,373
1x8 SC (model 3776)	November 2005	188	13	17	15.0	5,565
1x8 Standard (model 3777)	April 2005	838	57	71	16.4	24,810
AnkerStim Lead (Approved in Europe): 09100	NA	201	142	13	12.6	3,165
Pisces Compact (model 3887)	January 1997	200	26	25	22.5	7,666
Pisces Plus (model 3888)	November 1992	455	44	44	14.9	12,490
Pisces Standard (model 3487A)	May 1988	992	55	166	31.1	42,088
Vectris SureScan MRI 1x8 Compact (model 977A2)	March 2013	4,602	1,876	342	23.3	130,139
Vectris SureScan MRI 1x8 Subcompact (model 977A1)	March 2013	144	33	11	23.3	4,153

Table 4.17: Spinal Cord Stimulation Percutaneous Lead Survival Probability (95% Confidence Intervals)

Model Name	1 Year	2 Years	3 Years	4 Years	5 Years
1x8 Compact (model 3778)	90.4% (88.9%, 91.8%)	87.0% (85.1%, 88.6%)	84.7% (82.6%, 86.6%)	84.2% (82.0%, 86.1%)	81.8% (79.3%, 84.1%)
1x8 SC (model 3776)	91.8% (85.6%, 95.4%)	91.8% (85.6%, 95.4%)	91.8% (85.6%, 95.4%)	89.8% (82.0%, 94.4%)	86.7% (75.6%, 93.0%)
1x8 Standard (model 3777)	92.8% (90.3%, 94.7%)	89.3% (86.2%, 91.8%)	89.3% (86.2%, 91.8%)	88.1% (84.5%, 91.0%)	87.4% (83.4%, 90.5%)
AnkerStim Lead (Approved in Europe): 09100	94.3% (88.9%, 97.1%)	91.2% (84.5%, 95.1%)	—	—	—
Pisces Compact (model 3887)	92.5% (78.3%, 97.6%)	83.1% (69.7%, 90.9%)	76.8% (63.2%, 85.9%)	75.3% (61.8%, 84.7%)	71.6% (57.7%, 81.6%)
Pisces Plus (model 3888)	92.5% (88.1%, 95.3%)	88.3% (82.8%, 92.2%)	85.1% (78.7%, 89.7%)	81.2% (74.1%, 86.5%)	79.2% (71.6%, 85.0%)
Pisces Standard (model 3487A)	91.8% (89.2%, 93.8%)	89.3% (86.4%, 91.6%)	84.8% (81.4%, 87.6%)	80.8% (77.0%, 84.1%)	76.5% (72.2%, 80.2%)
Vectris SureScan MRI 1x8 Compact (model 977A2)	94.4% (93.6%, 95.0%)	91.8% (90.8%, 92.7%)	90.6% (89.5%, 91.6%)	89.5% (88.3%, 90.6%)	88.4% (87.0%, 89.7%)
Vectris SureScan MRI 1x8 Subcompact (model 977A1)	94.3% (88.5%, 97.3%)	90.0% (82.4%, 94.4%)	90.0% (82.4%, 94.4%)	90.0% (82.4%, 94.4%)	—

Model Name	6 Years	7 Years	8 Years	9 Years	10 Years
1x8 Compact (model 3778)	80.6% (77.8%, 83.0%)	77.4% (74.1%, 80.4%)	75.9% (72.3%, 79.1%)	75.4% (71.7%, 78.7%)	73.2% (69.0%, 77.0%)
1x8 SC (model 3776)	83.5% (70.4%, 91.2%)	77.6% (62.3%, 87.3%)	77.6% (62.3%, 87.3%)	—	—
1x8 Standard (model 3777)	85.6% (80.7%, 89.3%)	83.6% (77.9%, 87.9%)	80.8% (73.9%, 86.1%)	78.1% (70.3%, 84.2%)	78.1% (70.3%, 84.2%)
AnkerStim Lead (Approved in Europe): 09100	—	—	—	—	—
Pisces Compact (model 3887)	69.4% (55.2%, 79.8%)	67.1% (52.7%, 78.0%)	67.1% (52.7%, 78.0%)	61.9% (46.9%, 73.8%)	59.3% (44.1%, 71.7%)
Pisces Plus (model 3888)	74.3% (65.6%, 81.2%)	71.7% (62.4%, 79.0%)	71.7% (62.4%, 79.0%)	71.7% (62.4%, 79.0%)	71.7% (62.4%, 79.0%)
Pisces Standard (model 3487A)	73.3% (68.7%, 77.4%)	71.4% (66.5%, 75.6%)	71.4% (66.5%, 75.6%)	66.7% (61.1%, 71.7%)	63.5% (57.5%, 68.9%)
Vectris SureScan MRI 1x8 Compact (model 977A2)	87.7% (86.0%, 89.2%)	86.6% (84.3%, 88.6%)	86.6% (84.3%, 88.6%)	—	—
Vectris SureScan MRI 1x8 Subcompact (model 977A1)	—	—	—	—	—

Model Name	11 Years	12 Years	13 Years	14 Years	15 Years
1x8 Compact (model 3778)	72.5% (68.0%, 76.5%)	72.5% (68.0%, 76.5%)	69.1% (62.6%, 74.8%)	—	—
1x8 SC (model 3776)	—	—	—	—	—
1x8 Standard (model 3777)	78.1% (70.3%, 84.2%)	76.8% (68.5%, 83.2%)	76.8% (68.5%, 83.2%)	76.8% (68.5%, 83.2%)	—
AnkerStim Lead (Approved in Europe): 09100	—	—	—	—	—
Pisces Compact (model 3887)	59.3% (44.1%, 71.7%)	—	—	—	—
Pisces Plus (model 3888)	71.7% (62.4%, 79.0%)	71.7% (62.4%, 79.0%)	—	—	—
Pisces Standard (model 3487A)	61.2% (54.8%, 67.0%)	58.2% (51.3%, 64.6%)	58.2% (51.3%, 64.6%)	58.2% (51.3%, 64.6%)	55.6% (48.0%, 62.5%)
Vectris SureScan MRI 1x8 Compact (model 977A2)	—	—	—	—	—
Vectris SureScan MRI 1x8 Subcompact (model 977A1)	—	—	—	—	—

Model Name	16 Years	17 Years			
1x8 Compact (model 3778)	—	—	—	—	—
1x8 SC (model 3776)	—	—	—	—	—
1x8 Standard (model 3777)	—	—	—	—	—
AnkerStim Lead (Approved in Europe): 09100	—	—	—	—	—
Pisces Compact (model 3887)	—	—	—	—	—
Pisces Plus (model 3888)	—	—	—	—	—
Pisces Standard (model 3487A)	54.1% (46.1%, 61.4%)	50.4% (41.4%, 58.7%)	—	—	—
Vectris SureScan MRI 1x8 Compact (model 977A2)	—	—	—	—	—
Vectris SureScan MRI 1x8 Subcompact (model 977A1)	—	—	—	—	—

Table 4.18: Spinal Cord Stimulation Surgical Lead Characteristics

Model Name	FDA Approval Date	Leads Enrolled	Leads Active	Initial Product Performance Events	Median Follow-up Time (Months)	Cumulative Follow-up Time (Months)
Specify 5-6-5 (model 39565)	June 2007	294	32	11	22.5	8,507
Specify SureScan MRI 2x8 (model 977C2)	February 2016	43	21	2	17.1	902
Specify SureScan MRI 5-6-5 (model 977C1)	February 2016	77	25	2	12.5	1,297

Table 4.19: Spinal Cord Stimulation Surgical Lead Survival Probability (95% Confidence Intervals)

Model Name	1 Year	2 Years	3 Years	4 Years	5 Years
Specify 5-6-5 (model 39565)	96.3% (92.8%, 98.2%)	95.7% (91.8%, 97.8%)	95.7% (91.8%, 97.8%)	94.0% (87.9%, 97.1%)	94.0% (87.9%, 97.1%)
Specify SureScan MRI 2x8 (model 977C2)	97.4% (83.0%, 99.6%)	—	—	—	—
Specify SureScan MRI 5-6-5 (model 977C1)	100.0% (NA)	—	—	—	—

Model Name	6 Years	7 Years	8 Years		
Specify 5-6-5 (model 39565)	94.0% (87.9%, 97.1%)	94.0% (87.9%, 97.1%)	89.8% (76.1%, 95.9%)	—	—
Specify SureScan MRI 2x8 (model 977C2)	—	—	—	—	—
Specify SureScan MRI 5-6-5 (model 977C1)	—	—	—	—	—

4.5 Extensions

From June 2004 to the report cut-off date of October 31, 2022, there were 3,677 extensions followed in the registry. The difference between the total number of extensions (n=3,677) versus neurostimulators (n=6,983) is due to the fact that some systems did not use an extension. The aggregate prospective follow-up time for all extensions was 122,692 months (10,224 years). An extension is a set of thin wires with a protective coating that connects the neurostimulator to the lead. Table 4.20 provides the number and percentage of extensions by model.

Table 4.20: Spinal Cord Stimulation Extension Counts by Model

Model Name	N (%)
Currently manufactured	**2,571 (69.9%)**
1x8 (37081)	1,533 (41.7%)
Bifurcated Stretch-Coil (37082)	647 (17.6%)
Single Stretch-Coil (37083)	391 (10.6%)
No longer manufactured	**1,082 (29.4%)**
Low Profile Quad (7489)	758 (20.6%)
Quadripolar in-line (7495)	280 (7.6%)
Synergy bifurcated 1x8 (7472)	26 (0.7%)
Quadripolar (7496)	9 (0.2%)
Synergy 1x8 (7471)	9 (0.2%)
Other/Unspecified	**24 (0.7%)**
Total	**3,677 (100%)**

4.5.1 Extension Events

There were 57 product performance-related events with an underlying reported etiology related to extension function. This includes 47 events with an extension etiology and 10 events with both an extension and other etiology (including device and non-device etiologies). Of these, 43 were the initial product performance event that affected extension survival estimates; the majority were extension fracture (n=17) and extension migration (n=10).

For the purposes of survival analysis, a device's follow-up time is cut-off for one of three reasons: 1) the occurrence of a product performance-related event; 2) the occurrence of a censoring event; or 3) the device is event-free and censored at the patient's last follow-up prior to the data cut-off. For extensions:

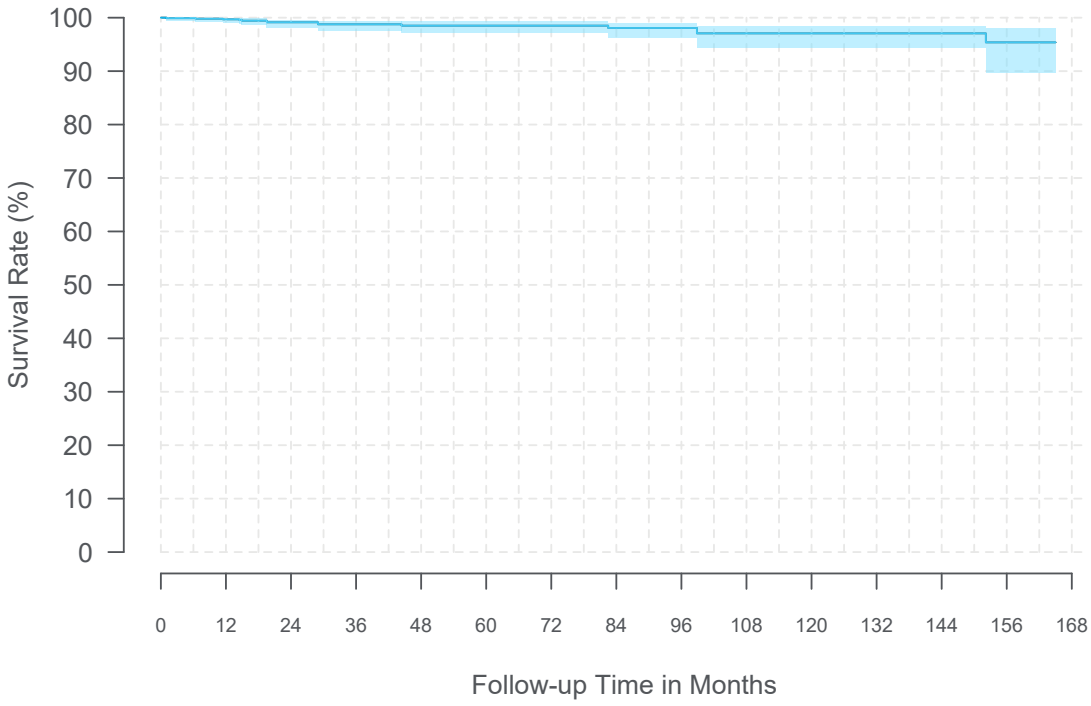
- 43 had follow-up time cut-off due to product performance-related events.
- 3,073 were censored in the survival analysis for the following reasons: patient expired, extension explanted, patient discontinued, therapy suspended, or site discontinued participation in the registry.
- 561 were free from product performance-related events and censoring events, and were censored at the last follow-up visit prior to the report cut-off.

4.5.2 Extension Models

The following figures and tables represent spinal cord extension survival and 95% confidence intervals where at least 20 spinal cord extensions contributed to each 3-month interval.

4.5.2.1 Model 1x8 Extension

Model Name	1x8 Extension (model 37081)
FDA Approval Date	April 2005
Extensions Enrolled	1,533
Extensions Currently Active in Study	280
Initial Product Performance Events	15
Median Follow-up Time (Months)	21.8
Cumulative Follow-up Time (Months)	52,830



Time Interval	1 Year	2 Years	3 Years	4 Years	5 Years
Survival (95% CI)	99.7% (99.1%, 99.9%)	99.1% (98.2%, 99.6%)	98.8% (97.6%, 99.4%)	98.5% (97.2%, 99.2%)	98.5% (97.2%, 99.2%)
Sample Size	851	577	424	364	328

Time Interval	6 Years	7 Years	8 Years	9 Years	10 Years
Survival (95% CI)	98.5% (97.2%, 99.2%)	98.1% (96.3%, 99.0%)	98.1% (96.3%, 99.0%)	97.1% (94.5%, 98.5%)	97.1% (94.5%, 98.5%)
Sample Size	278	217	201	177	137

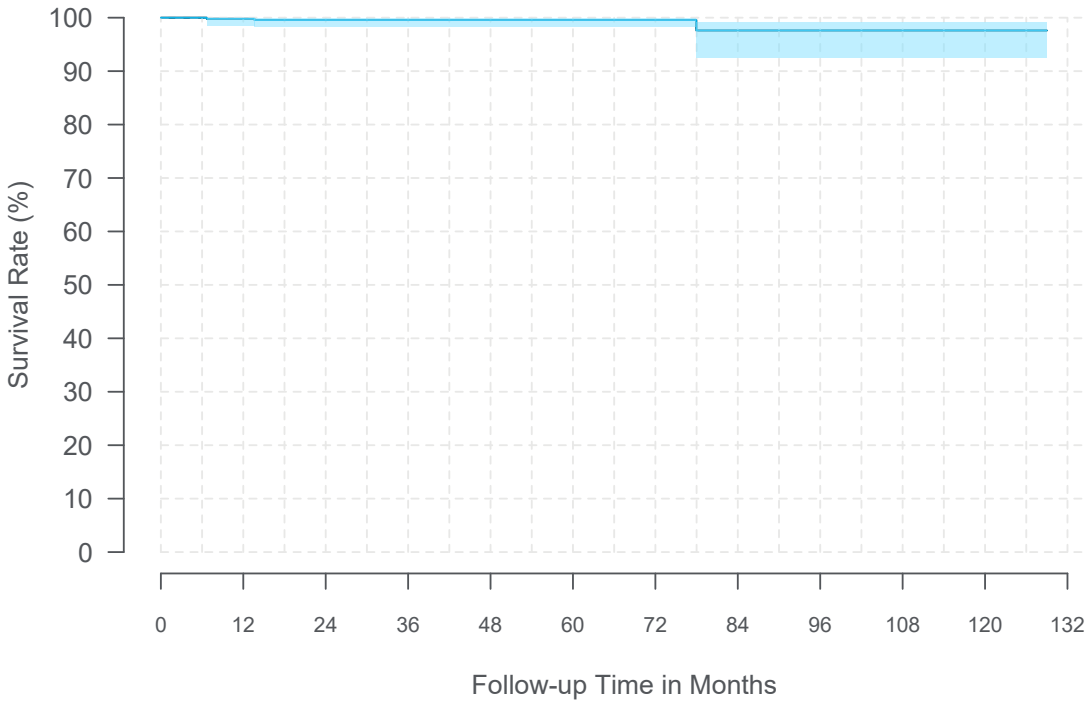
Time Interval	11 Years	12 Years	13 Years	At 165 Months	
Survival (95% CI)	97.1% (94.5%, 98.5%)	97.1% (94.5%, 98.5%)	95.4% (89.7%, 98.0%)	95.4% (89.7%, 98.0%)	—
Sample Size	102	74	45	25	

Specification: 1x8 Extension	
Length (cm)	20, 40, 60
Distal End Compatibility	1 Octad Lead
Distal End Set Screws	1
Proximal End INS Compatibility	Restore Family

Extension Event Summary: 1x8 Extension	N
Extension fracture	7
High impedance	5
Extension migration	2
Low impedance	1
Total	**15**

4.5.2.2 Model Bifurcated Stretch-Coil Extension

Model Name	Bifurcated Stretch-Coil Extension (model 37082)
FDA Approval Date	March 2006
Extensions Enrolled	647
Extensions Currently Active in Study	40
Initial Product Performance Events	4
Median Follow-up Time (Months)	23.6
Cumulative Follow-up Time (Months)	23,353



Time Interval	1 Year	2 Years	3 Years	4 Years	5 Years
Survival (95% CI)	99.8% (98.6%, 100%)	99.6% (98.2%, 99.9%)	99.6% (98.2%, 99.9%)	99.6% (98.2%, 99.9%)	99.6% (98.2%, 99.9%)
Sample Size	436	314	227	173	140

Time Interval	6 Years	7 Years	8 Years	9 Years	10 Years
Survival (95% CI)	99.6% (98.2%, 99.9%)	97.6% (92.6%, 99.2%)	97.6% (92.6%, 99.2%)	97.6% (92.6%, 99.2%)	97.6% (92.6%, 99.2%)
Sample Size	111	88	66	50	36

