SUMMARY OF SAFETY AND EFFECTIVENESS DATA (SSED)

I. GENERAL INFORMATION

Device Generic Name: Automated Insulin Dosing System

Device Trade Name: MiniMed™ 780G System

Device Procode: OZP

Applicant's Name and Address: Medtronic MiniMed, Inc.
18000 Devonshire Street
Northridge, CA 91325

Date(s) of Panel Recommendation: None

Premarket Approval Application (PMA) Number: P160017/S125

Date of FDA Notice of Approval: 12/11/2025

The original PMA for the MiniMed 670G system (P160017) was approved on September 28, 2016, for use in persons ages 14 years and older. PMA Panel Track Supplement P160017/S017, approved on February 13, 2018, added the upper arm as an alternate insertion site for the Guardian Sensor (3). PMA Panel Track Supplement P160017/S031, approved on June 21, 2018, expanded the indication for pediatric patients 7 to 13 years of age. PMA Panel Track Supplement P160017/S076, approved on August 31, 2020, expanded the indications for the MiniMed 770G system to include pediatric patients down to 2 years old and changed the pump communication protocol to Bluetooth Low Energy (BLE).

The SSEDs for prior algorithm updates, CGM compatibility expansions, hardware updates, and indication expansions—including P160017/S017, P160017/S031, P160017/S076, P160017/S091, P160017/S116, P160017/S118, and P160017/S124—are incorporated by reference and can be accessed on the CDRH website.

The current Panel Track Supplement expands the compatible insulins for use with the MiniMed 780G system to include Fiasp and Lyumjev.

II. INDICATIONS FOR USE

The MiniMed 780G system is indicated for use with either the Simplera Sync sensor, or with the Guardian 4 sensor/Guardian 4 transmitter. Indications for use for the MiniMed 780G system are provided for each of the two system configurations separately:

MiniMed 780G System for use with Guardian 4 Sensor/Guardian 4 Transmitter

MiniMed 780G System

The MiniMed 780G system is intended for the continuous delivery of basal insulin at

selectable rates, and the administration of insulin boluses at selectable amounts for the management of type 1 diabetes mellitus in persons 7 years of age and older requiring insulin.

The system is also intended to continuously monitor glucose values in the fluid under the skin. The MiniMed 780G system includes SmartGuard technology, which can be programmed to automatically adjust insulin delivery based on continuous glucose monitoring (CGM) sensor glucose values and can suspend delivery of insulin when the SG value falls below or is predicted to fall below predefined threshold values.

The MiniMed 780G system consists of the following devices:

- MiniMed 780G insulin pump
- Guardian 4 transmitter
- Guardian 4 sensor
- One-press serter
- Accu-Chek Guide Link blood glucose meter
- Accu-Chek Guide Test Strips

The system requires a prescription from a healthcare professional.

Guardian 4 sensor

The Guardian 4 sensor is intended for use with the MiniMed 780G system and the Guardian 4 transmitter to monitor glucose levels for the management of diabetes.

The sensor is intended for single use and requires a prescription. The Guardian 4 sensor is indicated for up to seven days of continuous use.

The Guardian 4 sensor is not intended to be used directly to make therapy adjustments while the MiniMed 780G is operating in manual mode. All therapy adjustments in manual mode should be based on measurements obtained using a blood glucose meter and not on values provided by the Guardian 4 sensor.

The Guardian 4 sensor has been studied and is approved for use in the systems, insertion sites, and ages listed in the following table.

System	Age	Sensor Insertion Site
MiniMed 780G System	7 years and older	Arm

One-press Serter

The serter is used as an aid for inserting the sensor. It is indicated for single-patient use and it is not intended for multiple-patient use.

Guardian 4 transmitter

The Guardian 4 transmitter is intended for use with the MiniMed 780G system and Guardian 4 sensor to monitor glucose levels for the management of diabetes.

Accu-Chek Guide™ Link Blood Glucose Monitoring System

The Accu-Chek Guide Link Blood Glucose Monitoring system is comprised of the Accu-Chek Guide Link meter and the Accu-Chek Guide test strips.

The Accu-Chek Guide Link Blood Glucose Monitoring System is intended to quantitatively measure glucose in fresh capillary whole blood from the fingertip, palm, and upper arm as an aid in monitoring the effectiveness of glucose control.

The Accu-Chek Guide Link Blood Glucose Monitoring System is intended for *in-vitro* diagnostic single-patient use by people with diabetes.

The Accu-Chek Guide Link Blood Glucose Monitoring System is intended to be used by a single person and should not be shared.

This system is not for use in diagnosing or screening for diabetes mellitus and not for neonatal use.

Alternative site testing should be done only during steady-state times (when glucose is not changing rapidly).

The Accu-Chek Guide Link Blood Glucose Monitoring System is intended to be used to wirelessly transmit glucose values to the MiniMed 780G system and MiniMed 770G system with Bluetooth wireless technology through the use of Bluetooth low energy communication.

MiniMed 780G System for use with Simplera Sync Sensor

The MiniMed 780G system is intended for the continuous delivery of basal insulin at selectable rates, and the administration of insulin boluses at selectable amounts for the management of type 1 diabetes mellitus in persons 7 years of age and older requiring insulin. The system is also intended to continuously monitor glucose values in the fluid under the skin. The MiniMed 780G system includes SmartGuard technology, which can be programmed to automatically adjust insulin delivery based on continuous glucose monitoring (CGM) sensor glucose values and can suspend delivery of insulin when the SG value falls below or is predicted to fall below predefined threshold values.

The MiniMed 780G system consists of the following devices:

- MiniMed 780G insulin pump
- Simplera Sync
- Accu-Chek™ Guide Link blood glucose meter
- Accu-Chek Guide Test Strips

The system requires a prescription from a healthcare professional.

Simplera Sync Sensor

The Simplera Sync sensor is intended for use with the MiniMed 780G system to monitor glucose levels for the management of diabetes. The Simplera Sync sensor can be used one time and has a life of up to six days, followed by a grace period of 24 hours. During the grace period, the sensor will continue to work as it did during the first six days, to allow the patient to change their sensor more flexibly. The Simplera Sync sensor is not intended to be used directly to make therapy adjustments while the MiniMed 780G is operating in manual mode. All therapy adjustments in Manual mode should be based on measurements obtained using a blood glucose meter and not on values provided by the Simplera Sync sensor. The Simplera Sync sensor has been studied and is approved for use in the systems, insertion sites, and ages listed in the following table.

System	Age	Sensor Insertion Site
MiniMed 780G System	7 years and older	Arm

Accu-Chek Guide Link Blood Glucose Monitoring System

The Accu-Chek Guide Link Blood Glucose Monitoring System is comprised of the Accu-Chek Guide Link meter and the Accu-Chek Guide test strips. The Accu-Chek Guide Link Blood Glucose Monitoring System is intended to quantitatively measure glucose in fresh capillary whole blood from the fingertip, palm, and upper arm as an aid in monitoring the effectiveness of glucose control.

The Accu-Chek Guide Link Blood Glucose Monitoring System is intended for in vitro diagnostic single-patient use by people with diabetes. The Accu-Chek Guide Link Blood Glucose Monitoring System is intended to be used by a single person and should not be shared. This system is not for use in diagnosing or screening for diabetes mellitus and not for neonatal use. Alternative site testing should be done only during steady-state times (when glucose is not changing rapidly).

The Accu-Chek Guide Link Blood Glucose Monitoring System is intended to be used to wirelessly transmit glucose values to the MiniMed 780G system and MiniMed 770G system with Bluetooth™ wireless technology through the use of Bluetooth low energy communication.

III. CONTRAINDICATIONS

A prominent boxed warning is included in the labeling regarding use of the device:

"Do not use the SmartGuard feature for people who require less than 8 units or more than 250 units of total daily insulin per day. A total daily dose of at least 8 units, but no more than 250 units, is required to use the SmartGuard feature."

MiniMed 780G System with Simplera Sync Sensor:

- The MiniMed 780G system is contraindicated for use in persons under age 7
- Pump therapy is not recommended for people with a significant cognitive or physical impairment that affects their ability to safely operate the pump, including a lack of physical dexterity
- Pump therapy is not recommended for children who are not under the care of a parent or caregiver who is capable of safely operating the pump for the patient
- The reservoir is contraindicated for the infusion of blood or blood products
- Infusion sets are indicated for subcutaneous use only and not for intravenous (IV) infusion
- Infusion sets are not indicated for the infusion of blood or blood products
- Insulin pump therapy is not recommended for persons who are unwilling or unable to perform BG meter readings
- Pump therapy is not recommended for people who are unwilling or unable to maintain contact with their healthcare professional

MiniMed 780G System with Guardian 4 Sensor and Guardian 4 Transmitter:

- The MiniMed 780G system is contraindicated for use in persons under age 7
- Do not use the serter to insert sensors other than the Guardian 4 sensor. Medtronic cannot guarantee the safety or efficacy of this product if used with other sensors
- The reservoir is contraindicated for the infusion of blood or blood products
- Infusion sets are indicated for subcutaneous use only and not for intravenous (IV) infusion
- Infusion sets are not indicated for the infusion of blood or blood products
- Pump therapy is not recommended for persons who are unwilling to or unable to perform BG meter readings
- Pump therapy is not recommended for people who are unwilling or unable to maintain contact with their healthcare professional

IV. WARNINGS AND PRECAUTIONS

The warnings and precautions are provided in the MiniMed 780G system with Guardian 4 labeling and the MiniMed 780G system with Simplera Sync labeling.

V. DEVICE DESCRIPTION

The MiniMed 780G System is comprised of the following devices:

MiniMed 780G Pump (MMT-1884)

The MiniMed 780G pump (model MMT-1884) is an ambulatory, battery--operated, rate -programmable micro-infusion pump designed to deliver insulin from a reservoir. The reservoir is driven by a motor to deliver pre-determined basal rate profiles and

user -selected bolus amounts of insulin into the subcutaneous tissue through an infusion set.

The MiniMed 780G pump is offered in one model (MMT-1884). The pump houses electronics, a pumping mechanism, a user interface, and a medication reservoir within the same physical device. The reservoir is attached to a tube that connects to the user's infusion site on their body. The pump is intended to deliver insulin through a diffusion mechanism. Model MMT-1884 is compatible with a 3.0 mL reservoir. The pump only displays blood glucose level units in mg/dL and this units setting cannot be reconfigured by the user.

In addition to insulin delivery, the MiniMed 780G pump is designed to receive and display real-time interstitial fluid glucose values from a compatible CGM. The MiniMed 780G pump is compatible with two CGMs: the Guardian 4 sensor with Guardian 4 transmitter and Simplera Sync sensor. When used in combination with a CGM, the transmitter sends sensor signals to the MiniMed 780G pump via a BLE wireless communication protocol every five minutes.

When using the 780G pump with the Guardian 4 sensor with Guardian 4 transmitter or Simplera Sync sensor, calibration is not required. However, the system is designed to use every BG meter reading either entered manually or received from a linked glucose meter to calibrate the sensor.

The 780G Pump can operate in Manual Mode or Auto Mode, and each mode includes various features and capabilities. These features and capabilities are described in detail in the MiniMed 780G system user guide. A summary of these features and capabilities is provided in *Table 1* below.

Table 1: Summary of the Features of the MiniMed 780G System

Mode	Description	When is it	Will I receive Alerts?
Manual Mode: Insulin Infusion Pump	This mode is when the device is functioning as a pump that can deliver insulin, but the device does not have a sensor connected, is not in Auto Mode and the insulin suspend features are not turned on.	This is the default mode, and the user does not have to specifically turn this mode on.	There are alerts if the pump has any issues with delivering insulin (e.g. suspended delivery) or low reservoir.

