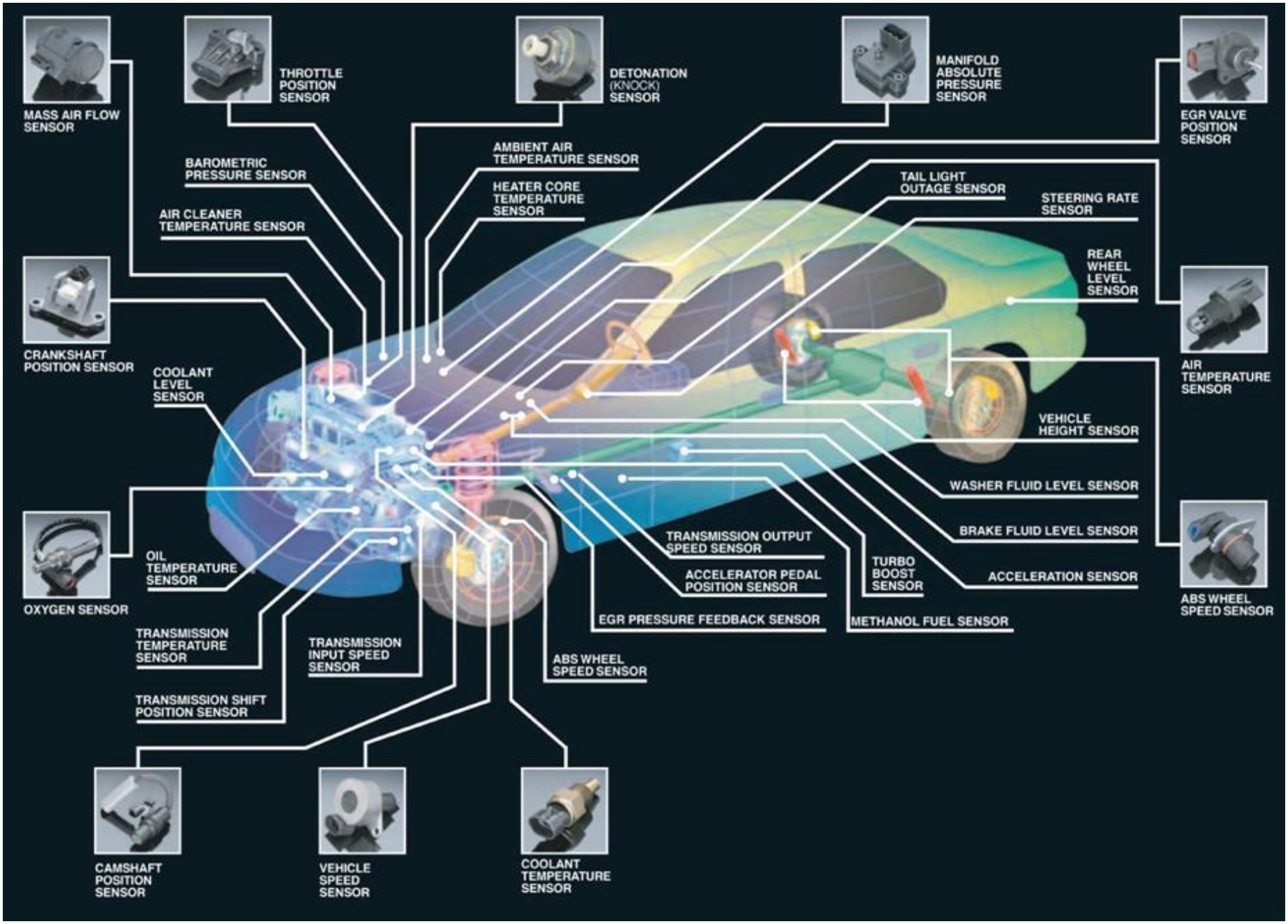
Disruptive changes in healthcare

Erno Duda

Béla

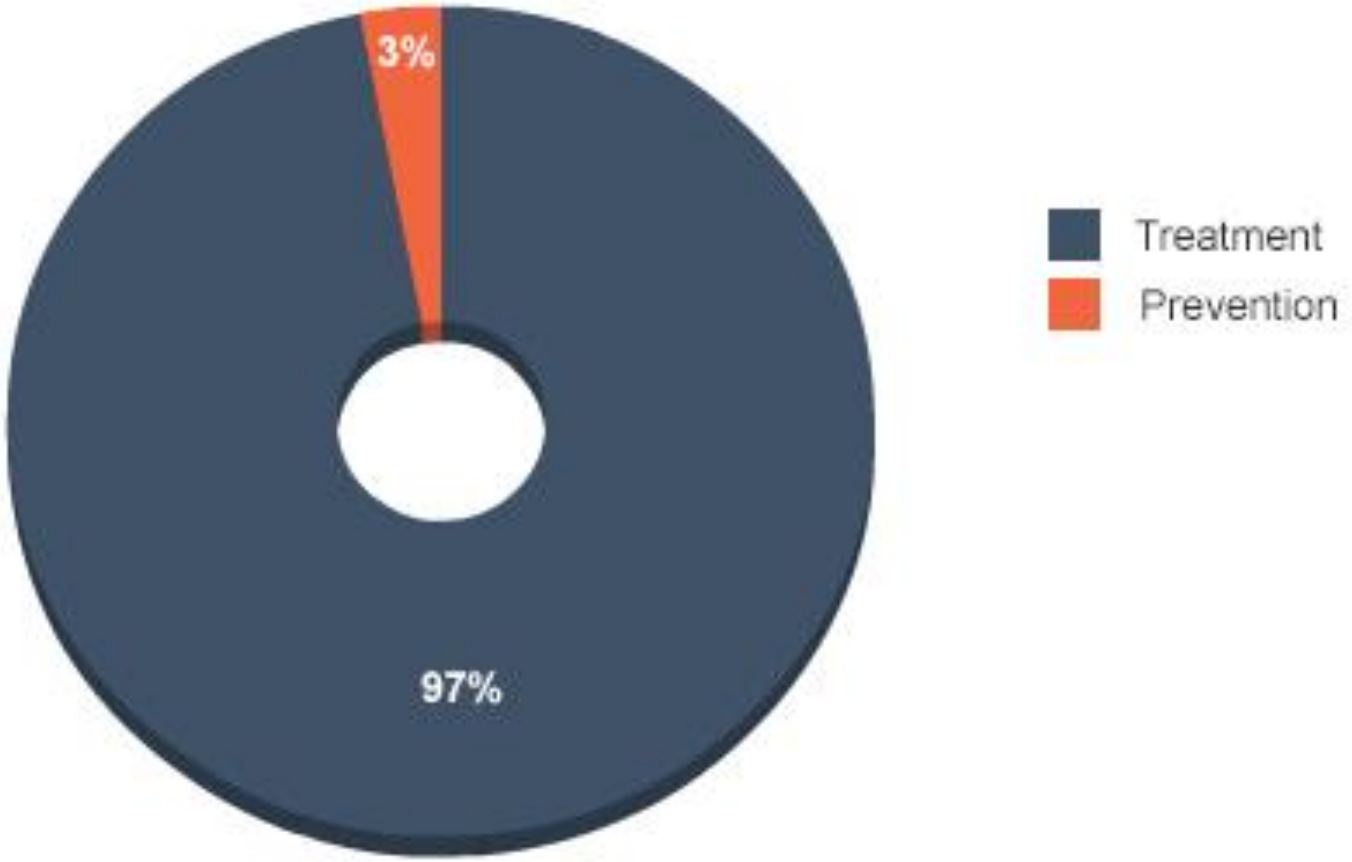

MASS AIR FLOW SENSOR
THROTTLE POSITION SENSOR
DETONATION (KNOCK) SENSOR
MANIFOLD ABSOLUTE PRESSURE SENSOR
EGR VALVE POSITION SENSOR
BAROMETRIC PRESSURE SENSOR
AMBIENT AIR TEMPERATURE SENSOR
HEATER CORE TEMPERATURE SENSOR
AIR CLEANER TEMPERATURE SENSOR
TAIL LIGHT OUTAGE SENSOR
STEERING RATE SENSOR
REAR WHEEL LEVEL SENSOR
CRANKSHAFT POSITION SENSOR