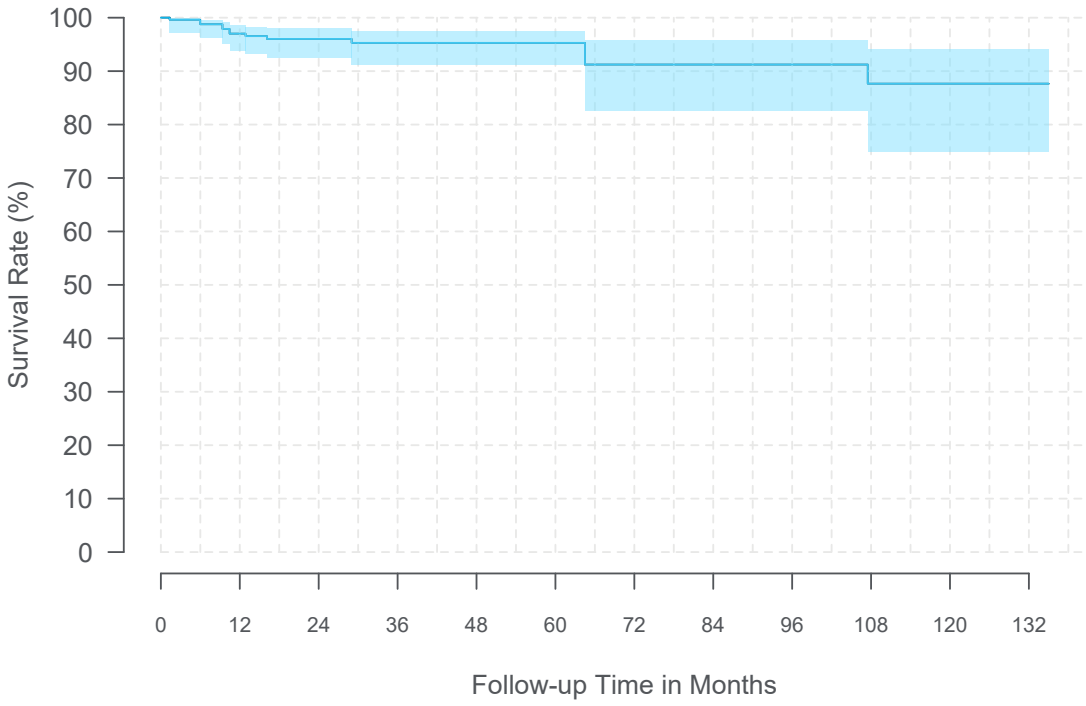
Time Interval	At 129 Months				
Survival (95% CI)	97.6% (92.6%, 99.2%)	—	—	—	—
Sample Size	20				

Specification: Bifurcated Stretch-Coil Extension	
Length (cm)	20, 40, 60
Distal End Compatibility	2 Quad Leads
Distal End Set Screws	8 (4 per Lead)
Proximal End INS Compatibility	Restore Family

Extension Event Summary: Bifurcated Stretch-Coil Extension	N
Device connection issue	2
Extension fracture	2
Total	**4**

4.5.2.3 Model Single Stretch-Coil Extension

Model Name	Single Stretch-Coil Extension (model 37083)
FDA Approval Date	September 2005
Extensions Enrolled	391
Extensions Currently Active in Study	142
Initial Product Performance Events	16
Median Follow-up Time (Months)	16.1
Cumulative Follow-up Time (Months)	10,796



Time Interval	1 Year	2 Years	3 Years	4 Years	5 Years
Survival (95% CI)	97.0% (93.8%, 98.6%)	96.0% (92.5%, 97.9%)	95.3% (91.3%, 97.5%)	95.3% (91.3%, 97.5%)	95.3% (91.3%, 97.5%)
Sample Size	221	157	84	61	46

Time Interval	6 Years	7 Years	8 Years	9 Years	10 Years
Survival (95% CI)	91.2% (82.6%, 95.7%)	91.2% (82.6%, 95.7%)	91.2% (82.6%, 95.7%)	87.7% (74.9%, 94.2%)	87.7% (74.9%, 94.2%)
Sample Size	38	38	30	24	22

Time Interval	11 Years	At 135 Months			
Survival (95% CI)	87.7% (74.9%, 94.2%)	87.7% (74.9%, 94.2%)	—	—	—
Sample Size	20	20			

Specification: Single Stretch-Coil Extension	
Length (cm)	20, 40, 60
Distal End Compatibility	1 Quad Lead
Distal End Set Screws	4
Proximal End INS Compatibility	Restore Family

Extension Event Summary: Single Stretch-Coil Extension	N
Extension migration	6
Extension fracture	5
Lead migration/dislodgement	2
Medical device complication	2
Device failure	1
Total	**16**

4.5.3 Extension Summary

Table 4.21: Spinal Cord Stimulation Extension Characteristics

Model Name	FDA Approval Date	Extensions Enrolled	Extensions Active	Initial Product Performance Events	Median Follow-up Time (Months)	Cumulative Follow-up Time (Months)
1x8 Extension (model 37081)	April 2005	1,533	280	15	21.8	52,830
Bifurcated Stretch-Coil Extension (model 37082)	March 2006	647	40	4	23.6	23,353
Single Stretch-Coil Extension (model 37083)	September 2005	391	142	16	16.1	10,796

Table 4.22: Spinal Cord Stimulation Extension Survival Probability (95% Confidence Intervals)

Model Name	1 Year	2 Years	3 Years	4 Years	5 Years
1x8 Extension (model 37081)	99.7%	99.1%	98.8%	98.5%	98.5%
	(99.1%, 99.9%)	(98.2%, 99.6%)	(97.6%, 99.4%)	(97.2%, 99.2%)	(97.2%, 99.2%)
Bifurcated Stretch-Coil Extension (model 37082)	99.8%	99.6%	99.6%	99.6%	99.6%
	(98.6%, 100%)	(98.2%, 99.9%)	(98.2%, 99.9%)	(98.2%, 99.9%)	(98.2%, 99.9%)
Single Stretch-Coil Extension (model 37083)	97.0%	96.0%	95.3%	95.3%	95.3%
	(93.8%, 98.6%)	(92.5%, 97.9%)	(91.3%, 97.5%)	(91.3%, 97.5%)	(91.3%, 97.5%)

Model Name	6 Years	7 Years	8 Years	9 Years	10 Years
1x8 Extension (model 37081)	98.5%	98.1%	98.1%	97.1%	97.1%
	(97.2%, 99.2%)	(96.3%, 99.0%)	(96.3%, 99.0%)	(94.5%, 98.5%)	(94.5%, 98.5%)
Bifurcated Stretch-Coil Extension (model 37082)	99.6%	97.6%	97.6%	97.6%	97.6%
	(98.2%, 99.9%)	(92.6%, 99.2%)	(92.6%, 99.2%)	(92.6%, 99.2%)	(92.6%, 99.2%)
Single Stretch-Coil Extension (model 37083)	91.2%	91.2%	91.2%	87.7%	87.7%
	(82.6%, 95.7%)	(82.6%, 95.7%)	(82.6%, 95.7%)	(74.9%, 94.2%)	(74.9%, 94.2%)

Model Name	11 Years	12 Years	13 Years		
1x8 Extension (model 37081)	97.1%	97.1%	95.4%	—	—
	(94.5%, 98.5%)	(94.5%, 98.5%)	(89.7%, 98.0%)		
Bifurcated Stretch-Coil Extension (model 37082)	—	—	—	—	—
Single Stretch-Coil Extension (model 37083)	87.7%	—	—	—	—
	(74.9%, 94.2%)				

5 Deep Brain Stimulation Systems

5.1 Study Participants

5.1.1 Centers

In this section, the deep brain stimulation tables and graphs were generated based on data collected between July 2009 and the report cut-off date of October 31, 2022. Sixty-four centers in North America, Europe, South America, Asia, and Australia have enrolled and contributed patients to the deep brain stimulation systems section of this report. Figure 5.1 shows a World Map, in which the countries that enrolled DBS patients are highlighted.

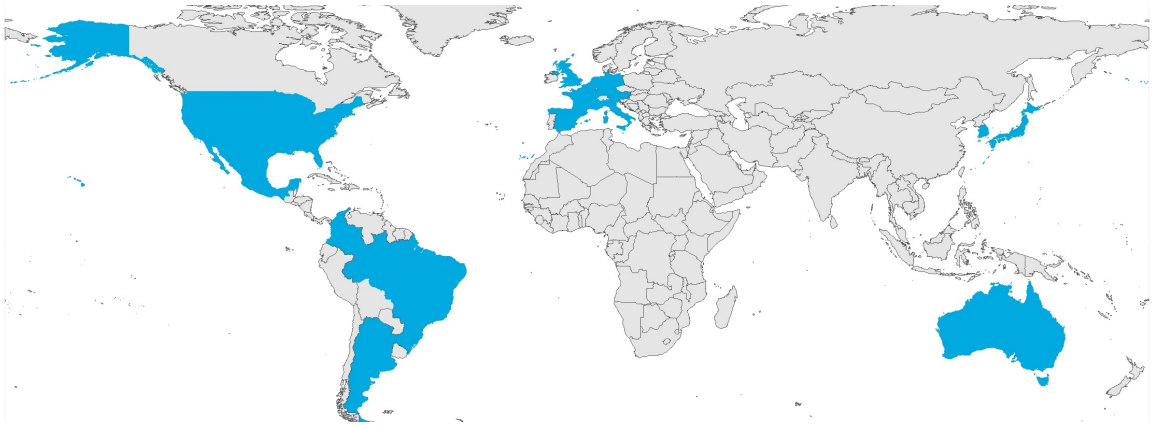


Figure 5.1: Countries with Deep Brain Stimulation Therapy Patients in Registry (Highlighted)

5.1.2 Patients

Of the 3,295 deep brain stimulation patients enrolled, the primary indications for implant were as follows: 61.1% were implanted for the treatment of Parkinson's Disease, 22.6% were implanted for the treatment of essential tremor, 9.9% were implanted for the treatment of dystonia, 1.5% were implanted for the treatment of epilepsy, 1.5% were implanted for the treatment of obsessive compulsive disorder, 2.3% were implanted for the treatment of other indications, and 1.0% were implanted for indications that were not specified in the database at the time of data cut-off (see Figure 5.2 and Table 5.1).

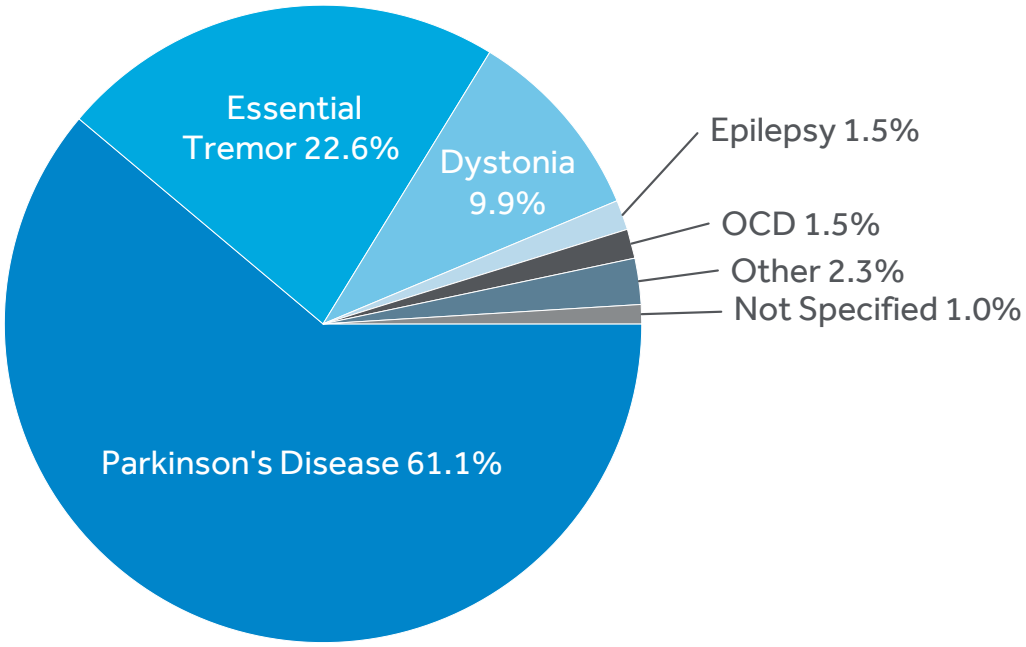


Figure 5.2: Deep Brain Stimulation Primary Treatment Indications

Table 5.1: Deep Brain Stimulation Primary Treatment Indications

Primary Treatment Indication[a]	Enrolled Patients (%)
Parkinson's Disease	2,014 (61.1%)
Essential Tremor	746 (22.6%)
Dystonia	327 (9.9%)
Epilepsy	50 (1.5%)
OCD	49 (1.5%)
Other	77 (2.3%)
Not Specified	32 (1.0%)
Total Patients	**3,295(100%)**

[a] For approved indications refer to product labeling for your geography.

It is recognized that healthcare providers prescribe therapies to meet specific patient needs; however, Medtronic only directs the use of its products based on approved labeling, which varies by geography. Please contact your local Medtronic representative for region-specific product labeling (http://www.medtronic.com/us-en/about/locations.html).

5.2 Event Summary

There were 479 product performance events reported between July 2009 and October 31, 2022, in patients with deep brain stimulation systems. These events represent 22.6% of the total reported events (479/2,124), occurred in 294 of the 3,295 (8.9%) total patients enrolled, and are presented graphically within this report (e.g. events per patient years as well as survival curves). Of the remaining 1,645 reported events 269 were serious (not product performance related) and 1,376 were non-serious (not product performance related). Serious non-product performance related events (n=269) are described in Table 5.6. Non serious non-product performance related (n=1,376) events are not listed in this report.

Any registry devices that are returned to Medtronic are analyzed via a Returned Product Analysis (RPA) process. If available, RPA findings overwrite in the classification of the events. Within this report, Table 5.2 differentiates the events by those determined by the RPA process versus those determined by the physician. Please refer to the Methodology section for more information.

There were 385 deaths reported for patients followed in the PSR with deep brain stimulation systems (see Table 5.7), none of which were reported as a direct result of a product performance event. Early versions of the protocol required events to be reported only when the event required a surgical intervention, resulted in therapy abandonment, or resulted in death. The required event reporting definition was expanded in April 2010 to include all adverse events related to the device, implant procedure, and/or therapy.

5.2.1 Product Performance Events

Table 5.2: Deep Brain Stimulation System Product Performance Events

Product Performance Events[a]	Event Counts	Events Per 100 Patient Years	Patients with Events (%) N=3,295[b]
RPA Determination	**3**	**0.03**	**3 (0.09%)**
Premature Battery Depletion	3	0.03	3 (0.09%)
Physician's Determination	**476**	**4.08**	**292 (8.86%)**
High Impedance	215	1.84	131 (3.98%)
Lead Migration/Dislodgement	46	0.39	33 (1.00%)
Low Impedance	32	0.27	21 (0.64%)
Device Malfunction	24	0.21	20 (0.61%)
Lead Fracture	22	0.19	18 (0.55%)
Extension Migration	21	0.18	11 (0.33%)
Neurostimulator Unable To Recharge[c]	18	0.15	18 (0.55%)
Extension Fracture	12	0.1	9 (0.27%)
Premature Battery Depletion	10	0.09	10 (0.30%)
Medical Device Complication	9	0.08	6 (0.18%)
Device Breakage	5	0.04	5 (0.15%)
Device Electrical Finding[d]	5	0.04	4 (0.12%)

...continued

Product Performance Events[a]	Event Counts	Events Per 100 Patient Years	Patients with Events (%) N=3,295[b]
Medical Device Site Infection	5	0.04	4 (0.12%)
Device Lead Issue	4	0.03	4 (0.12%)
Device Protrusion	4	0.03	2 (0.06%)
Device Connection Issue	3	0.03	3 (0.09%)
Device Electrical Impedance Issue	3	0.03	2 (0.06%)
Device End Of Life	3	0.03	3 (0.09%)
Electric Shock Sensation	3	0.03	2 (0.06%)
Neurostimulator Inversion	3	0.03	3 (0.09%)
Device Charging Issue	2	0.02	2 (0.06%)
Device Material Corroded	2	0.02	1 (0.03%)
Device Short Circuiting	2	0.02	2 (0.06%)
Electromagnetic Interference	2	0.02	2 (0.06%)
Medical Device Site Erosion	2	0.02	2 (0.06%)
Other[e]	19	0.16	17 (0.52%)
Total	**479**	**4.11**	**294 (8.92%)**

[a] Medical Dictionary for Regulatory Activities (MedDRA) Lower-Level Term or Medtronic's coding system term for events that do not exist in the MedDRA dictionary.

[b] The total number of patients with events may not represent the sum of all rows, as a patient may have experienced more than one type of event.

[c] There were 721 patients that used rechargeable neurostimulators for DBS in the registry. A total of 2.5% (18/721) of patients with a rechargeable neurostimulator experienced a neurostimulator unable to recharge event.

[d] Including open circuit contact, electric discharge.

[e] Composed of event codes with 1 event each.

A total of 221 (46.1%) of the 479 product performance events were related to the lead, 92 (19.2%) were related to the extension, 84 (17.5%) were related to the neurostimulator, 15 (3.1%) were related to multiple etiologies, which includes events where at least one device and one non-device etiology was indicated, and 67 (14.0%) were related to other etiologies, including: 36 (7.5%) were related to other component, 10 (2.1%) were related to incisional site/device tract, 9 (1.9%) were related to surgery/anesthesia, 6 (1.3%) were related to recharging process, 5 (1.0%) were related to programming/stimulation, and 1 (0.2%) was related to other etiology (see Figure 5.3). Events could have more than one etiology.

Relatedness is reported by the physician. In cases where the Clinical Events Committee (CEC) has adjudicated relatedness differently from the site, the CEC adjudication is used in this report for analysis purposes. However, both the site's reporting and the CEC's adjudication remain in the database.

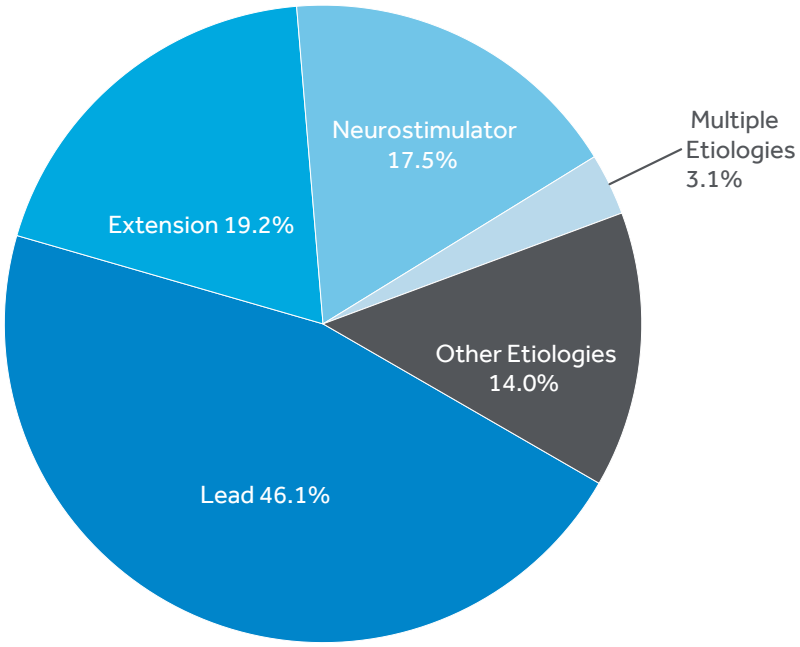


Figure 5.3: Deep Brain Stimulation System Product Performance Events by Relatedness

Table 5.3 and Table 5.4 describe the interventions taken for reported impedance events. In 39.1% and 31.2% of the high and low impedance events, the action taken was a surgical intervention. However, impedance could be used as a diagnostic measurement and may not result in any intervention or clinical impact. The majority of events required no intervention, or device reprogramming only (54.9% for high impedance and 68.8% for low impedance).