Mode	Description	When is it	Will I receive Alerts?
Manual Mode: Sensor Augmented Pump	This mode is when the device is functioning as a sensor and pump, but the device is not in Auto Mode and the insulin suspend features are not turned on.	This user has to be wearing a CGM that is communicating to the pump in order to receive sensor glucose alerts.	There is a mandatory severe low alarm for the system used with each compatible CGM; 64 mg/dL for Guardian 4 and Simplera Sync. The user can also set optional high and low alerts to sound on or before setting sensor glucose levels.
Manual Mode: Suspend On Low	When this feature is active the device detects that your sensor glucose level has reached a pre-set sensor glucose value, and it automatically suspends basal insulin delivery when that value is reached.	The user has to turn this feature on. It is not available when Auto Mode is turned on, and it cannot be turned on if Suspend before Low is turned on.	There is a mandatory severe low alarm for the system used with each compatible CGM: 64 mg/dL Guardian 4 CGM and Simplera Sync and at the pre-set low level. The user can also set optional high alerts to sound on or before set sensor glucose levels, and an optional alert before low
Manual Mode: Suspend Before Low	When this feature is active the device detects when your sensor glucose is predicted to reach a pre-set value, and it automatically suspends basal insulin delivery before that value is reached.	The user has to turn this feature on. It is not available when Auto Mode is turned on, and it cannot be turned on if Suspend before Low is turned on.	There is a mandatory severe low alarm for the system used with each compatible CGM: 64 mg/dL Guardian 4 and Simplera Sync CGM and at the pre-set low level. The user can also set optional high alerts to sound on or before set sensor glucose levels, and an optional alarm before low
Auto Mode	When this mode is active, the device can automatically adjust basal insulin by increasing, decreasing, or turning off basal insulin delivery based on sensor glucose levels. The device can also automatically deliver an auto correction bolus without the user input based on the sensor	The user has to turn this mode on, and certain pre-defined conditions have to be met.	There is a mandatory severe low alarm for the system used with each compatible CGM: 64 mg/dL Guardian 4 and Simplera Sync CGM and a mandatory high alarm if user is ≥250 mg/dL for 3 hours; The user can also set optional high and low alerts to sound on or before set sensor glucose levels.

Mode	Description	When is it	Will I receive Alerts?
Auto Mode: Safe Basal Delivery	When this feature is active, the device will deliver basal insulin at a patient-specific safe basal or safe basal low rate for no longer than 90 minutes. If the fault condition resolves within 90 minutes, the system will begin to automatically adjust basal insulin again. If the fault does not resolve within 90 minutes, the system will switch to Manual Mode.	This feature turns on when the system determines that either the sensor data is not adequate for Auto Mode or delivery at the minimum or maximum limit for a set amount of time has elapsed.	There is a mandatory alert before this feature turns on when the sensor glucose accuracy check fails. The user can also set optional alerts to sound before this feature turns on when minimum or maximum insulin delivery times out or when the sensor has been under- reading for too long. There is a mandatory severe low alarm for the system used with each compatible CGM: 64 mg/dL Guardian 4 CGM and Simplera Sync. The user can also set optional high and low alerts to sound on or before set sensor glucose

Guardian 4 transmitter (MMT-7841)

The Guardian 4 transmitter is a portable, electrical current meter intended to process, store, and transmit glucose sensor values to the compatible insulin pump. The transmitter sends sensor glucose (DG) values and sensor integrity (SI) data from the Guardian 4 sensor to the MiniMed 780G insulin pump via BLE wireless communication protocol. The Guardian 4 transmitter does not require entry of fingerstick blood glucose measurement for calibration purposes.

Guardian 4 sensor (MMT-7040)

The Guardian 4 sensor is a sterile, single-use, single patient glucose sensing component for continuous monitoring of glucose levels in the user's interstitial fluid for up to seven days. The Sensor is inserted into the subcutaneous tissue using the One-Press Serter and is taped to the user's skin. It connects to the Guardian 4 transmitter, which in turn communicates with the MiniMed 780G pump,

Simplera Sync Sensor (MMT- 5120*)*

The sensor is a sterile, all-in-one glucose sensing device, intended as a single patient, single-use component of a personal CGM system for the management of diabetes in persons 7 years of age and older. The Simplera Sync sensor can be used one time and has a life of up to six days, followed by a grace period of 24 hours. During the grace period, the sensor will continue to work as it did during the first six days, to allow the patient to change their sensor more flexibly. The sensor calculates user glucose concentrations based on collected signals from the interstitial fluid and transmits glucose and device data to the networked device. It is intended to replace fingerstick blood glucose (BG) readings for treatment decisions and reduce the overall burden associated with diabetes management.

Accu-Chek Guide™ Link Blood Glucose Meter

The Accu-Chek Guide™ Link Blood Glucose Meter can be used with the MiniMed 780G system. The meter sends blood glucose values to the insulin pump for sensor calibration via a BLE wireless communication protocol. The blood glucose meter was previously reviewed and approved under P160017/S076.

Additional System Accessories

The following additional accessory devices listed in *Table 2* are compatible with the MiniMed 780G Insulin Pump:

Table 2: Accessory Devices

Device	**Model**
Reservoirs and Infusion Sets	**Model Numbers**
MiniMed Quick Set infusion set	MMT-386, MMT-387, MMT-394, MMT-396, MMT-397, MMT-398, MMT-399
MiniMed Silhouette infusion set	MMT-368, MMT-377, MMT-378, MMT-381, MMT-382, MMT-383, MMT-384
MiniMed Mio Infusion set	MMT-921, MMT-923, MMT-925, MMT-941, MMT-943, MMT-945, MMT-965, MMT-975
MiniMed Sure-T infusion set	MMT-862, MMT-864, MMT-866, MMT-874, MMT-876, MMT-884, MMT-886
MiniMed Mio Advance infusion set	MMT-213A, MMT-242, MMT-243A, MMT-244A
Medtronic Extended infusion set	MMT-430A, MMT-431A, MMT-432A, MMT-433A, MMT-440A, MMT-441A, MMT-442A, MMT-443A
MiniMed reservoir	MMT-332A
Medtronic Extended reservoir	MMT-342
Optional Devices	**Model Numbers**
MiniMed Mobile Application (Android)	MMT-6101
MiniMed Mobile Application (iOS)	MMT-6102
CareLink Connect Application (Android)	MMT-6111
CareLink Connect Application (iOS)	MMT-6112
Blue Adapter	ACC-190
CareLink Online (Personal)	MMT-7333
CareLink Pro	MMT-7335

This medical device product has functions subject to FDA premarket review as well as functions (e.g., the MiniMed Mobile Applications) that are not subject to FDA premarket review. For this application, if the product has functions that are not subject to FDA premarket review, FDA assessed those functions only to the extent

that they either could adversely impact the safety and effectiveness of the functions subject to FDA premarket review or they are included as a labeled positive impact that was considered in the assessment of the functions subject to FDA premarket review.

VI. ALTERNATIVE PRACTICES AND PROCEDURES

Control of diabetes can be achieved through a combination of various behaviors and methods.

Self-behaviors including healthy eating, taking the clinically indicated medications (pharmaco-vigilance), and being physically active are fundamental lifestyle activities that are important for achieving glycemic control regardless of the methods of monitoring glucose and insulin administration.

Methods of monitoring glycemic control include periodic measurement of Hemoglobin A1c (HbA1c) which reflects mean blood levels control over a three-month period. This test is ordered and interpreted by the person with diabetes (PWDs) healthcare provider. Self-monitoring of blood glucose using glucose meters and test strips provides quantitative measurements of blood glucose at a single point in time for PWDs and their healthcare providers. This helps to monitor the effectiveness of glycemic control, as well as in making more immediate treatment modifications.

Adoption of continuous glucose monitoring (CGM), which includes both real-time CGM and intermittently scanned CGM, has grown rapidly over the past few years as a result of improvements in sensor accuracy, greater convenience, ease of use, and expanding reimbursement. As a component of diabetes self-management, use of CGM provides the ability to obtain immediate feedback on current glucose levels as well as direction and rate of change in glucose levels. This information allows PWDs to optimize their self-care behaviors, make informed therapy decisions regarding mealtime and correction dosing of insulin, and, importantly, react immediately and appropriately to mitigate or prevent acute glycemic events. While CGM-based glycemic targets must be personalized to meet the needs of each individual with diabetes, experts agree that most T1 and T2 PWDs should strive to achieve at least 70% in Time in Range (TIR, 70-180 mg/dL) and less than 4% Time Below Range (under 70 mg/dL). Monitoring TIR goes beyond A1C monitoring in representing blood glucose levels because it captures variation – the highs, lows, and in-range values that characterize life with diabetes. By contrast, A1C is a measure of average blood sugar over a two-to-three-month period; it cannot capture time spent in various blood glucose ranges. Importantly, CGM-derived metrics are patient-centric because PWDs understand their glucose levels and can feel when it is too high or too low where they are often unclear the meaning of A1C since they can't feel or see this surrogate marker of glycemia in real time.

PWDs may administer insulin by injection or using other insulin infusion pumps as prescribed by their physician. An insulin pump is an alternative to multiple daily insulin injections (via insulin syringe or an insulin pen). There are currently several commercially available ambulatory insulin infusion pumps that can be used for insulin

infusion. Additionally, sensor-augmented insulin infusion pumps or continuous glucose monitoring systems may be used to record continuous interstitial glucose information and provide real-time hypoglycemia and hyperglycemia alerts. Several available insulin pump systems offer automated features where insulin delivery may be suspended when sensor glucose has reached or is predicted to reach a user selected low glucose threshold. Hybrid closed loop insulin pump systems are also available for use to treat type 1 diabetes. These systems can automatically increase or decrease the amount of insulin delivered to maintain glucose within an optimal range.

VII. MARKETING HISTORY

The MiniMed 780G system has been commercially available in Europe since October 2020. The MiniMed 780G system has been commercially available in the US since May 2023.

The MiniMed 780G system is an iteration of the MiniMed 770G system (identical to the MiniMed 670G except it has Bluetooth communication capability). The MiniMed 670G system was originally approved for marketing in the United States on September 28, 2016 (P160017) and received approval for marketing with a pediatric indication (ages 7-13 years) on June 21, 2018 (P160017/S031). On August 31, 2020, the MiniMed 770G system was approved for an indication that included users ages 2-6 years old, and for an updated BLE communications protocol. Neither the MiniMed 670G system nor the MiniMed 770G system have been withdrawn from the market for any reason related to their safety or effectiveness.

The insulin reservoirs and infusion sets used with the MiniMed 780G system are also the same as those currently used with the MiniMed 530G system (P120010), the MiniMed 630G system (P150001), the MiniMed 670G system (P160017), and the MiniMed 770G system (P160017/S076). These devices have not been withdrawn from commercial distribution for any reason related to either safety or effectiveness.

VIII. POTENTIAL ADVERSE EFFECTS OF THE DEVICE ON HEALTH

Potential device-related serious adverse events include

- Diabetic ketoacidosis (DKA) resulting from high blood glucose due to suspension of insulin delivery or inadequate insulin delivery (which may result from catheter occlusion, hardware or software malfunction, erroneous CGM readings in Auto Mode or suspend mode, or inadequate insulin dosing).
- Severe hypoglycemia resulting from over-delivery of insulin (which can result from hardware or software malfunction, erroneous CGM readings in Auto Mode, or erroneous insulin dosing), which may lead to seizure, unconsciousness and, rarely, death.

Potential device related non-serious events include:

- Skin irritation or redness

- Infection
- Pain or discomfort
- Bruising
- Edema
- Rash
- Bleeding
- Induration of skin
- Allergic reaction to adhesive

Sensor breakage with fragments retained under the skin is a potential adverse event related to use of the CGM component of the 780G system, but this was not observed during the clinical studies. Based on post-market experience with similar devices and the results observed in the clinical studies described below, the occurrence and severity of these events are low.

Infection at the insulin pump infusion set insertion site and sensor insertion site is a potential complication related to insertion of the CGM, or the insulin pump infusion set. Based on post-market experience with similar devices, and the results observed in clinical studies, the occurrence and severity of these events are not expected to differ from other approved infusion sets and CGM devices.

Insulin pump use is known to carry an increased risk of DKA. However, FDA has received information indicating some patients are willing to accept an increased risk of DKA or ketosis and hyperglycemia (severe hyperglycemia) because of the benefits of pump use (see also Section IX below).

Like other insulin pumps, there is an inherent risk that users of the device who do not use the 780G system as intended could harm themselves. Therefore, the device is for prescription use only and contraindicated for people unwilling or unable to perform fingerstick blood glucose meter readings and for people unwilling or unable to maintain contact with their healthcare professional.

As demonstrated under P120010/S046 for the MiniMed 530G system (which has the same 'suspend on low' feature, where insulin delivery will suspend for two hours after the low glucose threshold has been reached), two-hour suspension of insulin delivery is unlikely to lead to clinically significant ketosis or ketoacidosis even if the pump inappropriately suspends when blood sugar is normal or elevated and should respond to insulin therapy and hydration within a few hours.

There is a theoretical risk of insulin over-delivery due to device malfunction, which has a risk of leading to severe hypoglycemia due to malfunction of the 780G system. However, this event did not occur during the pivotal study. If insulin over-delivery were to occur, there are several mechanisms in place, designed to help detect and mitigate the risk of impending and/or current hypoglycemia, including the presence of alarms/alerts and insulin delivery suspension/reduction.

