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Final Report

Diabetes – Insulin – Care
## Patent and Technology Landscape

8.12.2017

ARTIFICIAL INTELLIGENCE
Powered Innovation

Executive Summary - 1

- Overall patenting in Diabetes – Care Wellness space is increasing

- Technologal change is very rapid and intense. Diagnostic technologies are merged with computer and software technologies.

- Range of smaller emerging technologies and business domains are visible (AI, early diagnosis, predictive care)

- Old and new firms compete intensely. The industry patents are applied for by a wide range of companies, old and new, large and startups

- Patents are increasingly important for new business and growth areas

Records By Publication Year
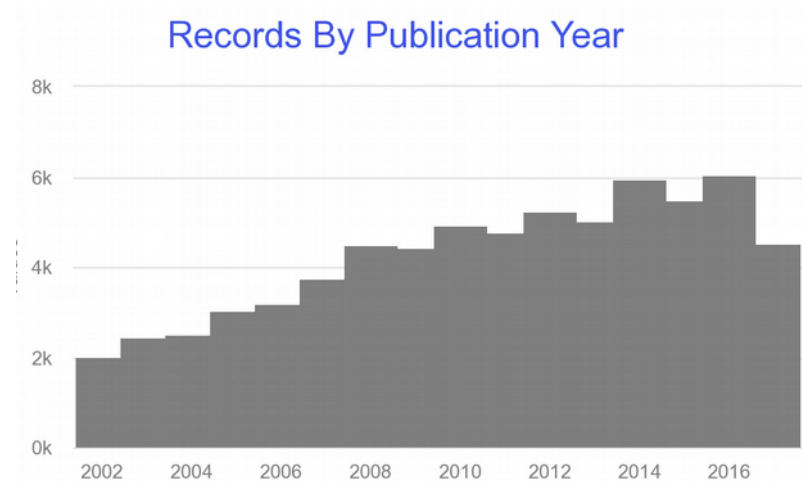
Total patenting in THE FINAL PATENT LANDSCAPE is about 6 000 annual new patents in 2017

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Executive Summary - 2

- **Growth Areas** are specific, small and emerging. They include:

  - **AI and Machine Learning for Diabetes.** This group involves much "wearable" type of inventions.

  - **Early Detection of Diabetes.** This includes also a range of "life style" related solutions.

  - **Solutions for type 2- Diabetes.** This group includes medical diagnosis and treatment inventions, but increasingly also "life style" related solutions.

- *Competition* is focussed on highly specialized technology and business segments.

- In contrast, **competition in established or old technology areas is markedly slow** or declining.

Patents By Publication Year
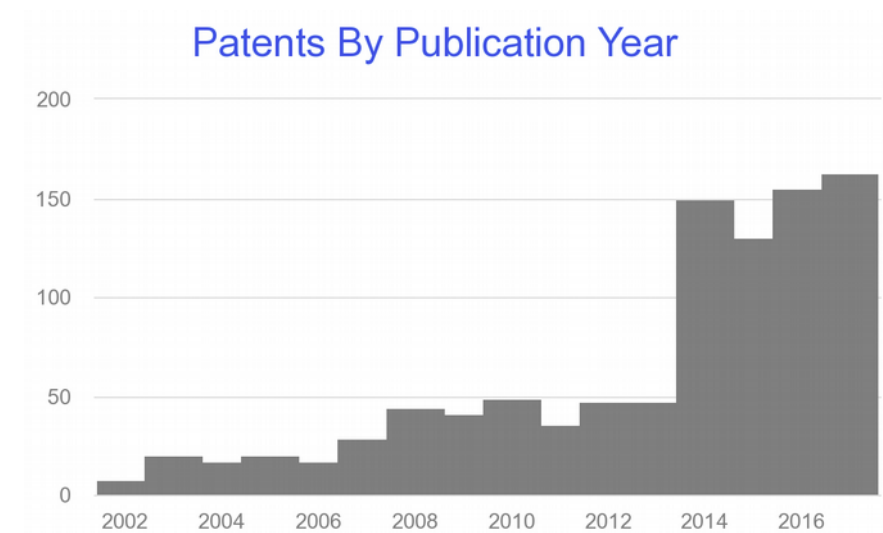
Rapid rise of patenting in AI and Machine Learning Diabetes Solution.

Predictive and intelligent wellness monitoring is a rapid growth area.

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Executive Summary - 4

- **Within established technology and business areas,** large incumbent firms have cemented their positions with very large patent portfolios.

- **In emerging technology and business domains** new and small firms have potential to capture industry leadership.

- **The balance between large-incumbent firms vs new-starups** is different depending on the pace of technology innovation in the business domain.

Top 10 Assignees
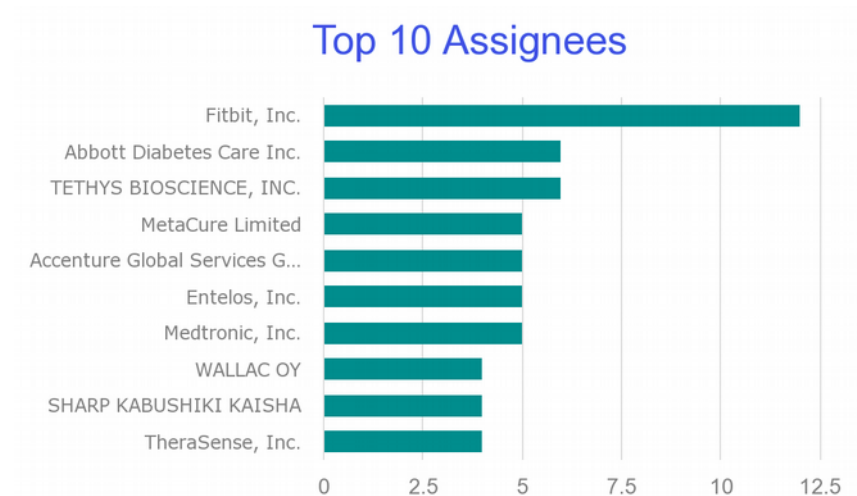
FITBIC INC, an industry outsider and wearable start-up, is the leading inventor for solutions to identify pre-diabetic conditions.

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Executive Summary - 5

- **Patenting is declining by large firms,** in general.

- This, together with **clearly emerging new technology areas,** suggests that large firms are trying to adapt to the new competitive landscape.

- **The role of small, innovative and, focussed firms is likely to be strengthened in the near future.**

- **An example is the Roche Group.**
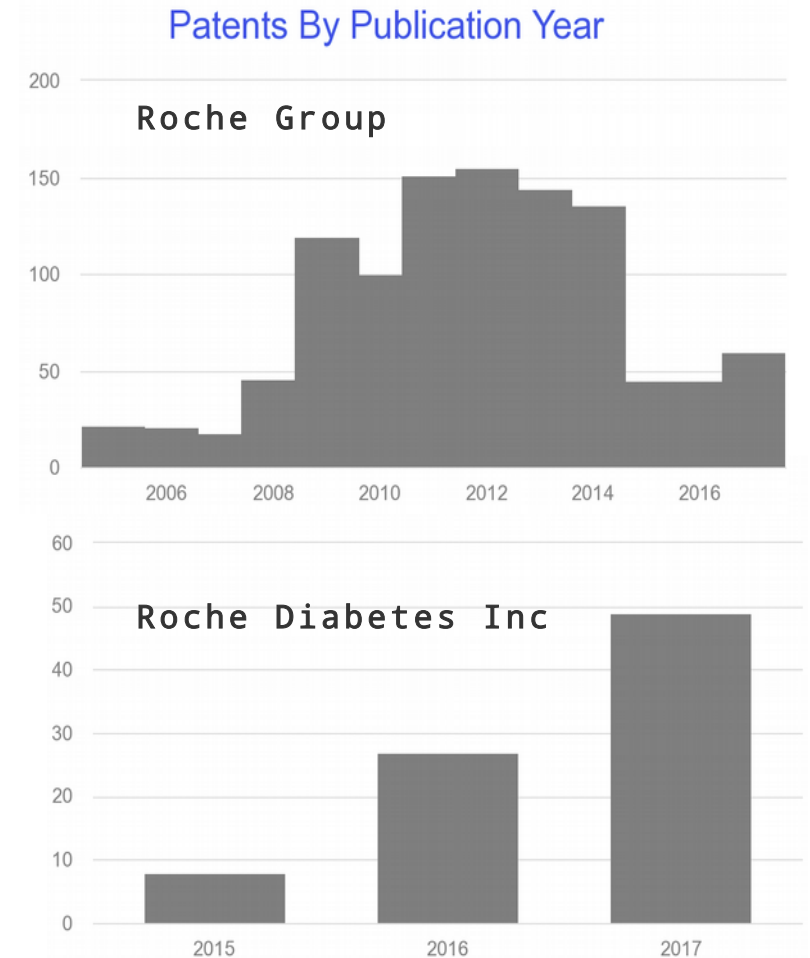
Diabetes patenting by Roche Group is declining, but Roche Diabetes shows strong increase in patenting emerging technologies

Executive Summary - 6

- M&A and venturing activity by large firms will increase in the near term.

- Digitalization is driving this trend

- This will impact technology and start-up strategies, as well as available VC funding.

- The trend is likely to continue for the next 2-4 years

mySugr joins the Roche Family

JUNE 30, 2017 BY

This is a momentous day for any startup, but for a team on a mission it's even greater. Today we're proud to announce that we're joining the Roche family to help create an open digital diabetes ecosystem that revolves entirely around people with diabetes.

New Abbott diabetes deal is a "missed opportunity" for DexCom

By ARUNDHATI PARMAR

1 Comment / Jul 13, 2017 at 1:52 PM

DexCom is the unrivaled king of the CGM market especially as it relates to various artificial pancreas development efforts.

A new deal between Abbott and startup Bigfoot Medical may be the beginnings of future competition for the San Diego CGM maker.

Abbott Laboratories announced Thursday that it is teaming up with Milpitas, California-based Bigfoot to develop diabetes management systems that would integrate Abbott's FreeStyle Libre glucose sensing technology with Bigfoot's insulin delivery solutions in the United States. Terms of the deal weren't disclosed

Executive Summary - 7

- **Key technologies in Diabetes Care are undergoing rapid change.** Large firms have cemented their leadership in old technologies, but face tough competition by startups in novel areas, such as AI / Machine Learning / Wearables / Life Style / Pre-diabetes solutions.

- Patenting is driven by **increasing inventive effort** in **specialized technology areas**

- **Successful and innovative companies must demonstrate ability to exploit emerging innovation frontiers.** Old technology areas are slow in their dynamics, indicating low future potential.

Roche Acquires Digital Diabetes Tech Startup

Mon, 07/03/2017 - 10:55am   1 Comment   by Ryan Bushey - Digital Editor -   @R_Bushey

Johnson & Johnson's LifeScan Sued By Decision Diagnostics Over Glucose Test Strip Patents

Published: Mar 17, 2016

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TEQMINE APPROACH

STAGE 1
12 million USPTO / EPO / PCT patents text-mined for *"diabetes"* OR *"insulin"* in patent full-text. Data 1.1.1990-31.9.2017 (USPTO) and 1978-31.9.2017 PCT/EPO. **Records: 395,363**

STAGE 2
Records classified into **10 technology and business areas** with TEQMINE AI solution.
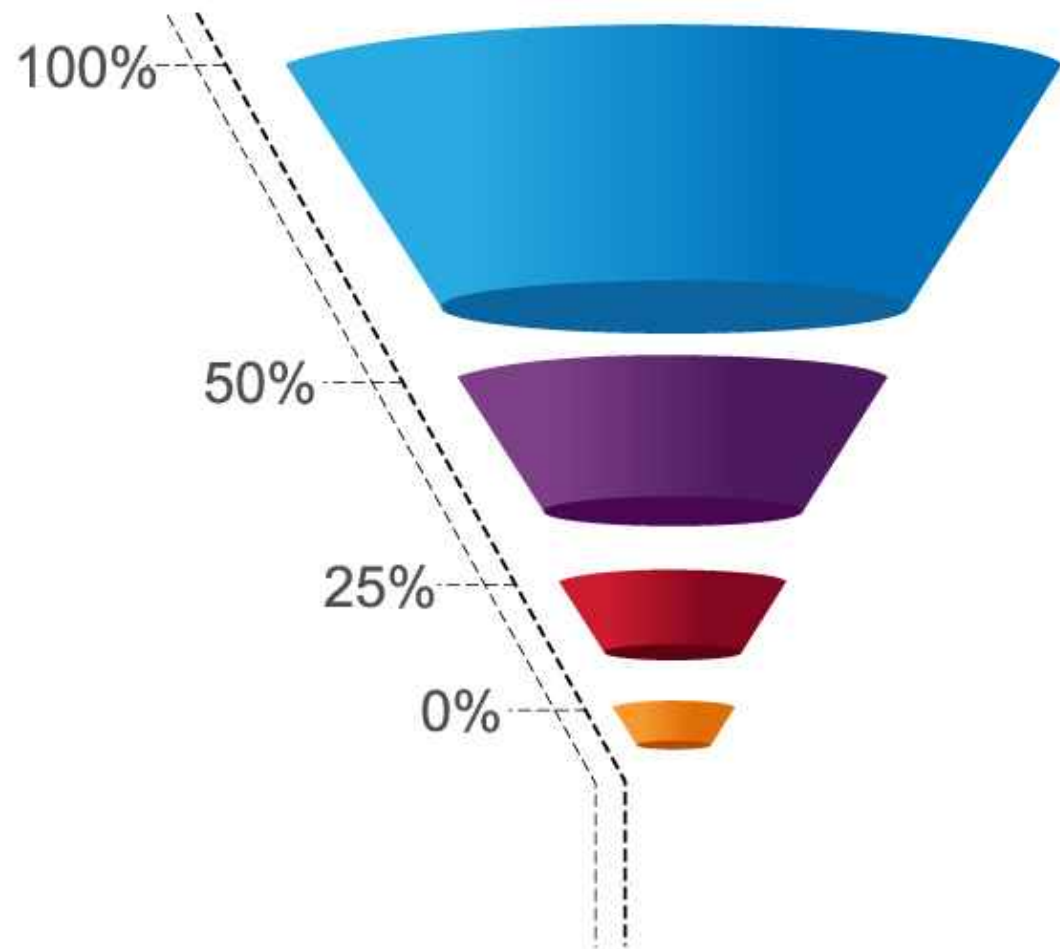
STAGE 3
Topic 3 identified as high-priority area. Select all patents < 0.30 weight for Topic 3. **Records=73,695**

STAGE 4
Records classified into 15 Topic Areas.
High accuracy identification of Client interest areas.

Network visualization of patent landscape and final analysis.

Online-Results and Tools

100%

50%

25%

0%

EVALUATING QUALITY Round 1

Method, system and computer readable medium for assessing actionable glycemic risk

Abstract

A system, method and non-transient computer readable medium for assessing the opportunity to address either hyperglycemic or hypoglycemic risk (or both) in patients with diabetes based on historical continuous glucose monitoring (CGM) data.

Classifications

A61B5/7275 Determining trends in physiological measurement data; Predicting development of a medical condition based on physiological measurements, e.g. determining a risk factor

View 5 more classifications

WO2016133879A1
WO Application

🔍 Find Prior Art

Application number: PCT/US2016/018027

Other languages: French

Inventor: Stephen D. Patek

Original Assignee: University Of Virginia Patent Foundation

Management method and system for implementation, execution, data collection, and data analysis of a structured collection procedure which runs on a collection device

Abstract

Methods for performing a structured collection procedure by utilizing a collection device are disclosed herein, in which a collection procedure is initiated for performing one or more data collections for one or more data event instances occurring according to a schedule of events. Each data event instances comprises a data collection pertaining to a biomarker to be performed according to one or more conditions of an adherence criterion. Each data event instance is determined to be successful or unsuccessful on the basis of actual performance of the data collection and meeting certain conditions of the predetermined adherence criteria for the data event instance. Contextual information for successful data collections is generated and a data file generated for storing records relating to successful data collections. For unsuccessful data event instances, substitute data relating to data collections performed separately from the collection procedure are included in the data file records for the collection procedure if the substitute data is determined to meet conditions of the predetermined adherence criterion for the corresponding data event instance.

Images (35)

US20140365534A1
US Application

📄 Download PDF   🔍 Find Prior Art

Legal status: Pending
Application number: US14469221

Inventor: Steven A. Bousamra , Abhishek Soni
Current Assignee: Roche Diabetes Care Inc
Original Assignee: Roche Diagnostics Operations Inc

Priority date: 2008-12-23
Filing date: 2014-08-26
Publication date: 2014-12-11

EVALUATING QUALITY Round 1

```
14469221, Management method and system for implementation, execution, data collection,
         and data analysis of a structured collection procedure which runs on a
         collection device, Roche Diagnostics, 2014
WO2012089318A1, Methods of selecting diabetes therapy regimens, Roche Diabetes, 2012
WO2016133879A1, Method, system and computer readable medium for assessing actionable
         glycemic risk, U Virginia, 2016
15063893, Method and system for recommending a set of insuling dosages for a patient,
         Quattro Folia Oy, 2017
```

- All high relevance patents score *very* high in TOPIC 3

- TOPIC 3 chosen as priority. 205,578 records have received weith in Topic 3.

- All patents with weight >= 0.25 in Topic 3 chosen for round 2.

