K190789 510(k) Summary

510(k) Summary	**Sponsor:**	Dornoch Medical Systems, Inc. 200 North West Parkway Riverside, MO 64150 Establishment Registration Number: 1954182
	Contact:	Michael T. Wolford Regulatory Affairs Associate Manager Phone: (330) 364-9411
	Date:	02/08/2019
	Trade Name:	*IntelliCart™ System*
	FDA Product Code/Device Common Name:	JCX – Apparatus, Suction, Ward Use, Portable, Ac-Powered
	Regulation Number and Description; Device Classification:	21 CFR 878.4780 – Powered suction pump; Class II
	Predicate Device	*IntelliCart™ System (K172481)*
	Device Description	The IntelliCart™ System is a self-powered suction / vacuum pump intended to collect and dispose of liquid waste within hospitals, pathology labs, surgical outpatient centers, and doctor's offices. The IntelliCart™ System (System) consists of a Fluid Cart (Cart) and Evac Station (Evac). Carts are mobile devices used during surgery to collect patient fluids. Evacs are stationary devices used to process and clean Carts. The System's closed design significantly reduces employee exposure to potentially infectious surgical fluids, while eliminating up to 70% of operating room red bag waste. Carts are equipped with large volume fluid reservoirs, a single regulated vacuum pump, and a height-adjustable IV pole. A single-use manifold (REF 00-5140-201-00) serves as the interface between a Cart's fluid reservoir and sterile patient suction tubing. A Cart model equipped with a bracket to hold a Smoke Evacuator is also available. The IntelliCartTM System is a closed self-powered suction device providing various levels of suction, as selected by the user, ranging from 0-600 mmHgat maximum flow volume, and collection of up to 34L of liquid surgical waste into cart canisters equipped with a viewing window for display of canister contents shown in 100ml increments.

The suction cart is portable, equipped with caster type wheels with a profile able to pass through 36 inch minimum wide doorways and allows for connection to a standard 120V/60Hz/15A facility power supply and connection to facility wall suction when necessary. Cart Canisters are integrated with a window tint feature that visually restricts canister contents during transport.

The *IntelliCart™ System* is operated using a back lit LCD touch screen display monitor equipped with lateral adjustment capabilities and provides digital display confirmation of total fluid capacity used as well as a functional interface for suction selection/adjustment and cart cleaning.

Single use manifolds are equipped with hydrophobic filters which turn color after wash cycle is completed, giving visual indication of a manifold which must be discarded.

The Evac Station is equipped with a coupler that connects to the Suction Cart and, using compatible bleach and enzymatic solutions to break down solid waste, empties, cleans and disinfects cart canisters. After emptying and cleaning cart canisters, the Evac Station allows for draining surgical waste into facility drains.

The *IntelliCart™ System* can be equipped with a powered or manual IV pole, supporting up to 12,000mL of bagged fluid and allows mounting of a compatible smoke evacuation device.

Indications for Use

The IntelliCartTM System is a self-powered suction/vacuum pump intended to collect and dispose of liquid waste within Hospitals, Pathology Labs, Surgical Outpatient Centers, and Doctor's Offices.

Technological Characteristics Comparison:

The following tables provide a comparison between the predicate device and modified device showing similarities and differences:

System Use

Property	Predicate Device (IntelliCart™ System (K172481)	K190789 (IntelliCart™ System)
Intended Use	The *IntelliCart™ System* is a self-powered suction/vacuum pump intended to collect and dispose of liquid waste within Hospitals, Pathology Labs, Surgical Outpatient Centers, and Doctor's Offices.	Same
Single Use or Reusable	Cart, Evac – Reusable Manifold, Single Use	Same
Target Population	Ward Use, General Surgical Application	Same

System Operating Principle

Property	Predicate Device (IntelliCart™ System (K172481)	K190789 (IntelliCart™ System)
Display	LCD, Backlit Touch	Same
Suction/Exhaust	Closed suction system with variable suction levels based on user selection providing regulated vacuum from 0-600mmHg using AC powered twin piston vacuum pump passing through single use manifolds and into canisters.	Same
Filtration	HEPA Filtration 99.97%	Same
Cleaning	Cart Canister Processing using automated validated cycle to low level disinfection	Same
Manifold	Single Use, disposable manifold with Hydrophobic Filter	Same
Software	Validated Software	Same
Electrical Requirements	**(Cart)** 120VAC, 60Hz, 4.75amp **(Evac)** Same	Same
Portable	Locking casters and push handle allow cart to be easily moved	Same

System Design

Property	Predicate Device (IntelliCart™ System (K172481)	K190789 (IntelliCart™ System)
Materials	No direct or indirect patient contact	Same
Touch Screen	LCD backlit color touch screen display	Same
Total Fluid Capacity	34L	Same

Single Use Manifold	Manifold hydrophobic filter turns blue after use, indicating it must be replaced	Same
Suction Range	0-600mmHg	Same
Footprint	55”H x 23.5”W x 23”D	Same
Safety Alert	Audible and visual display for early warning of overflow protection system and vacuum start up alert	Same
Compatible with Wall Suction	Yes	Same
ConSeal™ Tint	Yes	Same
Canister Exterior Graduations	Graduations marked on canister exterior provide approximate visual indication of contents in 100mL increments.	Same
IV Pole	Carts available with powered or manual IV pole, capable of 12,000mL maximum fluid capacity	Same
External Mounting of compatible smoke evacuation	Yes	Same
HEPA Filtration	99.97%	Same
Cleaning	Multiple user selected Enzymatic and Bleach cleaning cycles from 3-12 minutes	Same

