DE NOVO CLASSIFICATION REQUEST FOR INNOVO

REGULATORY INFORMATION

FDA identifies this generic type of device as:

Transcutaneous electrical continence device. A transcutaneous electrical continence device consists of cutaneous electrodes that are used to apply external stimulation to reduce urinary incontinence.

NEW REGULATION NUMBER: 21 CFR 876.5330

CLASSIFICATION: Class II

PRODUCT CODE: QAJ

BACKGROUND

DEVICE NAME: Innovo

SUBMISSION NUMBER: DEN170049

DATE DE NOVO RECEIVED: September 18, 2017

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INDICATIONS FOR USE

The Innovo is a transcutaneous electrical stimulator indicated for the treatment of stress urinary incontinence in adult females.

The Innovo is indicated for prescription use only.

LIMITATIONS

The sale, distribution, and use of the Innovo are restricted to prescription use in accordance with 21 CFR 801.109.

The device is not intended for uses other than that described in the labeling.

PLEASE REFER TO THE LABELING FOR A COMPLETE LIST OF WARNINGS, PRECAUTIONS AND CONTRAINDICATIONS.

DEVICE DESCRIPTION

The Innovo is a single channel, rechargeable, non-implanted electrical stimulator that is intended for the treatment of stress urinary incontinence.

The Innovo is comprised of the following main components, along with accessories:

- Controller
- Body Garments (right and left)
- Gel Pads (8 surface electrodes)
- Battery Charger
- Lead Wire
- Neck Strap

Figure 1: Innovo Controller and Body Garments

The Controller generates the electrical stimulation patterns for coupling the stimulation signals to the body when sued with the Gel Pad electrodes and lead wire. The Body Garments, equipped with 8 surface electrodes, are worn by the patient and cover the buttocks, lateral pelvis, and upper thighs. The electrodes have a skin conductive adhesive hydrogel layer, a current dispersing layer, and a garment conductive adhesive hydrogel layer.

The four electrodes on the right side are combined into a single equivalent electrode (and similarly as are the electrodes on the left side). The electrical stimulation current is passed across the pelvic area (from the right side to the left site), thereby stimulating the pelvic floor muscles.

Table 1: General Features

No. of Output Modes	1
Number of Output Channels	1
Regulated Current or Regulated Voltage	Regulated Current
Software/Firmware/Microprocessor Control?	Yes

Automatic Shut Off	Yes
Patient Override Control?	Yes (Pause Button)
Indicator Display - On/Off Status?	Yes
Indicator Display –Low Battery?	Yes
Indicator Display –Voltage/Current Level?	Yes
Timer range (minutes)	30 minutes

Table 2: Output Specifications

Waveform	Pulsed, Symmetrical, Biphasic
Shape	Rectangular, with interphase interval
Pulse Width	620 µS
Baseline to peak current @ 500 Ω	120 mA
Peak Voltage	(b) (4)
Frequency	50 Hz
Maximum Current Density	(b) (4) @ 500 Ω
Maximum Power Density (using smallest electrode conductive surface area)	(b) (4) @ 500 Ω
Maximum Phase Charge	(b) (4)
Net Charge	(b) (4) @ 500 Ω
Maximum Output Voltage (RMSV) (+/-10%)	(b) (4)
Maximum Output Current (RMSA) (+/-10%)	(b) (4)
Contraction Time	5 seconds
Relaxation Time	(b) (4) econds
Treatment Session	30 minutes, fixed
Maximum Charge Current	(b) (4)
Power Source	Battery Pack (7.2 V)

The Innovo delivers a symmetric biphasic, current controlled waveform. The amplitude is modulated for the contraction-relaxation cycle for the pelvic floor muscles. The clinician guides the user to set the stimulation intensity. A treatment session is fixed and lasts for 30 minutes. The Controller is powered by a pre-installed rechargeable battery pack. It has a mechanical interlock to prevent connections to a charger or USB cable during treatment. The Innovo is recommended for use for one treatment session per day for a minimum 12-week treatment plan.

SUMMARY OF NONCLINICAL/BENCH STUDIES

BIOCOMPATIBILITY/MATERIALS

The Innovo has components that have direct or indirect patient contact. The Gel Pads (external hydrogel electrodes), were previously evaluated for biocompatibility and

cleared under K000947. Biological safety report was provided for fabrics and ink used in the Body Garments. Other patient-contacting components of the device were evaluated for biocompatibility per ISO 10993-1 and tested as a surface device with limited (<24 hours) contact with intact skin with potential for repeated exposure since the device is reusable. From the evaluations and supporting information, the components of the Innovo were found to be biocompatible for its use.