There is a theoretical risk of insulin under-delivery (due to a hardware or software malfunction) which may lead to severe hyperglycemia or DKA due to malfunction of the 780G system. However, this event did not occur during the pivotal study or the continuation phase of the pivotal study. If insulin under-delivery were to occur, there are mechanisms in place to help detect impending and/or current hyperglycemia, including the presence of alerts and alarms.

The consequences of falsely high glucose readings on the CGM would be potential over-delivery of insulin via automated insulin delivery and missed low glucose suspensions and alerts/alarms, which have the potential to lead to severe hypoglycemia.

The consequences of falsely low glucose readings on the continuous glucose monitor would be potential under-delivery of insulin and missed high glucose alerts, which have the potential to lead to severe hyperglycemia or DKA.

IX. SUMMARY OF NON-CLINICAL STUDIES

1. Laboratory Studies

Application-level verifications were performed on the full MiniMed 780G system (i.e. MiniMed 780G pump, transmitters, BG meter, MiniMed Mobile App, CareLink, and CareLink Connect App) to ensure that the devices are compatible, and that data is successfully transferred. Please see the SSED for P160017/S076, P160017/S091, and P160017/S118 for all other system testing.

Pre-clinical testing of the MiniMed 770G pump hardware supports the safe use of the 780G pump as the corresponding pumps contain identical hardware. Please see the SSEDs for P160017, and P160017/S076 for descriptions of pre-clinical testing of the MiniMed 780G pump with the A1 configuration. See approval of P160017/S116 for details on design changes, component material changes and manufacturing changes impacting the MiniMed 780G System with the A2 configuration.

The One-Press Serter remains unchanged. Please see the SSED for P160017 for descriptions of the pre-clinical testing of the One- Press Serter.

The Accu-Chek Guide™ Link Meter remains unchanged since its approval under P160017/S076. Please see the SSED for P160017/S076 for descriptions of the pre-clinical testing of the Accu-Chek Guide™ Link Meter.

The Guardian 4 CGM remains unchanged since its approval under P160017/S091. Please see the SSED for P160017/S091 for descriptions of the pre-clinical testing of the Guardian 4 CGM. The Simplera Sync CGM remains unchanged since its approval under P160017/S118. Please see the SSED for P160017/S118 for descriptions of the preclinical testing of the Simplera Sync sensor (MMT-5120).

2. Drug Stability and Compatibility Testing

Comprehensive drug stability and compatibility testing was conducted for the new insulin types with the MiniMed 780G system, including:

- **Photostability Testing:** Evaluation of Lyumjev and Fiasp under illumination conditions while stored in Medtronic reservoirs and the MiniMed 780G pump
- **In-Vitro Stability Testing:** Assessment of insulin stability when delivered through the system under worst-case conditions (37°C with agitation at 70 strokes/minute) for up to 14 days depending on infusion set type
- **Particulate Matter Testing:** Evaluation of particulate content in insulin samples after delivery through the pump system and infusion sets under worst-case temperature and agitation conditions
- **Bio-identity Testing:** Confirmation that insulin biological activity is maintained after delivery through the MiniMed 780G system for both insulin types
- **Preservative Effectiveness Testing:** Verification that antimicrobial preservatives (phenol, m-cresol) maintain effectiveness after system delivery per USP <51> requirements
- **Excipient Analysis:** Testing of critical excipients (sodium citrate, zinc, magnesium for Fiasp; niacinamide, L-arginine, zinc for Lyumjev) to ensure stability under worst-case use conditions

3. Catheter Occlusion Bench Testing

Testing was performed to demonstrate no incidence of pump malfunctions or infusion set occlusions due to insulin crystallization with Lyumjev and Fiasp. Testing included 12-hour suspension periods (double the maximum suspend time allowed by Min Insulin Delivery Timeout and PLGM algorithms) with Sure-T, Quick-Set, and Extended infusion sets. All studies confirmed successful basal delivery resumption after suspension periods.

4. Delivery Volume Accuracy (DVA) Testing

DVA testing was successfully conducted with Lyumjev and Fiasp insulins using the MiniMed 780G pump with Quick-set and Extended infusion sets, demonstrating that delivery accuracy specifications are met.

5. Packaging

Medtronic packages all devices to meet the requirements for shipping as defined in ASTM D4169, Standard Practice for Performance Testing of Shipping Containers and Systems. This enables packages to withstand typical events associated with distribution without defects or loss of sterility as applicable. The ability of the package to protect the products throughout handling, distribution, and the storage environment is evaluated and documented.

Pre-clinical testing performed on the MiniMed 770G pump hardware and packaging supports the 780G pump as the corresponding pump hardware and packaging are identical. Please see the SSED for P160017/S076 for packaging validation. Please see the SSED for P160017/S091 for descriptions of the pre-clinical packaging validation conducted for Guardian 4 Transmitter and Guardian 4 Sensor. Please see approval of

P160017/S116 for details on design changes, component material changes and manufacturing changes impacting the MiniMed 780G System packaging.

6. Software

Software verification and validation were conducted in accordance with the FDA Guidance Document entitled *General Principles of Software Validation: Final Guidance for Industry and FDA Staff*. Software development activities included establishing detailed software requirements, linking requirements with associate verification tests, software code reviews, unit testing, system level testing and defect tracking and dispositioning to ensure the software conforms to user needs and intended uses.

Comprehensive verification and validation testing were conducted to confirm that the software used in the MiniMed 780G system, Simplera Sync CGM, Guardian 4 CGM met all specified requirements, and that the software will operate reliably and safely under normal or abnormal use conditions.

7. Firmware Over the Air (FOTA)

The MiniMed 780G pump has the capability to securely receive and install firmware-over-the-air (FOTA) updates, via the FOTA app (Class I). Verification of the FOTA functionality in the MiniMed 770G pump software, which supports safe use of the FOTA feature, is relevant for the 780G pump as the FOTA architecture and components are identical for both pumps. Please see the SSED for P160017/S076 and P160017/S093 for details regarding pre-clinical testing of the FOTA functionality.

8. Human Factors Testing

Human Factors usability validation studies were conducted in accordance with the IEC 62366-1 standard entitled Medical Devices – Application of Usability Engineering to Medical Devices and the FDA Guidance Document entitled Applying Human Factors and Usability Engineering to Medical Device. The human factors testing provided under P160017/S118 remains applicable.

9. Animal Studies

Not Applicable

10. Additional Studies

Not Applicable

X. SUMMARY OF PRIMARY CLINICAL STUDIES

The sponsor performed two clinical studies to establish a reasonable assurance of safety and effectiveness of the MiniMed 780G System with Fiasp and Lyumjev insulins for the management of Type 1 diabetes in the US under IDE #G210307 and G220010. Data from

these clinical studies were the basis for the PMA approval decision. A summary of the clinical studies is presented below.

Clinical Study	IDE	Patient Population	Study Design/Objective
Evaluation of the MiniMed™ 780G System in Type 1 Adult and Pediatric Subjects Utilizing Insulin Fiasp® (Insulin Aspart Injection)	G210307	7-80 years	Multi-center, single arm study in insulin-requiring adult and pediatric subjects with type 1 diabetes on the MiniMed 780G system using Fiasp (insulin aspart), faster-acting insulin injection as well as Medtronic Extended infusion set and reservoir. The objective of this study was to evaluate the safety and effectiveness of the MiniMed 780G system utilizing insulin Fiasp to support product and system labeling.
Evaluation of the Advanced Hybrid Closed Loop (AHCL) System in Type 1 Adult and Pediatric Subjects Utilizing Lyumjev® insulin lispro-aabc	G220010	7-80 years	Multi-center, single arm study in insulin-requiring adult and pediatric subjects with type 1 diabetes on the MiniMed™ 780G system using Lyumjev® (insulin lispro-aabc) and Medtronic Extended infusion set and reservoir. The objective of the study was to evaluate the safety and effectiveness of utilizing Lyumjev insulin in the MiniMed 780G System to support product and system labeling.

In addition to the clinical study reports, the sponsor provided further analyses of the data from these studies to support a reasonable assurance of safety and effectiveness of using the MiniMed 780G system with the AHCL algorithm with Fiasp and Lyumjev and Guardian 4 and Simplera Sync CGMs. The analyses included in-silico data with the updated AHCL algorithm to evaluate therapy outcomes for patients 7 years of age and older with insulin-requiring diabetes with the MiniMed 780G automated insulin delivery system when utilizing Fiasp or Lyumjev with Guardian 4 and Simplera Sync CGMs. These analyses demonstrated that use of the MiniMed 780G system is safe and effective when utilizing Fiasp or Lyumjev with either the Guardian 4 sensor or Simplera Sync sensor in patients with insulin-requiring diabetes. To support the credibility of these simulations, Medtronic has provided supporting information and data consistent with the

recommendations in the FDA guidance document "Assessing the Credibility of Computational Modeling and Simulation in Medical Device Submissions," issued on November 17, 2023.

Evaluation of the MiniMed™ 780G System in Type 1 Adult and Pediatric Subjects Utilizing Insulin Fiasp® (Insulin Aspart Injection)

1. Study Design

This study was a global, multi-center, single arm study in insulin-requiring adult and pediatric subjects with type 1 diabetes on the MiniMed 780G system using Fiasp (insulin aspart), faster-acting insulin injection as well as Medtronic Extended infusion set and reservoir. The run-in period and study period was approximately 120 days long. Subjects participated in meal challenge during the run-in and study periods, and exercise challenges during the study periods, that lasted for at least 4 hours in duration from the start of the challenge.

The study included general and study-specific inclusion and exclusion criteria as listed below. The inclusion/exclusion criteria below applied for both the Fiasp and Lyumjev studies.

1. Clinical Inclusion and Exclusion Criteria

Inclusion Criteria

i. Age 7 - 80 years at time of screening.
ii. Has a clinical diagnosis of type 1 diabetes:
    1. 14 – 80 years of age: A clinical diagnosis of type 1 diabetes for 2 years or more as determined via medical record or source documentation by an individual qualified to make a medical diagnosis.
    2. 7 – 13 years of age: A clinical diagnosis of type 1 diabetes for 1 year or more as determined via medical record or source documentation by an individual qualified to make a medical diagnosis.
iii. Does not require a legally authorized representative to consent on their behalf due to mental or intellectual disability.
iv. Subject or parent/caregiver is literate and able to read the language offered in the pump
v. Subject and/or legally authorized representative is willing to provide informed consent for participation.
vi. Is willing to perform fingerstick blood glucose measurements as needed.
vii. Is willing to wear the system continuously throughout the study.

viii. Must have a minimum daily insulin requirement (Total Daily Dose) of greater than or equal to 8 units and maximum total daily dose of 250 units or less.

ix. Has a Glycosylated hemoglobin (HbA1c) less than 10% (as processed by Central Lab) at time of screening visit.
Note: All HbA1c blood specimens will be sent to and tested by a National Glycohemoglobin Standardization Program (NGSP) certified Central Laboratory. HbA1c testing must follow NGSP standards.

x. Has thyroid-stimulating hormone (TSH) in the normal range OR if the TSH is out of normal reference range the Free T3 is below or within the lab's reference range and Free T4 was within the normal reference range.

xi. Uses pump therapy for greater than 6 months prior to screening (with or without CGM experience).

xii. Is willing to upload data from the study pump, and has Internet access, and a computer system, or compatible smartphone that meets the requirements for uploading the study pump.

xiii. Is willing to take one of the following insulins and can financially support the use of insulin preparations as required by the study:
- Humalog (insulin lispro injection)
- NovoLog (insulin aspart injection)

xiv. Was willing to take Fiasp (insulin aspart), faster-acting insulin injection during the Study period (supplied via Sponsor).

