Technology Innovation Alert

Connected Insulin Delivery System

6 July–12 July, 2018

Interesting Innovation

Compliance with regulations
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**Highlights of the week**

**Active players of the week**
- Medtrum
- Abbott diabetes care

**Most filed jurisdiction**
- United states

**Start-ups**
- InnoMD

**Large companies**
- Tandem diabetic care
- Abbott diabetes care
- Novo Nordisk

**Small & Medium Enterprises**
- Medtrum
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**Highlights of the week**

*Patents protected under jurisdictions in this week*

United states

China
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Problems and its proposed solutions in this week

- Clinical variables (insulin sensitivity factor & carbohydrate factor) determined by manual method
  - Automating or partially automating determination of values for clinical variable by instructing the patient through a process of determination

- Difficulties in determination of carbohydrate content for each part of the meal
  - Compiling a database of meal records that does not comprise carbohydrate content of meal

- Presence of time delay and inaccuracy in artificial pancreas
  - Construction of an auto-regression model to describe the insulin concentration
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Problems and its proposed solutions in this week

- Measurement of concentration easily affected by patient actions for continuous glucose monitoring in interstitial fluid
- Detecting activity level of patient for motion compensation
- Inconvenience in keeping track of time when insulin was injected
- Unique design of insulin injecting device with a wearing module, detection module and administration module
Problems and its proposed solutions in this week

Integration of communication or software part within medical product requires renewed approval of entire product during updates

Medical and communication part are connected by predetermined protocol for data exchange and functionalities of each part are separated

Power management and shelf life in continuous or automatic monitoring of analytes

Determining when to activate an analyte alarm of a continuous analyte monitor
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### Highlights of the week

**DexPatent Findings – Areas of Innovation**

- Master-Slave
- PID algorithm
- Glycemic event
- Raman spectrum
- Alarm activation
- Power management
- Activity monitoring
- Closed-loop control
- Information exchange
- Needle-free injector
- Auto-regressive model
- Infusion dose control
- Communication Protocol

- Medical recommendation
- Classification of meals
- Insulin dose determination
- Insulin sensitivity factor
- Insulin dose recommendation
- Compliance with regulations
- Different modes of operation
- Blood glucose level detection
- Continuous glucose monitoring
- Insulin to carbohydrate ratio
- Meal-related analyte response
- Blood glucose trend prediction
- User guidance via infusion pump

July 06, 2018 to July 12, 2018
A method of determining clinical variables to control an infusion pump includes instructing a user on carbohydrate intake; obtaining amount of carbohydrate intake in current and subsequent meal from user; obtaining glucose level data before and after intake of carbohydrates from a CGM; and determining the amount of insulin dose to be infused.
A method of determining and administering insulin dose based on meal consumption information and glucose data. Meal consumed by user and insulin dose administered for that meal is stored in a database as meal record that does not contain a carbohydrate content and each meal record is classified as one of a plurality of menu items. Insulin doses are recommended based on meal selected by user in an electronic device.

Insulin dose recommendation
Classification of meals
Meal-related analyte response

Insulin dose control
A closed loop control method to control insulin pump comprises obtaining real-time measurements of blood glucose from CGM; calculating the estimated insulin concentration; predicting blood glucose trend variation using auto-regressive model; and calculating required amount of insulin infusion using PID controller.

Innovation Involves

✓ Closed-loop algorithm
✓ Auto-regressive model
✓ PID algorithm
✓ Blood glucose trend prediction
✓ Infusion volume determination

DexPatent Abstract

By Small & Medium Enterprises

Utility Area

Artificial Pancreas

Application
A closed-loop control method for artificial pancreas uses activity level of patient determined using a motion sensor to adjust a correlation algorithm and switch the mode of operation of the artificial pancreas.

**Innovation Involves**

- Closed-loop control
- Activity monitoring
- Different modes of operation
- Dynamic blood glucose monitoring

**By Small & Medium Enterprises**

**Utility Area**

**Artificial Pancreas**

**Application**
An insulin injection device comprises a wearable module, detection module and dose administration module. The detection module monitors blood glucose level using a Raman spectrum and determines the amount of insulin to be administered. The dose administration module administers corresponding doses of insulin. The construction of the three modules are characterized.

- Blood glucose level detection
- Raman spectrum
- Needle-free injector
- Insulin dose determination
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**DexPatent Abstract**

A method of communicating medical data information (e.g. glucose value) of an integrated medical device having medical and communication part connected via physical interfaces. The medical part includes continuous body fluid monitoring & drug administration apparatus and exchanges data with communication part according to a predetermined protocol, where medical and communication part act as master and slave.

**Innovation Involves**

- Communication Protocol
- Approval of medical products
- Information exchange
- Master-Slave

**By Company**

![novo nordisk]

**Utility Area**

Medical information Exchange

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July 06, 2018 to July 12, 2018
A method of determining when to activate an analyte-related alarm (e.g. glucose) includes receiving analyte concentration from analyte sensor; determining a best-estimate; checking whether user analyte concentration and best-estimate are in agreement and accordingly implementing an alarm.

Innovation Involves:
- Medical recommendation
- Alarm activation
- Continuous glucose Monitor
- Power management
- Glycemic event

By Company: Abbott Diabetes Care

Utility Area: Alarm Prevention Mechanism

Application: Patent Family Count 4
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Contact: 
Manohar Jha 
mano@dexpatent.com 
+91 822 000 7279

US|3422 Old Capitol Trail | Suite 15| Wilmington,DE 19808| Tel: +1 (302) 747 – 5836 
India|6, Alexandria Road|Trichy - 620 001| (M): +91 994 495 2855 / +91 822 000 7279