SHELF LIFE/STERILITY

The Innovo is provided non-sterile for single-person use and does not require any of the components to be sterilized by the end user. It is intended only for external use. The Gel Pads are disposable and can be replaced as needed. Cleaning instructions are provided in the Instruction Manual for safe handling and proper care of the device.

ELECTROMAGNETIC CAPABILITY & ELECTROMAGNETIC SAFETY

The Innovo conformed to the following electromagnetic compatibility, electrical, mechanical, and thermal safety standards:

- IEC 60601-1: Medical Electrical Equipment; Part 1: General Requirements for Basic Safety and Essential Performance.
- IEC 62133: Secondary Cells and Batteries Containing alkaline or Other Non-acid electrolytes – Safety Requirements for Portable Sealed Secondary Cells, and for Batteries Made from Them, for use in Portable Applications.
- IEC 60601-1-2: Medical Electrical Equipment; Part 1-2: General Requirements for Basic Safety and Essential Performance – Collateral Standard: Electromagnetic compatibility – Requirements and Tests.
- IEC 60601-2-10: Medical Electrical Equipment; Part 2-10: Particular Requirements for the Basic Safety and Essential Performance of Nerve and Muscle Stimulators.
- IEC 60601-1-11: Medical Electrical Equipment; General Requirements for Basic Safety and Essential Performance – Collateral Standard: Requirements for Medical Electrical Equipment and Medical Electrical Systems Used in the Home Healthcare Environment.

MAGNETIC RESONANCE (MR) COMPATIBILITY

The Innovo has not been tested for MR Compatibility and should not be used in an MRI suite.

SOFTWARE

The Innovo Controller operates on software and allows the user to select the stimulation level and program via the use of the following: on/off/pause, increase or decrease intensity, program, information, up intensity, down intensity, mute and keylock. The Controller has a display screen to provide information for Intensity Level, Load Sense,

Program Number, Low Battery, Battery Level, Pause Function, Recharge Status, and Countdown Timer/Treatment Time. The software for the Controller has a "moderate" level of concern, as discussed in the 2005 FDA "Guidance for the content of Premarket Submissions for Software Contained in Medical Devices," and is addressed by supporting software documentation.

PERFORMANCE TESTING - BENCH

All features and output specifications of the device, including those identified in Tables 1 and 2, were verified by individual pulse output waveform tracings for loads of 500, 2k, and 10k ohms, to simulate conditions that the device could encounter during use.

SUMMARY OF CLINICAL INFORMATION

Clinical data for the Innovo primarily consisted of a randomized non-inferiority US pivotal study and a prematurely terminated German sham-controlled study. There was also a series of smaller feasibility studies conducted during the development of the device. The two clinical studies are briefly summarized below with a discussion of their findings.

Study 1 – Sham Controlled Trial Germany:

Study Design: Randomized (1:1), double-blinded, sham-controlled study to evaluate the safety and performance of the Innovo device ("high dose") compared to a modified version ("low dose") of the device to be representative of sham treatment.

- Patient Population: The study reported on measures for 50 women clinically diagnosed with stress urinary incontinence (SUI).
- Co-Primary Endpoints: Reduction from baseline to 12 weeks in the 1-hour Pad Weight Test and improvement in Incontinence Quality of Life Questionnaire (iQoL).
- Secondary Endpoints: There were many secondary endpoints. Data was provided for the proportion of subjects with greater than 50% reduction in 24-hour Pad Weight Test.

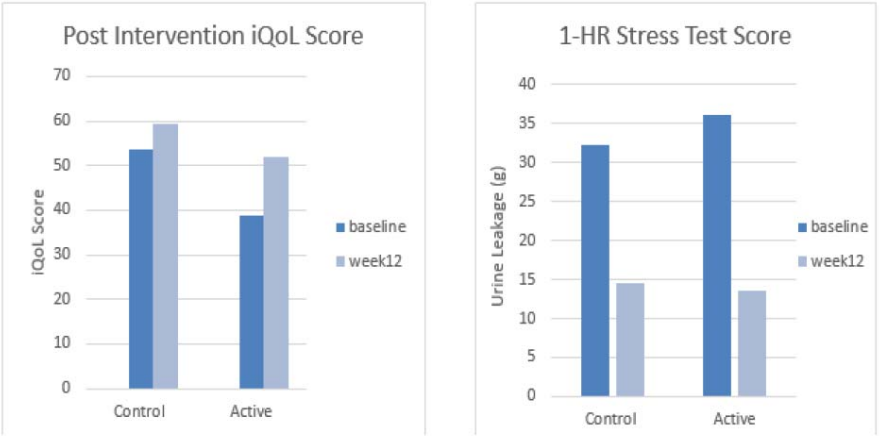

Figure 2: Primary Endpoint Results at Week 12

Outcome Measure	Group	Baseline	Week 4	Week 8	Week 12
Significant Improvement - 1hr pad test (50% ↓ v baseline)	Low Dose	0%	37%	42%	47%
	High Dose	0%	53%	61%	75%
Significant Improvement- 24hr pad test (50% ↓ v baseline)	Low Dose	0%	25%	42%	41%
	High Dose	0%	26%	56%	44%