Safety Features

Feature	Predicate Device (IntelliCart™ System (K172481)	K190789 (IntelliCart™ System)
Closed System Design	Confine and contain fluids during collection and disposal	Same
Interactive Controls	Graphical User Interface (GUI) guides user through system operation	Same
Bleach Cycle Monitoring	Continuous automatic monitoring of bleach cycle using electronic sensors	Same
Fluid Backflow Protection	Positive air gap maintained between collected fluids and single-use Manifolds	Same
Vacuum System Protection	Hydrophobic filters shut off vacuum supply when wet, preventing liquids from contaminating the Cart vacuum supply	Same

Air Exhaust Protection	Replaceable HEPA rated filter	Same
Overflow Protection	Warning to alert user when reservoir is 3000mL and 1500mL from full capacity – automatic shut off when canisters have reached full capacity	Same
ES 60601-1 Classification	Class 1, Type B applied part (suction tubing – not supplied by Zimmer Biomet)	Same

Summary of Non-Clinical Performance Data

The following performance standards are applicable to the predicate and modified devices:

Standard or Test Type	Predetermined Acceptance Criteria	Results	
		Predicate Device (IntelliCart™ System (K172481)	K190789 (IntelliCart™ System)
IEC 60601-1 Medical electrical equipment - Part 1: General requirements for basic safety and essential performance	Yes	Pass	Pass
IEC 60601-1-2 Medical electrical equipment - Part 1-2: General requirements for basic safety and essential performance - Collateral Standard: Electromagnetic disturbances - Requirements and Tests	Yes	Pass	Pass
IEC 60601-1-6 Medical electrical equipment - Part 1-6: General requirements for basic safety and essential performance - Collateral standard: Usability	Yes	Pass	Pass
ISO 10079-1 Medical suction equipment - Part 1: Electrically powered suction equipment	Yes	Pass	Pass
ISO 10993-1 Biological evaluation of medical devices - Part 1: Evaluation and testing within a risk management process	Not required – no direct or indirect patient contact	N/A	N/A

Electrical Safety, Electromagnetic compatibility (EMC)

Medical device safety testing was conducted in accordance with IEC 60601-1 standard for safety, IEC 60601-1-2 standard for EMC. Human factors were also considered in the design of the IntelliCart™ System and testing was performed in accordance with IEC 60601-1-6 and Applying

Human Factors and Usability Engineering to Optimize Medical Device Design, Guidance for Industry and Food and Drug Administration Staff, February 3, 2016. Critical and essential tasks were identified as part of the studies. All identified issues were managed and mitigated to an acceptable level. The IntelliCart™ System passed all electrical safety, and electromagnetic compatibility tests to predetermined acceptance criteria.

Software and Display Verification and Validation

Software verification and validation were performed at a systems and unit level and information supplied in accordance with guidance as recommended by FDA Guidance for Industry "Guidance for the Content of Premarket Submissions for Software Contained in Medical Devices". Software passed all predetermined acceptance criteria including reservoir overflow protection, cart reservoir processing and low level disinfection using validated cycles, watchdog safety transducer and safety start up warning screen.

Mechanical Verification and Validation

Suction Performance

The IntelliCart™ System suction performance was designed and evaluated according to ISO 10079-1 Electrically powered suction equipment and as recommended by FDA "Guidance for Industry and FDA Reviewers/Staff: Guidance Document for Powered Suction Pump 510(k)s". All critical and essential tasks were identified and mitigated through risk analysis to an acceptable level.

The IntelliCart™ System was evaluated to provide adjustable vacuum pressure as measured at the manifold port to predetermined acceptance criteria to demonstrate operation capable of providing adjustable vacuum up to 12 hours of continuous use at 600mmHg.

Safety Features

The IntelliCart™ System was tested to predetermined acceptance criteria for Closed System Design, Interactive controls including de-bounce feature, Fluid Backflow Protection, Watchdog Safety Transducer, Wash Fluid leak free seals around covers and manifolds, and User Interface Vacuum Start Up Warning. The IntelliCart™ System met all predetermined acceptance criteria with passing results.

The IntelliCart™ fluid path was tested to predetermined acceptance criteria for chemical resistance against compatible enzymatic cleaners, bleach and Bactisure™. The IntelliCart™ met all predetermined acceptance criteria with passing results.

The IntelliCart™ System disposable manifold was tested to predetermined acceptance criteria to provide vacuum seal in the reservoir when installed. The IntelliCart™ met all acceptance criteria with passing results.

IV Pole Function and Support

Manual and Power IV Poles were tested to predetermined acceptance criteria for maximum bagged fluid support and automatic function (power IV pole only). The IntelliCart™ met all acceptance criteria with passing results.

Outer Body Shell and Fluid Capacity

The IntelliCart™ was tested to predetermined acceptance criteria for portability using casters and brakes including profile requirements to pass through standard 36" door thresholds. The IntelliCart™ met all acceptance criteria with passing results.

IntelliCart™ was tested to predetermined acceptance criteria to include directly viewable fluid measurements, easily viewable touchscreen monitor and exterior surfaces which provide chemical resistance to standard hospital wipes. The IntelliCart™ met all acceptance criteria with passing results.

Fluid Reservoir Concealment

ConSeal™ technology providing concealment of canister contents was evaluated to predetermined acceptance criteria for the concealment of collected waste fluid. The IntelliCart™ met all acceptance criteria with passing results.

Conclusion

Based on the intended uses, technological characteristics and non-clinical performance data, the subject device is as safe, as effective, and performs as well as or better than the legally marketed predicate device (K172481), Class II (21 CFR 878.4780), product code JCX.