Exclusion Criteria

i. Has a history of 2 or more episodes of severe hypoglycemia, which resulted in any of the following during the 6 months prior to screening:
1. Medical assistance (i.e. Paramedics, Emergency Room [ER] or Hospitalization)
2. Coma
3. Seizures

ii. Has been hospitalized or had visited the ER in the 6 months prior to screening resulting in a primary diagnosis of uncontrolled diabetes.

iii. Has DKA in the last 6 months prior to screening visit.

iv. Is unable to tolerate tape adhesive in the area of sensor placement as assessed by a qualified individual.

v. Has any unresolved adverse skin condition in the area of sensor placement (e.g; psoriasis, dermatitis herpetiformis, rash, Staphylococcus infection).

vi. Is female of child-bearing potential and result of pregnancy test is positive at screening.

vii. Is sexually active female of child-bearing potential and is not using a form of contraception deemed reliable by the investigator.

viii. Is female and plans to become pregnant during the course of the study.

ix. Is being treated for hyperthyroidism at time of screening.

x. Has diagnosis of adrenal insufficiency.

xi. Has taken any oral, injectable, or intravenous (IV) glucocorticoids within 8 weeks from time of screening visit, or plans to take any oral, injectable, or IV glucocorticoids during the course of the study.
xii. Is using hydroxyurea at time of screening or plans to use it during the study.
xiii. Is actively participating in an investigational study (drug or device) wherein he/she has received treatment from an investigational study drug or investigational study device in the last 2 weeks.
xiv. Has used a MiniMed 780G pump prior to screening.
xv. Is currently abusing illicit drugs.
xvi. Is currently abusing marijuana.
xvii. Is currently abusing prescription drugs.
xviii. Is currently abusing alcohol.
xix. Is using pramlintide (Symlin), DPP-4 inhibitor, liraglutide (Victoza or other GLP-1 agonists), metformin, canagliflozin (Invokana or other SGLT2 inhibitors) at time of screening.
xx. Has a history of visual impairment which would not allow subject to participate in the study and perform all study procedures safely, as determined by the investigator.
xxi. Has elective surgery planned that requires general anesthesia during the course of the study.
xxii. Has sickle cell disease, hemoglobinopathy; or has received red blood cell transfusion or erythropoietin within 3 months prior to time of screening.
xxiii. Plans to receive red blood cell transfusion or erythropoietin over the course of study participation.
xxiv. Is diagnosed with current eating disorder such as anorexia or bulimia.
xxv. Has been diagnosed with chronic kidney disease resulting in chronic anemia.
xxvi. Has a hematocrit that is below the normal reference range of lab used.
xxvii. Is on dialysis.
xxviii. Has serum creatinine of >2 mg/dL.
xxix. Has celiac disease that is not adequately treated as determined by the investigator.
xxx. Has had any of the following cardiovascular events within 1 year of screening: myocardial infarction, unstable angina, coronary artery bypass surgery, coronary artery stenting, transient ischemic attack, cerebrovascular accident, angina, congestive heart failure, or ventricular rhythm disturbances.
xxxi. Has had history of cardiovascular event 1 year or more from the time of screening without
    a. a normal EKG and stress test within 6 months prior to screening or during screening or
    b. clearance from a qualified physician prior to receiving the study devices if there is an abnormal EKG or stress test.

xxxii. Has 3 or more cardiovascular risk factors listed below without a normal EKG within 6 months prior to screening or during screening or clearance from a qualified physician if there is an abnormal EKG:
- Age >35 years
- Type 1 diabetes of >15 years' duration
- Presence of any additional risk factor for coronary artery disease
- Presence of microvascular disease (proliferative retinopathy or nephropathy, including microalbuminuria)
- Presence of peripheral vascular disease
- Presence of autonomic neuropathy

xxxiii. Is a member of the research staff involved with the study.

xxxiv. Has used a MiniMed 780G pump prior to screening

2. Clinical Endpoints
The following descriptive endpoints were evaluated separately for subjects 7-17 and 18-80 years old:

- The overall mean change in Hemoglobin A1c (HbA1c) from baseline to end of 3-month study period
- The mean % of time in range (TIR 70-180 mg/dL)
- The mean percentage sensor glucose (SG) values <54 mg/dL

Safety Data Summarized

- Serious Adverse Events (SAE)
- Serious Adverse Device Effects (SADE)
- Unanticipated Adverse Device Effects
- Incidence of Severe Hypoglycemia
- Incidence of Severe Hyperglycemia
- Incidence of DKA

2. Accountability of PMA Cohort

A total of 240 subjects were enrolled in the study, of which 14 subjects were screen failures. A total of 226 subjects entered the Run-in period, with 223 subjects completing the Run-in period. A total of 223 subjects entered the Study period, with 215 subjects completing the Study period.

3. Study Population Demographics and Baseline Parameters

The table below provides a high-level summary of the baseline demographics of subjects 7-80 years of age that entered the study period with SmartGuard (i.e., ITT population).

Table 3: *Summary of Subject Demographic and Other Baseline (at Screening) Characteristics, ITT Population*

Characteristic	Age 7-17 Years (N=107)	Age 18-80 Years (N=116)
AGE(Years)		
n	107	116
Mean (SD)	14.0 (2.4)	48.3 (14.5)
Median	15.0	49.0
Min, Max	7.0, 17.0	18.0, 80.0
Gender N(%)		
Female	56 (52.3%)	54 (46.6%)
Male	51 (47.7%)	62 (53.4%)
Country N(%)		
Australia	9 (8.4%)	0 (0.0%)
Canada	9 (8.4%)	7 (6.0%)
United States	89 (83.2%)	109 (94.0%)
Race N(%)		
White	82 (76.6%)	105 (90.5%)
American Indian or Alaska Native, White	1 (0.9%)	0 (0.0%)
Asian, White	2 (1.9%)	0 (0.0%)
American Indian or Alaska Native	0 (0.0%)	1 (0.9%)
Asian	2 (1.9%)	4 (3.4%)
Asian, Native Hawaiian / Other Pacific Islander	1 (0.9%)	0 (0.0%)
Black or African American	7 (6.5%)	5 (4.3%)
Native Hawaiian / Other Pacific Islander	1 (0.9%)	0 (0.0%)
Other (Biracial)	0 (0.0%)	1 (0.9%)
Not reported	11 (10.3%)	0 (0.0%)
Ethnicity N(%)		
Hispanic or Latino	16 (15.0%)	3 (2.6%)
Not Hispanic or Latino	82 (76.6%)	113 (97.4%)
Not reported	9 (8.4%)	0 (0.0%)
Diabetes History(Years)		
n	107	116
Mean (SD)	7.1 (3.3)	29.0 (14.6)
Median	6.9	26.7
Min, Max	1.1, 15.0	2.1, 63.4
Baseline Height(cm)		
n	107	116
Mean (SD)	161.6 (14.3)	171.4 (10.2)
Median	163.8	171.0

Characteristic	Age 7-17 Years (N=107)	Age 18-80 Years (N=116)
Min, Max	122.8, 194.6	150.0, 195.6
Baseline Weight (kg)		
n	107	116
Mean (SD)	61.6 (16.9)	86.2 (19.1)
Median	61.3	87.2
Min, Max	22.1, 105.5	52.4, 139.7
Baseline BMI (Kg/m^2)		
n	107	116
Mean (SD)	23.2 (4.5)	29.3 (6.2)
Median	22.5	28.3
Min, Max	14.7, 36.1	19.0, 54.6
Treatment Method at Baseline		
Closed Loop Therapy (Pump + CGM + Algorithm)	66 (61.7%)	89 (76.7%)
CSII	10 (9.3%)	13 (11.2%)
Other	1 (0.9%)	1 (0.9%)
SAP (Pump + CGM)	30 (28.0%)	13 (11.2%)
Baseline A1C (%)		
n	107	116
Mean (SD)	7.8 (0.9)	7.4 (0.8)
Median	7.7	7.4
Min, Max	5.8, 9.9	5.6, 9.5

4. Safety and Effectiveness Results

Safety and effectiveness results were evaluated separately for subjects 18-80 years of age and 7-17 years of age.

Safety Results

Subjects 7-17 Years of Age: A total of 51 adverse events (AEs) during the study period were reported from all investigational sites for subjects enrolled in the study. There were no serious adverse events (SAEs) reported during the study period, no reports of severe hypoglycemia, 5 reports of severe hyperglycemia, and one report of diabetic ketoacidosis. There were no reports of unanticipated adverse device effects (UADEs).

Subjects 18-80 Years of Age: A total of 37 AEs during the study period were reported from all investigational sites for subjects enrolled in the study. There were no SAEs reported during the study period, one report of severe hypoglycemia, no reports of severe hyperglycemia, and no reports of diabetic ketoacidosis. There were no reports of UADEs.

Effectiveness Results

Change in HbA1c

The overall mean change in Hemoglobin A1c (HbA1c) from baseline to end of 3-month study period was analyzed separately for pediatric and adult populations.

Overall Mean Change in HbA1C from Baseline to End of 3-Month Study Period, ITT Population – Fiasp

Age Group	Number of Subjects	Overall Mean Δ in HbA1c (%)
7-17 years	76	-0.3
18-80 years	114	-0.4

% Time in Range (TIR, 70-180 mg/dL)

The mean % of time in range (TIR 70-180 mg/dL) during Study Period Stage 3 using the ITT population is shown in Table 7 below.

Percentage of TIR (70-180 mg/dL), ITT Population - Fiasp

Age Group	Number of Subjects	TIR (%)
7-17 years	106	65.7
18-80 years	113	77.1

The table below shows CGM metrics for pediatric subjects who had SmartGuard ON during run-in phase, comparing baseline (with Humalog/NovoLog) to study period (with Fiasp).

Table 4: Percent of SG in Different Ranges, Analysis for Data Collected During Baseline and Study Period, ITT Population, Age 7-17 Years, Subjects had SmartGuard ON

Category	**SG Range (mg/dL)**	**Run-in Period**	**Study Period Overall**	**Study Period Stage 1**	**Study Period Stage 2**	**Study Period Stage 3**
Number of Subjects	—	55	55	55	55	55
Low SG Value	SG < 54	0.5 ± 0.7 (0.3, 0.7)	0.4 ± 0.4 (0.3, 0.5)	0.4 ± 0.5 (0.2, 0.5)	0.6 ± 0.7 (0.4, 0.8)	0.4 ± 0.4 (0.3, 0.5)
	SG < 70	2.0 ± 2.0 (1.4, 2.5)	1.9 ± 1.6 (1.5, 2.4)	1.8 ± 1.9 (1.2, 2.3)	2.3 ± 2.2 (1.7, 2.9)	1.9 ± 1.5 (1.4, 2.3)

Category	SG Range (mg/dL)	Run-in Period	Study Period Overall	Study Period Stage 1	Study Period Stage 2	Study Period Stage 3
Target SG Value	SG 70–140	30.8 ± 12.2 (27.5, 34.1)	42.7 ± 10.1 (40.0, 45.5)	41.3 ± 10.9 (38.4, 44.2)	43.9 ± 11.2 (40.9, 46.9)	42.9 ± 11.1 (39.9, 45.9)
	SG 70–180	53.3 ± 15.1 (49.2, 57.4)	65.6 ± 11.3 (62.6, 68.7)	66.2 ± 12.5 (62.8, 69.6)	66.6 ± 11.6 (63.4, 69.7)	64.9 ± 12.5 (61.5, 68.3)
High SG Value	SG > 140	67.3 ± 13.1 (63.7, 70.8)	55.3 ± 10.9 (52.4, 58.3)	56.9 ± 11.8 (53.7, 60.1)	53.8 ± 12.4 (50.5, 57.2)	55.2 ± 11.8 (52.0, 58.4)
	SG > 180	44.7 ± 15.7 (40.5, 48.9)	32.4 ± 11.8 (29.2, 35.6)	32.0 ± 13.0 (28.5, 35.5)	31.1 ± 12.4 (27.8, 34.5)	33.3 ± 13.0 (29.7, 36.8)
	SG > 250	17.2 ± 11.1 (14.1, 20.2)	10.8 ± 7.5 (8.8, 12.8)	10.2 ± 8.3 (8.0, 12.4)	10.2 ± 7.9 (8.1, 12.4)	11.5 ± 8.5 (9.2, 13.8)
	SG > 350	2.6 ± 3.2 (1.7, 3.4)	1.7 ± 2.0 (1.2, 2.3)	1.5 ± 2.1 (1.0, 2.1)	1.7 ± 2.5 (1.1, 2.4)	1.9 ± 2.5 (1.2, 2.6)

Note: Values are presented by Mean ± SD (95% CI) except Number of Subjects

The table below shows CGM metrics for adult subjects who had SmartGuard ON during run-in phase, comparing baseline (with Humalog/NovoLog) to study period (with Fiasp)

Table 5: Percent of SG in Different Ranges, Analysis for Data Collected During Baseline and Study Period, ITT Population, Age 18-80 Years, Subjects had SmartGuard ON