Table 5.3: Deep Brain Stimulation System High Impedance Events by Intervention

Intervention	N (%) of High Impedance Events
Device Surgical Intervention	72 (33.5%)
Reprogramming	52 (24.2%)
Other Surgical Intervention	12 (5.6%)
Other Intervention	7 (3.3%)
Medical or Non-Surgical Therapy	5 (2.3%)
Therapy Suspension	1 (0.5%)
No Action Taken	66 (30.7%)
Total	**215 (100%)**

Table 5.4: Deep Brain Stimulation System Low Impedance Events by Intervention

Intervention	N (%) of Low Impedance Events
Device Surgical Intervention	10 (31.2%)
Reprogramming	10 (31.2%)
No Action Taken	12 (37.5%)
Total	**32 (100%)**

Table 5.5 describes the interventions taken for reported lead migration/dislodgement events; 78.3% of them led to a surgical intervention, and 13.0% were reprogramming.

Table 5.5: Deep Brain Stimulation System Lead Migration/Dislodgement Events by Intervention

Intervention	N (%) of Lead Migration/Dislodgement Events
Device Surgical Intervention	34 (73.9%)
Reprogramming	6 (13.0%)
Other Surgical Intervention	2 (4.3%)
Medication	1 (2.2%)
No Action Taken	3 (6.5%)
Total	**46 (100%)**

5.2.2 Clinical Events Not Related To Product Performance

The clinical events not related to product performance are summarized if:

- The patient was enrolled in the PSR at the time in which the clinical event collection was initiated (N=2,112)
- Categorized as serious adverse events (SAEs, N=269)
- Occurred with a System Organ Class (SOC) threshold $\geq$1% of patients
- Other Considerations
  - Some events are described in high level group terms (HLGT) to provide more specificity, if needed
  - Some therapies will provide therapy relevant events

Table 5.6: Deep Brain Stimulation System Clinical Events Not Related To Product Performance

Event Type	Number of SAE	Patients with SAE n (%)[a] N=2,112	SAE Per 100 Patient Months	Patient with SAE Requiring Surgical Intervention n (%) N=2,112
Infections and infestations	**107**	**87 (4.12%)**	**0.13**	**81 (3.84%)**
Infections - pathogen unspecified	104	84 (3.98%)	0.13	78 (3.69%)
Other[b]	3	3 (0.14%)	0.00	3 (0.14%)
Nervous system disorders	**59**	**52 (2.46%)**	**0.07**	**11 (0.52%)**
Central nervous system vascular disorders	19	19 (0.90%)	0.02	3 (0.14%)
Movement disorders (incl parkinsonism)	18	18 (0.85%)	0.02	3 (0.14%)
Neurological disorders NEC	11	10 (0.47%)	0.01	3 (0.14%)
Other[b]	11	11 (0.52%)	0.01	2 (0.09%)
General disorders and administration site conditions	**49**	**46 (2.18%)**	**0.06**	**29 (1.37%)**
Complications associated with device	36	34 (1.61%)	0.05	25 (1.18%)
General system disorders NEC	7	7 (0.33%)	0.01	1 (0.05%)
Other[b]	6	6 (0.28%)	0.01	3 (0.14%)
Other SOC Terms (<1.0% Threshold)	**54**	**52 (2.46%)**	**0.07**	**19 (0.90%)**
Total	**269**	**212 (10.04%)**	**0.34**	**130 (6.16%)**

[a] The total number of patients with events may not represent the sum of all rows, as a patient may have experienced more than one type of event.
[b] Composed of high level group term event codes with fewer than 5 events each.

5.2.3 Patient Deaths

There were 385 deaths reported for patients with deep brain stimulation systems, none of which were reported as a direct result of a product performance event. Since July 2009, a total of 310 (80.5%) deaths have been reported in this patient registry study based upon patients receiving therapy for Parkinson's Disease, 51 (13.2%) for essential tremor, 15 (3.9%) for dystonia, 3 (0.8%) for epilepsy, 1 (0.3%) for OCD, and 5 (1.3%) for other indications (see Table 5.7). The percentage is based upon the total patient death events and not based upon the rate of occurrence.

Table 5.7: Deep Brain Stimulation System Patient Deaths by Primary Indication

Number of Reports of Death by Primary Indication[a]	N (%) of Deaths	Mean Age of Death in Years
Parkinson's Disease	310 (80.5%)	74.06
Essential Tremor	51 (13.2%)	79.8
Dystonia	15 (3.9%)	56.1
Epilepsy	3 (0.8%)	37.6
OCD	1 (0.3%)	70.4
Other	5 (1.3%)	75.3
Total	**385 (100%)**	**74.1**

[a] For approved indications refer to product labeling for your geography.

5.3 Neurostimulators

From July 2009 to the report cut-off date of October 31, 2022, there were 5,212 neurostimulators followed in the registry. The difference between the total number of patients (n=3,295) versus the number of neurostimulators (n=5,212) is due to the fact that some patients were implanted with more than one neurostimulator or were subsequently re-implanted. The aggregate prospective follow-up time for all neurostimulators was 150,157 months (12,513 years). Table 5.8 provides the number and percentage of neurostimulators by model.

Table 5.8: Deep Brain Stimulation Neurostimulator Counts by Model

Model Name	N (%)
Currently manufactured	
Activa PC	2,730 (52.4%)
Activa SC	1,106 (21.2%)
Activa RC	738 (14.2%)
Percept PC	526 (10.1%)
No longer manufactured	
Soletra	67 (1.3%)
Other/Unspecified[a]	33 (0.6%)
Total	**5,212 (100%)**

[a] Other includes Activa PC+S and non-Activa systems used for DBS.

5.3.1 Neurostimulator Events

Of the total of 479 product performance-related events, there were 86 product performance-related events with an underlying reported etiology related to neurostimulator function. This includes 84 events with a neurostimulator etiology and 2 events with both a neurostimulator and other etiology (including device and non-device etiologies). Of these, 66 were the initial product performance events that affected neurostimulator survival estimates. For neurostimulators in the registry, the current return rate to Medtronic Returned Product Analysis (RPA) was 4.1% (94/2,311). The proportion was based upon the number of registry neurostimulators received by RPA, divided by the sum of the total number of explanted devices and the total number of neurostimulators in patients who have expired. In the 86 neurostimulator events, 96.5 % (83/86) were assigned as device related by the physician, not returned to Medtronic RPA (see Table 5.9).

Table 5.9: Deep Brain Stimulation Neurostimulator Product Performance Events by Determination

Product Performance Events	N (%)
RPA Determination	**3 (3.5%)**
Premature Battery Depletion	3 (3.5%)
Physician's Determination	**83 (96.5%)**
High Impedance	37 (43.0%)
Device Malfunction	10 (11.6%)
Premature Battery Depletion	10 (11.6%)
Low Impedance	6 (7.0%)
Device End Of Life	3 (3.5%)
Device Electrical Finding[a]	2 (2.3%)
Electromagnetic Interference	2 (2.3%)
Extension Migration	2 (2.3%)
Device Computer Software Issue	1 (1.2%)
Device Protrusion	1 (1.2%)
Device Short Circuiting	1 (1.2%)
Device Vibration	1 (1.2%)
Electric Shock Sensation	1 (1.2%)
Medical Device Site Discomfort	1 (1.2%)
Medical Device Site Erosion	1 (1.2%)
Medical Device Site Infection	1 (1.2%)
Neurostimulator Inversion	1 (1.2%)
Neurostimulator Unable To Recharge	1 (1.2%)
Wound Infection	1 (1.2%)
Total	**86 (100%)**

[a] Open circuit contact.

For the purposes of survival analysis, a device's follow-up time is cut-off for one of three reasons: 1) the occurrence of a product performance-related event; 2) the occurrence of a censoring event; or 3) the device is event-free and censored at the patient's last follow-up prior to the data cut-off. For neurostimulators:

- 66 had follow-up time cut-off due to product performance-related events.
- 3,390 were censored in the survival analysis for the following reasons: patient expired, neurostimulator explanted, patient discontinued, therapy suspended, or site discontinued participation in the registry.
- 1,756 were free from product performance-related events and censoring events, and were censored at the last follow-up visit prior to the report cut-off.

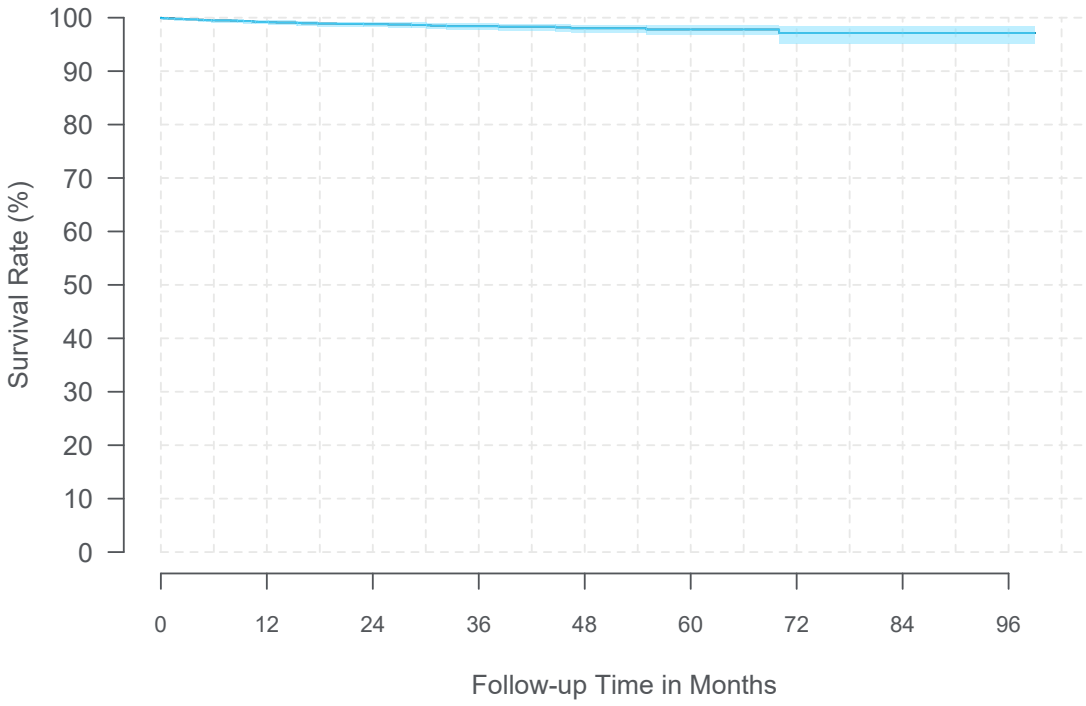
5.3.2 Neurostimulator Models

The following figures and tables represent neurostimulator survival and 95% confidence intervals where at least 20 neurostimulators contributed to each 3-month interval.

The Soletra and Kinetra models were removed from the table due to the limited number of active devices in PSR. For information on survival for those models, please refer to past reports.

5.3.2.1 Model Activa PC

Model Name	Activa PC
FDA Approval Date	April 2009
Neurostimulators Enrolled	2,730
Neurostimulators Currently Active in Study	584
Initial Product Performance Events	42
Median Follow-up Time (Months)	29.2
Cumulative Follow-up Time (Months)	87,874



Time Interval	1 Year	2 Years	3 Years	4 Years	5 Years
Survival (95% CI)	99.2% (98.7%, 99.5%)	98.8% (98.2%, 99.2%)	98.4% (97.8%, 98.9%)	98.0% (97.2%, 98.6%)	97.8% (96.8%, 98.5%)
Sample Size	2,193	1,640	1,042	600	323

Time Interval	6 Years	7 Years	8 Years	At 99 Months	
Survival (95% CI)	97.1% (95.1%, 98.3%)	97.1% (95.1%, 98.3%)	97.1% (95.1%, 98.3%)	97.1% (95.1%, 98.3%)	—
Sample Size	125	60	23	21	

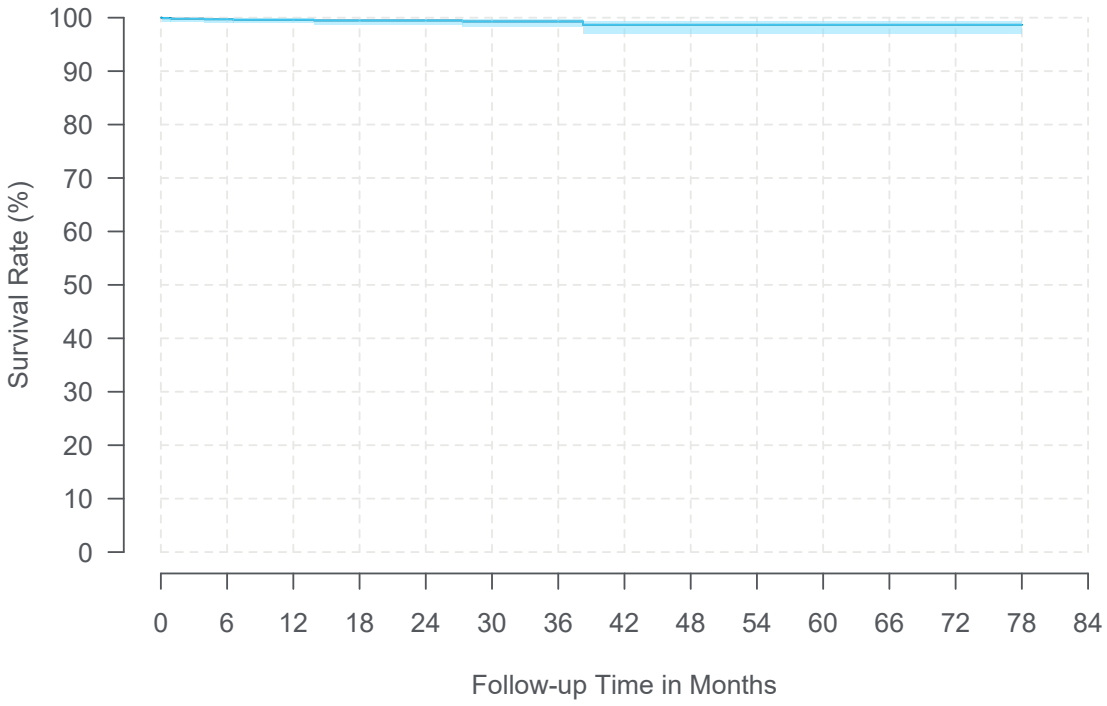
Specification: Activa PC	
Height	2.6 in (65 mm)
Width	1.9 in (49 mm)
Thickness	0.6 in (15 mm)
Volume	39 cc
Battery type	Non-Rechargeable
Expected Battery life	Depends on settings and use
Maximum Electrodes	8
Amplitude	0 - 10.5 V (voltage mode) 0 - 25.5 mA (current mode)
Rate	2 - 250 Hz (voltage mode) 30 - 250 Hz (current mode)
Pulse Width	60 - 450 µsec
Groups	4
Programs	16 (up to 4 per group)
Implant Depth	≤ 4 cm

Neurostimulator Event: Activa PC	N
High impedance	17
Premature battery depletion	12
Device malfunction	5
Device end of life	3
Device electrical finding[a]	1
Device protrusion	1
Electromagnetic interference	1
Low impedance	1
Medical device site infection	1
Total	**42**

[a] Open circuit contact.