- Total records = 73,695

doc_number_1	topic	weight
14469221	3	0.936508356376
14469221	7	0.0433857135235
14469221	8	0.0190862155859
15063893	3	0.878024052943
15063893	7	0.11828663196
WO2012089318A1	3	0.845680813128
WO2012089318A1	7	0.143484636468
WO2016133879A1	3	0.753415166641
WO2016133879A1	7	0.142952058805
WO2016133879A1	8	0.0729265449237
WO2016133879A1	10	0.0182467011325

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EVALUATING QUALITY Round 2

doc_number_1	topic	weight
14469221	3	0.121816136539
14469221	5	0.197535887831
14469221	9	0.0629149546361
14469221	10	0.61222862918
15063893	3	0.206242553891
15063893	5	0.212584925376
15063893	9	0.151032524941
15063893	10	0.394466895351
15063893	12	0.0303218762795
WO2012089318	3	0.125676407303
WO2012089318	5	0.209781186736
WO2012089318	9	0.0317595709613
WO2012089318	10	0.620224259817
WO2016133879	3	0.24565231755
WO2016133879	4	0.0347372618494
WO2016133879	5	0.191988894743
WO2016133879	9	0.0632224949611
WO2016133879	10	0.282114183257
WO2016133879	12	0.170633341513

- High-Relevance Topic Areas

  – Topic 10

  – Topic 5

- Very similar Topic profiles

14469221, Management method and system for implementation, execution, data collection, and data analysis of a structured collection procedure which runs on a collection device, Roche Diagnostics, 2014

WO2012089318A1, Methods of selecting diabetes therapy regimens, Roche Diabetes, 2012

WO2016133879A1, Method, system and computer readable medium for assessing actionable glycemic risk, U Virginia, 2016

15063893, Method and system for recommending a set of insuling dosages for a patient, Quattro Folia Oy, 2017
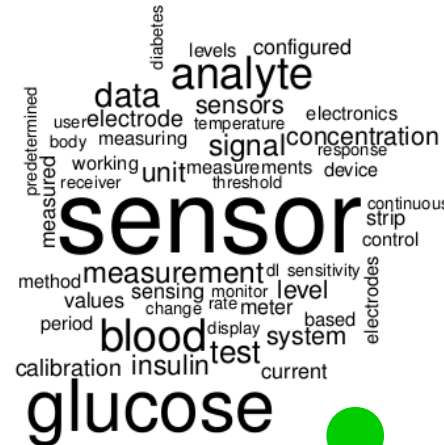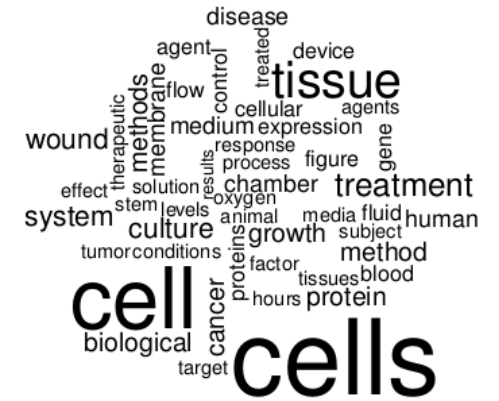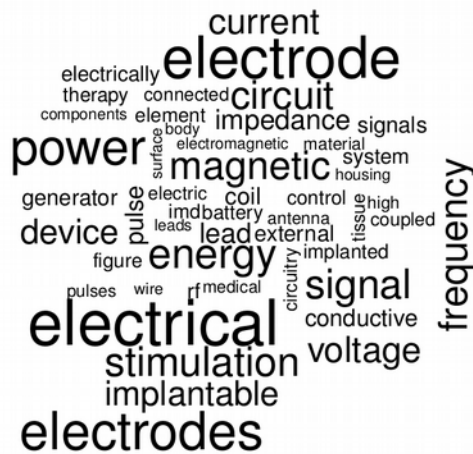
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TEQMINE Created 15 Topic Areas
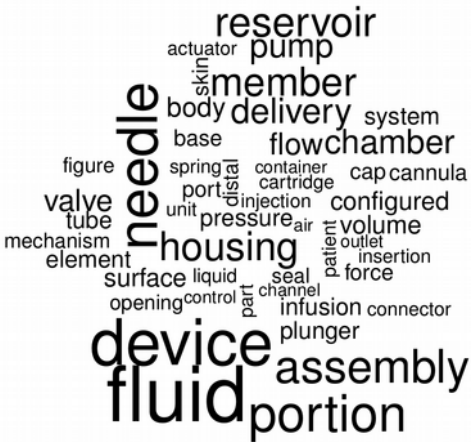
Topic 1

Topic 2

Topic 3

Topic 4

Topic 5

Topic 6

Topic 7

Topic 8

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TEQMINE Created 15 Topic Areas

Topic 9

Topic 10

Topic 11

Topic 12

Topic 13

Topic 14

Topic 15

● High Client Interest Area Topic

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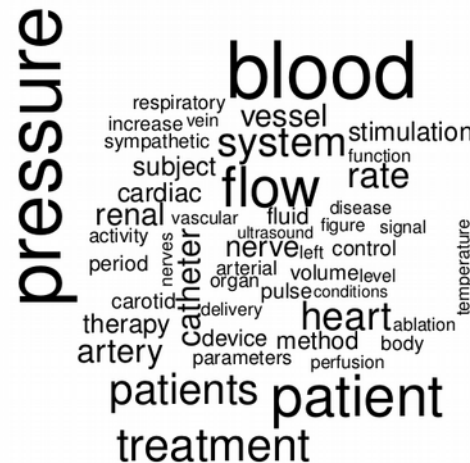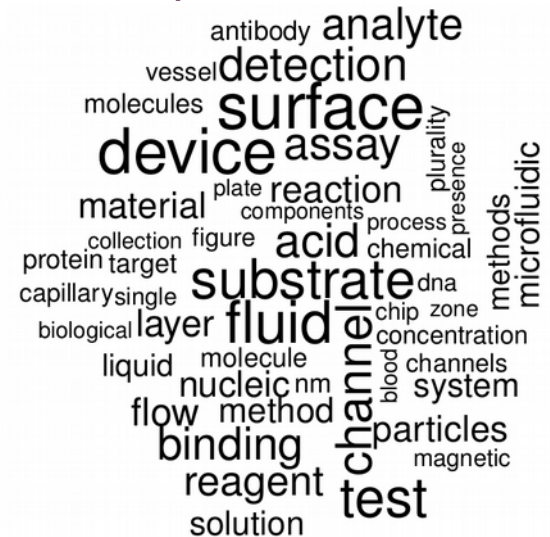
High Priority Topic Areas

Topic 3

Topic 5

Topic 10

🔵 **Topic 3:** Sensor – Measuring - Data – Glucose – Insuling - Blood

🟡 **Topic 5:** Medical - Device – Data – Communication – User – Wireless - interface

🟣 **Topic 10:** Patient – Health – Information – User – Data – Healthcare – Software - Database

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Total Patenting – Diabetes Map
2002-2017 (september)

Records By Publication Year

- C.a. **6000 patents / year** and sligthly increasing patenting in the technology area

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Topic Size by Patenting
Diabetes
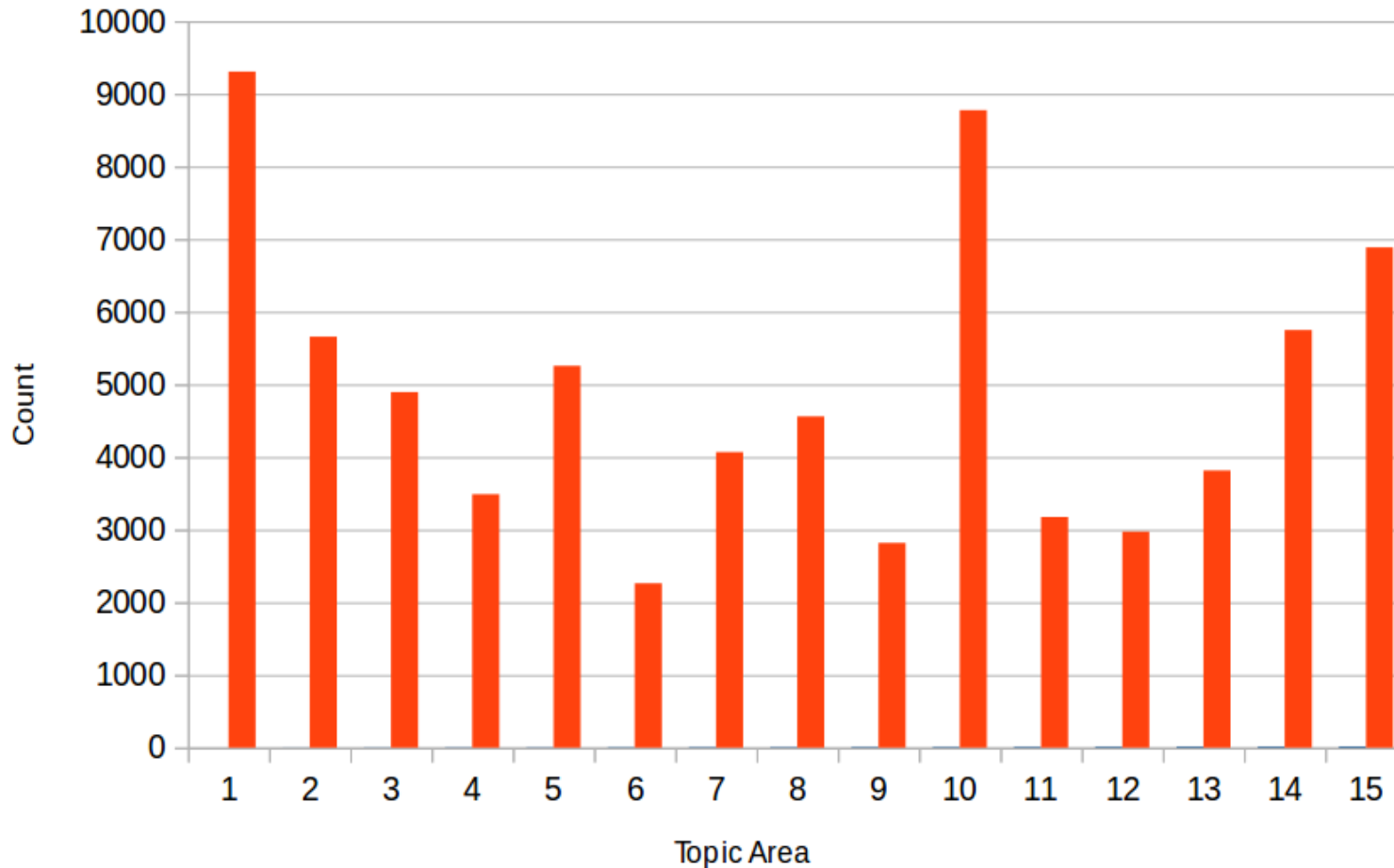
- Topic 1 and 2 are largest

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Total Patenting – Diabetes Map
2002-2017 (september)
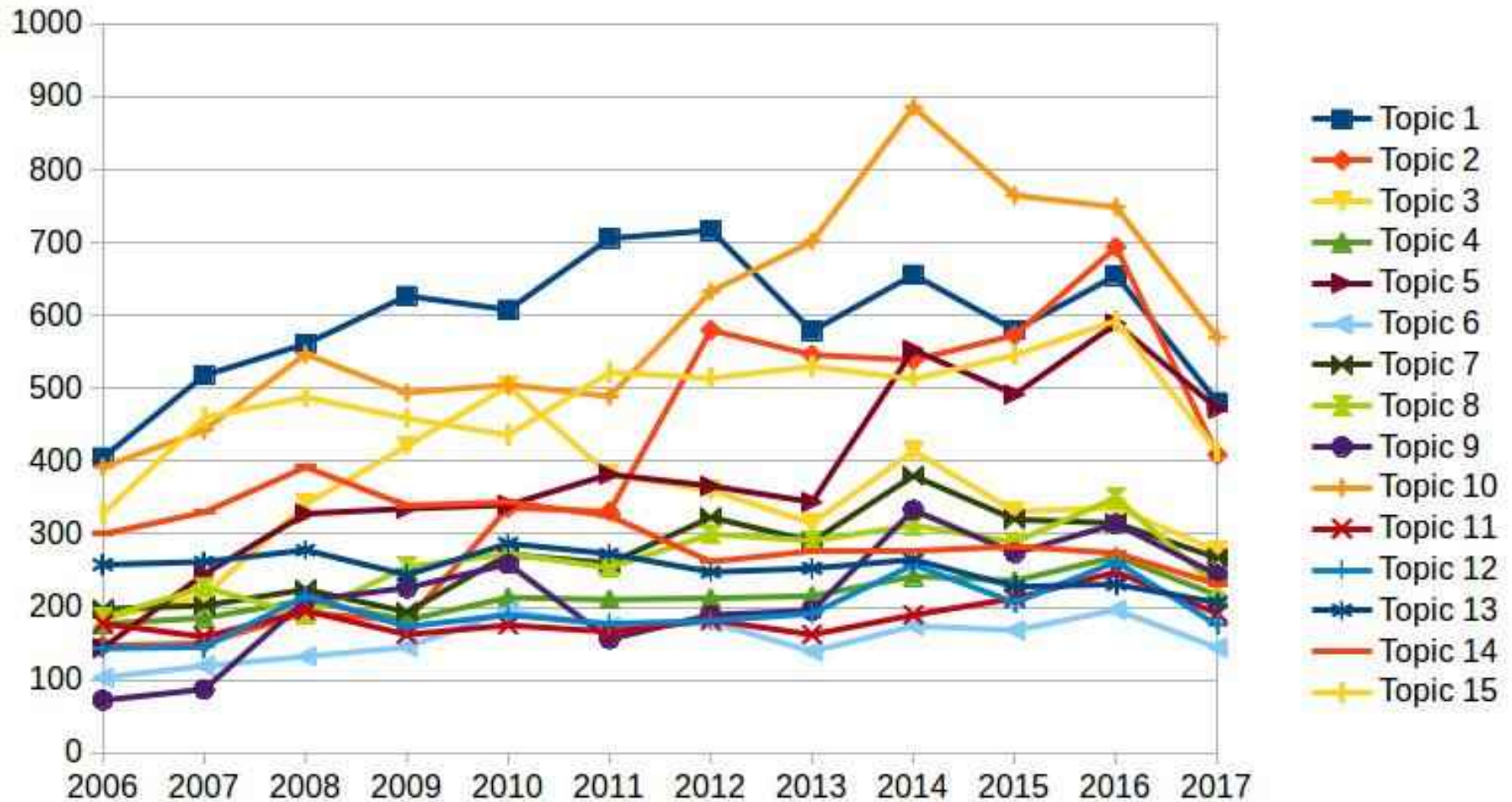
- **Topic 10** is a major growth area
- **Topic 5** is recent major growth area

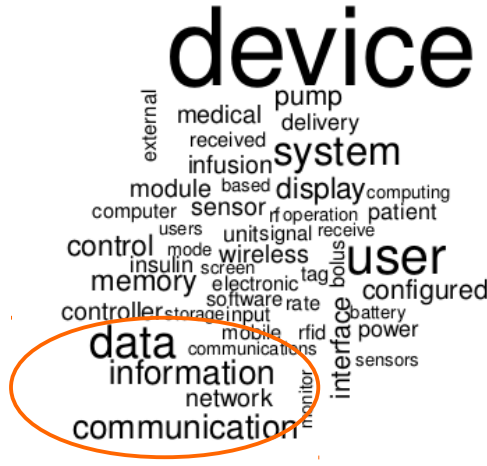TEQMINE®

Total Patenting – Diabetes Map
Priority Topic Areas 2002-2017 (september)
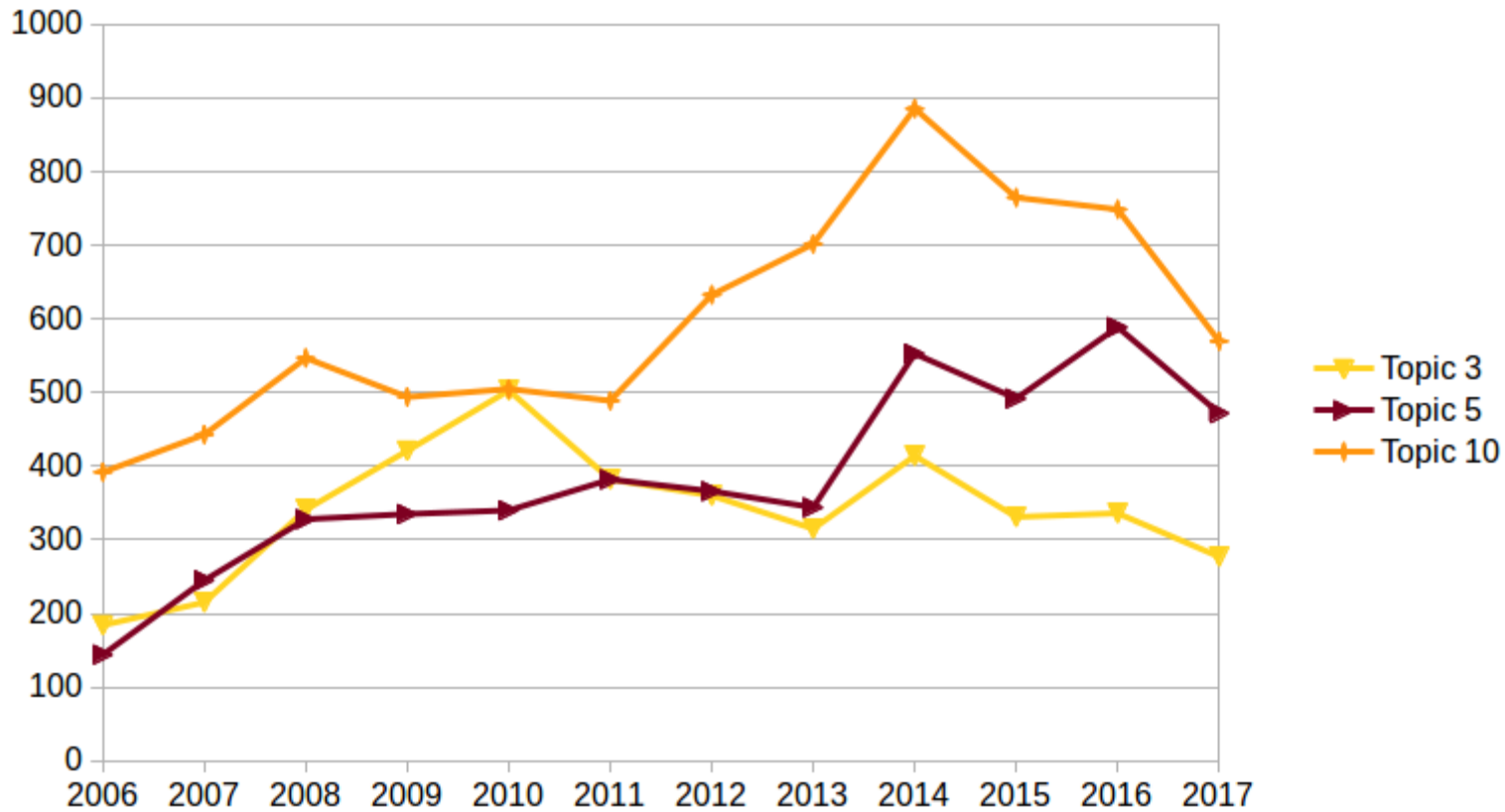
Topic 3
Topic 5
Topic 10