Category	SG Range (mg/dL)	Run-in Period	Study Overall	Stage 1	Stage 2	Stage 3
Number of Subjects	—	72	72	72	72	71
Low SG Value	SG < 54	0.4 ± 0.7 (0.2, 0.5)	0.2 ± 0.3 (0.2, 0.3)	0.2 ± 0.3 (0.1, 0.2)	0.2 ± 0.3 (0.2, 0.3)	0.3 ± 0.3 (0.2, 0.3)
	SG < 70	2.0 ± 2.1 (1.5, 2.5)	1.5 ± 1.0 (1.3, 1.7)	1.2 ± 1.0 (0.9, 1.4)	1.6 ± 1.2 (1.3, 1.9)	1.5 ± 1.0 (1.3, 1.8)
Target SG Value	SG 70–140	44.4 ± 10.7 (41.9, 46.9)	50.9 ± 9.4 (48.7, 53.2)	44.7 ± 10.7 (42.2, 47.2)	52.2 ± 11.6 (49.5, 54.9)	52.9 ± 9.5 (50.7, 55.2)
	SG 70–180	70.4 ± 10.9 (67.8, 73.0)	77.3 ± 8.6 (75.2, 79.3)	74.2 ± 9.7 (71.9, 76.5)	77.9 ± 9.7 (75.6, 80.1)	78.4 ± 8.7 (76.3, 80.4)
High SG Value	SG > 140	53.6 ± 11.4 (50.9, 56.3)	47.6 ± 9.8 (45.3, 49.9)	54.1 ± 11.0 (51.5, 56.7)	46.2 ± 11.9 (43.4, 49.0)	45.6 ± 9.8 (43.2, 47.9)

Category	SG Range (mg/dL)	Run-in Period	Study Overall	Stage 1	Stage 2	Stage 3
	SG > 180	27.6 ± 11.3 (24.9, 30.2)	21.2 ± 8.8 (19.2, 23.3)	24.6 ± 9.9 (22.3, 27.0)	20.5 ± 10.0 (18.2, 22.9)	20.1 ± 8.9 (18.0, 22.2)
	SG > 250	6.0 ± 5.0 (4.8, 7.1)	3.8 ± 3.2 (3.0, 4.5)	4.1 ± 3.5 (3.3, 5.0)	3.7 ± 3.5 (2.9, 4.5)	3.6 ± 3.3 (2.8, 4.4)
	SG > 350	0.3 ± 0.6 (0.2, 0.5)	0.2 ± 0.4 (0.2, 0.3)	0.2 ± 0.4 (0.1, 0.3)	0.3 ± 0.6 (0.1, 0.4)	0.2 ± 0.4 (0.1, 0.3)

Note: Values are presented by Mean ± SD (95% CI) except Number of Subjects

The table below shows complete CGM metrics across all study phases for all pediatric subjects

Table 6: Percent of SG in Different Ranges, Analysis for Data Collected During Baseline and Study Period, Intention to Treat Population, Age 7-17 Years

Category	SG Ranges (mg/dL)	Run-in Period	Study Period Overall	Study Period Stage 1	Study Period Stage 2	Study Period Stage 3
Number of Subjects	—	107	107	107	106	106
Low SG Value	SG < 54	0.6 ± 0.7 (0.4, 0.7)	0.4 ± 0.3 (0.3, 0.4)	0.3 ± 0.4 (0.3, 0.4)	0.5 ± 0.6 (0.4, 0.6)	0.3 ± 0.3 (0.3, 0.4)
	SG < 70	2.2 ± 2.0 (1.8, 2.6)	1.8 ± 1.3 (1.5, 2.0)	1.6 ± 1.6 (1.3, 1.9)	2.1 ± 1.8 (1.7, 2.4)	1.7 ± 1.3 (1.5, 1.9)
Target SG Value	SG 70–140	31.2 ± 11.9 (28.9, 33.4)	42.4 ± 9.3 (40.6, 44.2)	40.2 ± 10.5 (38.2, 42.2)	43.5 ± 10.3 (41.6, 45.5)	43.0 ± 10.1 (41.1, 45.0)
	SG 70–180	53.0 ± 14.5 (50.2, 55.7)	65.8 ± 10.4 (63.8, 67.8)	65.2 ± 11.7 (63.0, 67.5)	66.6 ± 10.9 (64.5, 68.7)	65.7 ± 11.3 (63.5, 67.9)
High SG Value	SG > 140	66.7 ± 12.8 (64.2, 69.1)	55.8 ± 9.9 (53.9, 57.7)	58.2 ± 11.2 (56.1, 60.4)	54.4 ± 11.2 (52.2, 56.5)	55.3 ± 10.6 (53.2, 57.3)
	SG > 180	44.9 ± 15.1 (42.0, 47.8)	32.4 ± 10.7 (30.4, 34.5)	33.1 ± 12.1 (30.8, 35.5)	31.3 ± 11.5 (29.1, 33.5)	32.6 ± 11.6 (30.3, 34.8)
	SG > 250	17.1 ± 10.5 (15.1, 19.1)	10.2 ± 6.9 (8.9, 11.5)	10.2 ± 7.9 (8.7, 11.8)	9.7 ± 7.2 (8.3, 11.1)	10.6 ± 7.7 (9.1, 12.0)
	SG > 350	2.4 ± 2.9 (1.9, 3.0)	1.6 ± 2.0 (1.2, 2.0)	1.5 ± 2.4 (1.1, 2.0)	1.5 ± 2.2 (1.1, 1.9)	1.7 ± 2.2 (1.3, 2.1)

Note: Values are presented by Mean ± SD (95% CI) except Number of Subjects

The table below shows complete CGM metrics across all study phases for all adult subjects.

Table 7: Percent of SG in Different Ranges, Analysis for Data Collected During Baseline and Study Period, Intention to Treat Population, Age 18-80 Years of Age

Category	SG Range (mg/dL)	Run-in Period	Study Period Overall	Stage 1	Stage 2	Stage 3
Number of Subjects	—	116	116	116	115	113
Low SG Value	SG < 54	0.5 ± 1.0 (0.3, 0.7)	0.3 ± 0.4 (0.2, 0.4)	0.2 ± 0.3 (0.1, 0.2)	0.3 ± 0.6 (0.2, 0.4)	0.3 ± 0.4 (0.2, 0.4)
	SG < 70	2.4 ± 2.9 (1.9, 3.0)	1.6 ± 1.3 (1.4, 1.9)	1.2 ± 1.1 (1.0, 1.4)	1.8 ± 1.6 (1.5, 2.1)	1.7 ± 1.3 (1.4, 1.9)
Target SG Value	SG 70–140	41.5 ± 11.9 (39.3, 43.7)	49.0 ± 10.4 (47.1, 50.9)	42.9 ± 10.7 (41.0, 44.9)	50.1 ± 12.1 (47.9, 52.4)	51.4 ± 10.6 (49.5, 53.4)
	SG 70–180	68.0 ± 12.2 (65.7, 70.2)	75.5 ± 9.9 (73.7, 77.4)	72.3 ± 10.5 (70.4, 74.3)	76.3 ± 10.9 (74.3, 78.3)	77.1 ± 9.6 (75.4, 78.9)
High SG Value	SG > 140	56.0 ± 12.9 (53.6, 58.4)	49.4 ± 10.8 (47.4, 51.4)	55.9 ± 11.1 (53.8, 57.9)	48.1 ± 12.6 (45.8, 50.4)	46.9 ± 11.0 (44.8, 48.9)
	SG > 180	29.6 ± 12.6 (27.2, 31.9)	22.8 ± 10.1 (21.0, 24.7)	26.4 ± 10.7 (24.5, 28.4)	22.0 ± 11.1 (19.9, 24.0)	21.2 ± 9.8 (19.3, 23.0)
	SG > 250	6.5 ± 5.6 (5.5, 7.6)	4.3 ± 3.9 (3.6, 5.0)	4.8 ± 4.3 (4.0, 5.6)	4.2 ± 4.0 (3.4, 4.9)	3.9 ± 3.7 (3.2, 4.6)
	SG > 350	0.4 ± 0.7 (0.2, 0.5)	0.3 ± 0.5 (0.2, 0.4)	0.3 ± 0.6 (0.2, 0.4)	0.3 ± 0.6 (0.2, 0.4)	0.2 ± 0.4 (0.2, 0.3)

Note: Values are presented by Mean ± SD (95% CI) except Number of Subjects.

The table below shows CGM metrics stratified by different glucose targets (100, 110, 120, 150 mg/dL) during study period.

Table 8: Glucose Distribution (%) During SmartGuard Stratified by Different Target During the Study Period, Intention to Treat Population, Age 7-17 Years

SG Range (mg/dL)	% During SmartGuard (All Users)	% at Set Point 100 mg/dL	% at Set Point 110 mg/dL	% at Set Point 120 mg/dL	% at Set Point 150 mg/dL
Number of Subjects Who Used Target Settings	—	107	100	5	106
SG < 54	0.4 ± 0.3 (0.3, 0.4)	0.4 ± 0.4 (0.3, 0.5)	0.4 ± 0.5 (–0.2, 1.1)	0.3 ± 0.6 (0.2, 0.5)	1.0 ± 2.0 (0.0, 1.9)

SG Range (mg/dL)	% During SmartGuard (All Users)	% at Set Point 100 mg/dL	% at Set Point 110 mg/dL	% at Set Point 120 mg/dL	% at Set Point 150 mg/dL
SG < 70	1.7 ± 1.3 (1.5, 2.0)	1.9 ± 1.5 (1.6, 2.2)	2.2 ± 1.6 (0.1, 4.2)	1.5 ± 1.5 (1.2, 1.8)	3.6 ± 5.9 (1.0, 6.3)
SG 70–140	43.4 ± 9.2 (41.6, 45.1)	45.3 ± 9.5 (43.4, 47.2)	44.8 ± 8.7 (33.9, 55.6)	40.1 ± 9.9 (38.2, 42.0)	39.7 ± 22.8 (29.3, 50.1)
SG 70–180	67.1 ± 9.9 (65.2, 69.0)	68.1 ± 10.4 (66.0, 70.1)	67.5 ± 9.6 (55.5, 79.4)	66.1 ± 10.3 (64.1, 68.1)	62.9 ± 23.5 (52.2, 73.6)
SG > 140	54.9 ± 9.8	52.8 ± 10.1	53.1 ± 9.8	58.4 ± 10.7	56.7 ± 25.4
SG > 180	31.2 ± 10.3	30.0 ± 10.7	30.4 ± 10.4	32.4 ± 10.7	33.4 ± 24.8
SG > 250	9.2 ± 6.1	8.9 ± 6.5	10.5 ± 7.0	9.3 ± 6.1	12.0 ± 22.2
SG > 350	1.2 ± 1.5	1.3 ± 1.7	1.7 ± 1.9	1.2 ± 1.6	3.8 ± 15.1

Note 1: Values are presented by mean ± SD (95% CI) except Number of Subjects.

The table below shows CGM metrics stratified by different glucose targets during study period

Table 9: Percent of SG in Different Ranges, Analysis for Data Collected During Baseline and Study Period, ITT Population, 18-80 Years of Age

SG Range (mg/dL)	% During SmartGuard	% at Set Point 100 mg/dL	% at Set Point 110 mg/dL	% at Set Point 120 mg/dL	% at Set Point 150 mg/dL
Number of Subjects	115	109	2	111	34
SG < 54	0.3 ± 0.4 (0.2, 0.3)	0.3 ± 0.4 (0.2, 0.4)	0.2 ± 0.3 (–2.1, 2.5)	0.2 ± 0.3 (0.1, 0.2)	1.9 ± 5.5 (–0.0, 3.8)
SG < 70	1.6 ± 1.3 (1.4, 1.8)	1.7 ± 1.4 (1.4, 2.0)	1.5 ± 2.1 (–17.2, 20.1)	1.2 ± 1.1 (1.0, 1.4)	8.5 ± 15.4 (3.1, 13.8)
SG 70–140	49.4 ± 10.1 (47.5, 51.3)	52.4 ± 10.0 (50.5, 54.3)	32.7 ± 46.2 (–382.7, 448.1)	42.4 ± 10.6 (40.4, 44.4)	58.1 ± 26.8 (48.7, 67.4)
SG 70–180	76.0 ± 9.5 (74.3, 77.8)	77.8 ± 9.1 (76.1, 79.5)	58.0 ± 40.1 (–302.3, 418.3)	72.4 ± 10.6 (70.4, 74.4)	76.1 ± 20.7 (68.8, 83.3)
SG > 140	49.0 ± 10.6 (47.1, 51.0)	45.9 ± 10.4 (44.0, 47.9)	65.8 ± 48.3 (–368.2, 499.9)	56.5 ± 11.1 (54.4, 58.5)	33.5 ± 26.9 (24.1, 42.8)
SG > 180	22.4 ± 9.7 (20.6, 24.2)	20.5 ± 9.2 (18.8, 22.3)	40.5 ± 42.2 (–338.4, 419.5)	26.4 ± 10.8 (24.4, 28.5)	15.5 ± 18.2 (9.1, 21.8)
SG > 250	4.0 ± 3.4 (3.4, 4.6)	3.6 ± 3.3 (3.0, 4.2)	1.1 ± 1.5 (–12.8, 15.0)	4.7 ± 4.1 (3.9, 5.5)	2.3 ± 5.2 (0.5, 4.1)
SG > 350	0.2 ± 0.4 (0.2, 0.3)	0.2 ± 0.4 (0.2, 0.3)	0.0 ± 0.0 (0, 0)	0.3 ± 0.5 (0.2, 0.4)	0.1 ± 0.5 (–0.0, 0.3)

Evaluation of the Advanced Hybrid Closed Loop (AHCL) System in Type 1 Adult and Pediatric Subjects Utilizing Lyumjev® (G220010)

A. Study Design

This study was a multi-center, single arm study in insulin-requiring adult and pediatric subjects with type 1 diabetes on the MiniMed 780G system using Lyumjev® insulin lispro-aabc as well as Medtronic Extended infusion set and reservoir. The run-in period and study period were approximately 120 days long. Subjects participated in meal challenge during the run-in and study periods, and exercise challenges during the study periods, that lasted for at least 4 hours in duration from the start of the challenge.