5.3.2.2 Model Activa SC

Model Name	Activa SC
FDA Approval Date	January 2011
Neurostimulators Enrolled	1,106
Neurostimulators Currently Active in Study	206
Initial Product Performance Events	9
Median Follow-up Time (Months)	26.5
Cumulative Follow-up Time (Months)	31,524



Time Interval	1 Year	2 Years	3 Years	4 Years	5 Years
Survival (95% CI)	99.6% (98.9%, 99.8%)	99.5% (98.7%, 99.8%)	99.3% (98.4%, 99.7%)	98.7% (97.1%, 99.4%)	98.7% (97.1%, 99.4%)
Sample Size	846	613	359	183	77

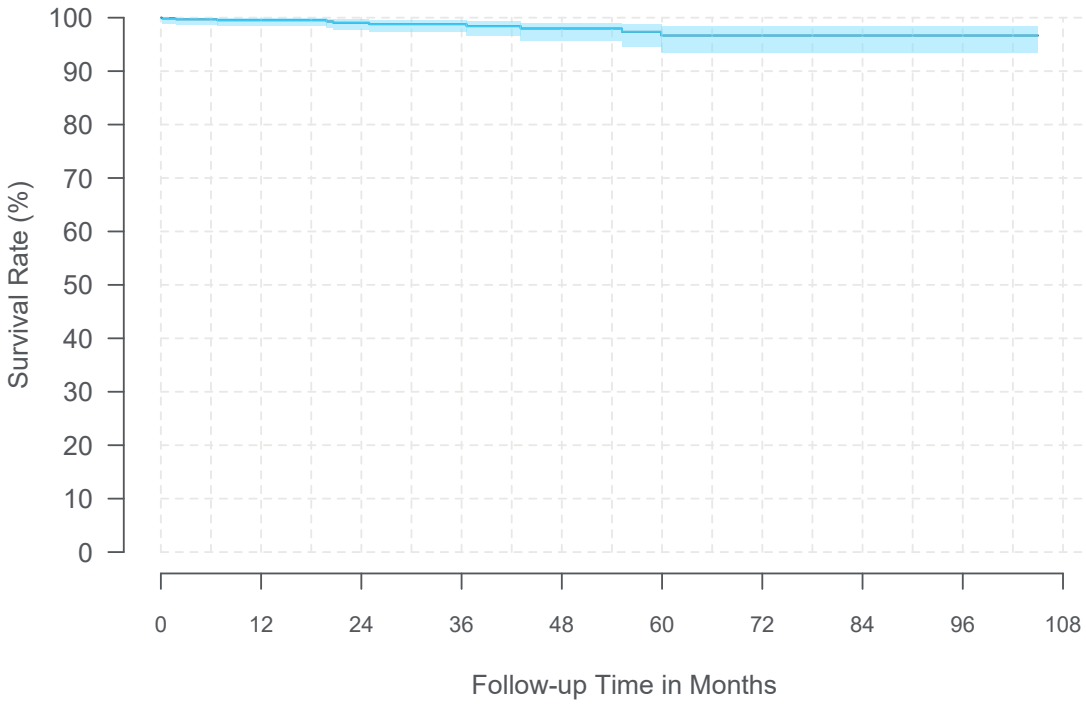
Time Interval	6 Years	At 78 Months			
Survival (95% CI)	98.7% (97.1%, 99.4%)	98.7% (97.1%, 99.4%)	—	—	—
Sample Size	38	27			

Specification: Activa SC	
Height	2.2 in (55 mm)
Width	2.4 in (60 mm)
Thickness	0.4 in (11 mm)
Volume	28 cc (Model 37602) 27 cc (Model 37603)
Battery type	Non-Rechargeable
Expected Battery life	Depends on settings and use
Maximum Electrodes	4
Amplitude	0 - 10.5 V (voltage mode) 0 - 25.5 mA (current mode)
Rate	2 - 250 Hz (voltage mode) 30 - 250 Hz (current mode)
Pulse Width	60 - 450 µsec
Groups	4
Programs	8 (up to 2 per group)
Implant Depth	≤ 4 cm

Neurostimulator Event: Activa SC	N
High impedance	4
Device short circuiting	1
Low impedance	1
Medical device site discomfort	1
Premature battery depletion	1
Wound infection	1
Total	**9**

5.3.2.3 Model Activa RC

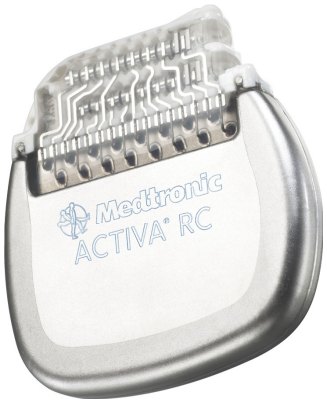
Model Name	Activa RC
FDA Approval Date	March 2009
Neurostimulators Enrolled	738
Neurostimulators Currently Active in Study	489
Initial Product Performance Events	12
Median Follow-up Time (Months)	24.8
Cumulative Follow-up Time (Months)	24,295



Time Interval	1 Year	2 Years	3 Years	4 Years	5 Years
Survival (95% CI)	99.5% (98.5%, 99.8%)	99.1% (97.7%, 99.6%)	98.8% (97.3%, 99.5%)	98.0% (95.8%, 99.0%)	96.7% (93.3%, 98.3%)
Sample Size	523	378	269	196	138

Time Interval	6 Years	7 Years	8 Years	At 105 Months	
Survival (95% CI)	96.7% (93.3%, 98.3%)	96.7% (93.3%, 98.3%)	96.7% (93.3%, 98.3%)	96.7% (93.3%, 98.3%)	—
Sample Size	86	52	29	21	

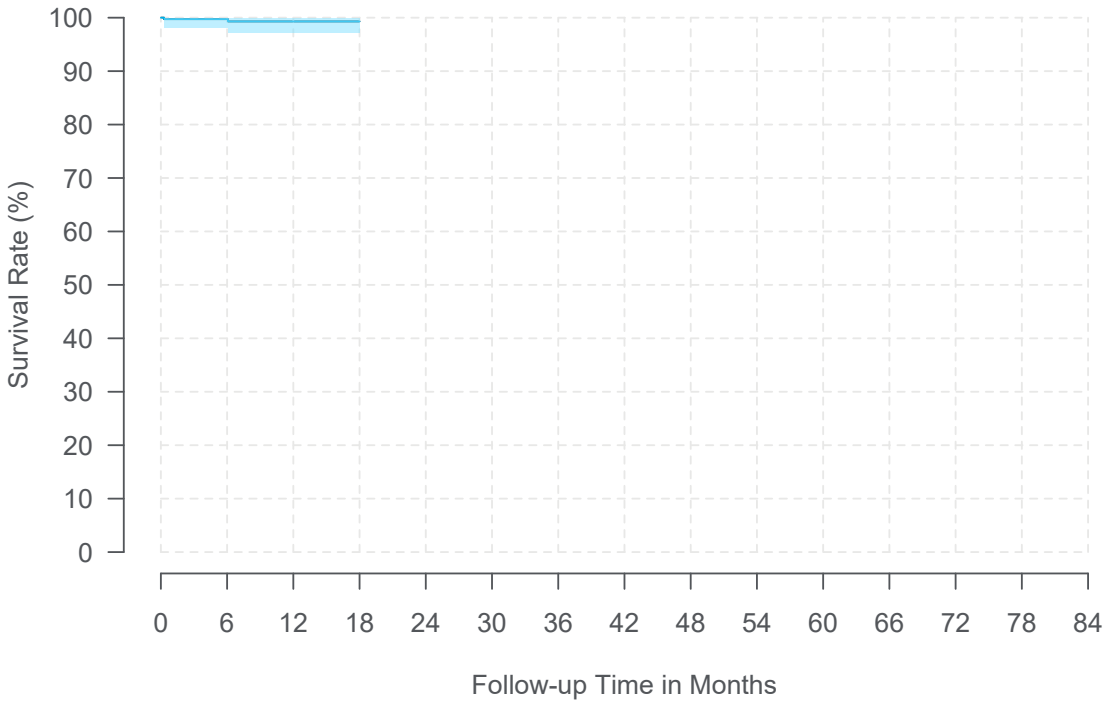
Specification: Activa RC	
Height	2.1 in (54 mm)
Width	2.1 in (54 mm)
Thickness	0.4 in (9 mm)
Volume	22 cc
Battery type	Rechargeable
Expected Battery life	9 years
Maximum Electrodes	8
Amplitude	0 - 10.5 V (voltage mode) 0 - 25.5 mA (current mode)
Rate	2 - 250 Hz (voltage mode) 30 - 250 Hz (current mode)
Pulse Width	60 - 450 µsec
Groups	4
Programs	16 (up to 4 per group)
Implant Depth	$\leq$ 1 cm



Neurostimulator Event: Activa RC	N
Device malfunction	2
Extension migration	2
High impedance	2
Device computer software issue	1
Electric shock sensation	1
Low impedance	1
Medical device site erosion	1
Neurostimulator inversion	1
Neurostimulator unable to recharge	1
Total	**12**

5.3.2.4 Model Percept PC

Model Name	Percept PC
FDA Approval Date	June 2020
Neurostimulators Enrolled	526
Neurostimulators Currently Active in Study	477
Initial Product Performance Events	2
Median Follow-up Time (Months)	4.9
Cumulative Follow-up Time (Months)	3,306



Time Interval	1 Year	At 18 Months
Survival	99.3%	99.3%
(95% CI)	(97.1%, 99.8%)	(97.1%, 99.8%)
Sample Size	110	36

Specification: Percept PC	
Height	68 mm
Width	2 in (51 mm)
Thickness	0.43 in (11 mm)
Volume	33 cc
Battery type	Non-Rechargeable
Expected Battery life	Depends on settings and use
Maximum Electrodes	16 Electrodes (8 per lead)
Amplitude	0 to 25.5 mA
Rate	2 to 250 Hz
Pulse Width	20 to 450 µsec
Groups	4
Programs	16
Implant Depth	≤ 4cm

Neurostimulator Event: Percept PC	N
Device electrical finding[a]	1
High impedance	1
Total	**2**

[a] Open circuit contact.

5.3.3 Neurostimulator Summary

Table 5.10: Deep Brain Stimulation Neurostimulator Characteristics

Model Name	FDA Approval Date	Neurostimulators Enrolled	Neurostimulators Active	Initial Product Performace Events	Median Follow-up Time (Months)	Cumulative Follow-up Time (Months)
Activa PC	April 2009	2,730	584	42	29.2	87,874
Activa SC	January 2011	1,106	206	9	26.5	31,524
Activa RC	March 2009	738	489	12	24.8	24,295
Percept PC	June 2020	526	477	2	4.9	3,306

Table 5.11: Deep Brain Stimulation Neurostimulator Survival Probability (95% Confidence Intervals)

Model Name	1 Year	2 Years	3 Years	4 Years	5 Years	6 Years	7 Years	8 Years
Activa PC	99.2% (98.7%, 99.5%)	98.8% (98.2%, 99.2%)	98.4% (97.8%, 98.9%)	98.0% (97.2%, 98.6%)	97.8% (96.8%, 98.5%)	97.1% (95.1%, 98.3%)	97.1% (95.1%, 98.3%)	97.1% (95.1%, 98.3%)
Activa SC	99.6% (98.9%, 99.8%)	99.5% (98.7%, 99.8%)	99.3% (98.4%, 99.7%)	98.7% (97.1%, 99.4%)	98.7% (97.1%, 99.4%)	98.7% (97.1%, 99.4%)	—	—
Activa RC	99.5% (98.5%, 99.8%)	99.1% (97.7%, 99.6%)	98.8% (97.3%, 99.5%)	98.0% (95.8%, 99.0%)	96.7% (93.3%, 98.3%)	96.7% (93.3%, 98.3%)	96.7% (93.3%, 98.3%)	96.7% (93.3%, 98.3%)
Percept PC	99.3% (97.1%, 99.8%)							%

5.4 Leads

From July 2009 to the report cut-off date of October 31, 2022, there were 5,602 leads followed in the registry. The difference between the total number of leads (n=5,602) versus neurostimulators (n=5,212) is due to the fact that some patients were subsequently re-implanted with a lead or were implanted with more than one lead. The aggregate prospective follow-up time for all leads was 241,313 months (20,109 years). Table 5.12 provides the number and percentage of leads by model.

Table 5.12: Deep Brain Stimulation Lead Counts by Model

Model Name	N (%)
3389 (compact electrode spacing)	2,935 (52.4%)
3387 (standard electrode spacing)	2,269 (40.5%)
SenSight B33005 (compact electrode spacing)	237 (4.2%)
SenSight B33015 (standard electrode spacing)	73 (1.3%)
3391 (large electrodes and wide spacing)	68 (1.2%)
Other/Unspecified[a]	20 (0.4%)
Total	**5,602 (100%)**

[a] Includes leads used in non-Activa systems.

5.4.1 Lead Events

Of the total of 479 product performance-related events, there were 230 product performance-related events with an underlying reported etiology related to lead function. This includes 221 events with a lead etiology and 9 events with both a lead and other etiology (including device and non-device etiologies). Of these, 134 were the initial product performance event that affected lead survival estimates.

Events of other/unspecified models are not shown. Model 3391 did not have any product performance-related events.

For the purposes of survival analysis, a device's follow-up time is cut-off for one of three reasons: 1) the occurrence of a product performance-related event; 2) the occurrence of a censoring event; or 3) the device is event-free and censored at the patient's last follow-up prior to the data cut-off. For leads:

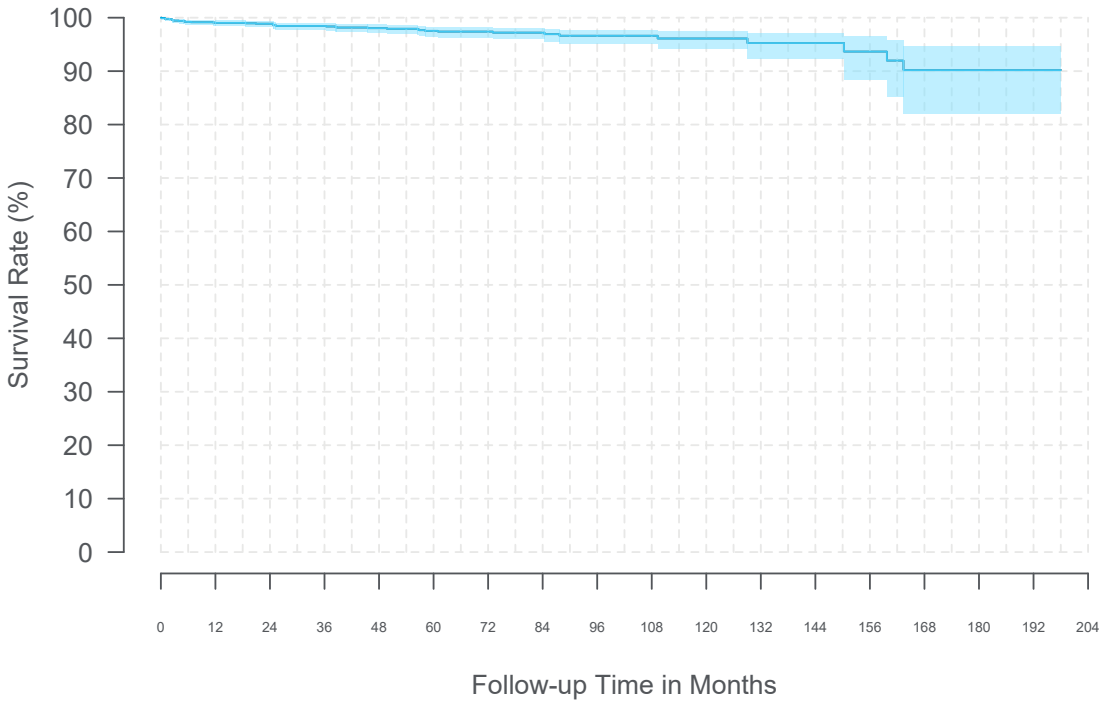
- 134 had follow-up time cut-off due to product performance-related events.
- 2,547 were censored in the survival analysis for the following reasons: patient expired, neurostimulator explanted, patient discontinued, therapy suspended, or site discontinued participation in the registry.
- 2,921 were free from product performance-related events and censoring events, and were censored at the last follow-up visit prior to the report cut-off.

5.4.2 Lead Models

The following figures and tables represent lead survival and 95% confidence intervals where at least 20 leads contributed to each 3-month interval. Due to enrollment of replacement patients with previously implanted leads, sample size may increase at later timepoints.

5.4.2.1 Model 3387

Model Name	3387
FDA Approval Date	July 1997
Leads Enrolled	2,269
Leads Currently Active in Study	1,144
Initial Product Performance Events	43
Median Follow-up Time (Months)	36.3
Cumulative Follow-up Time (Months)	97,797



Time Interval	1 Year	2 Years	3 Years	4 Years	5 Years
Survival (95% CI)	99.0% (98.4%, 99.4%)	98.9% (98.2%, 99.3%)	98.5% (97.7%, 99.0%)	98.0% (97.1%, 98.7%)	97.5% (96.5%, 98.3%)
Sample Size	1,532	1,189	1,000	851	714

Time Interval	6 Years	7 Years	8 Years	9 Years	10 Years
Survival (95% CI)	97.4% (96.3%, 98.2%)	97.2% (96.0%, 98.0%)	96.6% (95.1%, 97.7%)	96.6% (95.1%, 97.7%)	96.1% (94.1%, 97.4%)
Sample Size	512	354	253	187	140

Time Interval	11 Years	12 Years	13 Years	14 Years	15 Years
Survival (95% CI)	95.3% (92.3%, 97.1%)	95.3% (92.3%, 97.1%)	93.7% (88.5%, 96.6%)	90.2% (82.1%, 94.7%)	90.2% (82.1%, 94.7%)
Sample Size	108	62	56	53	35

Time Interval	16 Years	At 198 Months			
Survival (95% CI)	90.2% (82.1%, 94.7%)	90.2% (82.1%, 94.7%)	—	—	—
Sample Size	24	22			

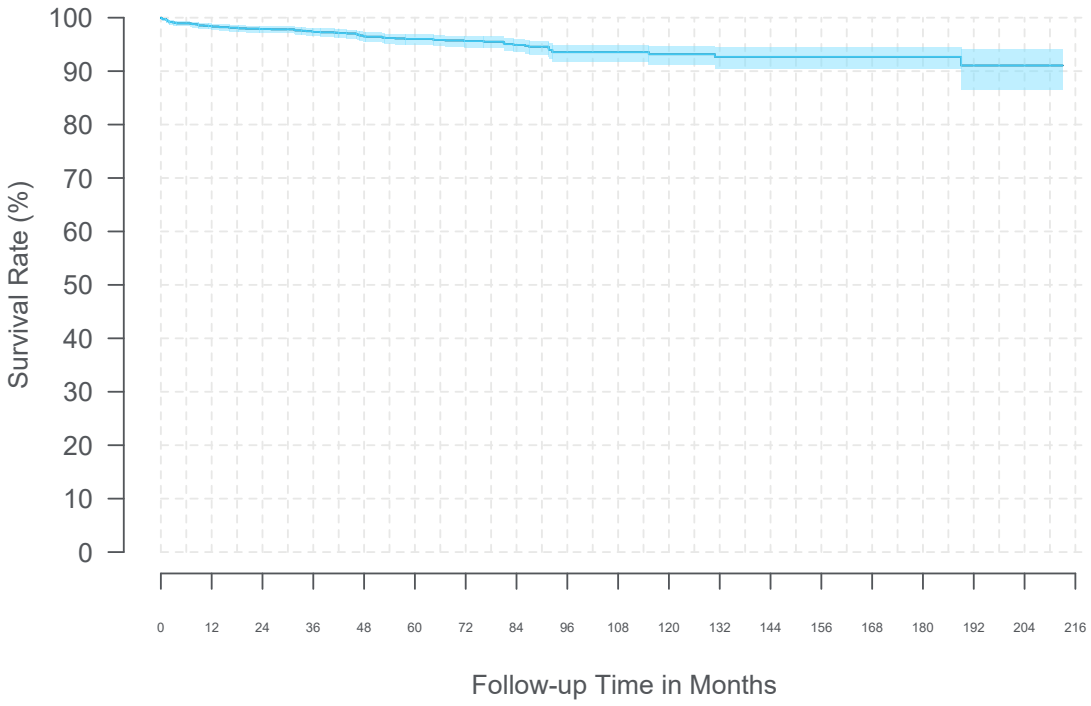
Specification: 3387	
Lead	
Length (cm)	40
Diameter (mm)	1.27
Electrode	
Number	4
Shape	Cylindrical
Length (mm)	1.5
Individual Surface Area (mm^2)	6.0
Inter-Electrode Spacing: Edge to Edge (mm)	1.5
Array Length (mm)	10.5

Lead Event: 3387	N
High impedance	20
Lead migration/dislodgement	10
Low impedance	7
Lead fracture	3
Device electrical finding[a]	1
Device lead issue	1
Medical device site pain	1
Total	**43**

[a] Open circuit contact.