Topic 3: Sensor – Measuring - Data – Glucose – Insuling - Blood

Topic 5: Medical - Device – Data – Communication – User – Wireless - interface

Topic 10: Patient – Health – Information – User – Data – Healthcare – Software - Database

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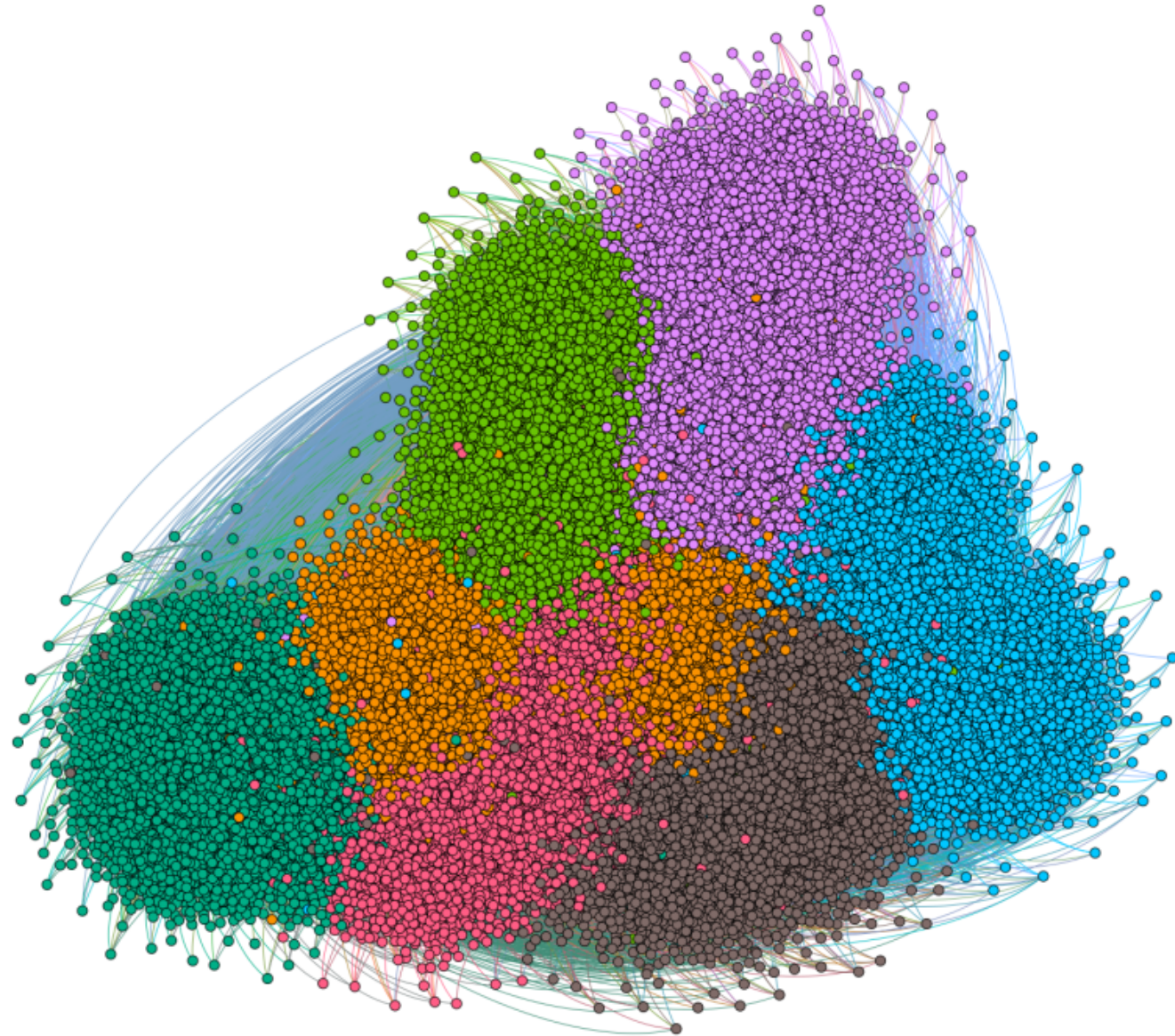
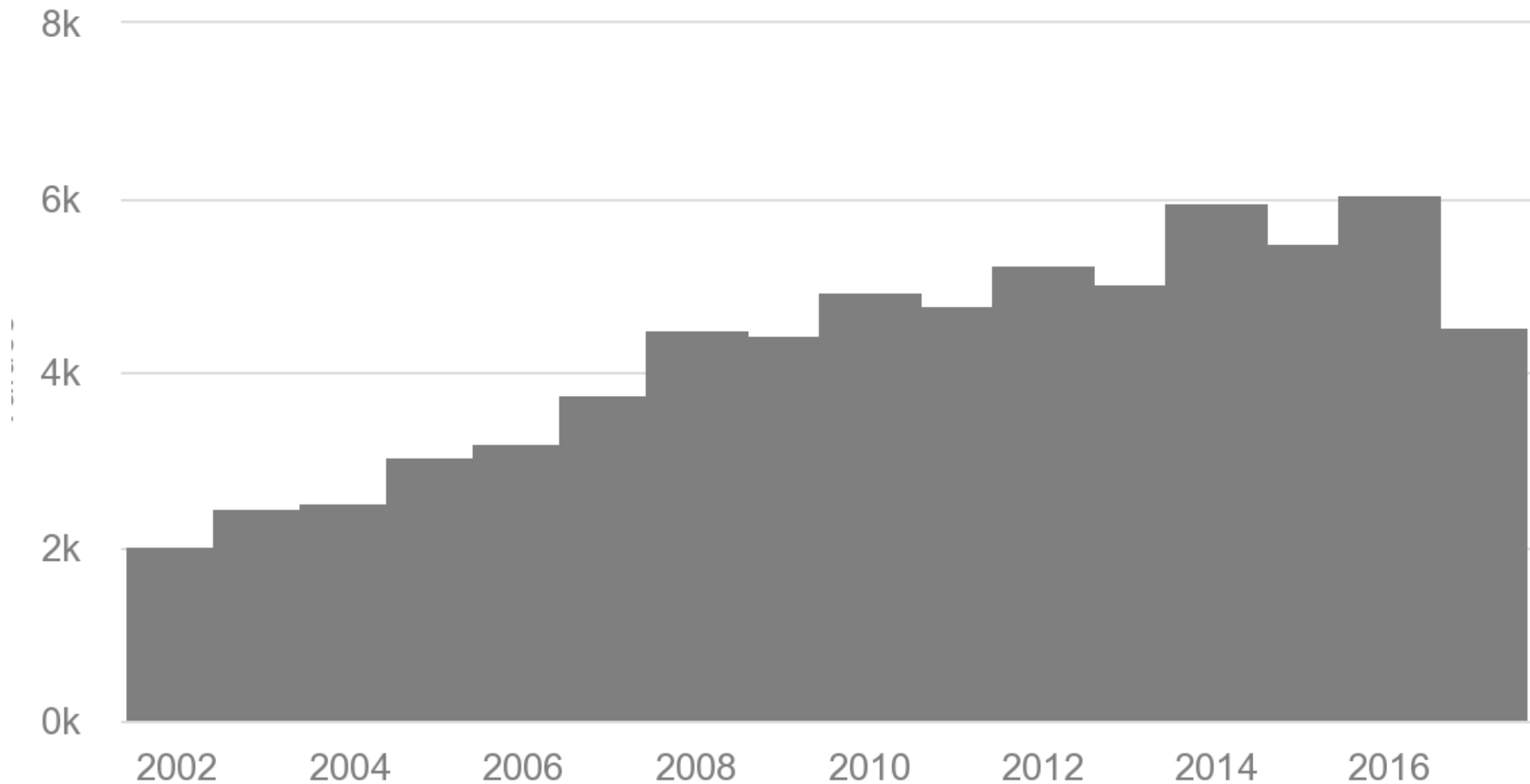# Diabetes Patent Map

Diabetes Patent Map

Priority Topic Areas in Detail

Topic 3: Sensor – Measuring - Data – Glucose – Insuling - Blood

Topic 5: Medical - Device – Data – Communication – User – Wireless - interface

Topic 10: Patient – Health – Information – User – Data – Healthcare – Software - Database

Topic 3 in Detail
Patenting activity and leading firms

- High growtn 2005-2010, but currently stabilized.
- Average patenting 300 / year
- Leading inventors are large medical equipment and healthcare firms specialized in Diabetes care, e.g. DexCom, Akray, Medtronic, etc.
- Univ of Virginia holds significant patent portfolio
- Leading firms have very sizable patent portfolios > 100 patents
- Inventors concentrated in the US, GP, JP, IL, DE, KR, CH.

Records By Publication Year
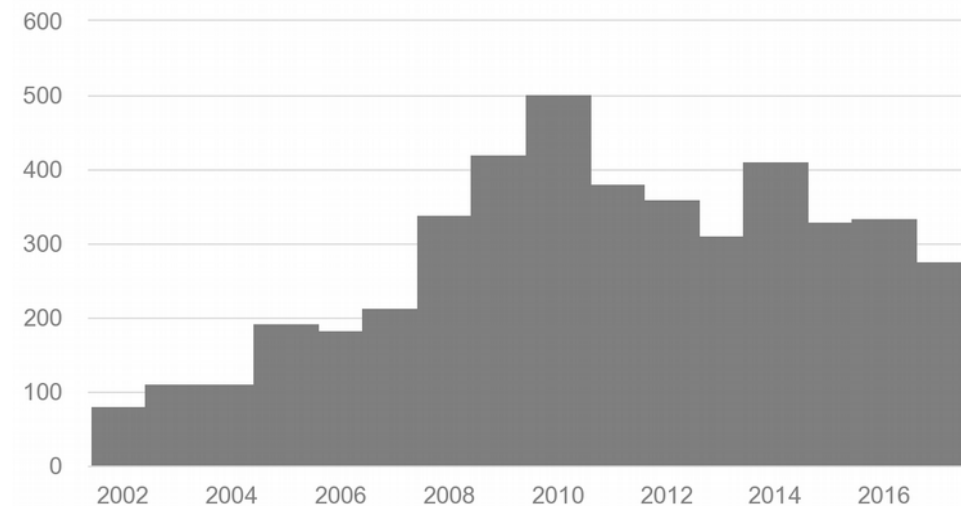
Top 10 Countries By Inventors
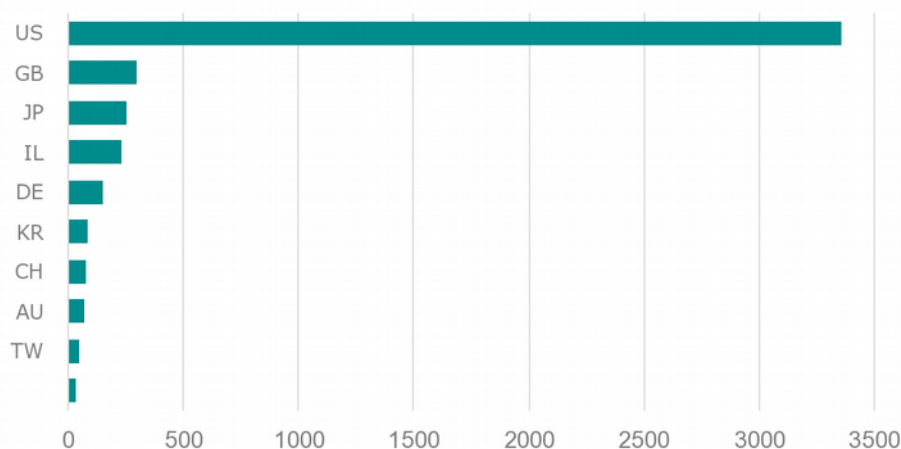
Top 15 Assignees
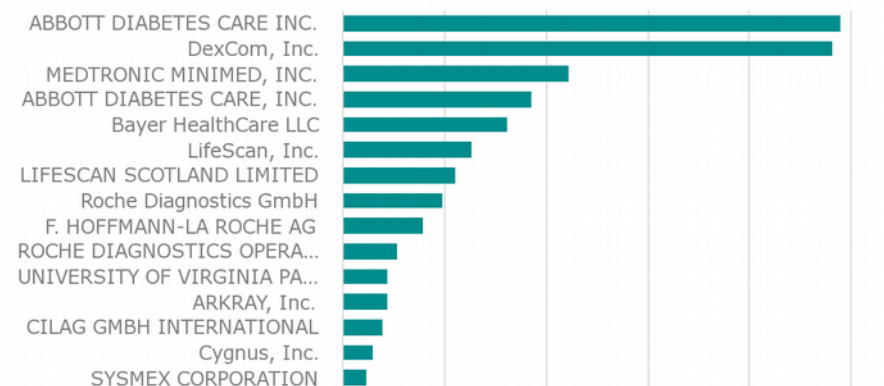
Topic 3 in Detail
IPC focus

- **A61B 5/00** Measuring for diagnostic purposes
- **A61B 5/145 Measuring characteristics of blood in vivo,** e.g. gas concentration, pH-value
- **G06F 19/00 Digital computing or data processing equipment or methods,** specially adapted for specific applications
- **G01N 27/00** Investigating or analysing materials by the use of electric, electro-chemical, or magnetic means
- **A61M** DEVICES FOR INTRODUCING MEDIA INTO, OR ONTO, THE BODY

Top 10 IPC Classes

IPC Class	Value
A61B5/145	~980
A61B5/00	~810
G06F19/00	~360
A61B 5/00	~330
G01N27/327	~300
A61B5/1495	~220
A61B5/1486	~215
G01N33/487	~215
A61M5/172	~180
A61B5/05	~170

Topic 5 in Detail
Patenting activity and leading firms

device pump medical delivery external received system infusion module based display computing computer sensor rf operation patient control mode wireless users unit signal receive insulin screen tag bolus user memory electronic configured controller storage input battery data mobile rfid power information communications sensors communication network monitor interface

- High growth in inventive and patenting effort, expect around 600 / year
- Leading inventors are large medical equipment and healthcare firms specialized in Diabetes care, but include also Samsung
- Leading firms have very sizable patent portfolios > 100 patents
- Inventors concentrated in the US, DE, GB, CH.
- Finland among top 15 countries

Records By Publication Year

Top 15 Countries By Inventors

US, DE, GB, CH, IL, DK, JP, KR, NL, SE, CA, AU, FR, FI

Top 15 Assignees

MEDTRONIC MINIMED, INC.
ABBOTT DIABETES CARE INC.
ROCHE DIAGNOSTICS GMBH
F. HOFFMANN-LA ROCHE AG
MEDTRONIC, INC.
ROCHE DIAGNOSTICS OPERA...
NOVO Nordisk A/S
Asante Solutions, Inc.
ALIPHCOM
Abbott Diabetes Care, Inc.
F.Hoffmann-La Roche AG
Apple Inc.
SAMSUNG ELECTRONICS CO....
SANOFI-AVENTIS DEUTSCHL...
TANDEM DIABETES CARE, INC.