The study included general and study-specific inclusion and exclusion criteria as listed below. The inclusion/exclusion criteria below applied for both the Fiasp and Lyumjev studies.

1. Clinical Inclusion and Exclusion Criteria

   The Lyumjev insulin study inclusion and exclusion criteria are the same as the Fiasp study except that Lyumjev is a lispro-based insulin requiring exclusion of patients with insulin lispro hypersensitivity (rather than insulin aspart hypersensitivity), allowed three run-in insulin options including Admelog (Humalog, NovoLog, and Admelog versus only Humalog and NovoLog/NovoRapid for Fiasp), and specified willingness to take Lyumjev insulin during the study period rather than Fiasp insulin.

2. Clinical Endpoints

   The clinical endpoints for the Lyumjev study were identical to the Fiasp study.

B. Accountability of PMA Cohort

A total of 244 subjects were enrolled in the study at 19 investigational sites across the United States. Of the 244 subjects enrolled, 198 subjects completed the study period.

C. Study Population Demographics and Baseline Parameters

The table below provides a high-level summary of the baseline demographics of subjects 7-80 years of age that entered the study period with SmartGuard (i.e., ITT population).

Table 10: Summary of Subject Demographic and Other Baseline (at Screening) Characteristics, ITT Population

Characteristic	Age 7-17 Years (N=101)	Age 18-80 Years (N=110)
Age (Years)		
Number of subjects, N	101	110
Mean (SD)	13.0 (2.6)	45.0 (14.2)

Characteristic	Age 7-17 Years (N=101)	Age 18-80 Years (N=110)
Median	13.0	45.5
Min, Max	8.0, 17.0	18.0, 75.0
Gender N (%)		
Female	51 (50.5%)	49 (44.5%)
Male	50 (49.5%)	61 (55.5%)
Race N (%)		
White	85 (84.2%)	103 (93.6%)
American Indian or Alaska Native, Asian, Black or African American	0 (0.0%)	1 (0.9%)
Black or African American	8 (7.9%)	4 (3.6%)
Asian, White	1 (1.0%)	0 (0.0%)
Asian	2 (2.0%)	0 (0.0%)
Native Hawaiian or Other Pacific Islander	1 (1.0%)	0 (0.0%)
Other, Mediterranean	0 (0.0%)	1 (0.9%)
Unknown	1 (1.0%)	0 (0.0%)
Not Reported	3 (3.0%)	1 (0.9%)
Ethnicity N (%)		
Hispanic or Latino	19 (18.8%)	7 (6.4%)
Not Hispanic or Latino	81 (80.2%)	103 (93.6%)
Not Reported	1 (1.0%)	0 (0.0%)
Diabetes History (Years)		
Number of subjects, N	101	110
Mean (SD)	6.1 (3.8)	26.9 (12.0)
Median	5.4	25.8
Min, Max	1.1, 17.2	2.6, 59.6
Height(cm)		
Number of subjects, N	101	110
Mean (SD)	157.2 (15.8)	173.5 (10.3)
Median	157.7	172.0
Min, Max	103.0, 186.6	149.0, 200.7
Weight (kg)		
Number of subjects, N	101	110
Mean (SD)	55.7 (17.5)	87.0 (19.4)
Median	55.6	83.9
Min, Max	20.0, 116.5	52.4, 135.4
Body Mass Index (kg/m^2)		
Number of subjects, N	101	110
Mean (SD)	22.0 (4.6)	28.8 (5.3)
Median	21.4	28.1
Min, Max	14.5, 41.6	15.9, 45.3
Treatment Method at Baseline N (%)		

Characteristic	Age 7-17 Years (N=101)	Age 18-80 Years (N=110)
Closed Loop Therapy (Pump + CGM + Algorithm)	85 (84.2%)	73 (66.4%)
CSII	2 (2.0%)	12 (10.9%)
Injection	0 (0.0%)	1 (0.9%)
Sap (Pump + Cgm)	14 (13.9%)	24 (21.8%)
Baseline A1C (%)		
Number of subjects, N	101	110
Mean (SD)	7.6 (1.1)	7.4 (0.9)
Median	7.6	7.3
Min, Max	5.4, 9.8	5.8, 9.8

D. Safety and Effectiveness Results

Safety and effectiveness results were evaluated separately for subjects 18-80 years of age and 7-17 years of age.

Safety Results

Subjects 7-17 Years of Age: A total of adverse events (AEs) during the study period were reported from all investigational sites for subjects enrolled in the study. There were no serious adverse events (SAEs) reported during the study period, no reports of severe hypoglycemia, 9 reports of severe hyperglycemia, and no reports of diabetic ketoacidosis. There were no reports of unanticipated adverse device effects (UADEs). Additionally, there were 150 insulin infusion reactions reported, with 32 considered adverse events and 5 resulting in study exit.

Subjects 18-80 Years of Age: A total of adverse events (AEs) during the study period were reported from all investigational sites for subjects enrolled in the study. There were no SAEs reported during the study period, no reports of severe hypoglycemia, 1 report of severe hyperglycemia, and no reports of diabetic ketoacidosis. There were no reports of UADEs.

Effectiveness Results

Change in HbA1c

The overall mean change in Hemoglobin A1c (HbA1c) from baseline to end of 3-month study period was analyzed separately for pediatric and adult populations.

Age Group	Number of Subjects	Overall Mean Δ in HbA1c (%)
7-17 years	97	-0.1
18-80 years	101	-0.5

% Time in Range (TIR, 70-180 mg/dL)

The mean % of time in range (TIR 70-180 mg/dL) during Study Period Stage 3 using the ITT population is shown below.

***Percentage of TIR (70-180 mg/dL), ITT Population* – Lyumjev**

Age Group	Number of Subjects	TIR (%)
7-17 years	98	68.6
18-80 years	102	77.6

Table below shows CGM metrics for pediatric subjects who had SmartGuard ON during run-in phase, comparing baseline (with Humalog/NovoLog) to study period (with Lyumjev)

Table 11: Percent of SG in Different Ranges, Analysis for Data Collected During Baseline and Study Period, ITT Population, Age 7-17 Years, Subjects had SmartGuard ON

Category	SG Range (mg/dL)	Run-in Period	Study Period Overall	Stage 1	Stage 2	Stage 3
Number of Subjects	—	22	22	22	22	22
Low SG Value	SG < 54	0.4 ± 0.5 (0.2, 0.6)	0.4 ± 0.3 (0.2, 0.5)	0.4 ± 0.5 (0.2, 0.7)	0.3 ± 0.3 (0.2, 0.4)	0.4 ± 0.4 (0.2, 0.6)
	SG < 70	1.8 ± 1.6 (1.1, 2.6)	1.7 ± 1.3 (1.1, 2.3)	1.8 ± 1.6 (1.1, 2.5)	1.6 ± 1.3 (1.0, 2.2)	1.8 ± 1.3 (1.2, 2.4)
Target SG Value	SG 70–140	35.8 ± 11.8 (30.6, 41.0)	46.2 ± 10.1 (41.7, 50.7)	44.9 ± 11.8 (39.7, 50.1)	46.4 ± 11.8 (41.2, 51.7)	46.7 ± 10.3 (42.2, 51.3)
	SG 70–180	58.7 ± 14.8 (52.1, 65.2)	69.9 ± 10.5 (65.3, 74.6)	70.6 ± 11.3 (65.6, 75.6)	70.4 ± 10.5 (65.8, 75.1)	69.4 ± 11.2 (64.5, 74.4)
High SG Value	SG > 140	62.4 ± 12.4 (56.9, 67.9)	52.0 ± 10.6 (47.4, 56.7)	53.3 ± 12.6 (47.7, 58.9)	52.0 ± 12.5 (46.4, 57.5)	51.5 ± 10.4 (46.9, 56.1)
	SG > 180	39.5 ± 15.1 (32.8, 46.2)	28.3 ± 10.6 (23.7, 33.0)	27.6 ± 11.7 (22.4, 32.8)	27.9 ± 10.9 (23.1, 32.8)	28.8 ± 11.0 (23.9, 33.7)
	SG > 250	13.3 ± 10.9 (8.5, 18.1)	8.2 ± 6.6 (5.2, 11.1)	7.8 ± 7.6 (4.5, 11.2)	7.1 ± 4.8 (5.0, 9.3)	8.8 ± 7.5 (5.5, 12.1)
	SG > 350	1.5 ± 2.5 (0.4, 2.6)	1.3 ± 1.7 (0.6, 2.1)	1.1 ± 1.6 (0.4, 1.8)	1.0 ± 1.0 (0.6, 1.5)	1.5 ± 2.2 (0.6, 2.5)

Note: Values are presented by Mean ± SD (95% CI) except Number of Subjects

The table below shows CGM metrics for adult subjects who had SmartGuard ON during run-in phase, comparing baseline (with Humalog/NovoLog) to study period (with Lyumjev)

Table 12: Percent of SG in Different Ranges, Analysis for Data Collected During Baseline and Study Period, ITT Population, Age 18-80 Years, Subjects had SmartGuard ON

Category	SG Range (mg/dL)	Run-in Period	Study Period Overall	Study Stage 1	Study Stage 2	Study Stage 3
Number of Subjects	—	52	52	52	52	51
Low SG Value	SG < 54	0.2 ± 0.3 (0.2, 0.3)	0.2 ± 0.3 (0.1, 0.3)	0.1 ± 0.2 (0.1, 0.2)	0.2 ± 0.3 (0.1, 0.3)	0.2 ± 0.3 (0.1, 0.3)
	SG < 70	1.3 ± 1.0 (1.0, 1.6)	1.2 ± 0.9 (1.0, 1.5)	1.0 ± 0.9 (0.8, 1.3)	1.3 ± 1.1 (1.0, 1.6)	1.3 ± 1.0 (1.0, 1.5)
Target SG Value	SG 70–140	41.9 ± 12.9 (38.3, 45.5)	51.5 ± 9.2 (48.9, 54.0)	45.5 ± 9.5 (42.8, 48.1)	51.9 ± 9.9 (49.2, 54.7)	53.6 ± 10.4 (50.7, 56.5)
	SG 70–180	70.0 ± 13.5 (66.2, 73.7)	78.8 ± 8.3 (76.4, 81.1)	76.0 ± 9.0 (73.5, 78.5)	78.9 ± 8.9 (76.4, 81.4)	79.8 ± 9.0 (77.2, 82.3)
High SG Value	SG > 140	56.7 ± 13.2 (53.1, 60.4)	47.3 ± 9.5 (44.7, 50.0)	53.5 ± 9.9 (50.8, 56.3)	46.8 ± 10.3 (43.9, 49.6)	45.1 ± 10.7 (42.1, 48.1)
	SG > 180	28.7 ± 13.6 (24.9, 32.5)	20.0 ± 8.4 (17.7, 22.4)	23.0 ± 9.2 (20.5, 25.6)	19.8 ± 9.1 (17.2, 22.3)	19.0 ± 9.0 (16.4, 21.5)
	SG > 250	6.4 ± 6.5 (4.6, 8.3)	3.2 ± 2.8 (2.5, 4.0)	3.8 ± 3.4 (2.9, 4.8)	3.0 ± 2.7 (2.3, 3.8)	3.1 ± 2.9 (2.3, 3.9)
	SG > 350	0.4 ± 0.8 (0.1, 0.6)	0.2 ± 0.3 (0.1, 0.2)	0.2 ± 0.3 (0.1, 0.3)	0.1 ± 0.3 (0.0, 0.2)	0.2 ± 0.3 (0.1, 0.3)