5.4.2.2 Model 3389

Model Name	3389
FDA Approval Date	September 1999
Leads Enrolled	2,935
Leads Currently Active in Study	1,483
Initial Product Performance Events	87
Median Follow-up Time (Months)	44.7
Cumulative Follow-up Time (Months)	138,874



Time Interval	1 Year	2 Years	3 Years	4 Years	5 Years
Survival (95% CI)	98.3% (97.7%, 98.8%)	97.9% (97.1%, 98.4%)	97.3% (96.5%, 98.0%)	96.5% (95.5%, 97.3%)	96.0% (95.0%, 96.9%)
Sample Size	1,879	1,565	1,405	1,257	1,091

Time Interval	6 Years	7 Years	8 Years	9 Years	10 Years
Survival (95% CI)	95.6% (94.5%, 96.5%)	94.9% (93.6%, 96.0%)	93.6% (91.8%, 94.9%)	93.6% (91.8%, 94.9%)	93.2% (91.2%, 94.7%)
Sample Size	818	600	414	295	218

Time Interval	11 Years	12 Years	13 Years	14 Years	15 Years
Survival (95% CI)	92.7% (90.4%, 94.4%)	92.7% (90.4%, 94.4%)	92.7% (90.4%, 94.4%)	92.7% (90.4%, 94.4%)	92.7% (90.4%, 94.4%)
Sample Size	183	152	131	97	74

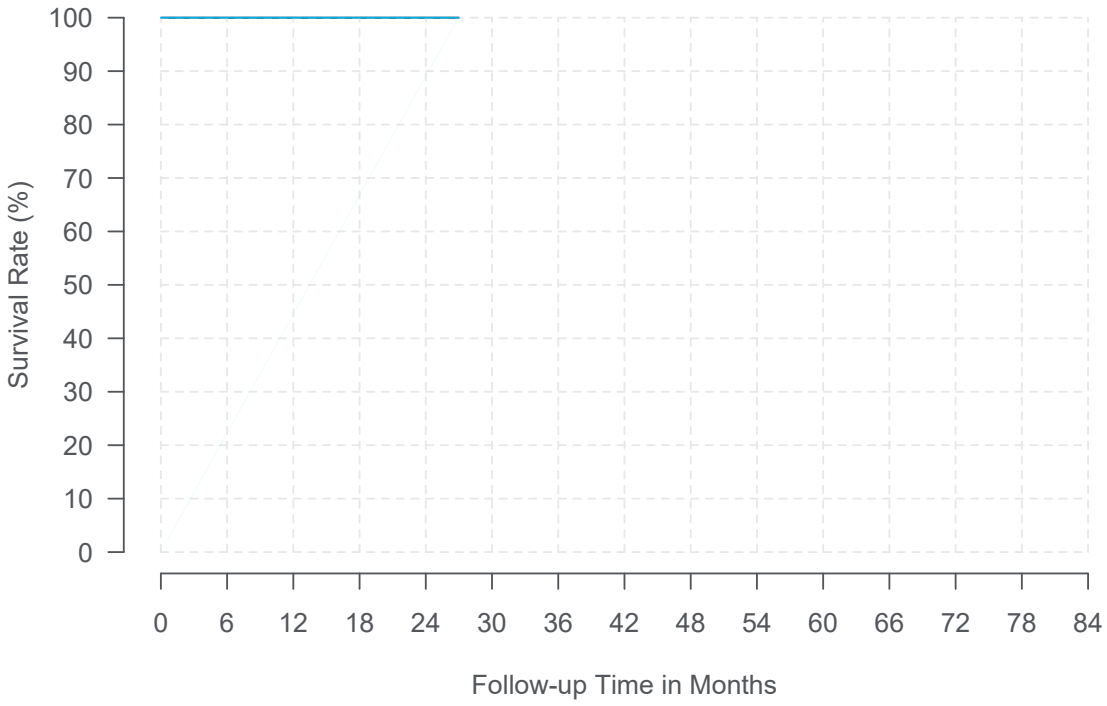
Time Interval	16 Years	17 Years	At 213 Months		
Survival (95% CI)	91.1% (86.6%, 94.1%)	91.1% (86.6%, 94.1%)	91.1% (86.6%, 94.1%)	—	—
Sample Size	54	36	21		

Specification: 3389	
Lead	
Length (cm)	40
Diameter (mm)	1.27
Electrode	
Number	4
Shape	Cylindrical
Length (mm)	1.5
Individual Surface Area (mm^2)	6.0
Inter-Electrode Spacing: Edge to Edge (mm)	0.5
Array Length (mm)	7.5

Lead Event: 3389	N
High impedance	43
Lead migration/dislodgement	20
Lead fracture	12
Low impedance	4
Device material corroded	2
Medical device complication	2
Medical device site infection	2
Device lead issue	1
Lead insulation failure	1
Total	**87**

5.4.2.3 Model 3391

Model Name	3391
FDA Approval Date	February 2009
Leads Enrolled	68
Leads Currently Active in Study	48
Initial Product Performance Events	0
Median Follow-up Time (Months)	29.0
Cumulative Follow-up Time (Months)	2,607



Time Interval	1 Year	2 Years	At 27 Months
Survival	100.0%	100.0%	100.0%
(95% CI)	(NA)	(NA)	(NA)
Sample Size	38	26	26

Specification: 3391	
Lead	
Length (cm)	40
Diameter (mm)	1.27
Electrode	
Number	4
Shape	Cylindrical
Length (mm)	3.0
Individual Surface Area (mm^2)	12
Inter-Electrode Spacing: Edge to Edge (mm)	4.0
Array Length (mm)	24

5.4.3 Lead Summary

Table 5.13: Deep Brain Stimulation Lead Characteristics

Model Name	FDA Approval Date	Leads Enrolled	Leads Active	Initial Product Performance Events	Median Follow-up Time (Months)	Cumulative Follow-up Time (Months)
3387	July 1997	2,269	1,144	43	36.3	97,797
3389	September 1999	2,935	1,483	87	44.7	138,874
3391	February 2009	68	48	0	29.0	2,607

Table 5.14: Deep Brain Stimulation Lead Survival Probability (95% Confidence Intervals)

Model Name	1 Year	2 Years	3 Years	4 Years	5 Years
3387	99.0% (98.4%, 99.4%)	98.9% (98.2%, 99.3%)	98.5% (97.7%, 99.0%)	98.0% (97.1%, 98.7%)	97.5% (96.5%, 98.3%)
3389	98.3% (97.7%, 98.8%)	97.9% (97.1%, 98.4%)	97.3% (96.5%, 98.0%)	96.5% (95.5%, 97.3%)	96.0% (95.0%, 96.9%)
3391	100.0% (NA)	100.0% (NA)	—	—	—

Model Name	6 Years	7 Years	8 Years	9 Years	10 Years
3387	97.4% (96.3%, 98.2%)	97.2% (96.0%, 98.0%)	96.6% (95.1%, 97.7%)	96.6% (95.1%, 97.7%)	96.1% (94.1%, 97.4%)
3389	95.6% (94.5%, 96.5%)	94.9% (93.6%, 96.0%)	93.6% (91.8%, 94.9%)	93.6% (91.8%, 94.9%)	93.2% (91.2%, 94.7%)
3391	—	—	—	—	—

Model Name	11 Years	12 Years	13 Years	14 Years	15 Years
3387	95.3% (92.3%, 97.1%)	95.3% (92.3%, 97.1%)	93.7% (88.5%, 96.6%)	90.2% (82.1%, 94.7%)	90.2% (82.1%, 94.7%)
3389	92.7% (90.4%, 94.4%)	92.7% (90.4%, 94.4%)	92.7% (90.4%, 94.4%)	92.7% (90.4%, 94.4%)	92.7% (90.4%, 94.4%)
3391	—	—	—	—	—

Model Name	16 Years	17 Years			
3387	90.2% (82.1%, 94.7%)	—	—	—	—
3389	91.1% (86.6%, 94.1%)	91.1% (86.6%, 94.1%)	—	—	—
3391	—	—	—	—	—

5.5 Extensions

From July 2009 to the report cut-off date of October 31, 2022, there were 5,657 extensions followed in the registry. The difference between the total number of extensions (n=5,657) versus neurostimulators (n=5,212) is due to some patients implanted with more than 1 extension or subsequently re-implanted with an extension. The aggregate prospective follow-up time for all extensions was 236,127 months (19,677 years). Table 5.15 provides the number and percentage of extensions by model.

Table 5.15: Deep Brain Stimulation Extension Counts by Model

Model Name	N (%)
Currently manufactured	
37085/37086 (quadripolar stretch)	4,735 (83.7%)
SenSight B34000/B34000M	309 (5.5%)
No longer manufactured	
7482[b] (quadripolar)	491 (8.7%)
Other/Unspecified[a]	122 (2.2%)
Total	**5,657 (100%)**

[a] Includes extensions for other legacy stimulation systems.
[b] Includes Models 7482 and 7482a.

5.5.1 Extension Events

Of the total of 479 product performance-related events, there were 96 product performance-related events with an underlying reported etiology related to extension function. This includes 92 events with an extension etiology and 4 events with both an extension and other etiology (including device and non-device etiologies). Of these, 82 were the initial product performance event that affected extension survival estimates.

Events of other/unspecified models and discontinued models are not shown.

For the purposes of survival analysis, a device's follow-up time is cut-off for one of three reasons: 1) the occurrence of a product performance-related event; 2) the occurrence of a censoring event; or 3) the device is event-free and censored at the patient's last follow-up prior to the data cut-off. For extensions:

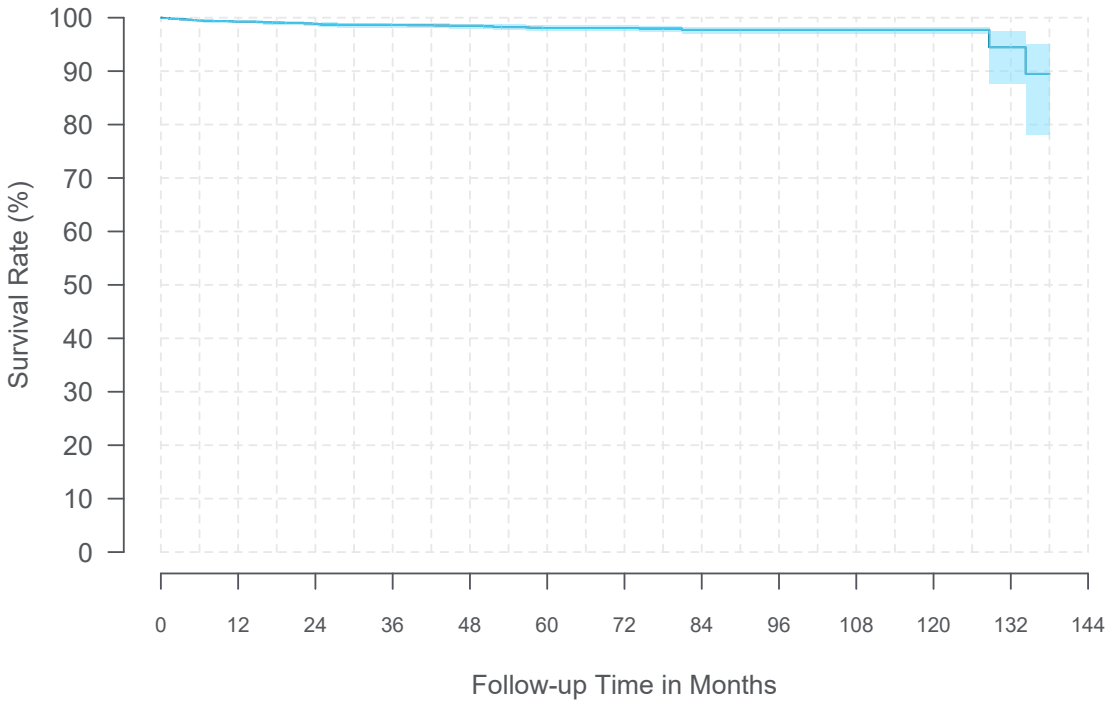
- 82 had follow-up time cut-off due to product performance-related events.
- 2,620 were censored in the survival analysis for the following reasons: patient expired, neurostimulator explanted, patient discontinued, therapy suspended, or site discontinued participation in the registry.
- 2,955 were free from product performance-related events and censoring events, and were censored at the last follow-up visit prior to the report cut-off.

5.5.2 Extension Models

The following figures and tables represent extension survival and 95% confidence intervals where at least 20 extensions contributed to each 3-month interval.

5.5.2.1 Model 37085/37086

Model Name	37085/37086
FDA Approval Date	March 2009/February 2012
Extensions Enrolled	4,735
Extensions Currently Active in Study	2,471
Initial Product Performance Events	68
Median Follow-up Time (Months)	37.6
Cumulative Follow-up Time (Months)	203,009

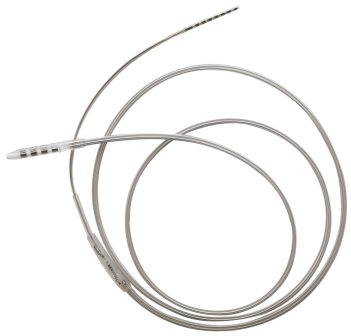


Time Interval	1 Year	2 Years	3 Years	4 Years	5 Years
Survival (95% CI)	99.2% (98.9%, 99.5%)	98.9% (98.4%, 99.2%)	98.6% (98.2%, 99.0%)	98.5% (98.0%, 98.9%)	98.1% (97.5%, 98.5%)
Sample Size	3,418	2,741	2,362	2,005	1,619

Time Interval	6 Years	7 Years	8 Years	9 Years	10 Years
Survival (95% CI)	98.1% (97.5%, 98.5%)	97.7% (97.0%, 98.3%)	97.7% (97.0%, 98.3%)	97.7% (97.0%, 98.3%)	97.7% (97.0%, 98.3%)
Sample Size	1,143	722	418	241	113

Time Interval	11 Years	At 138 Months			
Survival (95% CI)	94.5% (87.7%, 97.6%)	89.5% (78.1%, 95.1%)	—	—	—
Sample Size	44	24			

Specification: 37085/37086	
Device Name	Stretch-Coil Extension
Length (cm)	40, 60, 95
Distal End Compatibility	3387, 3389, or 3391 lead
Distal End Set Screws	4
Proximal End INS Compatibility	Activa RC, Activa PC, Activa SC, or Percept PC



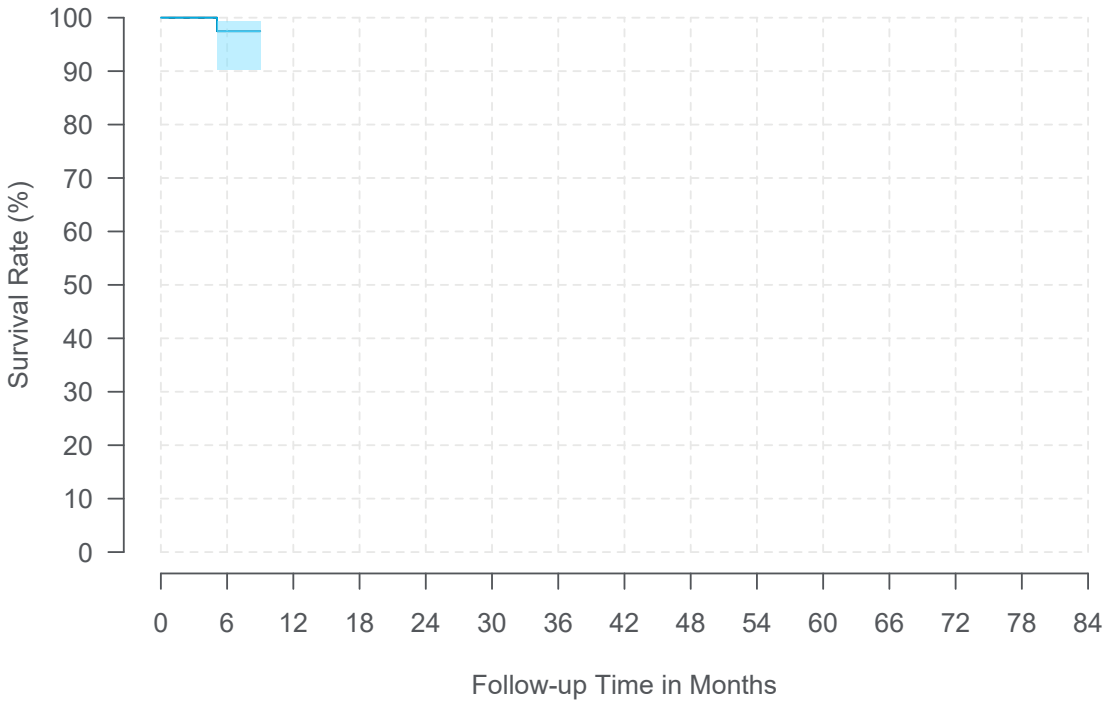
Extension Event: 37085/37086	Total
High impedance	27
Extension migration	15
Extension fracture	8
Low impedance	4
Medical device complication	4
Device protrusion	3
Device electrical finding[a]	2
Electric shock sensation	2
Device malfunction	1
Dystonia[b]	1
Lead migration/dislodgement	1
Total Extension Events	**68**

[a] Open circuit contact.

[b] Device recharging process issue.