Topic 5 in Detail
IPC focus

- **A61B 5/00** Measuring for diagnostic purposes
- **A61B 5/145 Measuring characteristics of blood in vivo,** e.g. gas concentration, pH-value
- **G06F 19/00 Digital computing or data processing equipment or methods,** specially adapted for specific applications
- **G01N 27/00** Investigating or analysing materials by the use of electric, electro-chemical, or magnetic means
- **G06Q 50/00** Systems or methods specially adapted for a specific business sector, e.g. utilities or tourism
- **G08B 23/00** Alarms responsive to unspecified undesired or abnormal conditions
- **A61M** DEVICES FOR INTRODUCING MEDIA INTO, OR ONTO, THE BODY

Top 15 IPC Classes

IPC Class
A61B5/00
G06F19/00
A61B5/145
A61M5/142
A61M5/172
G06F 19/00
A61B 5/00
A61M5/168
A61M 5/142
G06Q50/00
A61B5/11
G08B23/00
H04W4/00
A61B5/0205
H04L29/06

No. of Patents (x-axis: 0, 100, 200, 300, 400, 500, 600, 700)

Topic 5 in Detail
Example Patent

device
external medical pump delivery
received system
infusion
module based display computing
computer sensor rf operation patient
control users unit signal receive
insulin mode wireless bolus user
memory electronic tag configured
controller storage input rate battery
data mobile rfid power
communications sensors
information interface monitor
network
communication

Secure pairing of ehealth devices and authentication of data using a gateway device having secured a

Abstract

A gateway device, method for operating the gateway device, and system are presented for securely obtaining health information from a personal medical device. The method comprises receiving a gateway application from a relying system, storing the gateway application, executing the gateway application. The executing the gateway application comprises establishing first secure communication with the personal medical device, establishing second secure communication with the relying system, receiving information from the personal medical device via the first secure communication, transmitting the information to the relying system via the second secure communication.

Images (4)

EP3133514A1
EP Application

📄 Download PDF   🔍 Find Prior Art

Legal status: Pending

Application number: EP20160169255

Other languages: German , French

Inventor: Sanjeev Verma

Current Assignee: Samsung Electronics Co Ltd

The PMDs 104 may be sensors for reporting on the heart rate, blood pressure, blood sugar level, or other measurable characteristic of a user's body. The PMDs 104 may also be actuators for dispensing insulin, electrical stimulation, or other therapeutic action. A PMD may also be referred to as an eHealth device. A PMD may include a health sensor/actuator application that uses a sensor/actuator driver, a hardware security module, and a communication module to provide its functionality in cooperation with an external device. A PMD typically has little or no direct user interface functionality, relying, instead on the external device for such functionality.

Topic 10 in Detail
Patenting activity and leading firms

- High growth in recent years, but has stabilized

- Expect around 600 patents / year

- Leading inventors are established software firms, large medical equipment and healthcare firms, as well as known patent trolls

- Leading firms have mid-size patent portfolios > 50 patents

- Inventors concentrated in the US, JP, CA, GB, DE, IL, NL

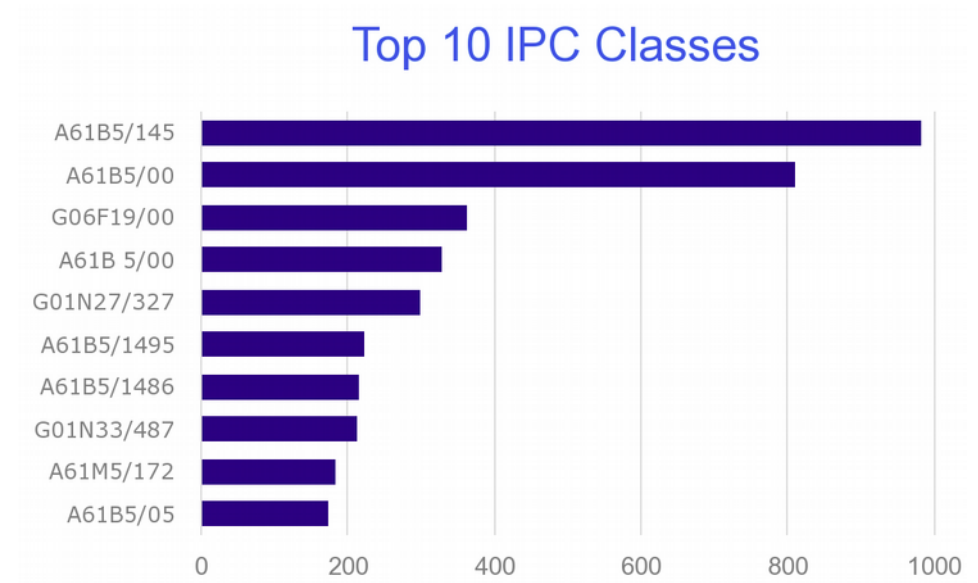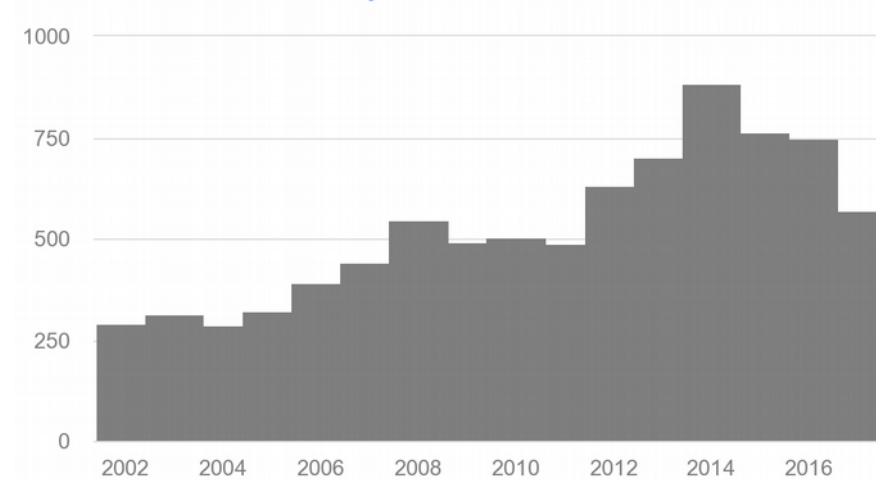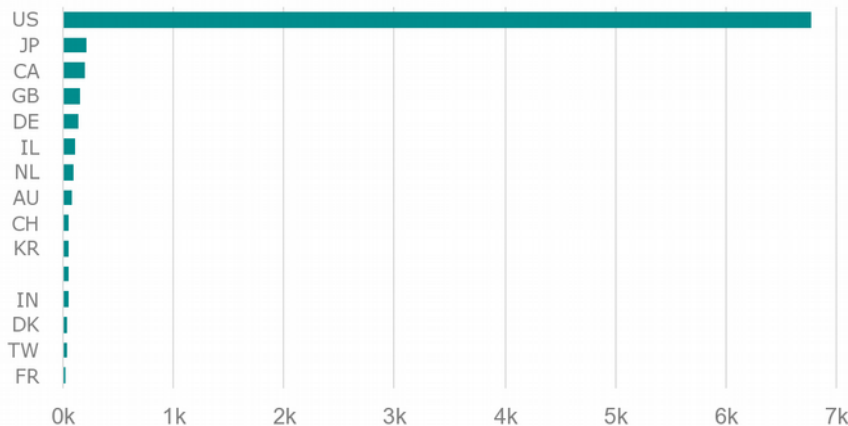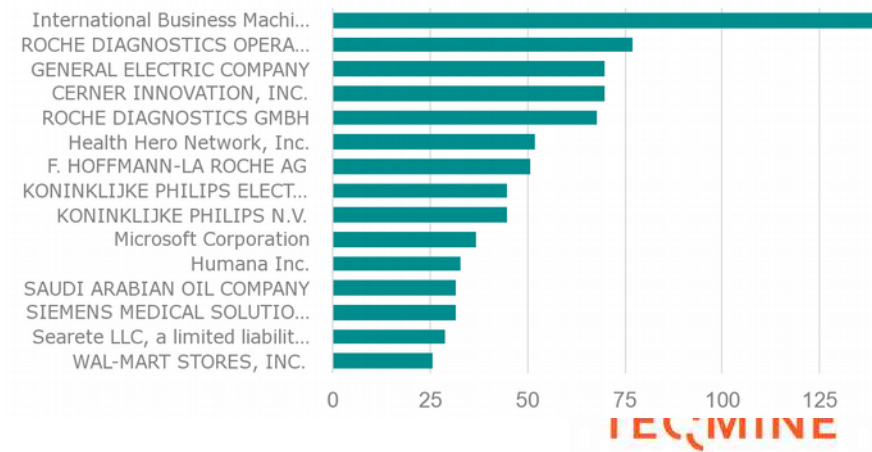Records By Publication Year

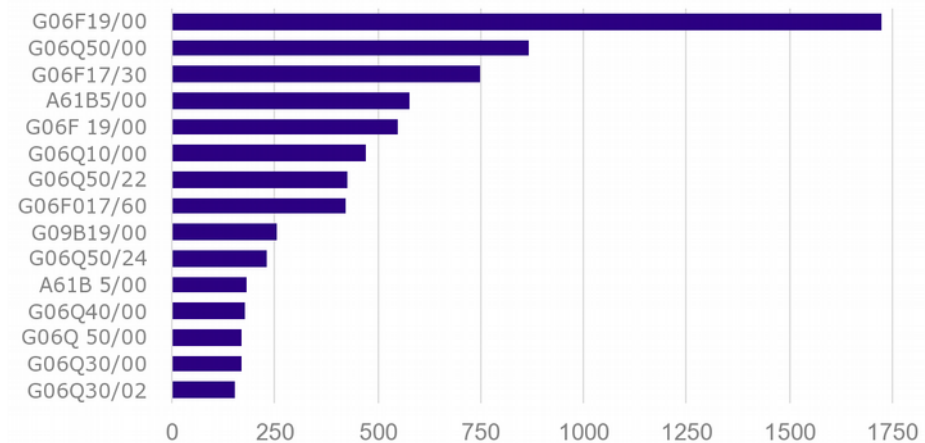Top 15 Countries By Inventors

Top 15 Assignees

International Business Machi...
ROCHE DIAGNOSTICS OPERA...
GENERAL ELECTRIC COMPANY
CERNER INNOVATION, INC.
ROCHE DIAGNOSTICS GMBH
Health Hero Network, Inc.
F. HOFFMANN-LA ROCHE AG
KONINKLIJKE PHILIPS ELECT...
KONINKLIJKE PHILIPS N.V.
Microsoft Corporation
Humana Inc.
SAUDI ARABIAN OIL COMPANY
SIEMENS MEDICAL SOLUTIO...
Searete LLC, a limited liabilit...
WAL-MART STORES, INC.

Topic 10 in Detail
IPC focus

- **A61B 5/00** Measuring for diagnostic purposes

- **A61B 5/145 Measuring characteristics of blood in vivo,** e.g. gas concentration, pH-value

- **G06F 19/00 Digital computing or data processing equipment or methods,** specially adapted for specific applications

- **G01N 27/00** Investigating or analysing materials by the use of electric, electro-chemical, or magnetic means

- **G06Q 50/00** Systems or methods specially adapted for a specific business sector, e.g. utilities or tourism

- **G08B 23/00** Alarms responsive to unspecified undesired or abnormal conditions

- **Topic Area technology** is more IT and software driven

Top 15 IPC Classes

IPC Class	
G06F19/00	~1700
G06Q50/00	~870
G06F17/30	~750
A61B5/00	~570
G06F 19/00	~550
G06Q10/00	~480
G06Q50/22	~420
G06F017/60	~420
G09B19/00	~250
G06Q50/24	~230
A61B 5/00	~175
G06Q40/00	~180
G06Q 50/00	~170
G06Q30/00	~170
G06Q30/02	~160

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Topic 10 in Detail
Example Patent

WO2017096102 (A1) - DEVICES, METHODS, AND COMPUTER MEDIUM TO PROVIDE REAL TIME 3D VISUALIZATION BIO-FEEDBACK

HORSEMAN SAMANTHA J [SA]; GILLIGAN LINDA [SA] +

SAUDI ARABIAN OIL CO [SA]; ARAMCO SERVICES CO [US] +

- international: *G06F19/00*

- cooperative: G06F19/321; G06F19/3406; G06F19/3431; G06F19/3437; G06F3/04815; G06F3/04842; G06T7/0016; G06T2200/24; G06T2207/30004; G06T2210/41

Description of the Related Art

[0002] In view of chronic health problems facing employees, employers may adopt workplace strategies to motivate and coach employees to improve their health and well- being. For example, diabetes may affect twenty percent (20%) of some populations. As will be understood by those skilled in the art, there exist a group of non-communicable diseases labeled "the big five": diabetes, cardiovascular disease, respiratory disease, cancer, and obesity. Research indicates that lifestyle is a contributing factor to the big five non- communicable diseases and may account for as much as eighty percent (80%) of the causes of these diseases.

Technology Focus Areas in Detail

- "Machine Learning" OR "Artificial Intelligence"
- "Pre-diabetic" - Preventive care
- Diabetes-2
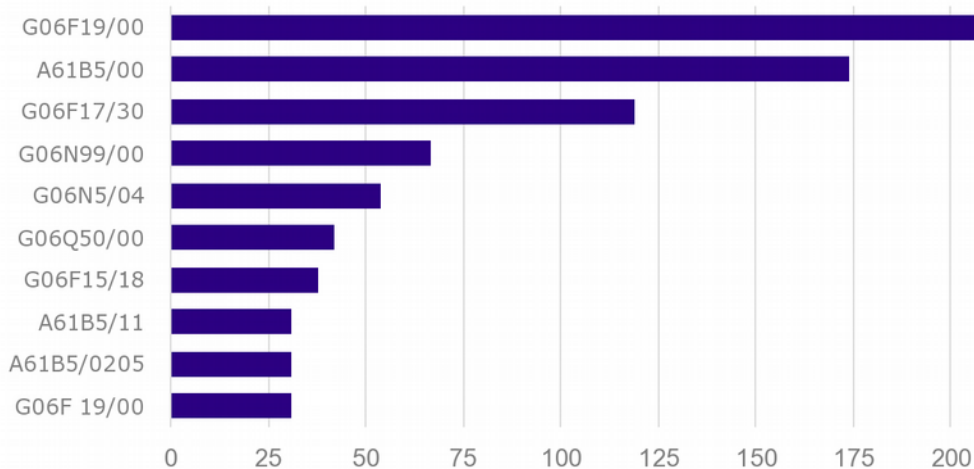- Diabetic Eye Conditions

Tech Area in Detail
Machine Learning - AI

- **DESCRIPTION:** "machine learning" OR "artificial intelligence"
  - 3158 patents
- **VERY HIGH growth,** expect 200 / 2017, and continued high growth
- Leading patent firms large software firms, specialized health-care software firms, and starupts.
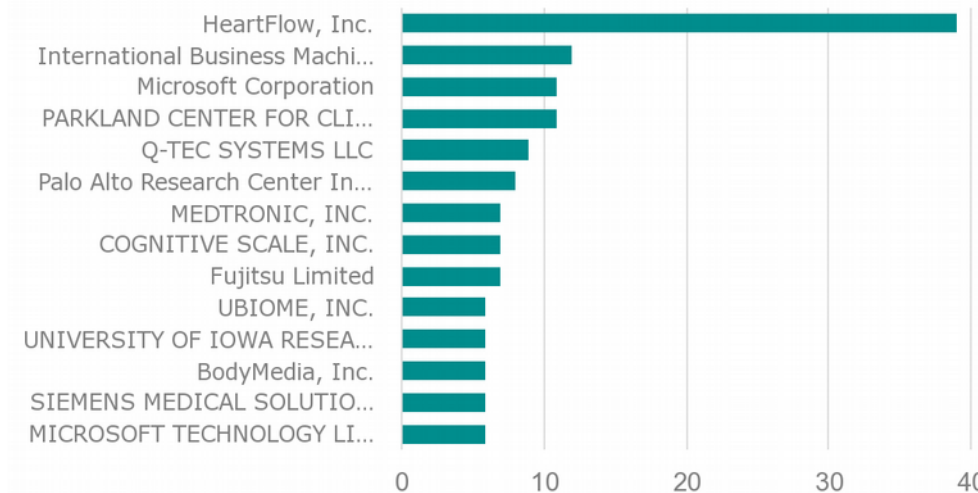

Patents By Publication Year
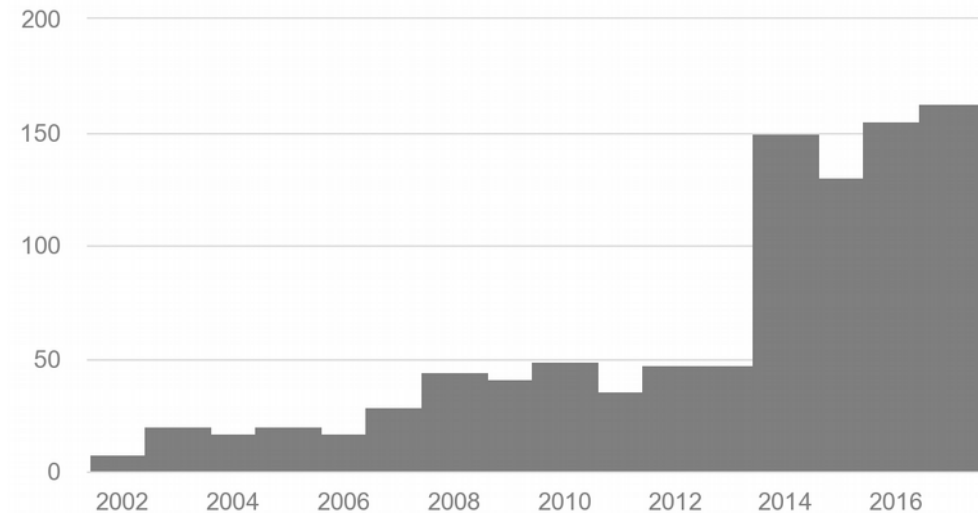
Top 10 IPC Classes

Top 14 Assignees

Tech Area in Detail
Machine Learning – AI – Example patent

US2017143279 (A1) - DEVICE AND METHOD TO DETECT DIABETES IN A PERSON USING PULSE PALPATION SIGNAL

JAYARAMAN SRINIVASAN [IN]; THOKALA NAVEEN KUMAR [IN]; PURUSHOTHAMAN BALAMURALIDHAR [IN] +

TATA CONSULTANCY SERVICES LTD [IN] +

Abstract of US2017143279 (A1)

Translate this text into [i]

[Select language ▾]   ⇄ **patenttranslate** powered by EPO and Google

A device and method is provided for the detection of diabetes in a person using pulse palpation signals. The pulse palpation signal is captured from the radial artery of the person using a photo-plethysmograph (PPG) sensor. The PPG signal is then preprocessed by a processor. The preprocessed PPG signal is then analyzed by the processor to detect the peak in the PPG signal. The detected peaks are used to extract a first set of feature parameters. The first of feature parameters are compared with a second set of feature parameters, wherein the second set of feature parameters are extracted from the control group of individuals. Based on the comparison it is detected that the person is one of in normal condition, pre-diabetic condition or a diabetic condition. According to another embodiment, the invention also provides a method to determine the severity index and progression risk of diabetes in the person.