Note: Values are presented by Mean ± SD (95% CI) except Number of Subjects

The table below shows complete CGM metrics across all study phases for all pediatric subjects

Table 13: Percent of SG in Different Ranges, Analysis for Data Collected During Baseline and Study Period, Intention to Treat Population, Age 7-17 Years

Category	SG Range (mg/dL)	Run-in Period	Study Period Overall	Stage 1	Stage 2	Stage 3
Number of Subjects	—	101	101	101	101	98
Low SG Value	< 54	0.6 ± 0.8 (0.4, 0.8)	0.4 ± 0.4 (0.3, 0.5)	0.4 ± 0.5 (0.3, 0.5)	0.4 ± 0.5 (0.3, 0.5)	0.4 ± 0.5 (0.3, 0.5)

Category	SG Range (mg/dL)	Run-in Period	Study Period Overall	Stage 1	Stage 2	Stage 3
	< 70	2.3 ± 2.2 (1.9, 2.7)	1.9 ± 1.6 (1.6, 2.2)	1.7 ± 1.6 (1.4, 2.0)	2.0 ± 1.9 (1.6, 2.4)	2.0 ± 1.8 (1.6, 2.3)
Target SG Value	70–140	30.1 ± 14.4 (27.3, 32.9)	45.0 ± 9.3 (43.2, 46.9)	42.0 ± 10.8 (39.9, 44.1)	45.9 ± 11.1 (43.7, 48.1)	46.1 ± 9.7 (44.2, 48.1)
	70–180	51.2 ± 17.2 (47.8, 54.6)	68.2 ± 9.8 (66.3, 70.2)	67.3 ± 10.7 (65.2, 69.4)	68.5 ± 11.1 (66.3, 70.7)	68.6 ± 10.3 (66.6, 70.7)
High SG Value	> 140	67.6 ± 15.4 (64.6, 70.6)	53.1 ± 9.9 (51.1, 55.0)	56.3 ± 11.6 (54.0, 58.6)	52.1 ± 11.8 (49.8, 54.5)	51.9 ± 10.2 (49.8, 53.9)
	> 180	46.5 ± 18.0 (42.9, 50.0)	29.8 ± 10.1 (27.9, 31.8)	31.0 ± 11.2 (28.8, 33.3)	29.5 ± 11.5 (27.2, 31.7)	29.4 ± 10.5 (27.3, 31.5)
	> 250	18.3 ± 13.0 (15.7, 20.8)	9.2 ± 6.5 (7.9, 10.5)	9.6 ± 7.4 (8.1, 11.0)	9.0 ± 7.0 (7.6, 10.4)	9.1 ± 7.0 (7.7, 10.5)
	> 350	2.7 ± 3.6 (2.0, 3.4)	1.5 ± 2.0 (1.1, 1.9)	1.4 ± 2.2 (1.0, 1.9)	1.5 ± 2.1 (1.0, 1.9)	1.5 ± 2.3 (1.1, 2.0)

Note: Values are presented by Mean ± SD (95% CI) except Number of Subjects

The table below shows complete CGM metrics across all study phases for all adult subjects.

Table 14: Percent of SG in Different Ranges, Analysis for Data Collected During Baseline and Study Period, ITT Population, 18-80 Years of Age

Category	SG Range (mg/dL)	Run-in Period	Study Period Overall	Stage 1	Stage 2	Stage 3
Number of Subjects	—	110	110	110	108	102
Low SG Value	< 54	0.3 ± 0.5 (0.2, 0.4)	0.2 ± 0.3 (0.2, 0.3)	0.2 ± 0.4 (0.2, 0.3)	0.3 ± 0.5 (0.2, 0.4)	0.2 ± 0.3 (0.2, 0.3)
	< 70	1.7 ± 1.8 (1.4, 2.1)	1.3 ± 1.1 (1.1, 1.5)	1.1 ± 1.2 (0.9, 1.4)	1.4 ± 1.6 (1.1, 1.7)	1.3 ± 1.1 (1.1, 1.5)
Target SG Value	70–140	39.5 ± 12.9 (37.1, 42.0)	48.9 ± 9.7 (47.1, 50.8)	43.9 ± 10.6 (41.9, 45.9)	49.7 ± 10.2 (47.8, 51.7)	51.1 ± 10.8 (49.0, 53.2)
	70–180	67.0 ± 13.6 (64.4, 69.6)	76.6 ± 8.9 (74.9, 78.3)	74.2 ± 10.0 (72.3, 76.1)	77.1 ± 9.1 (75.4, 78.8)	77.6 ± 9.6 (75.7, 79.4)
High SG Value	> 140	58.8 ± 13.4 (56.2, 61.3)	49.8 ± 10.0 (47.9, 51.7)	55.0 ± 11.1 (52.9, 57.1)	48.8 ± 10.8 (46.8, 50.9)	47.7 ± 11.1 (45.5, 49.8)

Category	SG Range (mg/dL)	Run-in Period	Study Period Overall	Stage 1	Stage 2	Stage 3
	> 180	31.3 ± 13.7 (28.7, 33.9)	22.1 ± 9.0 (20.4, 23.9)	24.6 ± 10.3 (22.7, 26.6)	21.5 ± 9.3 (19.7, 23.2)	21.2 ± 9.7 (19.3, 23.1)
	> 250	7.1 ± 6.9 (5.8, 8.4)	3.9 ± 3.2 (3.3, 4.5)	4.3 ± 4.2 (3.6, 5.1)	3.5 ± 2.9 (2.9, 4.0)	3.8 ± 3.3 (3.1, 4.4)
	> 350	0.4 ± 1.1 (0.2, 0.6)	0.2 ± 0.5 (0.1, 0.3)	0.2 ± 0.5 (0.1, 0.3)	0.2 ± 0.4 (0.1, 0.2)	0.3 ± 0.7 (0.1, 0.4)

The table below shows CGM metrics stratified by different glucose targets (100, 110, 120, 150 mg/dL) during study period.

Table 15: Glucose Distribution (%) During SmartGuard Stratified by Different Target During the Study Period, ITT Population, 7-17 Years of Age

SG Range (mg/dL)	% During SmartGuard	% at Set Point 100 mg/dL	% at Set Point 110 mg/dL	% at Set Point 120 mg/dL	% at Set Point 150 mg/dL
Number of Subjects at Target Setpoints	—	**101**	**98**	**6**	**100**
SG < 54	0.4 ± 0.5 (0.3, 0.5)	0.4 ± 0.5 (0.3, 0.5)	0.7 ± 0.9 (–0.3, 1.6)	0.4 ± 0.5 (0.3, 0.5)	3.0 ± 10.1 (–1.1, 7.2)
SG < 70	1.9 ± 1.7 (1.5, 2.2)	2.0 ± 2.0 (1.6, 2.4)	2.8 ± 2.4 (0.3, 5.3)	1.7 ± 1.7 (1.3, 2.0)	6.9 ± 12.3 (1.8, 12.0)
SG 70–140	45.9 ± 8.7 (44.1, 47.6)	47.3 ± 9.2 (45.4, 49.1)	46.4 ± 9.2 (36.7, 56.1)	42.9 ± 10.4 (40.8, 44.9)	44.7 ± 16.9 (37.7, 51.7)
SG 70–180	69.4 ± 8.7 (67.7, 71.1)	69.9 ± 9.5 (68.0, 71.8)	71.7 ± 6.8 (64.6, 78.8)	68.4 ± 9.6 (66.5, 70.3)	68.4 ± 21.7 (59.5, 77.4)
SG > 140	52.3 ± 9.4 (50.4, 54.1)	50.7 ± 9.7 (48.8, 52.7)	50.8 ± 10.8 (39.5, 62.1)	55.5 ± 11.3 (53.2, 57.7)	48.4 ± 19.7 (40.3, 56.5)
SG > 180	28.7 ± 9.0 (26.9, 30.5)	28.1 ± 9.7 (26.1, 30.0)	25.5 ± 8.5 (16.6, 34.4)	29.9 ± 10.1 (27.9, 31.9)	24.7 ± 20.6 (16.2, 33.2)
SG > 250	8.2 ± 5.4 (7.1, 9.3)	8.1 ± 5.9 (6.9, 9.3)	5.6 ± 2.4 (3.1, 8.1)	8.6 ± 6.1 (7.3, 9.8)	7.5 ± 12.3 (2.4, 12.6)
SG > 350	1.1 ± 1.5 (0.8, 1.4)	1.1 ± 1.6 (0.8, 1.4)	0.5 ± 0.7 (–0.2, 1.2)	1.1 ± 1.9 (0.7, 1.5)	0.7 ± 2.5 (–0.3, 1.7)

The table below shows CGM metrics stratified by different glucose targets during study period

Table 16: Glucose Distribution (%) During SmartGuard Stratified by Different Target During the Study Period, ITT Population, 18-80 Years of Age

SG Range (mg/dL)	% During SmartGuard(All Users)	% at Set Point 100 mg/dL	% at Set Point 110 mg/dL	% at Set Point 120 mg/dL	% at Set Point 150 mg/dL
Number of Subjects Using Target Setpoints	—	**106**	**4**	**110**	**34**
SG < 54	0.2 ± 0.3 (0.2, 0.3)	0.3 ± 0.4 (0.2, 0.3)	0.2 ± 0.3 (–2.1, 2.5)	0.2 ± 0.3 (0.1, 0.2)	1.1 ± 2.2 (0.3, 1.8)
SG < 70	1.3 ± 1.1 (1.1, 1.5)	1.4 ± 1.5 (1.1, 1.7)	0.7 ± 0.6 (–0.3, 1.7)	1.0 ± 1.0 (0.9, 1.2)	5.5 ± 8.1 (2.6, 8.3)
SG 70–140	49.2 ± 9.6 (47.3, 51.0)	51.3 ± 10.3 (49.3, 53.3)	45.4 ± 18.1 (16.6, 74.2)	43.8 ± 10.4 (41.9, 45.8)	53.9 ± 24.5 (45.3, 62.4)
SG 70–180	76.8 ± 8.8 (75.2, 78.5)	77.5 ± 9.1 (75.8, 79.3)	74.3 ± 15.8 (49.0, 99.5)	74.4 ± 10.1 (72.5, 76.3)	80.1 ± 14.1 (75.2, 85.0)
SG > 140	49.6 ± 10.0 (47.7, 51.5)	47.3 ± 10.9 (45.2, 49.4)	53.9 ± 18.4 (24.6, 83.2)	55.1 ± 10.9 (53.1, 57.2)	40.7 ± 26.9 (31.3, 50.1)
SG > 180	21.9 ± 8.9 (20.2, 23.6)	21.1 ± 9.4 (19.3, 22.9)	25.0 ± 16.2 (–0.8, 50.9)	24.5 ± 10.4 (22.6, 26.5)	14.4 ± 15.0 (9.2, 19.7)
SG > 250	3.7 ± 3.0 (3.2, 4.3)	3.5 ± 2.9 (3.0, 4.1)	3.0 ± 2.9 (–1.5, 7.6)	4.2 ± 3.9 (3.5, 5.0)	1.5 ± 2.8 (0.6, 2.5)
SG > 350	0.2 ± 0.3 (0.1, 0.2)	0.2 ± 0.3 (0.1, 0.2)	0.1 ± 0.1 (–0.1, 0.2)	0.2 ± 0.4 (0.1, 0.3)	0.0 ± 0.1 (–0.0, 0.0)

ITT - Intent to treat, Values are presented by mean ± SD (95% CI) except Number of Subjects.

Insulin Infusion Reactions - Lyumjev Study

A total of 150 insulin infusion reactions were reported during the Lyumjev study, with 32 classified as adverse events. Notably, 5 subjects (4.2% of the pediatric cohort) exited the study due to moderate or severe infusion site reactions. These reactions included burning, redness, pain, or itching at injection sites. The majority of reactions were mild and resolved without intervention, but the higher incidence compared to other rapid-acting insulins represents an important safety consideration for patient selection and monitoring.