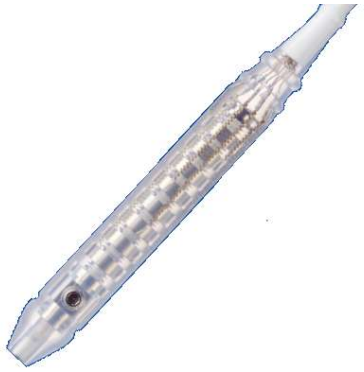
5.5.2.2 Model B34000/B34000M

Model Name	B34000/B34000M
FDA Approval Date	May 2021
Extensions Enrolled	309
Extensions Currently Active in Study	290
Initial Product Performance Events	2
Median Follow-up Time (Months)	1.2
Cumulative Follow-up Time (Months)	922



Time Interval	6 Months	9 Months
Survival (95% CI)	97.5% (90.3%, 99.4%)	97.5% (90.3%, 99.4%)
Sample Size	62	33

Specification: B34000/B34000M	
Device Name	SenSight Extension Kit
Length (cm)	40, 60, 95
Distal End Compatibility	B33005, or B33015 Lead
Distal End Set Screws	1
Proximal End INS Compatibility	Activa RC, Percept PC , or Percept RC



Extension Event: B34000/B34000M	Total
Extension migration	2
Total Extension Events	**2**

5.5.3 Extension Summary

Table 5.16: Deep Brain Stimulation Extension Characteristics

Model/Name	FDA Approval Date	Extensions Enrolled	Extensions Active	Initial Product Performance Events	Median Follow-up Time (Months)	Cumulative Follow-up Time (Months)
37085/37086	March 2009	4,735	2,471	68	37.6	203,009
B34000/B34000M	May 2021	309	290	2	1.2	922

Table 5.17: Deep Brain Stimulation Extension Survival Probability (95% Confidence Intervals)

Model Name	1 Year	2 Years	3 Years	4 Years	5 Years
37085/37086	99.2% (98.9%, 99.5%)	98.9% (98.4%, 99.2%)	98.6% (98.2%, 99.0%)	98.5% (98.0%, 98.9%)	98.1% (97.5%, 98.5%)
B34000/B34000M	—	—	—	—	—

Model Name	6 Years	7 Years	8 Years	9 Years	10 Years
37085/37086	98.1% (97.5%, 98.5%)	97.7% (97.0%, 98.3%)	97.7% (97.0%, 98.3%)	97.7% (97.0%, 98.3%)	97.7% (97.0%, 98.3%)
B34000/B34000M	—	—	—	—	—

Model Name	11 Years				
37085/37086	94.5% (87.7%, 97.6%)	—	—	—	—
B34000/B34000M	—	—	—	—	—

6 Sacral Neuromodulation Systems

6.1 Study Participants

6.1.1 Centers

In this section, the sacral neuromodulation tables and graphs were generated based on data collected between April 2010 and the report cut-off date of October 31, 2022. Twenty-four centers in North America, South America, and Europe have enrolled and contributed patients to the sacral neuromodulation systems section of this report.

6.1.2 Patients

Of the 1,558 sacral neuromodulation patients enrolled, the primary indications for implant were as follows: 43.4% were implanted for the treatment of urinary urge incontinence, 27.1% were implanted for the treatment of urgency-frequency, 13.3% were implanted for the treatment of urinary retention, 9.4% were implanted for the treatment of fecal incontinence, 2.3% were implanted for the treatment of bladder pain syndrome, 3.3% were implanted for the treatment of some other indication, and 1.2% were implanted for indications that were not specified in the database at the time of data cut-off (see Figure 6.1 and Table 6.1).

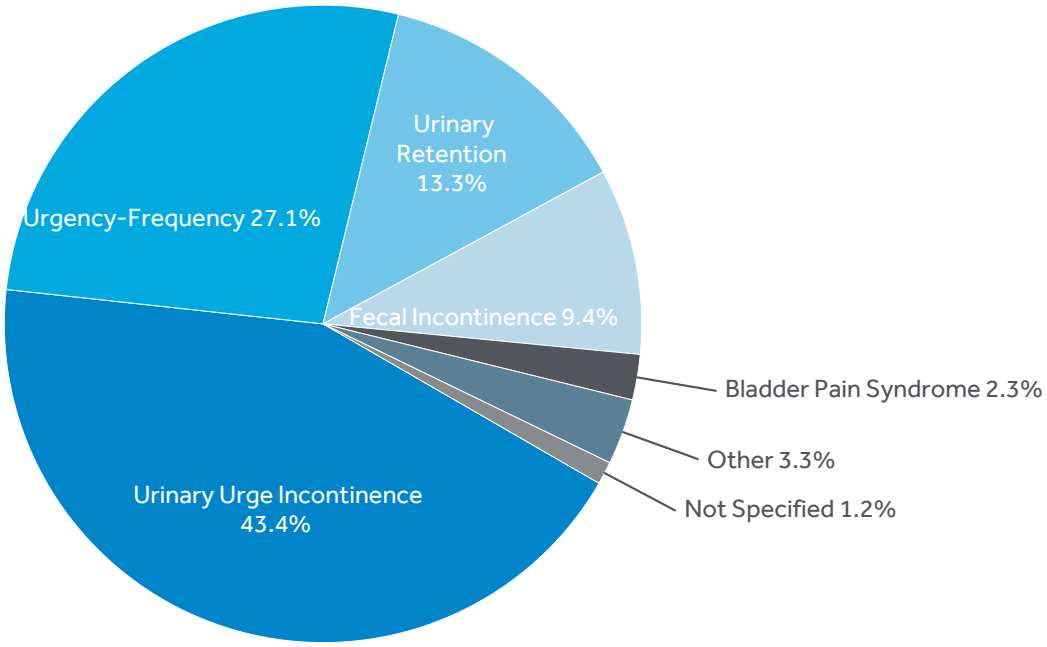


Figure 6.1: Sacral Neuromodulation Primary Treatment Indications

Table 6.1: Sacral Neuromodulation Primary Treatment Indications

Primary Treatment Indication[a]	Enrolled Patients (%)
Urinary Urge Incontinence	676 (43.4%)
Urgency-Frequency	422 (27.1%)
Urinary Retention	207 (13.3%)
Fecal Incontinence	147 (9.4%)
Bladder Pain Syndrome	36 (2.3%)
Other	52 (3.3%)
Not Specified	18 (1.2%)
Total Patients	**1,558 (100%)**

[a] For approved indications refer to product labeling for your geography.

It is recognized that healthcare providers prescribe therapies to meet specific patient needs; however, Medtronic only directs the use of its products based on approved labeling, which varies by geography. Please contact your local Medtronic representative for region-specific product labeling (http://www.medtronic.com/us-en/about/locations.html).

6.2 Event Summary

There were 238 product performance events reported between April 2010 and October 31, 2022, in patients with sacral neuromodulation systems. These events represent 19.3% of the total reported events (238/1,235), occurred in 168 (10.8%) of the 1,558 total patients enrolled, and are presented graphically within this report (e.g. events per patient years as well as survival curves). In addition, there were 972 non-product performance events that were collected to understand patient experience (clinical signs and symptoms) with the sacral neuromodulation systems. As an ongoing registry, events not coded at the time of the data snapshot (waiting on further information) will be included in future reports (n=25).

Any registry devices that are returned to Medtronic are analyzed via a Returned Product Analysis (RPA) process. If available, RPA findings assist in the classification of the events. Within this report, Table 6.2 differentiate the events by those determined by the RPA process versus those determined by the physician. Please refer to the Methodology section for more information.

There were 70 deaths reported for patients followed in the PSR with sacral neuromodulation systems, none of which were reported as a direct result of a product performance event.

6.2.1 Product Performance Events

Table 6.2: Sacral Neuromodulation System Product Performance Events

Product Performance Events[a]	Event Counts	Events Per 100 Patient Years	Patients with Events (%) N=1,558[b]
RPA Determination	**0**	**0.00**	**0 (0.00%)**
Physician's Determination	**238**	**5.64**	**168 (10.78%)**
High Impedance	86	2.04	64 (4.11%)
Lead Migration/Dislodgement	47	1.11	38 (2.44%)
Device Lead Issue	29	0.69	19 (1.22%)
Lead Fracture	25	0.59	21 (1.35%)
Device Malfunction[c]	13	0.31	11 (0.71%)
Low Impedance	11	0.26	10 (0.64%)
Device Electrical Impedance Issue	6	0.14	4 (0.26%)
Premature Battery Depletion	4	0.09	3 (0.19%)
Device Issue	3	0.07	2 (0.13%)
Device Failure	2	0.05	1 (0.06%)
Device Overheating	2	0.05	2 (0.13%)
Neurostimulator Unable To Recharge	2	0.05	2 (0.13%)
Device Battery Issue	1	0.02	1 (0.06%)
Device Charging Issue	1	0.02	1 (0.06%)
Device Connection Issue	1	0.02	1 (0.06%)
Device Lead Damage	1	0.02	1 (0.06%)
Device Stimulation Issue	1	0.02	1 (0.06%)

...continued

Product Performance Events[a]	Event Counts	Events Per 100 Patient Years	Patients with Events (%) N=1,558[b]
Device Wireless Communication Issue	1	0.02	1 (0.06%)
Electromagnetic Interference	1	0.02	1 (0.06%)
Therapeutic Product Ineffective	1	0.02	1 (0.06%)
Total	**238**	**5.64**	**168 (10.78%)**

[a] Medical Dictionary for Regulatory Activities (MedDRA) Lower-Level Term or Medtronic's coding system term for events that do not exist in the MedDRA dictionary.

[b] The total number of patients with events may not represent the sum of all rows, as a patient may have experienced more than one type of event.

[c] See Neurostimulator Event Summary Tables for additional details on device malfunctions by model.

A total of 158 (66.4%) of 238 product performance events were related to the lead only, 49 (20.6%) related to the neurostimulator only, 2 (0.8%) related to the extension only, 8 (3.4%) related to multiple etiologies (which includes events where at least one device and one non-device etiology was indicated), and 21 (8.8%) related to other etiologies . Relatedness is determined by the physician.

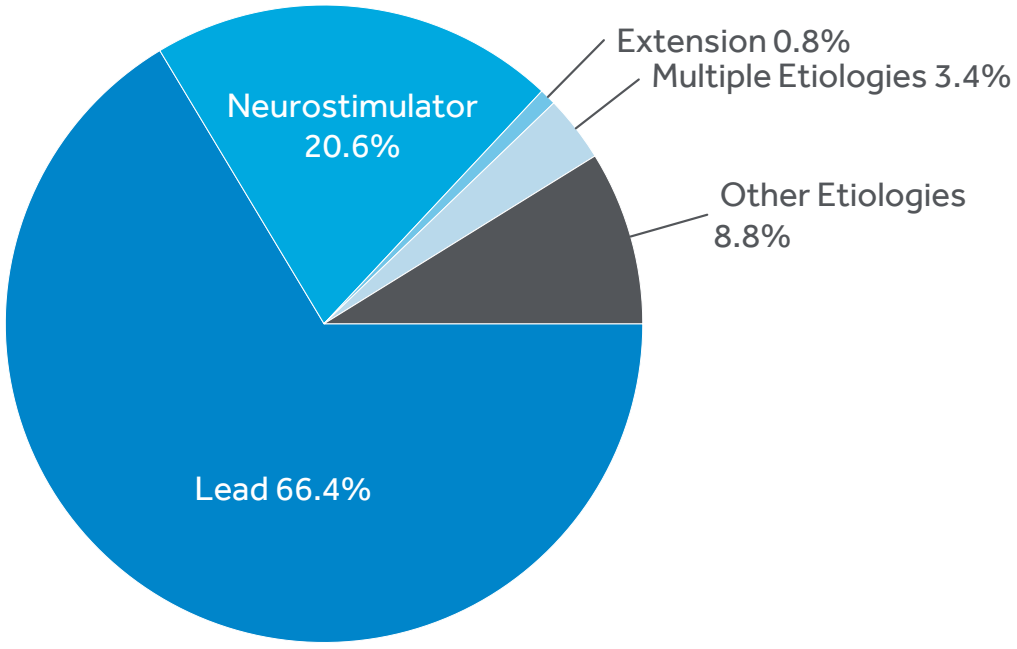


Figure 6.2: Sacral Neuromodulation System Product Performance Events by Relatedness

Table 6.3 describes the interventions completed for product performance events that required action from the health care provider and thereby, may have resulted in an incremental

impact to the patient. Survival estimates presented in previous product performance reports included events where no action was taken. To present survival estimates that may better correlate with patient impact, events where no action was taken have been removed from the device survival estimates presented in this 2022 report. The far-left column lists the top five reported PPEs, and all other reported PPEs are listed under Other. The subsequent columns represent the actions taken by the reporting physician.

Table 6.3: Sacral Neuromodulation System Product Performance Events by Intervention

Events by Intervention	Surgical Intervention	Reprogramming	Therapy Suspension	Medical or Non-Surgical Intervention [a]	No Action Taken	Total Events
High Impedance	45 (52.3%)	34 (39.5%)	0 (0.0%)	0 (0.0%)	7 (8.1%)	**86**
Lead Migration/Dislodgement	33 (70.2%)	6 (12.8%)	1 (2.1%)	1 (2.1%)	6 (12.8%)	**47**
Device Lead Issue	11 (37.9%)	9 (31.0%)	4 (13.8%)	0 (0.0%)	5 (17.2%)	**29**
Lead Fracture	17 (68.0%)	2 (8.0%)	1 (4.0%)	3 (12.0%)	2 (8.0%)	**25**
Device Malfunction	6 (46.2%)	4 (30.8%)	2 (15.4%)	0 (0.0%)	1 (7.7%)	**13**
Other [b]	24 (63.2%)	7 (18.4%)	1 (2.6%)	2 (5.3%)	4 (10.5%)	**38**
Total	**136**	**62**	**9**	**6**	**25**	**238**

[a] Medical or Non-Surgical Therapy contains but is not limited to the following actions: medication adjustment based on disease symptoms, imaging (e.g. MRI or X-ray), other specialist referral.
[b] Other represents all reported PPEs that were not in the top five of occurrence.

6.2.2 Clinical Events Not Related To Product Performance

The clinical events not related to product performance are summarized if:

- The patient was enrolled in the PSR at the time in which the clinical event collection was initiated (n=1,248)
- Categorized as serious adverse events (SAEs, n=11)
- Occurred with a System Organ Class (SOC) threshold $\geq$0.5% of patients
- Other Considerations
  - Some events are described in high level group terms (HLGT) to provide more specificity, if needed

Table 6.4: Sacral Neuromodulation System Clinical Events Not Related To Product Performance

Event Type	Number of SAE	Patients with SAE n (%) N=1,248	SAE Per 100 Patient Months	Patient with SAE Requiring Surgical Intervention n (%) N=1,248
Infections and infestations	**9**	**9 (0.72%)**	**0.024**	**7 (0.56%)**
Infections - pathogen unspecified	9	9 (0.72%)	0.024	7 (0.56%)
Other SOC Terms (<0.5% Threshold)[a]	**2**	**2 (0.16%)**	**0.005**	**1 (0.08%)**
Total	**11**	**11 (0.88%)**	**0.030**	**8 (0.64%)**

[a] Composed of high level group term event codes with fewer than 5 events each.

6.2.3 Patient Deaths

In earlier versions of the protocol, deaths were only assessed for the relatedness to the device product performance. After 2010, death assessments were expanded to also include the relationship to the implant procedure and/or therapy. As of the report cut-off, a total of 70 patients in the registry had expired. As with previous reports, no deaths were reported as a direct result of a product performance event.

The percentage is based upon the total patient death events and not based upon the rate of occurrence. **Tables depicted without a patient denominator should not be interpreted using other numbers within this report to calculate event rates.**

Table 6.5: Sacral Neuromodulation System Patient Deaths by Primary Indication

Number of Reports of Death by Primary Indication[a]	N (%) of Deaths
Urinary Urge Incontinence	28 (40.0%)
Urgency-Frequency	24 (34.3%)
Urinary Retention	9 (12.9%)
Fecal Incontinence	4 (5.7%)
Other	5 (7.1%)
Total	**70 (100%)**

[a] For approved indications refer to product labeling for your geography.

6.3 Neurostimulators

From April 2010 to the report cut-off date of October 31, 2022, there were 1,627 neurostimulators followed in the registry. The difference between the total number of patients (n=1,558) versus the total number of neurostimulators (n=1,627) is due to the fact that some

patients were subsequently re-implanted. The aggregate prospective follow-up time for all neurostimulators was 49,272 months (4,106 years).

Table 6.6: Sacral Neuromodulation Neurostimulator Counts by Model

Model Name	N (%)
InterStim II	1378 (84.7%)
InterStim	101 (6.2%)
InterStim X	88 (5.4%)
InterStim Micro	60 (3.7%)
Total	**1,627 (100%)**

6.3.1 Neurostimulator Events

There were 53 product performance-related events with an underlying reported etiology related to neurostimulator function. This includes 49 events with a neurostimulator etiology and 4 events with both a neurostimulator and other etiology (including device and non-device etiologies). Of these, 44 were the initial product performance events that affected neurostimulator survival estimates. For neurostimulators in the registry, the current return rate to Medtronic Returned Product Analysis (RPA) was 12.1% (57/471). The proportion was based upon the number of registry neurostimulators received by RPA, divided by the sum of the total number of explanted devices and the total number of neurostimulators in patients who have expired. In the 53 neurostimulator events, 100.0% (53/53) were assigned as device related by the physician, not returned to Medtronic RPA (see Table 6.7).

Table 6.7: Sacral Neuromodulation Neurostimulator PPE by Determination

Product Performance Events	N (%)
Physician's Determination	**53 (100%)**
High Impedance	17 (32.1%)
Device Lead Issue	7 (13.2%)
Device Malfunction[a]	7 (13.2%)
Lead Migration/Dislodgement	5 (9.4%)
Premature Battery Depletion	3 (5.7%)
Device Electrical Impedance Issue	2 (3.8%)
Device Issue	2 (3.8%)
Device Overheating	2 (3.8%)
Lead Fracture	2 (3.8%)
Device Battery Issue	1 (1.9%)
Device Connection Issue	1 (1.9%)
Device Failure	1 (1.9%)
Device Stimulation Issue	1 (1.9%)
Neurostimulator Unable To Recharge	1 (1.9%)
Therapeutic Product Ineffective	1 (1.9%)

[a] See Neurostimulator Event Summary Tables for additional details on device malfunction model.

For the purposes of survival analysis, a device's follow-up time is cut off for one of three reasons: 1) the occurrence of a product performance-related event; 2) the occurrence of a censoring event; or 3) the device is event-free and censored at the patient's last follow-up prior to the data cut-off. For neurostimulators:

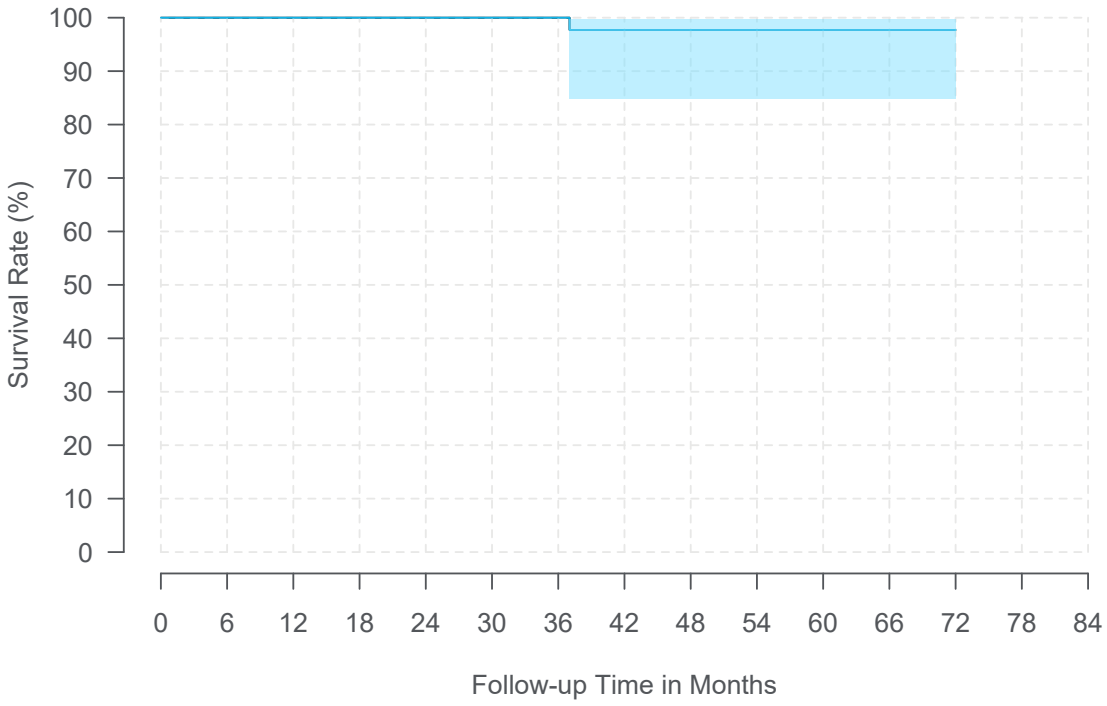
- 44 had follow-up time cut-off due to product performance-related events.
- 894 were censored in the survival analysis for the following reasons: patient expired, neurostimulator explanted, patient discontinued, therapy suspended, or site discontinued participation in the registry.
- 689 were free from product performance-related events and censoring events, and were censored at the last follow-up visit prior to the report cut-off.