Table 3: Secondary Endpoint Results

Study 1 compared the safety and effectiveness of the Innovo to a sham version of the device. The sham version of the device was designed to not treat stress incontinence from the contraction/strengthening of the pelvic muscles because the current path did not cross the pelvic floor region. The sham version of the device used a single electrode pair on one leg at a low level to illicit sensory response at a distal location on the patient's leg, which may have caused a significant difference in sensation between the study arms, thereby questioning whether blinding was effectively maintained in the study.

This study was prematurely stopped, which limited the treatment arm to N=24 subjects and control (sham) arm to N=26 subjects that completed 12 weeks of treatment. From the data available, both the active and sham groups had improved iQOL scores versus baseline after 12 weeks. The 1-hour pad weight test scores also showed improvement in both groups after 12 weeks compared to baseline. The one-hour pad weight test showed improvement in the percentage of subjects who experienced greater than 50% reduction in pad weight for the treatment over sham at 12 weeks (75% treatment versus 47% control). The 24-hour pad weight measures for treatment and control at 12 weeks showed little difference for the same outcome measure (44% treatment versus 41% control). Additional secondary endpoint data were not reported. This study had a smaller sample size than originally intended, but it provided some evidence that there is an effect of the device over the sham in the one-hour pad weight test.

Study 2 – Randomized Non-Inferiority Study USA:

Study Design: Multicenter, randomized (1:1), non-inferiority clinical study involving 180 subjects at 12 US sites to assess the safety and performance of the Neurotech Vital Compact Device (Innovo device) compared to the iTouch Sure Pelvic Floor Exerciser (comparator device) for the treatment of stress urinary incontinence in females.

- Patient Population: Women clinically diagnosed with stress urinary incontinence. All subjects scored 9 or less out of 18 for urge incontinence and were confirmed as having predominant stress urinary incontinence on the Medical Epidemiologic and Social Aspects of Aging Urinary Incontinence (MESA) Questionnaire.

- Primary Endpoint: Proportion of subjects with significant improvement (defined as at least 50% reduction) in the Provocative Pad Weight Test at 12 weeks.
- Follow-Up: After screening and baseline, follow-ups occurred in Week 1 (via telephone), Week 4, and Week 12 for evaluations.

System Organ Class Preferred Term	Vital Compact (N=89)		itouch sure (N=91)	
	Subjects[a] n (%)	# Events	Subjects[a] n (%)	# Events
Any Adverse Event				
Overall	44 (49.4%)	76	43 (47.3%)	87
Gastrointestinal disorders				
Abdominal pain	0	0	3 (3.3%)	3
Constipation	0	0	2 (2.2%)	2
General disorders and administration site conditions				
Chest pain	1 (1.1%)	1	2 (2.2%)	2
Medical device discomfort	8 (9.0%)	10	1 (1.1%)	1
Medical device pain	4 (4.5%)	4	1 (1.1%)	1
Infections and infestations				
Bronchitis	3 (3.4%)	3	1 (1.1%)	1
Gastroenteritis viral	1 (1.1%)	1	2 (2.2%)	2
Sinusitis	3 (3.4%)	4	4 (4.4%)	4
Upper respiratory tract infection	3 (3.4%)	3	6 (6.6%)	6
Urinary tract infection	2 (2.2%)	3	4 (4.4%)	4
Vaginal infection	1 (1.1%)	1	3 (3.3%)	3
Vulvovaginal mycotic infection	1 (1.1%)	1	2 (2.2%)	2
Musculoskeletal and connective tissue disorders				
Pain in extremity	2 (2.2%)	2	1 (1.1%)	1
Nervous system disorders				
Headache	0	0	2 (2.2%)	2
Psychiatric disorders				
Depression	2 (2.2%)	2	0	0
Respiratory, thoracic and mediastinal disorders				
Cough	1 (1.1%)	1	2 (2.2%)	2
Oropharyngeal pain	2 (2.2%)	2	1 (1.1%)	1
Skin and subcutaneous tissue disorders				
Skin irritation	4 (4.5%)	4	1 (1.1%)	1