XI. FINANCIAL DISCLOSURE

The Financial Disclosure by Clinical Investigators regulation (21 CFR 54) requires applicants who submit a marketing application to include certain information concerning the compensation to, and financial interests and arrangement of, any clinical investigator conducting clinical studies covered by the regulation.

The Evaluation of the MiniMed™ 780G System in Type 1 Adult and Pediatric Subjects Utilizing Insulin Fiasp® (CIP336) pivotal study (G210307) included 19 investigators. The Evaluation of the Advanced Hybrid Closed loop (AHCL) System in Type 1 Diabetes Utilizing Lyumjev® (CIP335) pivotal study (G220010) included 19 investigators.

The applicant has adequately disclosed the financial interest/arrangements with clinical investigators. Statistical analyses were conducted by FDA to determine whether the financial interests/arrangements had any impact on the clinical study outcome. The information provided does not raise any questions about the reliability of the data.

XII. SUMMARY OF SUPPLEMENTAL CLINICAL INFORMATION

Medtronic evaluated the *in-silico* glucose therapy outcomes for an insulin dependent type 1 diabetes virtual patient population using Medtronic Diabetes' simulation environment. Simulation studies were conducted with various setpoint (100 and 120 mg/dL) and active insulin time (AIT; 2 or 4 hours) combinations to enable the analysis of in-silico outcomes with various parameter settings. Equivalency between type 1 diabetes (T1D) virtual patients (VPs) and real patients (RPs) who used the MiniMed 780G system during CIP336 (G210307) and CIP335 (G220010) was demonstrated based on predetermined characteristics and outcomes for the AHCL algorithms and the Guardian 4 CGM.

For the equivalency studies, the model met predefined equivalence criteria for matching the RP population and produced outcomes consistent with clinical data for time in range (70-180 mg/dL), glycemic management indicator (GMI), and a number of other glucose metrics. While some differences were observed for certain settings/configurations, most comparisons between virtual patients and real patients fell within the ranges of the established equivalence bounds.

Additionally, in summary, the virtual clinical trial in T1D subjects predicted the safety and effectiveness of use of the AHCL version 5.3A (a component of pump SW version 6.41) and the G4S and Simplera Sync CGMs with Fiasp and Lyumjev insulins, when assessed according to the thresholds evaluated in CIP336 and CIP335, respectively. These combinations of AHCL algorithm, CGMs and Fiasp / Lyumjev insulin products has not previously been evaluated in clinical studies (the CIP336 and CIP335 study evaluated AHCL version 4.3). The same thresholds evaluated in CIP336 and CIP335 were exceeded with statistical significance, confirming non-inferiority for time in range and time below 70 mg/dL compared to the outcomes from previous pivotal HCL studies with rapid-acting insulins.

The *in-silico* studies, including equivalence and virtual clinical trial testing, support the expectation that use of the MiniMed 780G system with the updated AHCL algorithm utilizing Fiasp or Lyumjev and either the Simplera Sync or Guardian 4 CGM is safe and effective. Although the Simplera Sync sensor was used in the clinical study, *in-silico* testing indicates that the performance of the system with the Guardian 4 sensor and Guardian 4 transmitter, compared to the Simplera Sync sensor, is expected to be clinically equivalent.

XIII. PANEL MEETING RECOMMENDATION AND FDA'S POST-PANEL ACTION

In accordance with the provisions of section 515(c)(2) of the act as amended by the Safe Medical Devices Act of 1990, this PMA was not referred to the Clinical Chemistry and Clinical Toxicology Devices Panel, an FDA advisory committee, for review and recommendation because the information in the PMA substantially duplicates information previously reviewed by this panel.

XIV. CONCLUSIONS DRAWN FROM PRECLINICAL AND CLINICAL STUDIES

A. Effectiveness Conclusions

The results of the clinical studies performed to support this submission establish a reasonable assurance of effectiveness that the MiniMed 780G system, with either Simplera Sync or Guardian 4 sensor, can automatically adjust basal insulin rates and calculate and deliver auto correction boluses based on CGM values in pediatric (7-17) and adult (18-80) patients utilizing Fiasp or Lyumjev.

B. Safety Conclusions

An understanding of the risks of the device are based on nonclinical laboratory data as well as on data collected in the clinical studies conducted to support PMA approval that are described above.

The following events are possible adverse device effects of inserting a sensor into your skin: local infection, inflammation, pain or discomfort, bleeding at the glucose sensor insertion site, bruising, itching, scarring or skin discoloration, hematoma, tape irritation, sensor or needle fracture during insertion, wear or removal.

Potential device related non serious events include:

- Skin Irritation or redness
- Infection
- Pain or discomfort
- Bruising
- Edema
- Rash
- Bleeding
- Induration of skin
- Allergic reaction to adhesives
- Hyperglycemia following inadequate or suspension of insulin delivery (which can result from catheter occlusion, hardware or software malfunction, or erroneous CGM readings)

- Ketosis following inadequate or suspension of insulin delivery (which can result from catheter occlusion, hardware or software malfunction, or erroneous CGM readings)
- Hypoglycemia resulting from insulin over-delivery (which can result from catheter occlusion, hardware or software malfunction, or erroneous CGM readings)

Sensor breakage with fragments retained under the skin is a potential adverse event related to use of the CGM component of the system, but this was not observed during these studies. Based on post-market experience with similar devices and the results observed in these clinical studies, the occurrence and severity of these events do not raise major concerns.

Infection at the insulin pump infusion set insertion site and sensor insertion site is a potential complication related to insertion of the CGM, or the insulin pump infusion set. Based on post-market experience with similar devices, and the results observed in these clinical studies, the occurrence and severity of these events are not expected to be different from other approved infusion sets and CGM devices and so do not pose an unreasonable risk.

The CGM readings (together with blood glucose meter readings) are used by the system to determine automated insulin delivery, including insulin suspension and insulin dosing, and are the basis for alerts for hypoglycemia and hyperglycemia. The Guardian 4 Sensor readings are also to be used by the patient for tracking and trending, when in Manual Mode. While in manual mode, the Guardian 4 Sensor readings are intended to be used adjunctively (i.e., confirmatory blood glucose meter readings should be used for diabetes treatment decisions) for tracking and trending of blood sugars. The Simplera Sync sensor readings are also to be used by the patient to make therapy decisions, when in Manual Mode. While in manual mode, the Simplera Sync sensor readings are intended to be used adjunctively. Treatment decisions should be made based on the combination of SG reading and trend arrow information.

The consequences of a false positive (falsely high) glucose reading on the continuous glucose meter would be potential over-delivery of insulin via automated insulin delivery, which has the potential to lead to severe hypoglycemia or even death. The consequences of a false negative (falsely low) glucose reading on the continuous glucose meter would be potential under-delivery of insulin, which has the potential to lead to severe hyperglycemia or DKA.

A confirmatory blood glucose meter reading has the potential to mitigate some of the risk of falsely high or falsely low glucose sensor readings, as the patient could choose to override the settings of the system in some cases (i.e., decline to take additional bolus of insulin as recommended by the system in setting of falsely high continuous glucose reading or exit Auto Mode).

The results of the clinical studies support approval establish a reasonable assurance that the MiniMed 780G system is safe for its intended use.

C. Benefit-Risk Determination

Summary of Benefits

The MiniMed 780G System is intended for continuous delivery of basal insulin at selectable rates, and the administration of insulin boluses at selectable amounts for the management of type 1 diabetes mellitus in persons 7 years of age and older requiring insulin. The system is also intended to continuously monitor glucose values in the fluid under the skin. The MiniMed 780G system includes SmartGuard technology, which can be programmed to automatically adjust insulin delivery based on continuous glucose monitoring (CGM) sensor glucose (SG) values and can suspend delivery of insulin when the SG value falls below or is predicted to fall below predefined threshold values.

The MiniMed 780G system consists of the MiniMed 780G insulin pump, a compatible infusion set, a compatible reservoir, the Accu-Chek Guide Link Meter, and a compatible CGM: Guardian 4 Sensor with Guardian 4 Transmitter (Guardian 4 CGM); Simplera Sync Sensor. These compatible CGMs (Guardian 4 and Simplera Sync) allow for no confirmatory fingersticks being required for treatment.

The benefits of 780G system use include reduced risk of acute hypoglycemia and hyperglycemia as well as better overall glucose control, which may result in reduction in long-term diabetes complications. In addition, use of the autocorrection feature offers a benefit of reducing hyperglycemia due to meal carb underestimation or missed meal boluses. Moreover, the SmartGuard Mode features of the 780G system are designed to improve time-in-range, keep time above and below range as small as possible, and maintain patients in SmartGuard Mode longer. These features were designed based on observation of the performance of the 670G (a predecessor of the 780G) in over 9 million patient-days.

The clinical studies (CIP336 for Fiasp and CIP335 for Lyumjev) demonstrated that the MiniMed 780G system maintains its established safety and effectiveness profile when used with Fiasp or Lyumjev insulins. Both studies reported improved CGM metrics compared to baseline - time in range (70-180 mg/dL), and decreased HbA1c in adult populations, with maintained safety profiles. The Fiasp study showed significant HbA1c improvements in both pediatric (-0.2%) and adult (-0.4%) populations, while the Lyumjev study showed significant improvement in adults (-0.4%) with a non-significant trend in pediatrics (-0.1%).

The addition of Fiasp and Lyumjev provides patients and healthcare providers with additional insulin choices beyond currently approved rapid-acting insulins, offering potential benefits for post-meal glucose management.

Summary of Risks

The established risks from the MiniMed 780G system (P160017/S118) remain unchanged, including potential insulin over-delivery leading to hypoglycemia, potential insulin under-delivery leading to hyperglycemia or DKA, device malfunction risks, sensor accuracy limitations, and user error risks.

Additional Insulin-Specific Risks:

Lyumjev-Specific Risks:

- Higher incidence of insulin infusion reactions: 150 total reactions reported, 32 classified as adverse events
- 5 subjects (4.2% of pediatric cohort) exited study due to moderate or severe infusion site reactions
- Infusion site reactions include burning, redness, pain, or itching at injection sites

Fiasp-Specific Risks:

- Risk profile similar to established rapid-acting insulins with the 780G system
- Lower incidence of infusion site reactions compared to Lyumjev

Clinical Safety Profile:

- No device-related severe hypoglycemia events in either study
- No device-related diabetic ketoacidosis events in either study
- Severe hyperglycemia events (5 pediatric with Fiasp; 7 pediatric/1 adult with Lyumjev) determined to be non-device-related
- One illness-related DKA event with Fiasp, both non-device-related

Risk Mitigation Strategies:

When the 780G insulin pump is operating in SmartGuard Mode, the risks are mitigated by the AHCL algorithm safeguards that include: insulin limit (imposes insulin delivery upper limit to avoid over delivery, and auto-correction is limited to 8% of TDD); sensor calibration check; low/high glucose mandatory alerts; missed transmission alert when there are no SG values available; reduce meal bolus if hypoglycemia is predicted; and limitation of SG-based correction boluses when conditions are detected for an over-reading sensor.

Risk Mitigation for Newly Added Insulins:

- Appropriate patient selection considering history of infusion site sensitivity or reactions

- Healthcare provider education on recognition and management of insulin-specific adverse events
- Continued adherence to established training, labeling, and contraindication requirements

Patient Perspectives

Patient perspectives considered during the review included:

Patients want a variety of therapeutic options and devices that provide information and aid in management of their glucose control to inform decision maintaining with their health care providers on lifestyle changes and treatment decisions. Patients have also expressed in conversations with FDA staff, on social media outlets, and at patient centered public conferences that they want devices that provide features that enable automated insulin delivery and are willing to accept reasonable risks related to such devices. This information was gathered via email, during patient-oriented conferences, and face-to-face meetings with patients.

D. Overall Conclusions

The data in this application support the reasonable assurance of safety and effectiveness of this device when used in accordance with the indications for use.

XV. CDRH DECISION

CDRH issued an approval order on December 11, 2025.

The applicant's manufacturing facilities have been inspected and found to be in compliance with the device Quality System (QS) regulation (21 CFR 820).

XVI. APPROVAL SPECIFICATIONS

Directions for use: See device labeling.

Hazards to Health from Use of the Device: See Indications, Contraindications, Warnings, Precautions, and Adverse Events in the device labeling.

Post-approval Requirements and Restrictions: See approval order.

XVII. REFERENCES

None.