6.3.2 Neurostimulator Models

The following figures and tables represent neurostimulator survival and 95% confidence intervals where at least 20 neurostimulators contributed to each 3-month interval. The InterStim X model is not shown due to the insufficient data.

6.3.2.1 Model 3023

Model Name	InterStim
FDA Approval Date	July 1998
Neurostimulators Enrolled	101
Neurostimulators Currently Active in Study	14
Initial Product Performance Events	2
Median Follow-up Time (Months)	30.4
Cumulative Follow-up Time (Months)	3,944



Time Interval	1 Year	2 Years	3 Years	4 Years	5 Years
Survival (95% CI)	100.0% (NA)	100.0% (NA)	100.0% (NA)	97.7% (84.8%, 99.7%)	97.7% (84.8%, 99.7%)
Sample Size	70	60	43	33	25

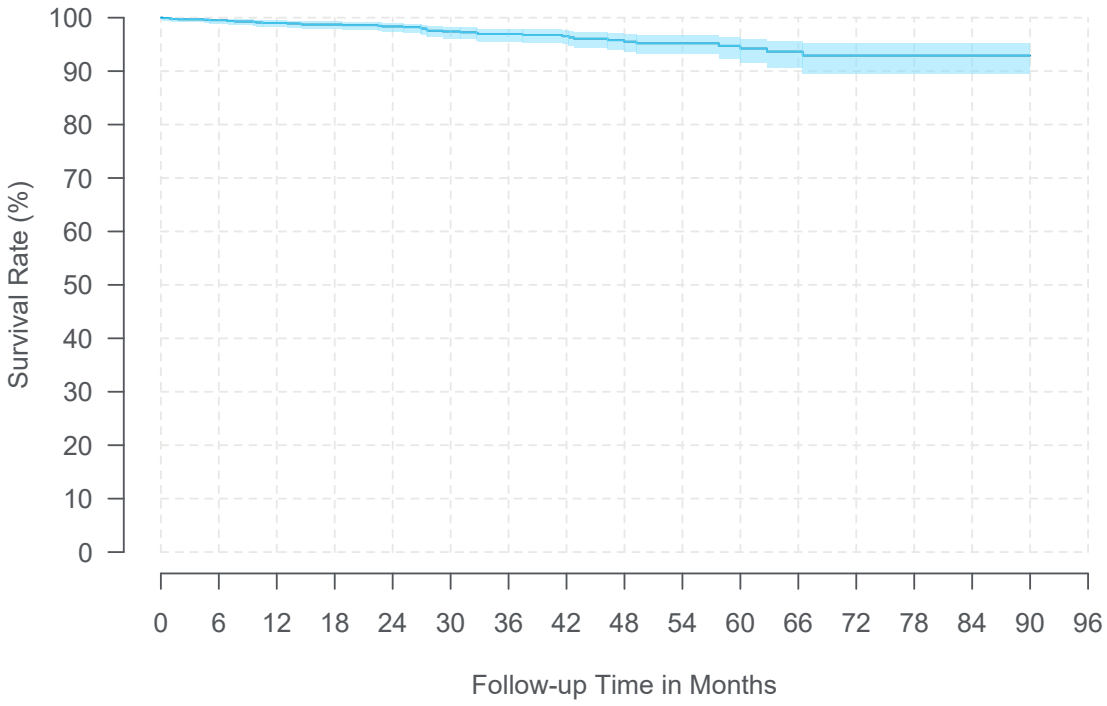
Time Interval	6 Years				
Survival (95% CI)	97.7% (84.8%, 99.7%)	—	—	—	—
Sample Size	20				

Specification: 3023	
Height	2.2 in (55 mm)
Width	2.4 in (60 mm)
Thickness	0.4 in (10 mm)
Volume	25 cc
Battery type	Non-Rechargeable
Expected Battery life	Depends on settings and use
Maximum Electrodes	4
Amplitude	0 - 10.5 V
Rate	2.1 - 130 Hz
Pulse Width	60 - 450 µsec
Programs	4
Implant Depth	≤ 4 cm

Neurostimulator Event Summary: 3023	N
High Impedance	1
Premature Battery Depletion	1
Total	**2**

6.3.2.2 Model 3058

Model Name	InterStim II
FDA Approval Date	June 2006
Neurostimulators Enrolled	1,378
Neurostimulators Currently Active in Study	540
Initial Product Performance Events	41
Median Follow-up Time (Months)	29.2
Cumulative Follow-up Time (Months)	44,664



Time Interval	1 Year	2 Years	3 Years	4 Years	5 Years
Survival (95% CI)	99.0% (98.3%, 99.4%)	98.4% (97.4%, 99.0%)	96.9% (95.5%, 97.9%)	95.5% (93.6%, 96.9%)	94.2% (91.6%, 96.0%)
Sample Size	1,058	781	552	336	186

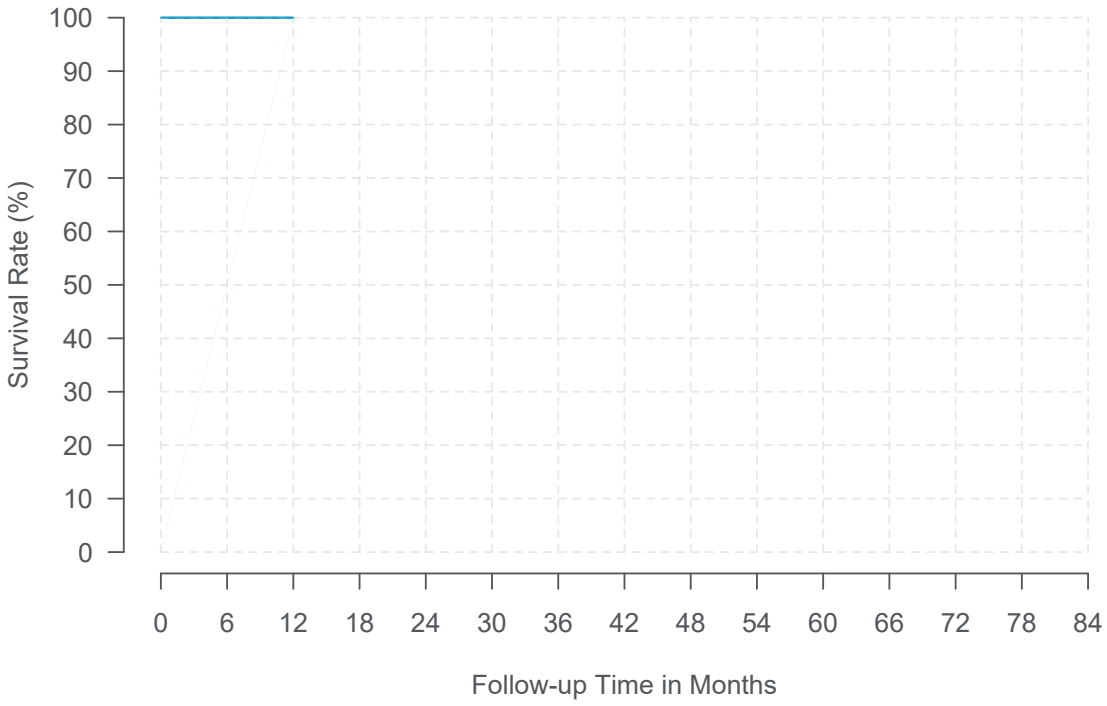
Time Interval	6 Years	7 Years	At 90 Months		
Survival (95% CI)	92.9% (89.5%, 95.2%)	92.9% (89.5%, 95.2%)	92.9% (89.5%, 95.2%)	—	—
Sample Size	98	47	25		

Specification: 3058	
Height	1.7 in (44 mm)
Width	2.0 in (51 mm)
Thickness	0.3 in (7.7 mm)
Volume	14 cc
Battery type	Non-Rechargeable
Expected Battery life	Depends on settings and use
Maximum Electrodes	4
Amplitude	0 - 8.5 V
Rate	2.1 - 130 Hz
Pulse Width	60 - 450 µsec
Programs	4
Implant Depth	≤ 2.5 cm

Neurostimulator Event Summary: 3058	N
High Impedance	14
Device Malfunction	6
Lead Migration/Dislodgement	5
Device Lead Issue	4
Device Electrical Impedance Issue	2
Device Issue	2
Premature Battery Depletion	2
Device Failure	1
Device Overheating	1
Device Stimulation Issue	1
Lead Fracture	1
Neurostimulator Unable To Recharge	1
Therapeutic Product Ineffective	1
Total	**41**

6.3.2.3 Model 97810

Model Name	InterStim Micro
FDA Approval Date	July 2020
Neurostimulators Enrolled	60
Neurostimulators Currently Active in Study	52
Initial Product Performance Events	0
Median Follow-up Time (Months)	11.1
Cumulative Follow-up Time (Months)	619



Time Interval	1 Year
Survival	100.0%
(95% CI)	(NA)
Sample Size	27

Specification: 97810	
Height	0.7 in (17 mm)
Length	1.9 in (47 mm)
Thickness	0.2 in (5 mm)
Volume	2.8 cc
Battery type	Rechargeable
Expected Battery life	15 years
Maximum Electrodes	1
Amplitude	0 to 12.5 mA (0.1 mA increment)
Rate	3 to 130 Hz
Pulse Width	40 to 450 µsec (10 µsec increment)
Programs	11
Implant Depth	$\leq$ 2.5 cm

6.3.3 Neurostimulator Summary

Table 6.8: Sacral Neuromodulation Neurostimulator Characteristics

Model Name	FDA Approval Date	Neurostimulators Enrolled	Neurostimulators Active	Initial Product Performance Events	Median Follow-up Time (Months)	Cumulative Follow-up Time (Months)
InterStim	July 1998	101	14	2	30.4	3,944
InterStim II	June 2006	1,378	540	41	29.2	44,664
InterStim Micro	July 2020	60	52	0	11.1	619

Table 6.9: Sacral Neuromodulation Neurostimulator Survival Probability (95% Confidence Intervals)

Model Name	1 Year	2 Years	3 Years	4 Years	5 Years	6 Years	7 Years
InterStim	100.0%	100.0%	100.0%	97.7%	97.7%	97.7%	—
	(NA)	(NA)	(NA)	(84.8%, 99.7%)	(84.8%, 99.7%)	(84.8%, 99.7%)	
InterStim II	99.0%	98.4%	96.9%	95.5%	94.2%	92.9%	92.9%
	(98.3%, 99.4%)	(97.4%, 99.0%)	(95.5%, 97.9%)	(93.6%, 96.9%)	(91.6%, 96.0%)	(89.5%, 95.2%)	(89.5%, 95.2%)
InterStim Micro	100.0%	—	—	—	—	—	—
	(NA)						

6.4 Leads

From April 2010 to the report cut-off date of October 31, 2022, there were 1,555 leads followed in the registry. The difference between the total number of leads (n=1,555) versus the total number of neurostimulators (n=1,627) is due to the fact that some patients were subsequently re-implanted with a new neurostimulator. The aggregate prospective follow-up time for all leads was 49,520 months (4,127 years). Table 6.10 provides the number and percentage of leads by model.

Table 6.10: Sacral Neuromodulation Lead Counts by Model

Model Name	N (%)
Currently manufactured	**1,443 (92.8%)**
InterStim Quad Lead Tined (3889)	1,175 (75.6%)
InterStim SureScan MRI Lead (978B1)	213 (13.7%)
InterStim SureScan MRI Lead (978A1)	55 (3.5%)
No longer manufactured	**105 (6.8%)**
InterStim Extended Electrode Quad Lead Tined (3093)	100 (6.4%)
InterStim Quad Lead (3080)	3 (0.2%)
InterStim Extended Electrode Quad Lead (3092)	2 (0.1%)
Other/Unspecified	**7 (0.5%)**
Total	**1,555 (100%)**

6.4.1 Lead Events

There were 162 product performance-related events with an underlying reported etiology related to lead function. This includes 158 events with a lead etiology and 4 events with both a lead and other etiology (including device and non-device etiologies). Of these, 126 were the initial product performance event that affected lead survival estimates.

For the purposes of survival analysis, a device's follow-up time is cut off for one of three reasons: 1) the occurrence of a product performance-related event; 2) the occurrence of a censoring event; or 3) the device is event-free and censored at the patient's last follow-up prior to the data cut-off. For leads:

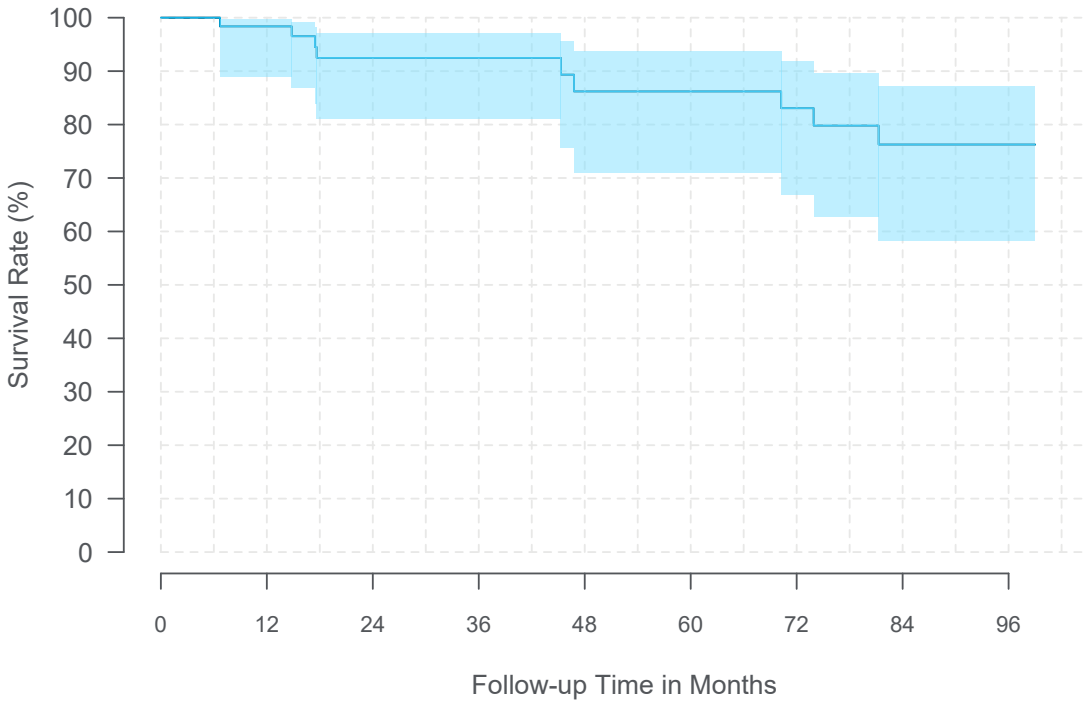
- 126 had follow-up time cut-off due to product performance-related events.
- 748 were censored in the survival analysis for the following reasons: patient expired, lead explanted, patient discontinued, therapy suspended, or site discontinued participation in the registry.
- 681 were free from product performance-related events and censoring events, and were censored at the last follow-up visit prior to the report cut-off.

6.4.2 Lead Models

The following figures and tables represent lead survival and 95% confidence intervals where at least 20 leads contributed to each 3-month interval.