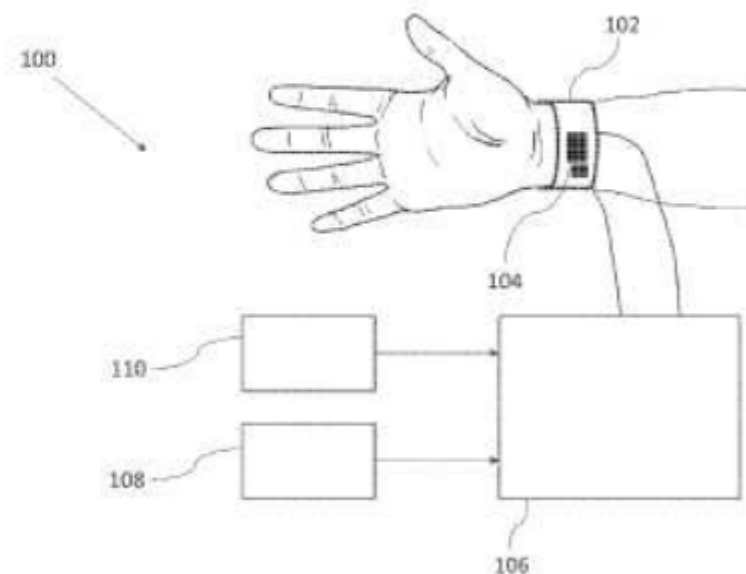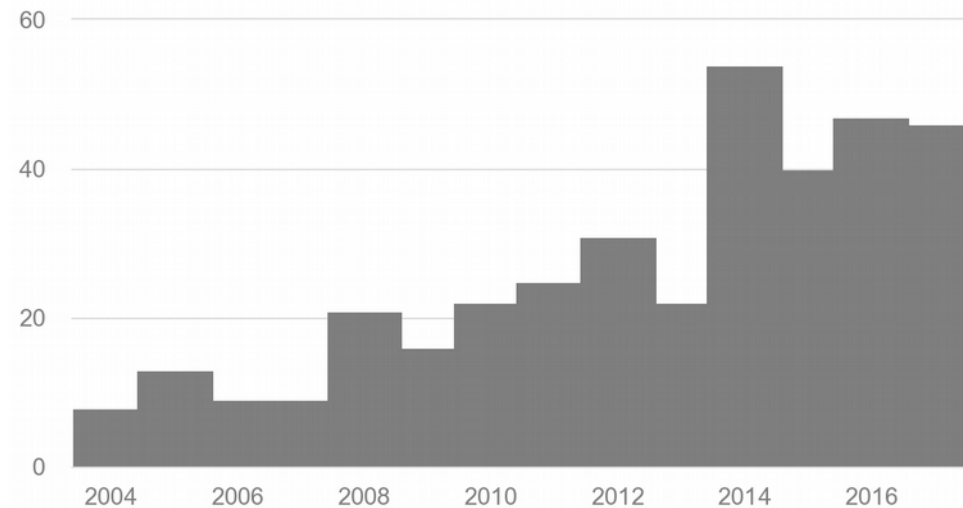FIG. 1
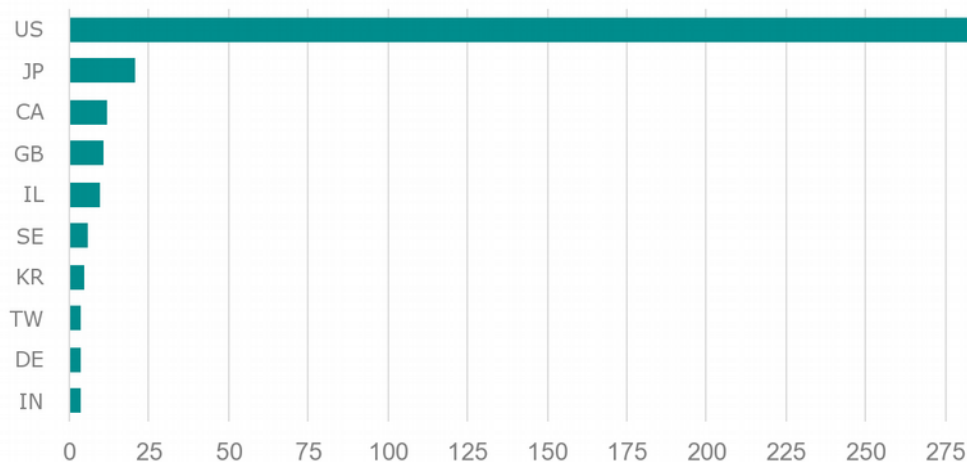
INE

Tech Area in Detail
Pre-Diabetic – Early Stage Diagnosis

- **DESCRIPTION**: "pre-diabetic" OR "pre diabetic" OR "early detection ..."
  - 391 patents
  - MYLIST: "pre-diabetic_2"
- **RELATIVELY SMALL PATENT AREA, BUT**
- **RAPIDLY EMERGING TECHNOLOGY AREA**, with high growth. **Currently around 60 / year** and continued high growth
- FITBIT the leading patent firm, followed by mixed group of specialized medical equipment and software firms. Universities also pay an important role.

Patents By Publication Year

Top 10 Countries By Inventors

Top 15 Assignees

(Top 15 Assignees, from highest to lowest)
- Fitbit, Inc.
- Abbott Diabetes Care Inc.
- TETHYS BIOSCIENCE, INC.
- MetaCure Limited
- Accenture Global Services G...
- Entelos, Inc.
- Medtronic, Inc.
- WALLAC OY
- SHARP KABUSHIKI KAISHA
- TheraSense, Inc.
- AVACEN, INC.
- PRESIDENT AND FELLOWS O...
- UNIVERSITY OF MIAMI
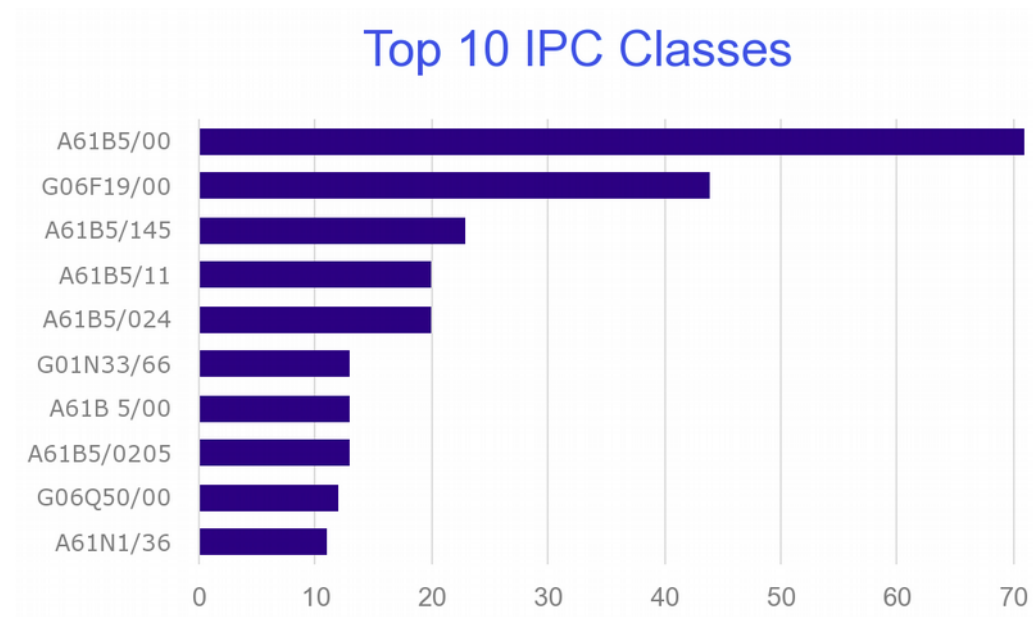- Cygnus, Inc.
- UNIVERSITY OF VIRGINIA PA...
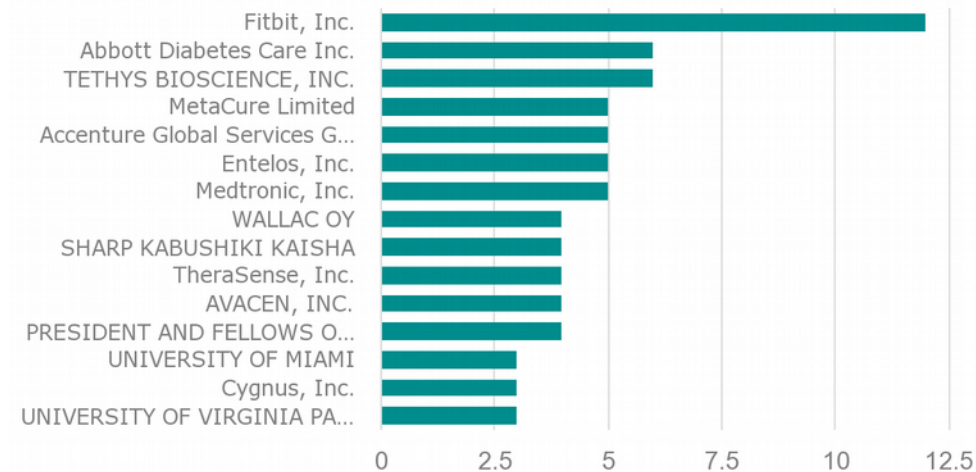
Tech Area in Detail
IPC focus of Pre-Diabetic

- **A61B 5/00** Measuring for diagnostic purposes
- **A61B 5/145 Measuring characteristics of blood in vivo,** e.g. gas concentration, pH-value
- **G06F 19/00 Digital computing or data processing equipment or methods,** specially adapted for specific applications
- **G01N 27/00** Investigating or analysing materials by the use of electric, electro-chemical, or magnetic means

- Diagnostic technologies mixed with software and computing technologies

Top 10 IPC Classes

IPC Class	Count
A61B5/00	~71
G06F19/00	~44
A61B5/145	~23
A61B5/11	~20
A61B5/024	~20
G01N33/66	~13
A61B 5/00	~13
A61B5/0205	~13
G06Q50/00	~12
A61N1/36	~11

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Tech Area in Detail
Pre-Diabetic – Example Patents

US2017277841 (A1) - SELF-LEARNING CLINICAL INTELLIGENCE SYSTEM BASED ON BIOLOGICAL INFORMATION AND MEDICAL DATA METRICS

SHANKAR SUSHANT [US]; DASH RAJESH [US]; DESAI NIKHIL [US]; FU JUSTIN JUNXUAN [US] ±

HEALTHPALS INC [US] ±

Biological information and medical knowledge information are used for self-learning clinical intelligence. Medical knowledge information is assembled. Medical rules are generated based on the medical knowledge. The medical rules can be generated probabilistically. A plurality of risk models can be learned. The plurality of risk models are associated with a given disease based on patient attributes. A medical probabilistic rule graph is built based on the medical rules and the plurality of risk models. The building of the medical probabilistic rule graph is based on ordering the medical rules. Attributes from an individual patient are applied to the medical probabilistic rule graph. A diagnosis for the individual is generated from the attributes applied to the medical probabilistic rule graph. A treatment for the individual can be generated from the attributes applied to the medical probabilistic rule graph.

[0040] The flow 100 can include building risk models 132. Risk models are based on medical knowledge information and related to medical rules, but the risk models focus on medical metrics and biological information that combine to indicate probabilistically certain medical risks. For example, the current best knowledge risk factors for heart disease include high blood pressure, high blood cholesterol, diabetes and prediabetes, smoking, being overweight or obese, being physically inactive, having a family history of early heart disease, having a history of preeclampsia during pregnancy, unhealthy diet, and age (55 or older for women). A risk model can be built using the known risk factors with a probabilistic traversal of the risk model, that is, factors A, B, C, and D may yield a higher risk than factors A, B, C, and E, for example. In addition, the risk models may include exposing the actual risk (well understood and accepted), exposing risk contributors (novel), and exposing what-if simulation (very novel) to provide clinical intelligence over a broader spectrum of possibilities than is normally available in a clinical setting. The risk models can be included in the building a medical probabilistic rule graph 130. In embodiments, the risk models can be included in the building a medical probabilistic inference graph.
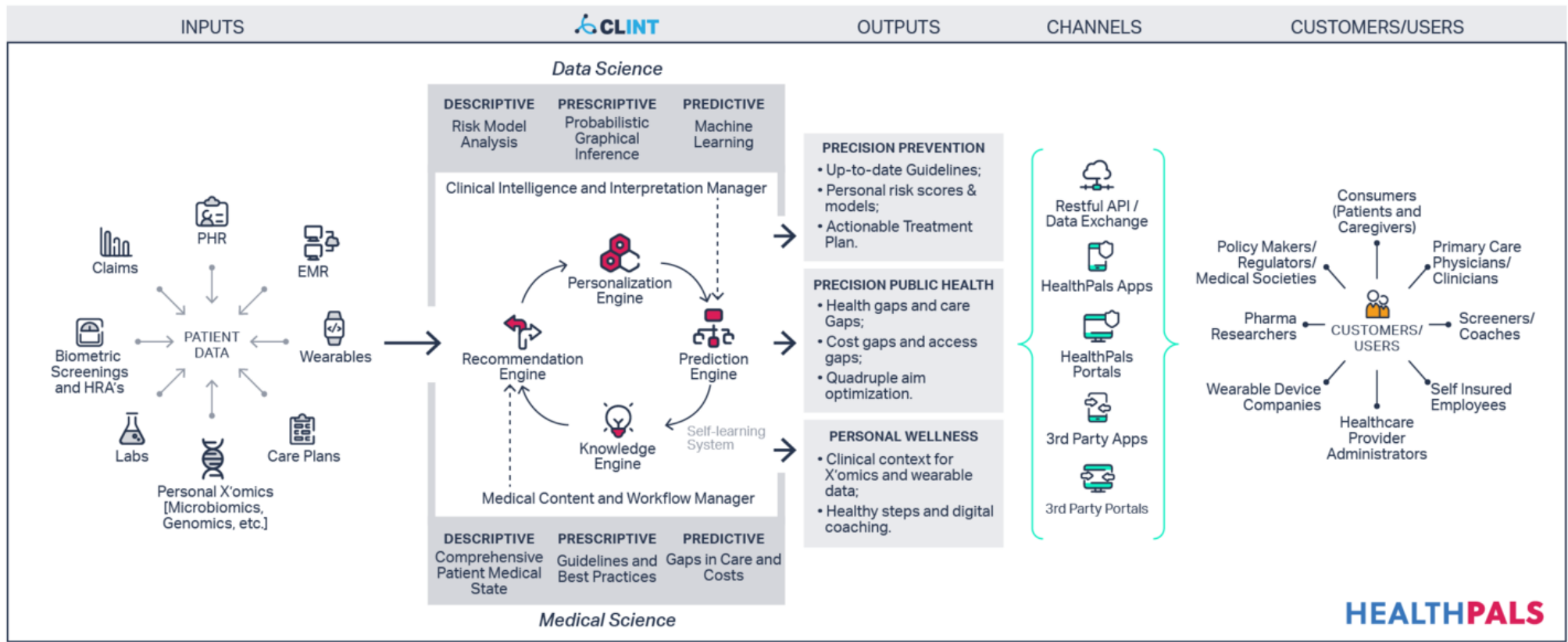
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Tech Area in Detail
Pre-Diabetic – Example Patents

US2017277841 (A1) - SELF-LEARNING CLINICAL INTELLIGENCE SYSTEM BASED ON BIOLOGICAL INFORMATION AND MEDICAL DATA METRICS

SHANKAR SUSHANT [US]; DASH RAJESH [US]; DESAI NIKHIL [US]; FU JUSTIN JUNXUAN [US] +

HEALTHPALS INC [US] +

Tech Area in Detail
Pre-Diabetic – Example Patents

<u>WO2017136218 (A1) - SYSTEM AND METHOD FOR DECISION SUPPORT USING LIFESTYLE FACTORS</u>

Systems and methods are provided relating to open loop decision-making for management of diabetes. People with diabetes face many problems in controlling their glucose because of the complex interactions between food, insulin, exercise, stress, activity, and other physiological and environmental conditions. Established principles of management of glucose sometimes are not adequate because there is a significant amount of variability in how different conditions impact different individuals and what actions might be effective for them. Accordingly, systems and methods according to present principles minimize the impact of the vagaries of diabetes on individuals, i.e., by looking for patterns and tendencies of an individual and customizing the management to that individual. Consequently, the same reduces the uncertainty that diabetes typically is associated with and improves quality of life.