Table 4: Summary of Adverse Events by Treatment in >1 Subject per Treatment Group

System Organ Class Preferred Term	Vital Compact (N=89)		itouch sure (N=91)	
	Subjects[a] n (%)	# Events	Subjects[a] n (%)	# Events
Any Adverse Event				
Overall	17 (19.1%)	24	11 (12.1%)	13
Gastrointestinal disorders				
Overall	0	0	1 (1.1%)	1
Abdominal pain	0	0	1 (1.1%)	1
General disorders and administration site conditions				
Overall	12 (13.5%)	15	2 (2.2%)	2
Medical device discomfort	8 (9.0%)	10	1 (1.1%)	1
Medical device pain	4 (4.5%)	4	1 (1.1%)	1
Pain	1 (1.1%)	1	0	0
Infections and infestations				
Overall	0	0	7 (7.7%)	7
Urinary tract infection	0	0	3 (3.3%)	3
Vaginal infection	0	0	2 (2.2%)	2
Vulvovaginal mycotic infection	0	0	2 (2.2%)	2
Musculoskeletal and connective tissue disorders				
Overall	2 (2.2%)	2	0	0
Arthralgia	1 (1.1%)	1	0	0
Myalgia	1 (1.1%)	1	0	0
Renal and urinary disorders				
Overall	2 (2.2%)	2	0	0
Dysuria	1 (1.1%)	1	0	0
Micturition urgency	1 (1.1%)	1	0	0
Reproductive system and breast disorders				
Overall	0	0	1 (1.1%)	1
Vaginal discharge	0	0	1 (1.1%)	1
Skin and subcutaneous tissue disorders				
Overall	5 (5.6%)	5	2 (2.2%)	2
Erythema	1 (1.1%)	1	0	0
Pruritus	0	0	1 (1.1%)	1
Rash	1 (1.1%)	1	0	0
Skin irritation	3 (3.4%)	3	1 (1.1%)	1

Table 5: Summary of Device Related Adverse Events by Treatment >1 Subject by Treatment Group

The most common adverse events observed were pain, medical device discomfort, skin irritation, and urinary tract and vaginal infections. There were 24 adverse events in 17 subjects (19.1%) for the Innovo group and 13 events in 11 subjects (12.1%) for itouch sure group that were considered to be related to the device. Most of the adverse events were considered to be mild or moderate in both groups and were resolved by stopping the treatment and/or reducing the stimulation intensity of the device. Overall, the Innovo (identified as Vital Compact in the above table) had a low adverse event profile.

Outcome Measure	Treatment Device	Control Device
Primary Endpoint: Proportion of Patients who attained significant improvement (50% reduction) in Provocative Pad Test (95% CI) at Week 12		
ITT Population/Multiple Imputation	N=89 56.3% (45.4%, 66.8%)	N=91 63.0% (52.2%, 72.9%)
ITT Population/LOCF	N=89 58.4% (47.5%, 68.8%)	N=91 61.5% (50.8%, 71.6%)
Per Protocol Population/Observed Case	N=72 59.7% (47.5%, 71.1%)	N=70 70% (57.9%, 80.4%)
Key Secondary Endpoints: Change from Baseline at Week 12 (LOCF)		
Provocative pad weight test (Mean±SD)	-8.48±25.053	-9.66±22.876
24-hour pad weight test (Mean±SD)	-13.07±21.531	-9.89±19.989
Number of incontinence episodes/day (Mean±SD)	-1.24±1.564	-1.43±4.120
Incontinence Quality of Life Questionnaire (I-QOL)	13.41±16.463	15.42±18.376
Number of pads used/day	-0.30±0.998	-0.44±0.984
Other Secondary Endpoints: Change from Baseline at Week 12 (Observed Case)		
Dryness (<1g leakage on the provocative pad weight test)	17 (19.1%) (11.5%, 28.8%)	29 (31.9%) (22.5%, 42.5%)
Improvement on Global Impression of Improvement (result of 1, 2 or 3 indicating improvement after treatment)	70.7%	63.0%

Table 6: Summary of Efficacy Outcomes

For the primary effectiveness endpoint of the proportion of patients that had significant (at least 50%) improvement in the provocative pad weight test, the Innovo treatment arm failed to demonstrate non-inferiority against the active comparator (iTouch Sure). The Innovo performed better than the active comparator for two of the secondary endpoints, the Global Impression of Improvement and the 24-hour pad weight test. Overall, the primary outcome of 56.3 percent of the patients experiencing a clinically significant (at least 50% reduction in the provocative pad weight test) is clinically meaningful. Moreover, all of the secondary outcomes showed evidence of clinical improvement.