6.4.2.1 Model 3093

Model Name	InterStim Extended Electrode Quad Lead Tined
FDA Approval Date	September 2002
Leads Enrolled	100
Leads Currently Active in Study	20
Initial Product Performance Events	11
Median Follow-up Time (Months)	30.1
Cumulative Follow-up Time (Months)	4,027



Time Interval	1 Year	2 Years	3 Years	4 Years	5 Years
Survival (95% CI)	98.4% (89.0%, 99.8%)	92.5% (81.1%, 97.1%)	92.5% (81.1%, 97.1%)	86.2% (71.0%, 93.8%)	86.2% (71.0%, 93.8%)
Sample Size	53	37	28	27	26

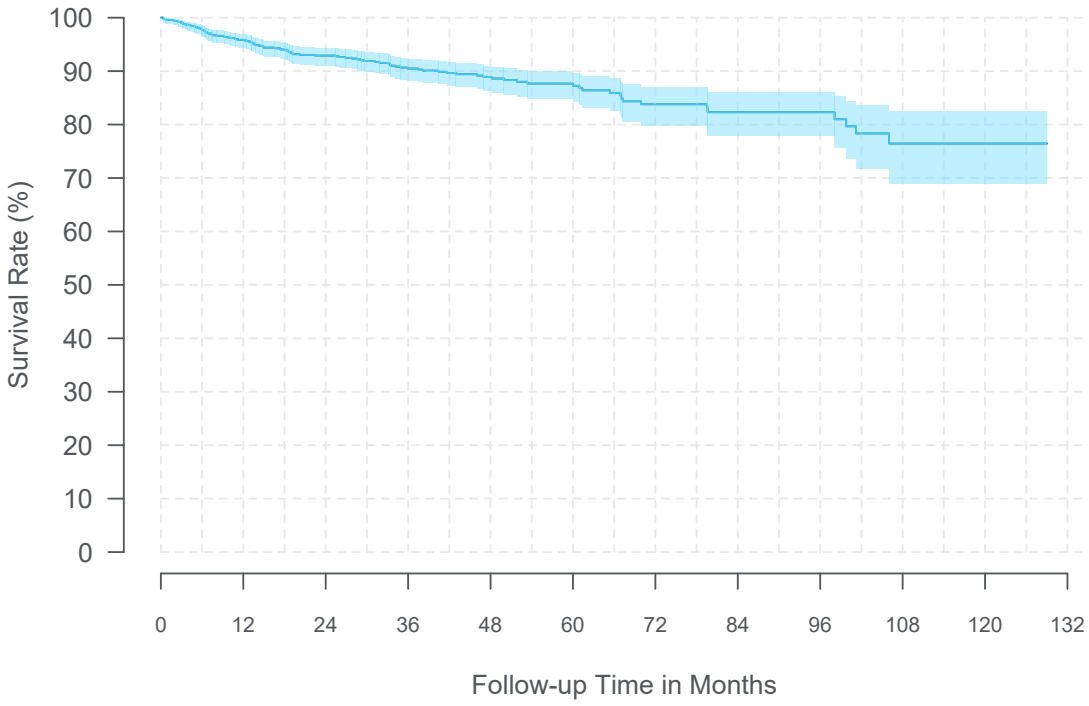
Time Interval	6 Years	7 Years	8 Years	At 99 Months	
Survival (95% CI)	83.1% (66.8%, 91.8%)	76.3% (58.3%, 87.3%)	76.3% (58.3%, 87.3%)	76.3% (58.3%, 87.3%)	—
Sample Size	26	22	24	22	

Specification: 3093	
Lead	
Length (cm)	28, 33, 41
Diameter (mm)	1.27
Electrode	
Number	4
Shape	Cylindrical/coiled
Length (mm)	3.0 (3x) and 10.2 (1x)
Individual Surface Area (mm^2)	12.0 and 40.7
Inter-Electrode Spacing: Edge to Edge (mm)	1.5
Array Length (mm)	23.7

Lead Event Summary: 3093	N
High Impedance	5
Device Lead Issue	2
Device Electrical Impedance Issue	1
Device Lead Damage	1
Lead Fracture	1
Lead Migration/Dislodgement	1
Total	**11**

6.4.2.2 Model 3889

Model Name	InterStim Quad Lead Tined
FDA Approval Date	September 2002
Leads Enrolled	1,175
Leads Currently Active in Study	425
Initial Product Performance Events	108
Median Follow-up Time (Months)	32.6
Cumulative Follow-up Time (Months)	43,364



Time Interval	1 Year	2 Years	3 Years	4 Years	5 Years
Survival (95% CI)	95.9% (94.4%, 96.9%)	92.9% (91.0%, 94.4%)	90.5% (88.2%, 92.3%)	88.9% (86.3%, 91.0%)	87.3% (84.3%, 89.7%)
Sample Size	877	680	487	322	212

Time Interval	6 Years	7 Years	8 Years	9 Years	10 Years
Survival (95% CI)	83.8% (79.8%, 87.1%)	82.3% (77.8%, 86.0%)	82.3% (77.8%, 86.0%)	76.4% (68.8%, 82.5%)	76.4% (68.8%, 82.5%)
Sample Size	149	101	65	36	24

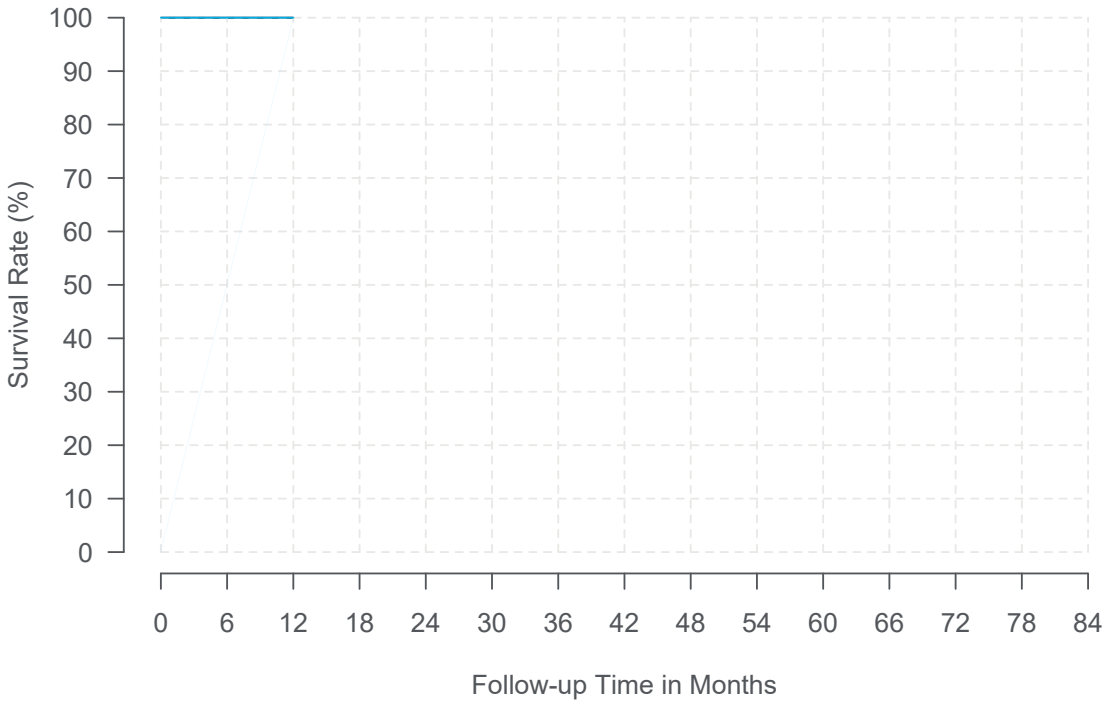
Time Interval	At 129 Months				
Survival (95% CI)	76.4% (68.8%, 82.5%)	—	—	—	—
Sample Size	21				

Specification: 3889	
Lead	
Length (cm)	28, 33, 41
Diameter (mm)	1.27
Electrode	
Number	4
Shape	Cylindrical/coiled
Length (mm)	3.0
Individual Surface Area (mm^2)	12.0
Inter-Electrode Spacing: Edge to Edge (mm)	3.0
Array Length (mm)	21.0

Lead Event Summary: 3889	N
High Impedance	44
Lead Migration/Dislodgement	28
Lead Fracture	14
Device Lead Issue	10
Low Impedance	6
Device Electrical Impedance Issue	2
Device Failure	1
Device Issue	1
Device Malfunction	1
Premature Battery Depletion	1
Total	**108**

6.4.2.3 Model 978A1

Model Name	InterStim SureScan MRI Lead
FDA Approval Date	July 2020
Leads Enrolled	55
Leads Currently Active in Study	47
Initial Product Performance Events	0
Median Follow-up Time (Months)	12.9
Cumulative Follow-up Time (Months)	619

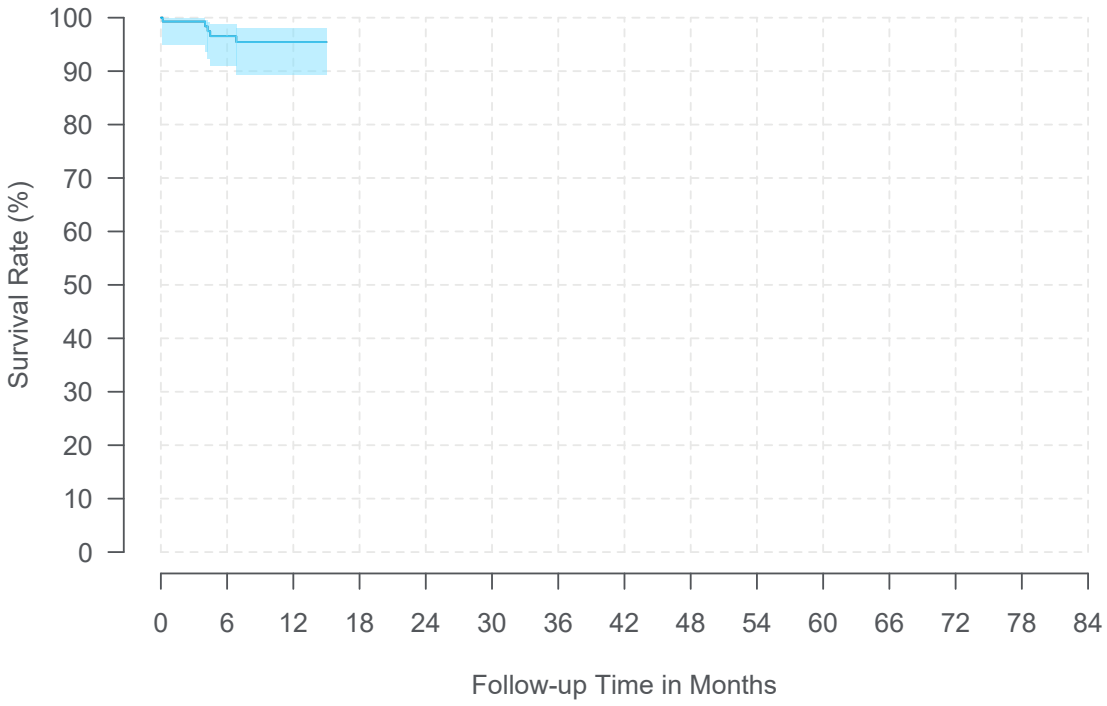


Time Interval	1 Year
Survival	100.0%
(95% CI)	(NA)
Sample Size	28

Specification: 978A1	
Lead	
Length (cm)	28, 33, 41
Diameter (mm)	1.27
Electrode	
Number	4
Shape	Cylindrical
Length (mm)	3 (4x)
Individual Surface Area (mm^2)	11.61
Inter-Electrode Spacing: Edge to Edge (mm)	3
Array Length (mm)	21

6.4.2.4 Model 978B1

Model Name	InterStim SureScan MRI Lead
FDA Approval Date	July 2020
Leads Enrolled	213
Leads Currently Active in Study	194
Initial Product Performance Events	5
Median Follow-up Time (Months)	4.5
Cumulative Follow-up Time (Months)	1,309



Time Interval	1 Year	At 15 Months
Survival (95% CI)	95.4% (89.3%, 98.1%)	95.4% (89.3%, 98.1%)
Sample Size	43	26

Specification: 978B1	
Lead	
Length (cm)	28, 33, 41
Diameter (mm)	1.27
Electrode	
Number	4
Shape	Cylindrical
Length (mm)	3 (4x)
Individual Surface Area (mm^2)	11.61
Inter-Electrode Spacing: Edge to Edge (mm)	3
Array Length (mm)	21

Lead Event Summary: 978B1	N
Device Lead Issue	2
Device Electrical Impedance Issue	1
High Impedance	1
Lead Migration/Dislodgement	1
Total	**5**

6.4.3 Lead Summary

Table 6.11: Sacral Neuromodulation Lead Characteristics

Model Name	FDA Approval Date	Leads Enrolled	Leads Active	Initial Product Performance Events	Median Follow-up Time (Months)	Cumulative Follow-up Time (Months)
InterStim Extended Electrode Quad Lead Tined (model 3093)	September 2002	100	20	11	30.1	4,027
InterStim Quad Lead Tined (model 3889)	September 2002	1,175	425	108	32.6	43,364
InterStim SureScan MRI Lead (978A1)	July 2020	55	47	0	12.9	619
InterStim SureScan MRI Lead (978B1)	July 2020	213	194	5	4.5	1,309

Table 6.12: Sacral Neuromodulation Lead Survival Probability (95% Confidence Intervals)

Model Name	1 Year	2 Years	3 Years	4 Years	5 Years
InterStim Extended Electrode Quad Lead Tined (model 3093)	98.4% (89.0%, 99.8%)	92.5% (81.1%, 97.1%)	92.5% (81.1%, 97.1%)	86.2% (71.0%, 93.8%)	86.2% (71.0%, 93.8%)
InterStim Quad Lead Tined (model 3889)	95.9% (94.4%, 96.9%)	92.9% (91.0%, 94.4%)	90.5% (88.2%, 92.3%)	88.9% (86.3%, 91.0%)	87.3% (84.3%, 89.7%)
InterStim SureScan MRI Lead (978A1)	100.0% (NA)	__	__	__	__
InterStim SureScan MRI Lead (978B1)	95.4% (89.3%, 98.1%)	__	__	__	__

Model Name	6 Years	7 Years	8 Years	9 Years	10 Years
InterStim Extended Electrode Quad Lead Tined (model 3093)	83.1% (66.8%, 91.8%)	76.3% (58.3%, 87.3%)	76.3% (58.3%, 87.3%)	__	__
InterStim Quad Lead Tined (model 3889)	83.8% (79.8%, 87.1%)	82.3% (77.8%, 86.0%)	82.3% (77.8%, 86.0%)	76.4% (68.8%, 82.5%)	76.4% (68.8%, 82.5%)
InterStim SureScan MRI Lead (978A1)	__	__	__	__	__
InterStim SureScan MRI Lead (978B1)	__	__	__	__	__

6.5 Extensions

From April 2010 to the report cut-off date of October 31, 2022, there were 110 extensions followed in the registry, in which 92.7% were Model 3095 (102/110). The difference between the total number of extensions (n=110) versus the total number of neurostimulators (n=1,627) is due to the fact that not all systems require an extension, or some patients were subsequently re-implanted with a new neurostimulator.

The aggregate prospective follow-up time for all extensions was 4,098 months (342 years).

6.5.1 Extension Events

There were 2 product performance-related events with an underlying reported etiology related to extension function. Of these, 1 was the initial product performance event that affected extension survival estimates.

For the purposes of survival analysis, a device's follow-up time is cut off for one of three reasons: 1) the occurrence of a product performance-related event; 2) the occurrence of a censoring event; or 3) the device is event-free and censored at the patient's last follow-up prior to the data cut-off. For extensions:

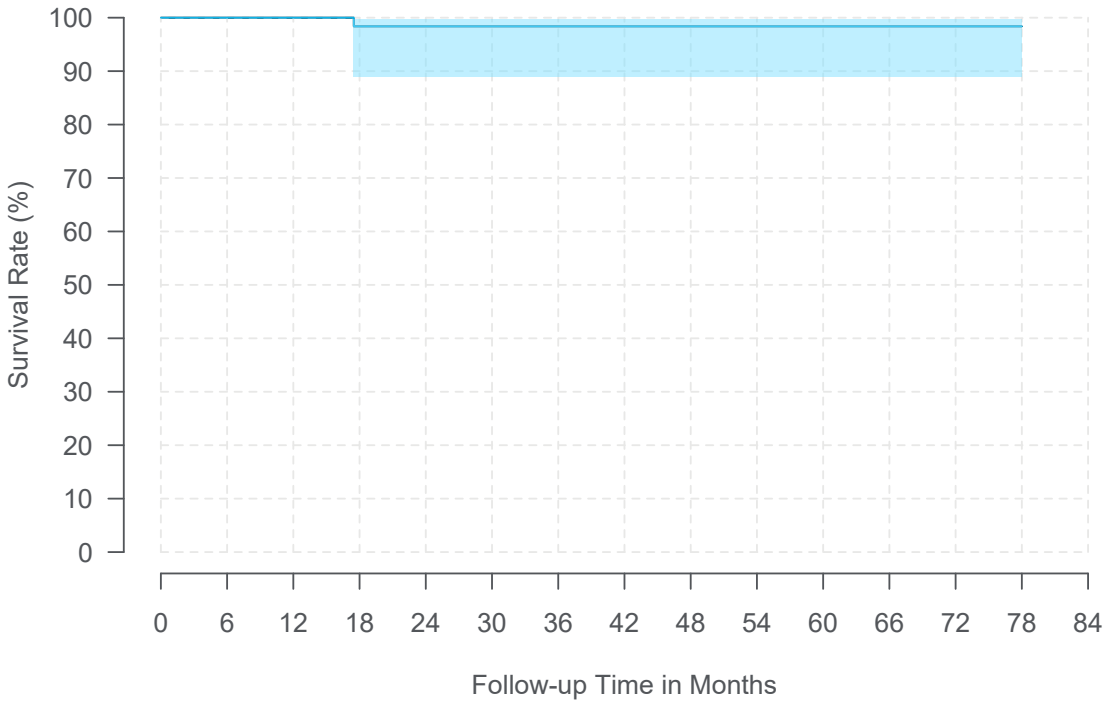
- 1 had follow-up time cut-off due to product performance-related events.
- 85 were censored in the survival analysis for the following reasons: patient expired, extension explanted, patient discontinued, therapy suspended, or site discontinued participation in the registry.
- 24 were free from product performance-related events and censoring events, and were censored at the last follow-up visit prior to the report cut-off.

6.5.2 Extension Models

The following figures and tables represent extension survival and 95% confidence intervals where at least 20 extensions contributed to each 3-month interval.

6.5.2.1 Model 3095

Model Name	Quadripolar extension
FDA Approval Date	July 1998
Extensions Enrolled	102
Extensions Currently Active in Study	16
Initial Product Performance Events	1
Median Follow-up Time (Months)	28.6
Cumulative Follow-up Time (Months)	4,096



Time Interval	1 Year	2 Years	3 Years	4 Years	5 Years
Survival (95% CI)	100.0% (NA)	98.4% (89.0%, 99.8%)	98.4% (89.0%, 99.8%)	98.4% (89.0%, 99.8%)	98.4% (89.0%, 99.8%)
Sample Size	64	52	34	26	24

Time Interval	6 Years	At 78 Months			
Survival (95% CI)	98.4% (89.0%, 99.8%)	98.4% (89.0%, 99.8%)	—	—	—
Sample Size	22	20			

Specification: 3095	
Length (cm)	10, 25, 51
Distal End Compatibility	Tined lead models 3889 and 3093
Distal End Set Screws	4
Proximal End INS Compatibility	InterStim Model 3023

Extension Event Summary: 3095	N
Lead Fracture[a]	1
Total	**1**

[a] Site reported event related to multiple system components.

6.5.3 Extension Summary

Table 6.13: Sacral Neuromodulation Extension Characteristics

Model Name	FDA Approval Date	Extensions Enrolled	Extensions Active	Initial Product Performance Events	Median Follow-up Time (Months)	Cumulative Follow-up Time (Months)
Quadripolar extension (model 3095)	July 1998	102	16	1	28.6	4,096

Table 6.14: Sacral Neuromodulation Extension Survival Probability (95% Confidence Intervals)

Model Name	1 Year	2 Years	3 Years	4 Years	5 Years	6 Years
Quadripolar extension (model 3095)	100.0%	98.4%	98.4%	98.4%	98.4%	98.4%
	(NA)	(89.0%, 99.8%)	(89.0%, 99.8%)	(89.0%, 99.8%)	(89.0%, 99.8%)	(89.0%, 99.8%)