Dexcom
Company

Dexcom

🌐 dexcom.com

Dexcom, Inc. is a company that develops, manufactures and distributes continuous glucose monitoring systems for diabetes management. It operates internationally with headquarters in San Diego, California, United States. Wikipedia

Stock price: DXCM (NASDAQ) US$50,74 +0,36 (+0,71 %)
10 Nov, 16.00 GMT-5 - Disclaimer

Headquarters: San Diego, California, United States

CEO: Kevin R. Sayer

CFO: Quentin Blackford

Founded: 1999

**EVP:** Andrew K. Balo (Clinical, Regulatory, Global Access), MORE

Subsidiaries: Nintamed GmbH & Co. KG, SweetSpot Diabetes Care, Inc., DXCM Sweden AB
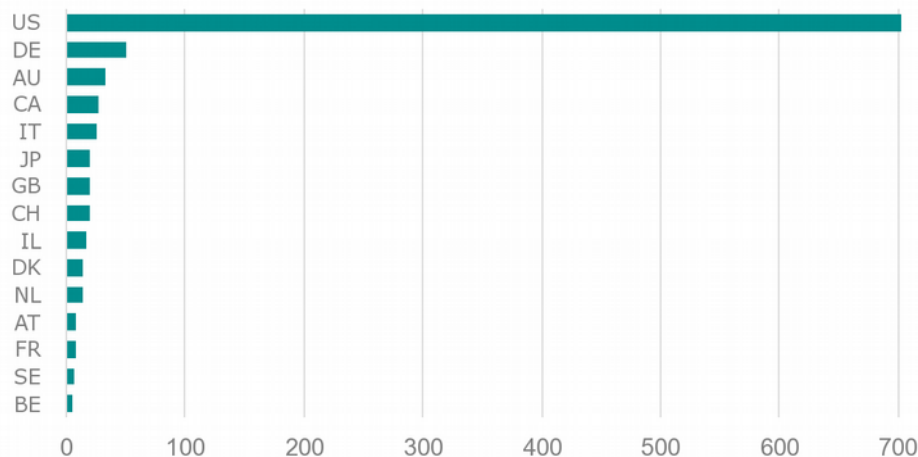
Tech Area in Detail
Type-2 Diabetes

- **DESCRIPTION**: "diabetes mellitus type 2" OR "diabetes type 2" OR "diabetes type-2" OR "type 2 diabetes" OR "type-2 diabetes"
  - 4130 patents
- **RELATIVELY LARGE PATENT AREA,** with stabilized growth. Expect 120 patents / 2017, and continued growth
- Leading patent firms large software firms, specialized health-care software firms, and starupts.
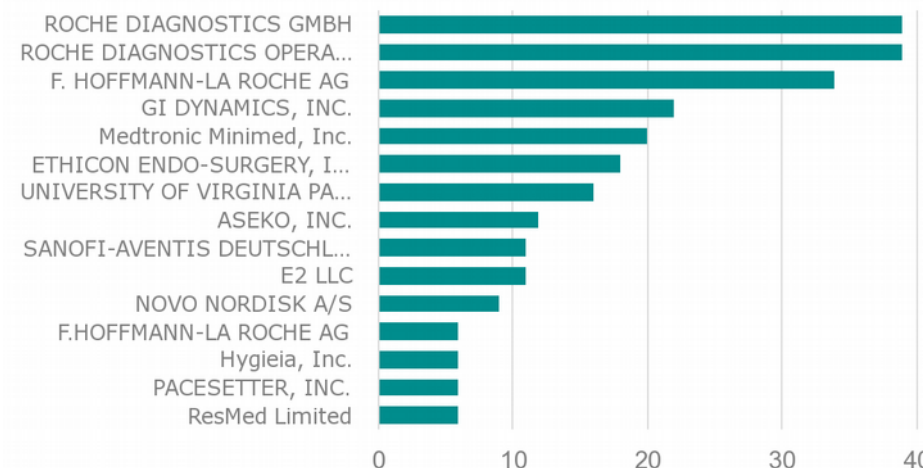- Includes large group of patents dealing with "life style" issues

Patents By Publication Year
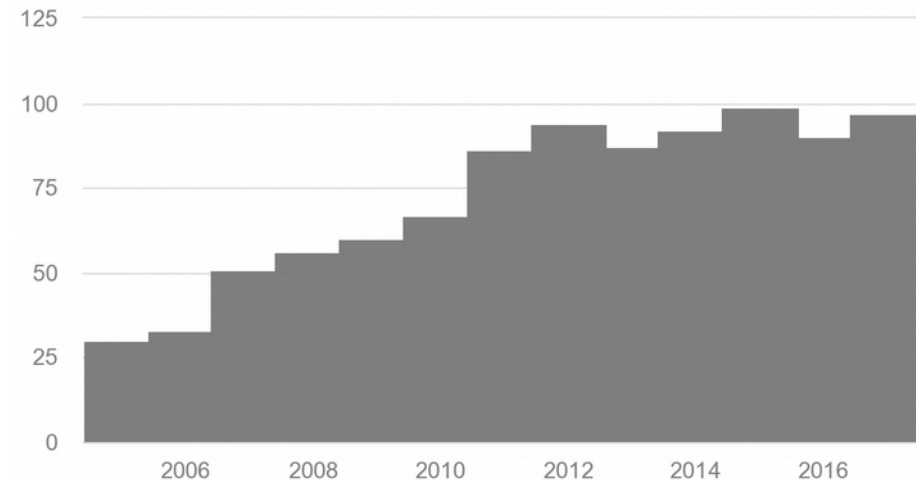
Top 15 Countries By Inventors
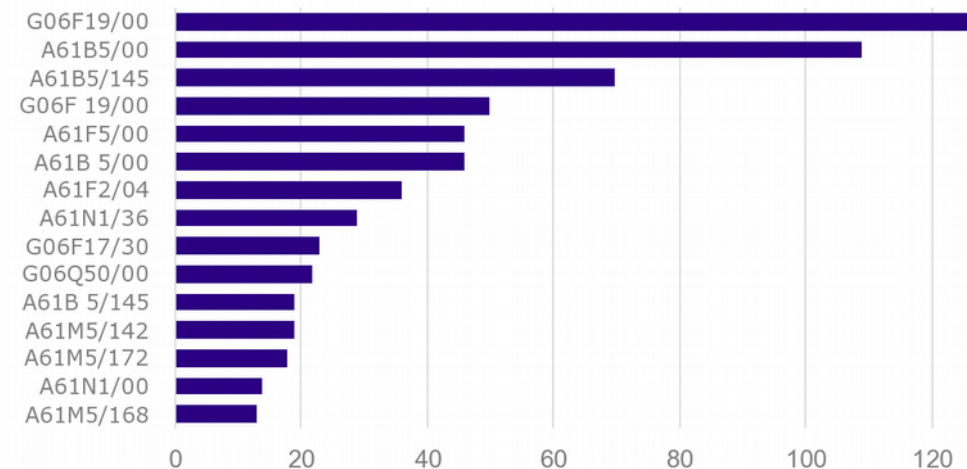

Top 15 Assignees

Tech Area in Detail
IPC focus of Type-2 Diabetes

- **A61B 5/00** Measuring for diagnostic purposes

- **A61B 5/145 Measuring characteristics of blood in vivo,** e.g. gas concentration, pH-value

- **G06F 19/00 Digital computing or data processing equipment or methods,** specially adapted for specific applications

- **G01N 27/00** Investigating or analysing materials by the use of electric, electro-chemical, or magnetic means

- Diagnostic technologies mixed with software and computing technologies

Top 15 IPC Classes

IPC Class	(bar length, approx.)
G06F19/00	125
A61B5/00	110
A61B5/145	70
G06F 19/00	50
A61F5/00	45
A61B 5/00	45
A61F2/04	36
A61N1/36	28
G06F17/30	22
G06Q50/00	21
A61B 5/145	19
A61M5/142	18
A61M5/172	17
A61N1/00	13
A61M5/168	13

Tech Area in Detail
Type 2 Diabetes - Example Patents

US2017293733 (A1) - Dynamic Selection and Sequencing of Healthcare Assessments for Patients

KELLY KARIE L [US]; KUMAR ATUL [US]; MCCOY ADAM C [US]; MRNUSTIK GUY B [US]; OLSEN RUSSELL G [US]; WALTERS PATRICK L [US] +

IBM [US] +

- international: *G06F17/27; G06F19/00*

[0035] It should be appreciated that the term "lifestyle" as it is used herein refers to the way in which a person lives their lives. The term "lifestyle information" refers to the data collected that characterizes the lifestyle of the patient and may encompass various temporal, spatial, environmental, and behavioral information/data about the patient that together comprises a unique combination of information/data that characterizes and represents the way in which that specific patient conducts their life on a daily basis. The lifestyle information for a patient is specific to that patient and is not generally applicable to multiple patients. The lifestyle information may be provided at various levels of granularity depending upon the particular implementation. As part of this lifestyle information, data generated by the specific patient via one or more computing devices or other data communication devices may be included such as actions performed by the patient on a daily basis, personal schedules, specifications of preferences, etc. For example, lifestyle information may include the patient entering information, such as into a computing device executing a patient tracking application, indicating that the patient ate breakfast at a fast food restaurant in the airport on the way to Virginia this morning. In addition, data generated by external systems associated with third parties that characterizes the patient's lifestyle may be included in the lifestyle information as well, e.g., a healthcare insurance company may have information about the patient's lifestyle, e.g., smoker, overweight, sedentary, high risk for diabetes, etc., which may be characteristic of the patient's lifestyle.
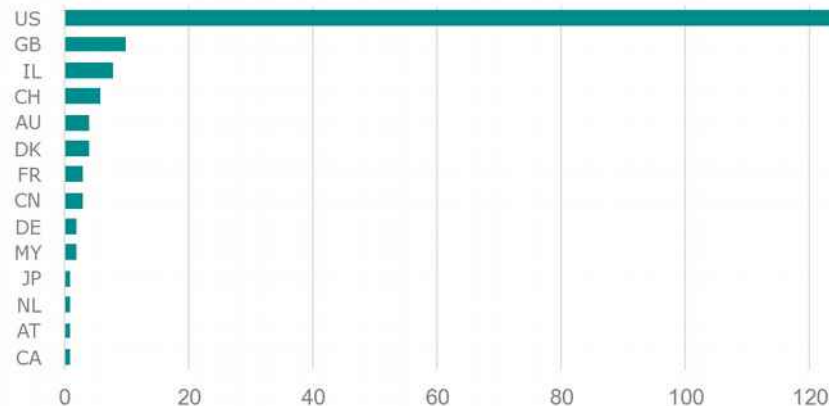
Tech Area in Detail
Diabetic Eye

- **CLAIMS**: "diabetic macular" OR "diabetic retinopathy" OR "diabetic eye"
  - 181 patents
- **NOTE:** Diabetic eye is very large patenting area focussing on treatment (esp drug delivery) and evaluation. Search limited to patents with related claims to narrow patents to reasonable number.
- Technologically separate area from other techonology areas analyzed here
- **Leading countries.** US, GB, IL, CH, AU, DK, FR, CN, DE.

Patents By Publication Year
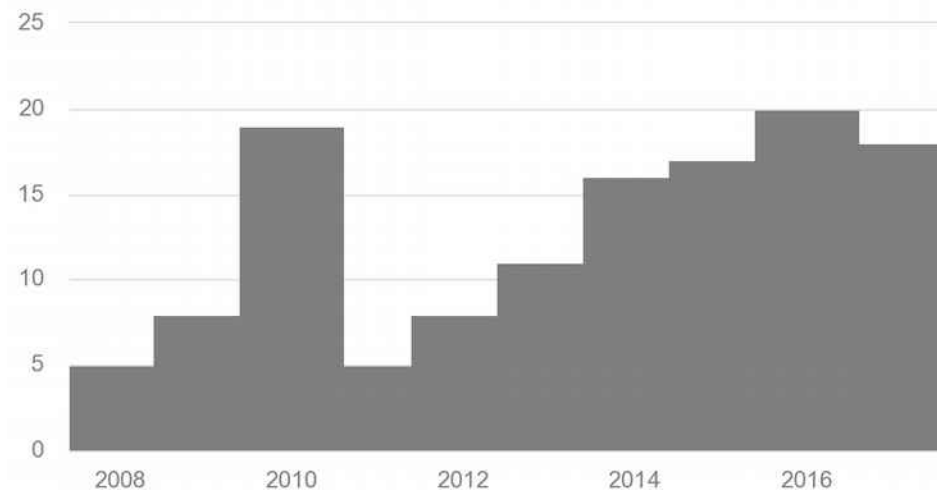
Top 15 Countries By Inventors

Top 10 Assignees

Tech Area in Detail
Diabetic Eye

- **A61B 3/00** Apparatus for testing the eyes; Instruments for examining the eyes
- **A61B 3/12** for looking at the eye fundus, e.g. ophthalmoscopes
- **A61B 3/14** Arrangements specially adapted for eye photography
- **A61B 3/10** Objective types, i.e. instruments for examining the eyes independent of the patients perceptions or reactions
- **A61B 5/00** Measuring for diagnostic purposes

Top 10 IPC Classes

IPC Class	Value
A61B3/00	~16
A61B3/12	~12
A61B3/14	~12
A61B5/00	~11
A61B3/10	~10
A61F9/00	~9
A61B 3/12	~8
A61B 5/00	~8
A61B3/06	~8
G06K9/00	~7

Tech Area in Detail
Diabetic Eye – Example Patent

Treatment and prevention of retinal vascular disease by photocoagulation

Abstract

This disclosure relates to methods for treatment or prevention of retinal vascular disease by photocoagulation. More specifically, this disclosure relates to an improved technique for the placement of retinal burns so as to prevent the development of hypoxia and progression of ischemia in retinal tissue, including the macula. The methods can also be employed to prevent potential ischemic tissue damage in diabetic, pre-diabetic or other patients with ischemic retinal vascular disease, or those at risk of ischemic retinal vascular disease.

Classifications

A61F9/00821   Methods or devices for eye surgery using laser for coagulation

View 1 more classifications

WO2017127732A1
WO Application

🔍 Find Prior Art

Other languages: French

Inventor: Thomas J. GAST, Xiao FU

Original Assignee: Indiana University Research And Technology Corporation

Priority date: 2016-01-21

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Major Firms in Detail

- Hoffman-La Roche Group
- Roche Diabetes
- Novartis
- Sanofi Aventis
- Medtronic
- Novo Nordisk
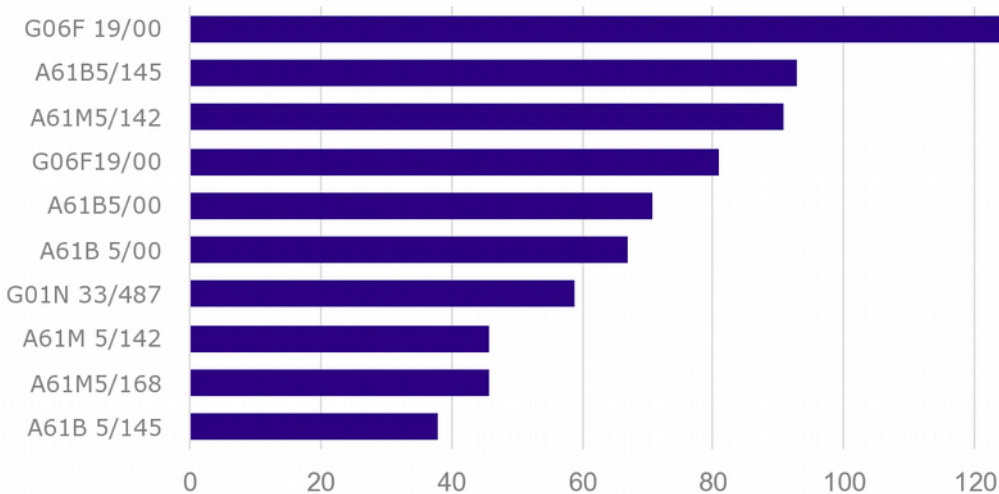- Abbott Diabetes
- Dexcom

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Roche Group in Detail

- Very strong and broad patent portfolio, covering different Diabetes areas.

- 1138 patents

- Main patent areas: Topic 1, 3, and 5.