Clinical Results Discussion:

In Study 1, the Innovo device was superior to the sham control in a responder analysis for both the 1-hour pad weight test at 12 weeks (75% treatment versus 47% sham control) and the 24 -hour pad weight even though neither was statistically significant. While the Study 2 (US study) failed to demonstrate non-inferiority to an active control, this study did confirm a clinically meaningful (56.3%) rate of improvement from baseline for the provocative pad weight test at 12 weeks.

Pediatric Extrapolation:

In this De Novo request, existing clinical information was not leveraged to support the use of the device in a pediatric patient population.

LABELING

Labeling has been provided that includes instructions for use and an appropriate prescription statement as required by 21 CFR 801.109. The labeling includes:

- Instruction Manual: The manual is the primary labeling material for the device. It provides information about the device and its components, indications, contraindications, precautions, warnings, possible adverse reactions, device functions, and guidelines for use. The manual includes instructions and diagrams that explain the user interface and describe where and how the device and its electrodes should be placed on the patient. The manual also includes cleaning instructions, care instructions for the included gel pads, and information about how the device can be washed and reused. Finally, the manual includes the electrical stimulation parameters of the device, in alignment with Table 2 above.
- Package Label: This provides sizing information, manufacturer information, and product summary.

RISKS TO HEALTH

The table below identifies the risks to health that may be associated with use of the transcutaneous electrical continence device and the measures necessary to mitigate these risks.

Table 7: Identified Risks to Health and Mitigation Measures

Identified Risks to Health	**Mitigation Measures**
Pain or tissue damage due to overstimulation	Non-clinical performance testing Software verification, validation, and hazard analysis Electrical safety testing Labeling
Adverse tissue reaction	Biocompatibility evaluation
Electrical shock or burn	Electrical safety testing Software verification, validation, and hazard analysis Labeling
Device failure due to electromagnetic interference	Electromagnetic compatibility (EMC) testing Software verification, validation, and hazard analysis Labeling
Use error that may result in user discomfort, injury, or delay in treatment	Software verification, validation, and hazard analysis Labeling

SPECIAL CONTROLS

In combination with the general controls of the FD&C Act, the transcutaneous electrical continence device is subject to the following special controls:

1. Non-clinical performance testing must characterize the electrical stimulation, including the following: waveforms, output modes, maximum output voltage, maximum output current, pulse duration, frequency, net charge per pulse, maximum phase charge at 500 ohms, maximum current density, maximum average current, and maximum average power density.

2. The patient-contacting materials must be demonstrated to be biocompatible.

3. Performance data must demonstrate the electromagnetic compatibility (EMC), electrical safety, thermal safety, and mechanical safety of the device.

4. Software verification, validation, and hazard analysis must be performed.

5. Labeling must include the following:
    a. Instructions for use, including specific instructions regarding the proper placement of electrodes;
    b. A summary of electrical stimulation parameters; and
    c. Cleaning instructions and reuse information.

BENEFIT-RISK DETERMINATION

The risks of the device are based on nonclinical testing and data collected in clinical studies described above. The probable risks with the use of the device include: pain, discomfort, skin irritation, urinary symptoms, and unintended injury (from electrical effects), all of which are minor, short-lived and reversible. Based on the available performance data, the probability of such harmful events is low, and occurrence can be managed or treated.

The probable benefits of the device are also based on nonclinical testing and data collected in clinical studies as described above. Probable benefits include improvement in symptoms related to stress urinary incontinence and improved quality of life.

Patient Perspectives

In Study 1 the treatment group had at least a 10-point improvement in the incontinence quality of life (iQOL) score at 12 weeks from baseline. In Study 2, the global impression of improvement was 70.7% for the Innovo at 12 weeks as compared to baseline.

BENEFIT/RISK CONCLUSION

In conclusion, given the available information above, for the following indication statement:

The Innovo is a transcutaneous electrical stimulator indicated for the treatment of stress urinary incontinence in adult females.

The Innovo is indicated for prescription use only.

The probable benefits outweigh the probable risks for the Innovo. The device provides benefits and the risks can be mitigated by the use of general controls and the identified special controls.

CONCLUSION

The De Novo request for the Innovo is granted and the device is classified as follows:

Product Code: QAJ
Device Type: Transcutaneous electrical continence device
Regulation Number: 21 CFR 876.5330
Class: II