- Technological and patenting focus is shifting from strategically
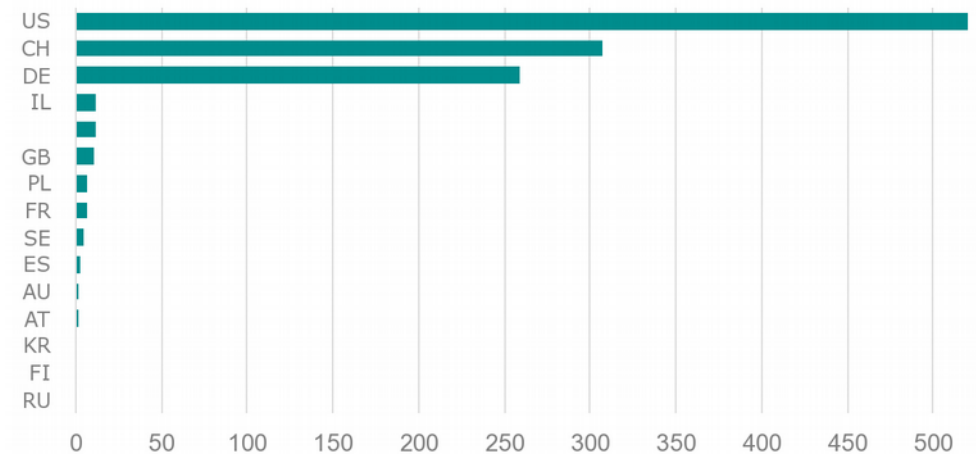
- Broad geographical base of inventors

Patents By Publication Year
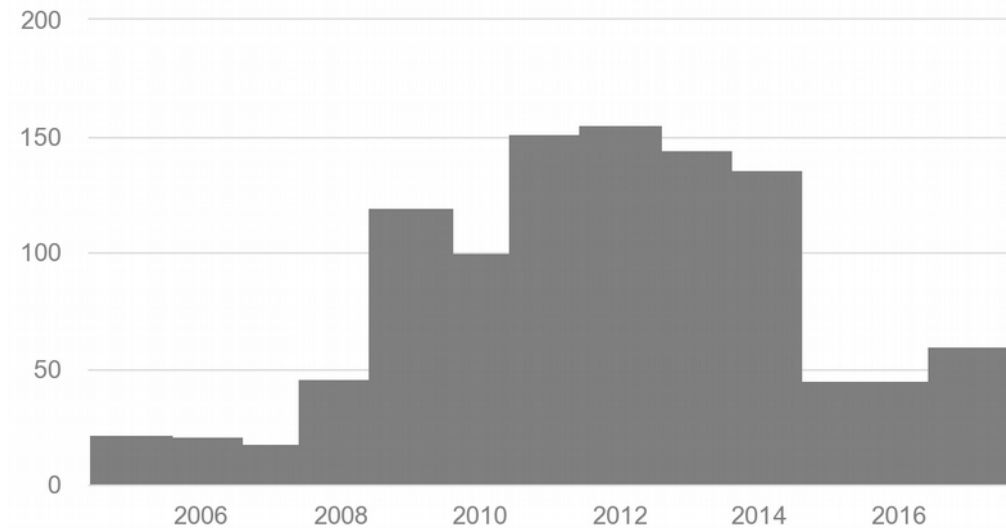
Top 10 IPC Classes

Top 15 Countries By Inventors

Roche Group in Detail
Topic Profile

- Topic Area distribution shows strategic focus
- Shiftings from one to other area
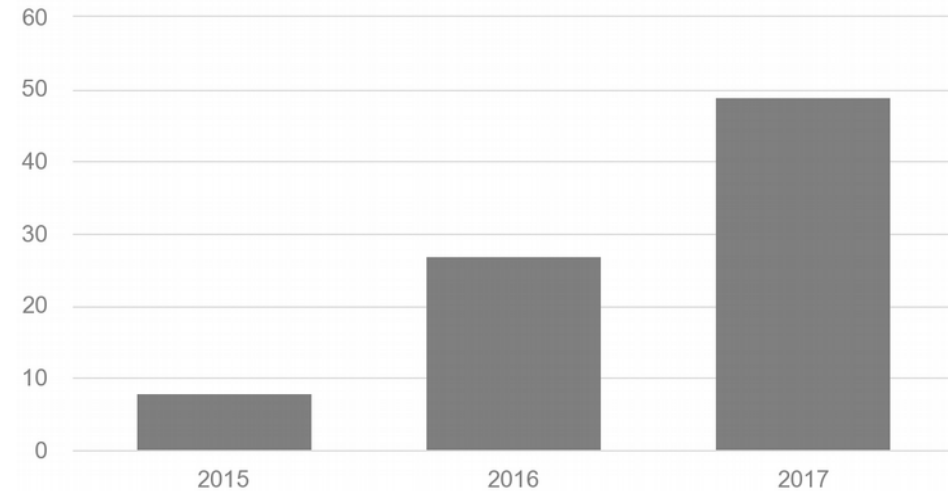- Main interest areas part of main trends of the broader map data

Topic	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Total
1	15	12	36	45	47	36	25	11	13	26	313
5	6	39	21	45	42	36	42	8	10	13	273
3	10	6	18	17	22	13	25	15	11	8	168
10	4	45	16	17	24	32	10	0	0	3	157
2	3	8	2	13	3	7	8	1	1	7	55
8	1	0	0	0	5	8	11	3	2	1	49

● **Topic 3:** Sensor – Measuring - Data – Glucose – Insuling - Blood

● **Topic 5:** Medical - Device – Data – Communication – User – Wireless - interface

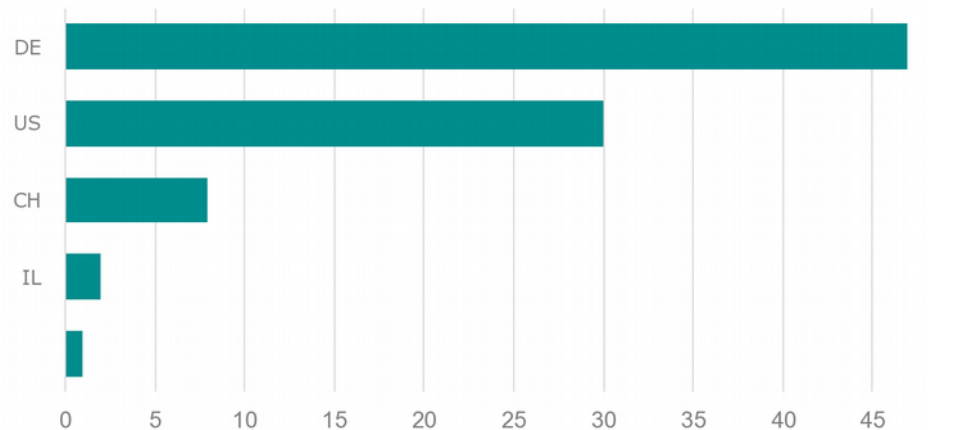● **Topic 10:** Patient – Health – Information – User – Data – Healthcare – Software - Database

TEQMINE®

Roche Diabetes in Detail

- A new entity with clear technology and business focus
- 85 patents
- **Strongly growing patenting activity**
- **Main patent areas: Topic 1, 3, and 5.**
- **Technological and patenting focus is shifting from strategically**
- **Broad geographical base of inventors**

Patents By Publication Year

Year	Patents
2015	~8
2016	~27
2017	~49

Top 10 Countries By Inventors

Country	Inventors
DE	~47
US	~30
CH	~8
IL	~2

Top 10 IPC Classes

IPC Class	Count
A61B5/145	~17.5
A61B5/00	~14
G06F19/00	~13
G01N27/327	~8
A61M5/142	~7
A61B5/1486	~6
A61M5/172	~5
A61B5/15	~4
G01N33/487	~3
A61M5/168	~3
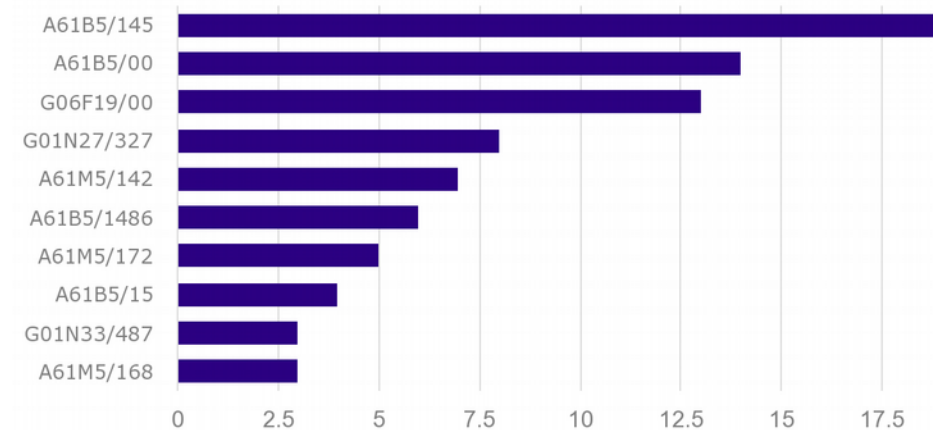
Roche Diabetes in Detail
Topic Profile

- Topic Area distribution shows strategic focus
- Main effort in Topic Area 1, 3, and 5

| Topic	2014	2015	2016	2017	Total
1	0	0	7	23	29
3	0	5	8	7	20
5	0	0	6	13	19
2	0	0	0	3	3
12	0	1	1	1	3
13	0	0	2	0	2
10	0	0	0	2	2

● **Topic 3:** Sensor – Measuring - Data – Glucose – Insuling - Blood

● **Topic 5:** Medical - Device – Data – Communication – User – Wireless - interface

● **Topic 10:** Patient – Health – Information – User – Data – Healthcare – Software - Database
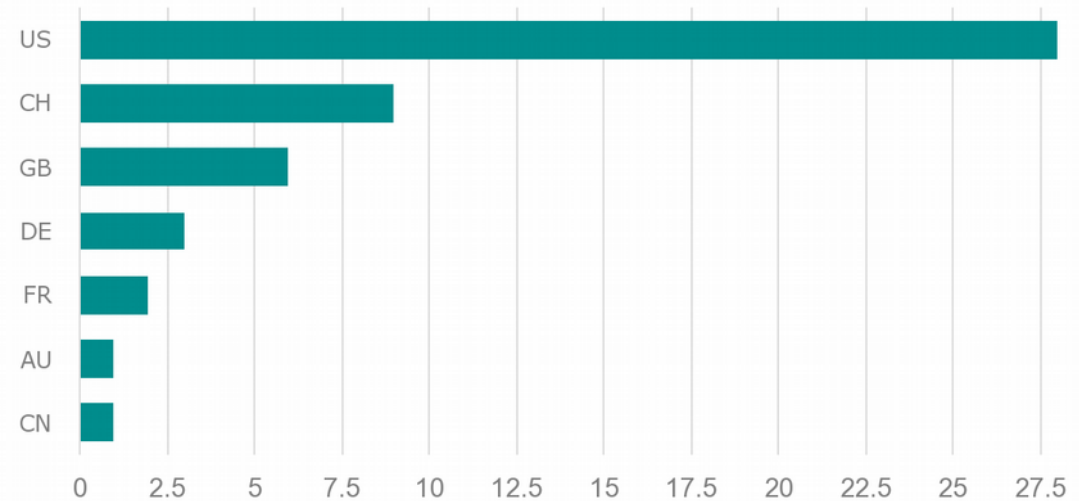
TEQMINE®

Novartis in Detail

- Small portfolio, but increasing
- 39 patents
- Patenting too small volume to support clear conclusions
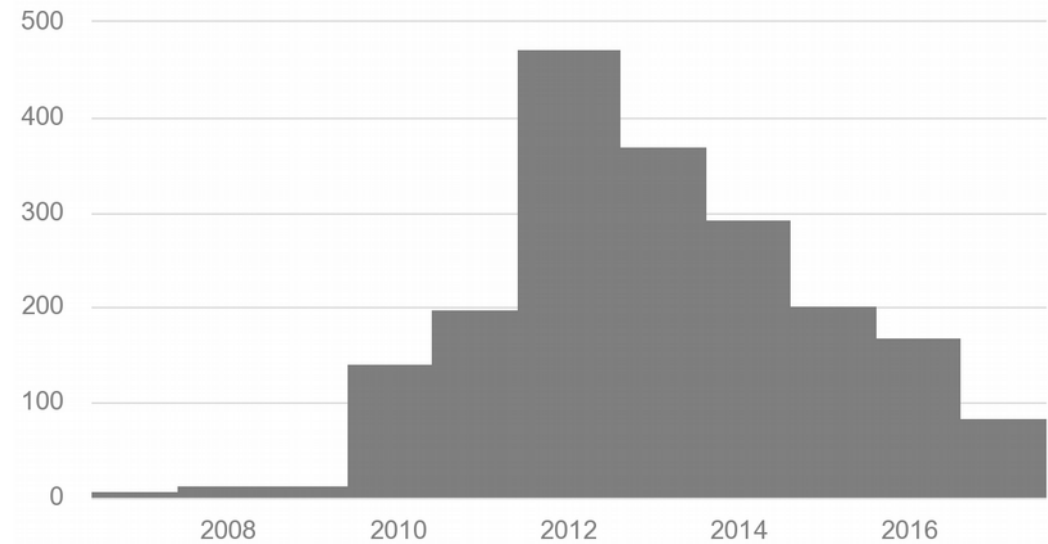

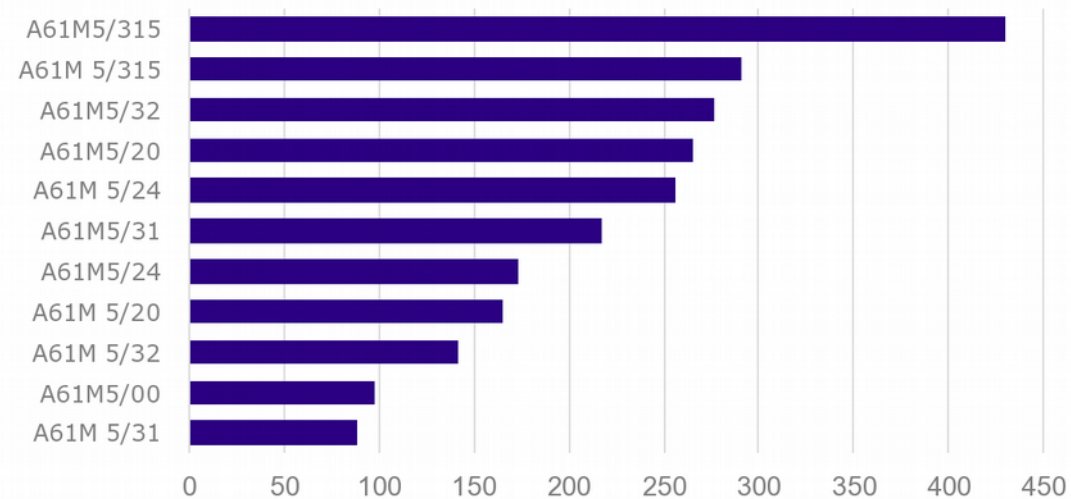Patents By Publication Year
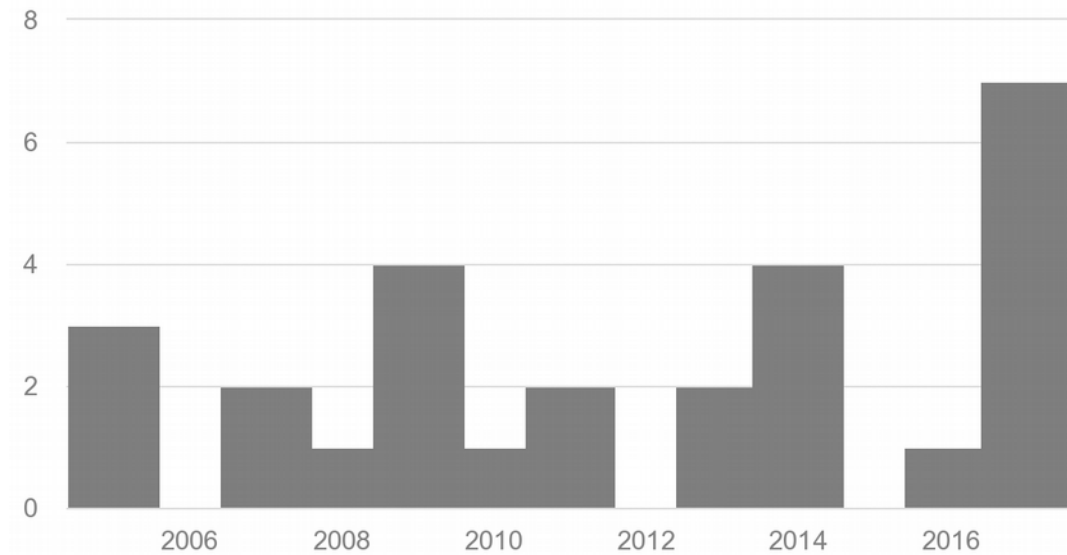
Top 10 Countries By Inventors

Sanofi-Aventis in Detail

- Very large patent portfolio, but decreasing patent effort
- 1908 patents
- **Very narrow technology and patent focus as analyzed in IPC and Topic Areas**
- **Main Focus Area Topic 2, IPC A61M5**

Patents By Publication Year


Top 11 IPC Classes

Sanofi-Aventis in Detail
Topic Profile

Topic	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Total
2	12	12	134	184	429	343	251	189	156	83	1,799
1	0	1	2	7	33	20	29	3	0	1	98
5	0	0	4	3	6	2	7	6	8	0	36
3	0	0	0	3	4	2	1	4	1	0	15
10	0	0	2	2	1	3	0	0	0	0	13
12	1	0	0	0	0	0	0	0	4	0	8
11	0	0	0	1	0	1	3	2	0	0	7
14	0	0	0	0	0	0	1	0	0	0	5
4	0	0	0	0	0	0	2	0	0	1	3

🔵 **Topic 3:** Sensor – Measuring - Data – Glucose – Insuling - Blood

🟡 **Topic 5:** Medical - Device – Data – Communication – User – Wireless - interface

🟣 **Topic 10:** Patient – Health – Information – User – Data – Healthcare – Software - Database

TEQMINE®

Medtronic in Detail

- Large portfolio, but increasing
- 1904 patents
- **Patenting continues strong in emerging areas, such as Topic Areas 1, 3, 5.**
- **Broad technological focus, as evident in IPC and Topic Area Analysis**

Patents By Publication Year

Top 10 IPC Classes
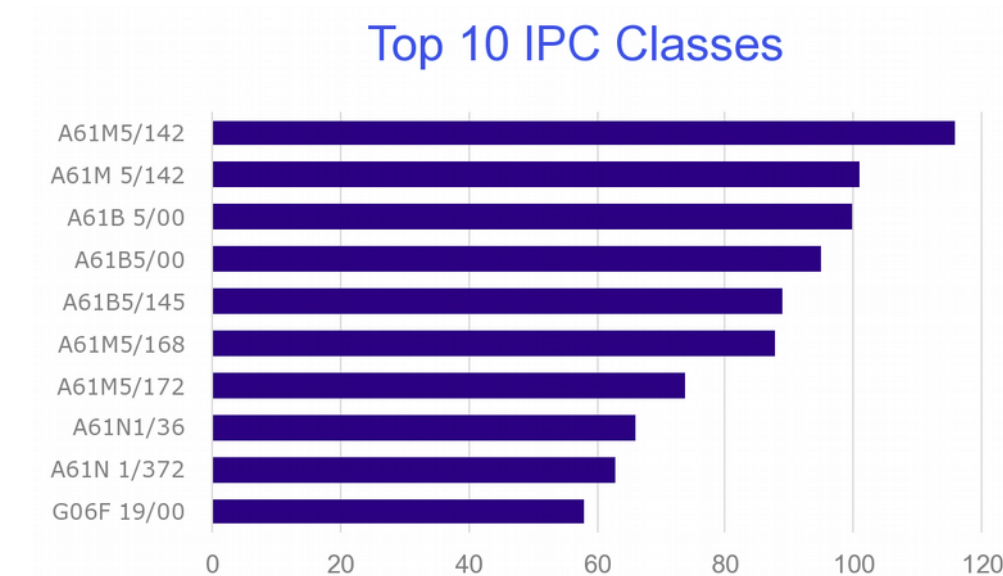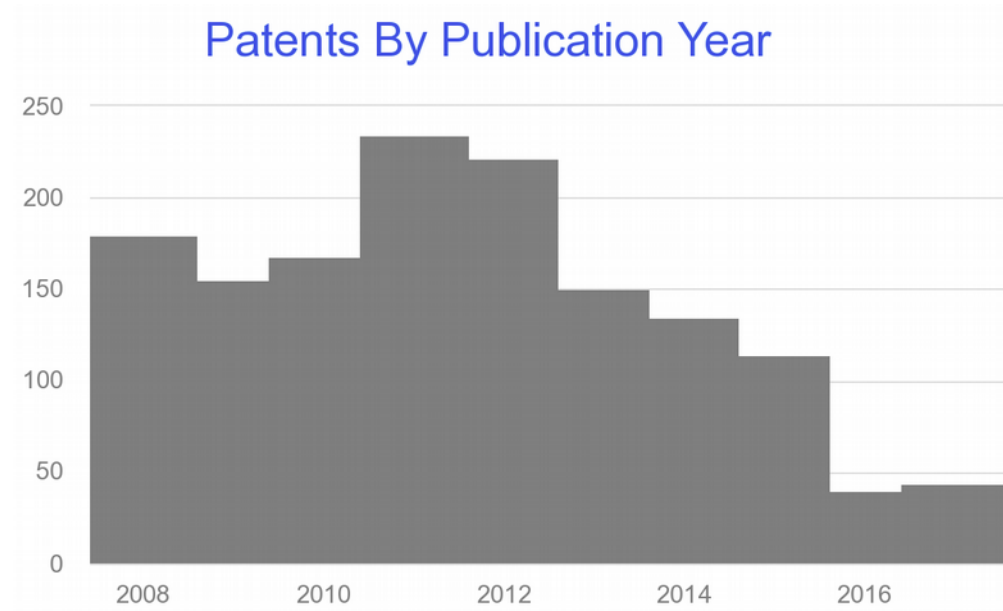
Medtronic in Detail
Topic Profile

Topic	2009	2010	2011	2012	2013	2014	2015	2016	2017	Total
1	34	36	59	72	38	37	22	12	7	449
5	29	31	39	36	16	8	18	11	13	320
3	15	25	34	22	23	19	20	1	10	242
6	34	9	56	15	11	8	4	4	2	224
7	4	12	9	28	35	30	19	6	6	193
15	6	11	9	25	16	9	23	1	0	167

🔵 **Topic 3:** Sensor – Measuring - Data – Glucose – Insuling - Blood

🟡 **Topic 5:** Medical - Device – Data – Communication – User – Wireless - interface

🟣 **Topic 10:** Patient – Health – Information – User – Data – Healthcare – Software - Database

TEQMINE®

Novo Nordisk in Detail

- Large portfolio, and relatively stable patent effort.
- Currently probably increasing.
- 805 patents
- **Technologically relatively narrow focus**

Patents By Publication Year
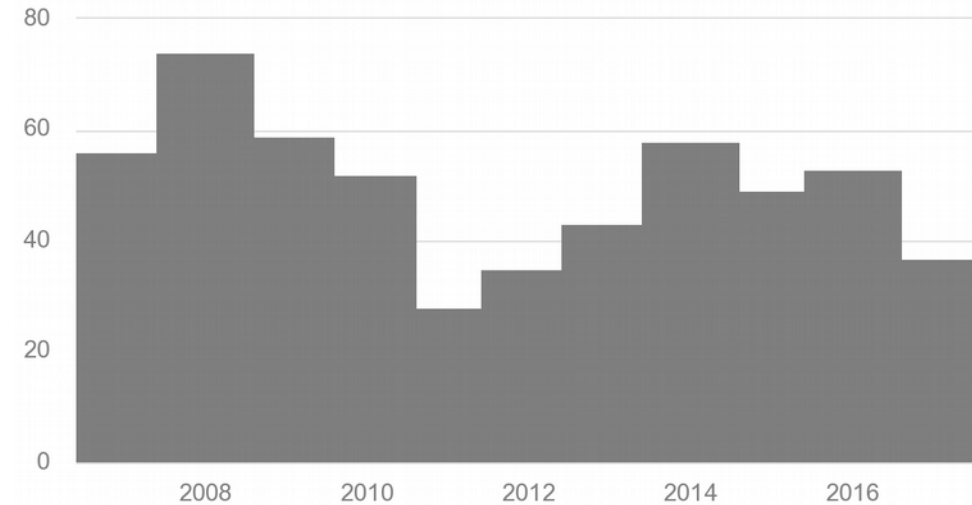
Top 11 Countries By Inventors
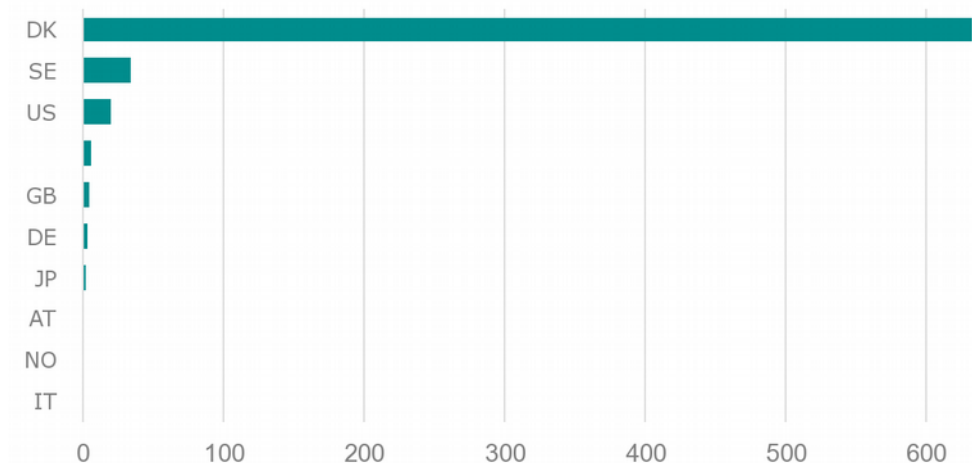
Novo Nordisk in Detail
Topic Profile

Topic	2009	2010	2011	2012	2013	2014	2015	2016	2017	Total
2	25	26	12	17	31	44	40	42	34	394
1	22	14	12	11	9	8	8	9	4	232
5	8	7	1	1	3	2	0	3	0	72
14	0	0	1	1	0	1	0	0	0	32
3	3	1	0	0	0	0	0	0	0	17
10	0	1	1	1	0	0	0	0	0	16

● **Topic 3:** Sensor – Measuring - Data – Glucose – Insuling - Blood

● **Topic 5:** Medical - Device – Data – Communication – User – Wireless - interface

● **Topic 10:** Patient – Health – Information – User – Data – Healthcare – Software - Database
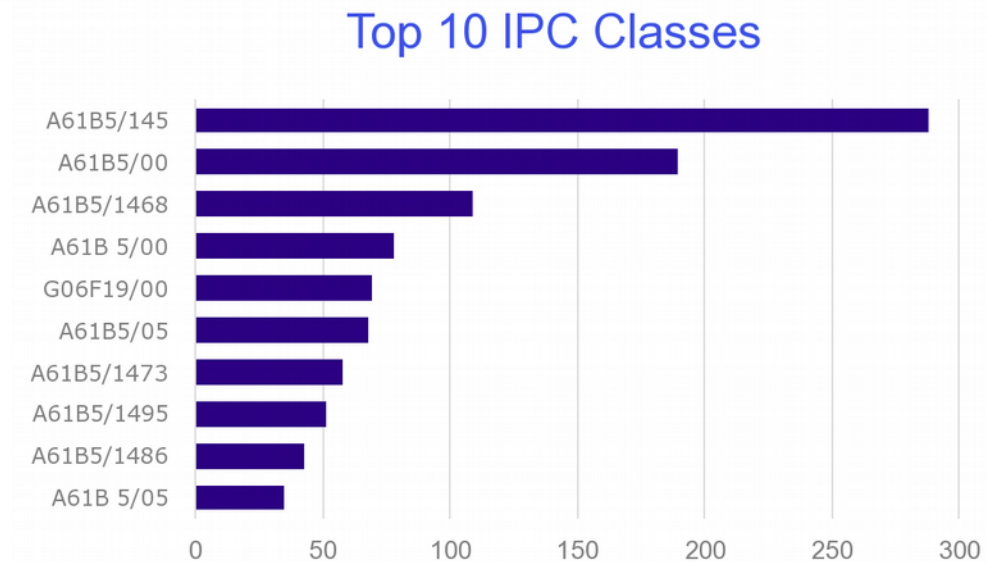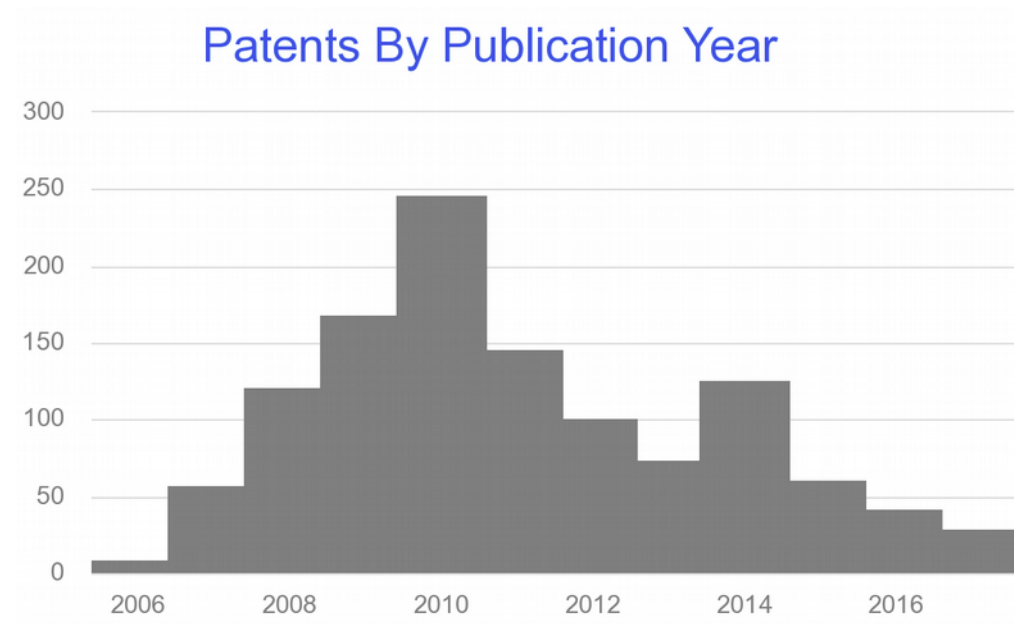
TEQMINE®

Abbott Diabetes in Detail

- Large portfolio, but strongly declining inventive effort
- 1185 patents
- **Technologically relatively narrow focus per IPC and Topic Area classification**

Patents By Publication Year

Top 10 IPC Classes

Abbott Diabetes in Detail
Topic Profile

Topic	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Total
3	38	84	120	135	71	56	42	62	29	28	18	688
5	2	19	19	41	30	20	16	43	25	12	9	238
1	6	8	21	44	24	15	5	4	3	1	1	132
14	9	9	7	20	10	8	7	13	4	1	0	89
10	0	0	0	3	9	1	0	1	0	0	1	15
6	2	0	2	2	0	0	2	1	1	0	0	11
8	1	2	0	0	1	0	1	2	0	0	0	7
2	0	0	0	2	0	1	1	0	0	0	0	4
15	0	0	0	0	1	0	0	0	0	0	0	1

🔵 **Topic 3:** Sensor – Measuring - Data – Glucose – Insuling - Blood

🟡 **Topic 5:** Medical - Device – Data – Communication – User – Wireless - interface

🟣 **Topic 10:** Patient – Health – Information – User – Data – Healthcare – Software - Database
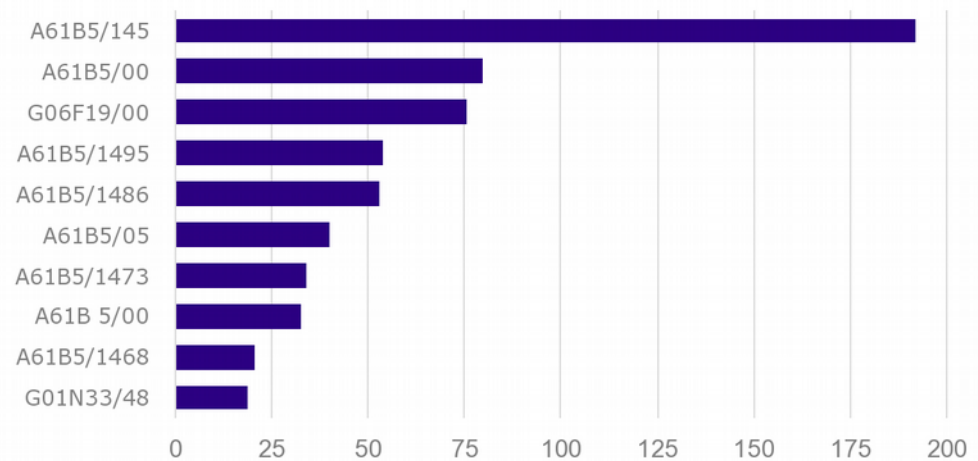
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Dexcom in Detail

- Large portfolio, but strongly declining inventive effort
- **Topic Area 5** is a modest, and only real, growth area (mobile & wireless devices)
- 577 patents
- **Technologically relatively broad focus per IPC and Topic Area classification**

Patents By Publication Year
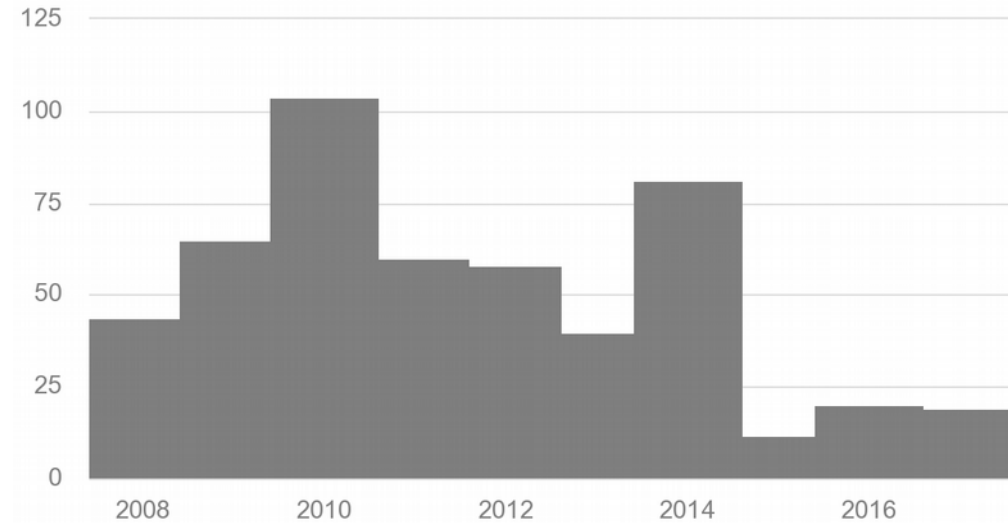
Top 10 IPC Classes

Dexcom in Detail
Topic Profile

Topic	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Total
3	41	63	103	53	55	30	65	7	13	7	494
14	0	2	1	4	2	5	3	0	0	4	28
5	0	0	0	1	0	1	10	3	4	6	27
13	3	0	0	1	1	0	3	1	0	0	15
1	0	0	0	0	0	4	0	0	0	2	6
15	0	0	0	1	0	0	0	0	1	0	4
10	0	0	0	0	0	0	0	1	2	0	3

🔵 **Topic 3:** Sensor – Measuring - Data – Glucose – Insuling - Blood

🟡 **Topic 5:** Medical - Device – Data – Communication – User – Wireless - interface

🟣 **Topic 10:** Patient – Health – Information – User – Data – Healthcare – Software - Database

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