AIR TEMPERATURE SENSOR
COOLANT LEVEL SENSOR
VEHICLE HEIGHT SENSOR
WASHER FLUID LEVEL SENSOR
BRAKE FLUID LEVEL SENSOR
OXYGEN SENSOR
OIL TEMPERATURE SENSOR
TRANSMISSION OUTPUT SPEED SENSOR
ACCELERATOR PEDAL POSITION SENSOR
TURBO BOOST SENSOR
ACCELERATION SENSOR
ABS WHEEL SPEED SENSOR
EGR PRESSURE FEEDBACK SENSOR
METHANOL FUEL SENSOR
TRANSMISSION TEMPERATURE SENSOR
TRANSMISSION INPUT SPEED SENSOR
ABS WHEEL SPEED SENSOR
TRANSMISSION SHIFT POSITION SENSOR
CAMSHAFT POSITION SENSOR
VEHICLE SPEED SENSOR
COOLANT TEMPERATURE SENSOR

How is Béla?

- Blood sugar level: 12
- Coronary artery narrowed by 80%
- Venous Thromboembolism risk
- Atrial fibrillation
- Early stage colorectal cancer

Only 3% of total healthcare spending goes towards prevention

National health expenditure (in $US billions) by source, 2011



Evidence Based Preventive Medicine is a Key Solution

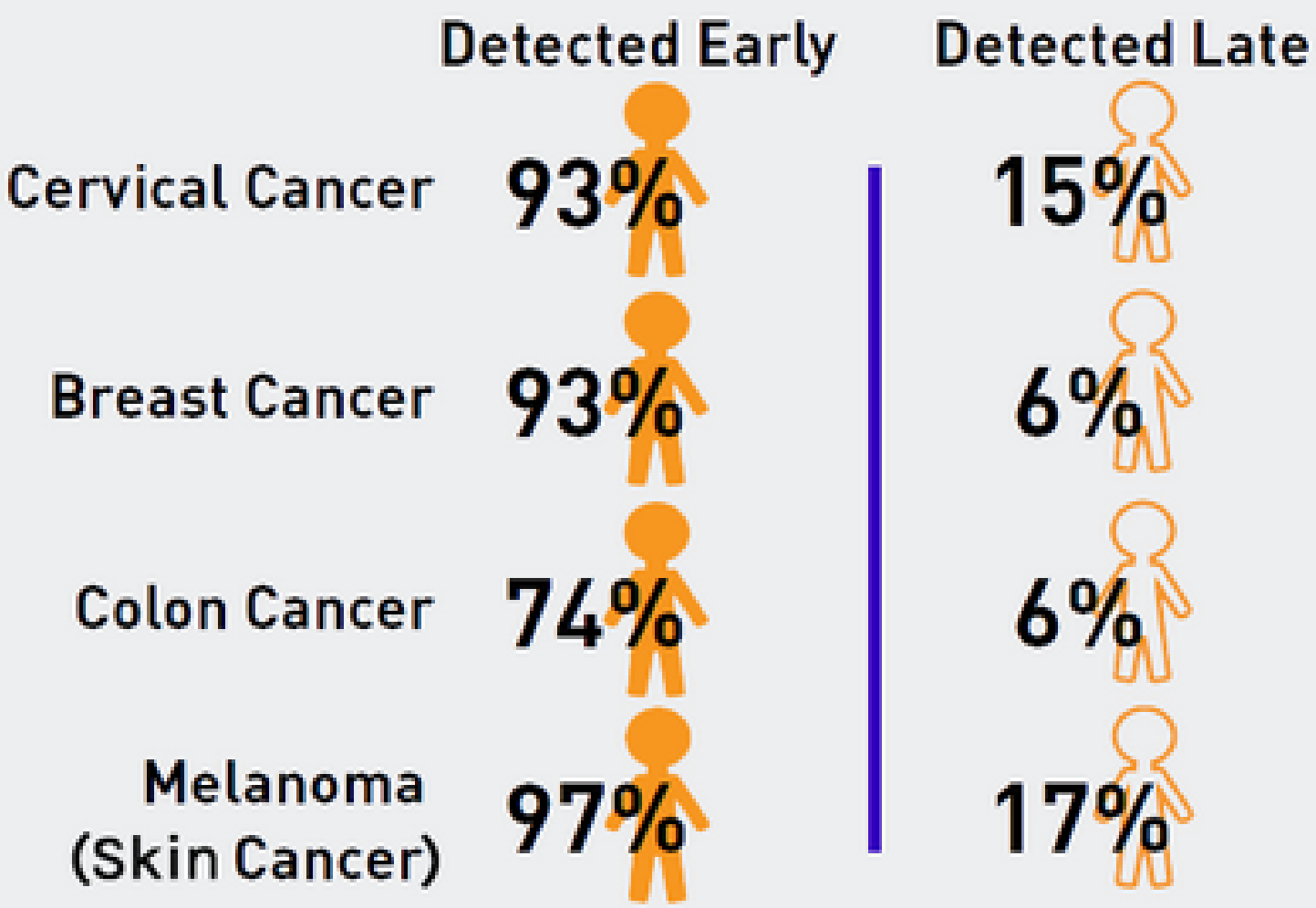
Centers for Disease Control and Prevention has found that:

↘ 80% of Heart Disease and Type II Diabetes as well as

↘ 40% of Cancer are ***Preventable***

- if people just:
  - » stopped smoking,
  - » ate healthy and
  - » exercised

Survival Rates



*Measured by 5 year survival rates
**Source: American Cancer Society

Health risk factors unknown to the „owner”

Elevated Risk

NAME	CONFIDENCE	YOUR RISK	AVG. RISK	COMPARED TO AVERAGE
Atrial Fibrillation	★★★★	33.9%	27.2%	1.25x
Prostate Cancer ♂	★★★★	27.0%	17.8%	1.51x
Age-related Macular Degeneration	★★★★	14.1%	6.5%	2.15x
Rheumatoid Arthritis	★★★★	3.2%	2.4%	1.34x
Restless Legs Syndrome	★★★★	2.5%	2.0%	1.25x
Multiple Sclerosis	★★★★	0.47%	0.34%	1.37x
Esophageal Squamous Cell Carcinoma (ESCC)	★★★★	0.43%	0.36%	1.21x
Stomach Cancer (Gastric Cardia Adenocarcinoma)	★★★★	0.28%	0.23%	1.22x
Scleroderma (Limited Cutaneous Type)	★★★★	0.08%	0.07%	1.24x

ED

erno duda
Profile settings

Feed
Your kits
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Order Kits

add new kit

gut

your gut data
open sample dashboard • 11 Feb 2015

Here is the overall makeup of your gut sample from kit 361-014-320, and how you compare to the average person in our dataset. Open the sample dashboard to explore!

Dashboard | Compare | Tree

Bacteria name	You	Average
Firmicutes	54.3%	59.5%
Bacteroidetes	41.3%	22.3%
Cyanobacteria	2.04%	0.193%
Actinobacteria	0.686%	2.43%
Proteobacteria	0.597%	3.15%

showing bacteria at phylum-level

gut

we received your gut sample
open sample dashboard • 23 Jan 2015

We received your gut sample from kit# 361-014-320 and it entered the processing pipeline.

survey for kit 361-014-320 completed

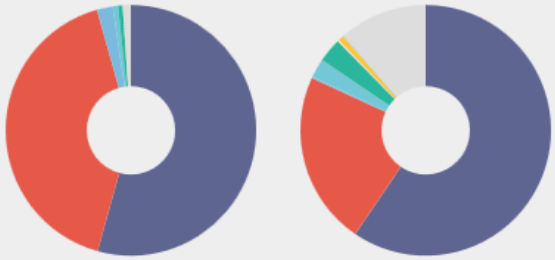
Contact us!

Your Gut Sample

All samples

This chart shows how your sample compares to the selected group; we start by comparing you to all samples, but you can chose another comparison from the list on the right. We then show you all the bacteria in your sample at the selected level and how you compare. The bar next to each bacteria shows the normal range in green —about two thirds of people fall into this group. Your sample is marked with a gray line (white when hovering).

phylum | class | order | family | genus

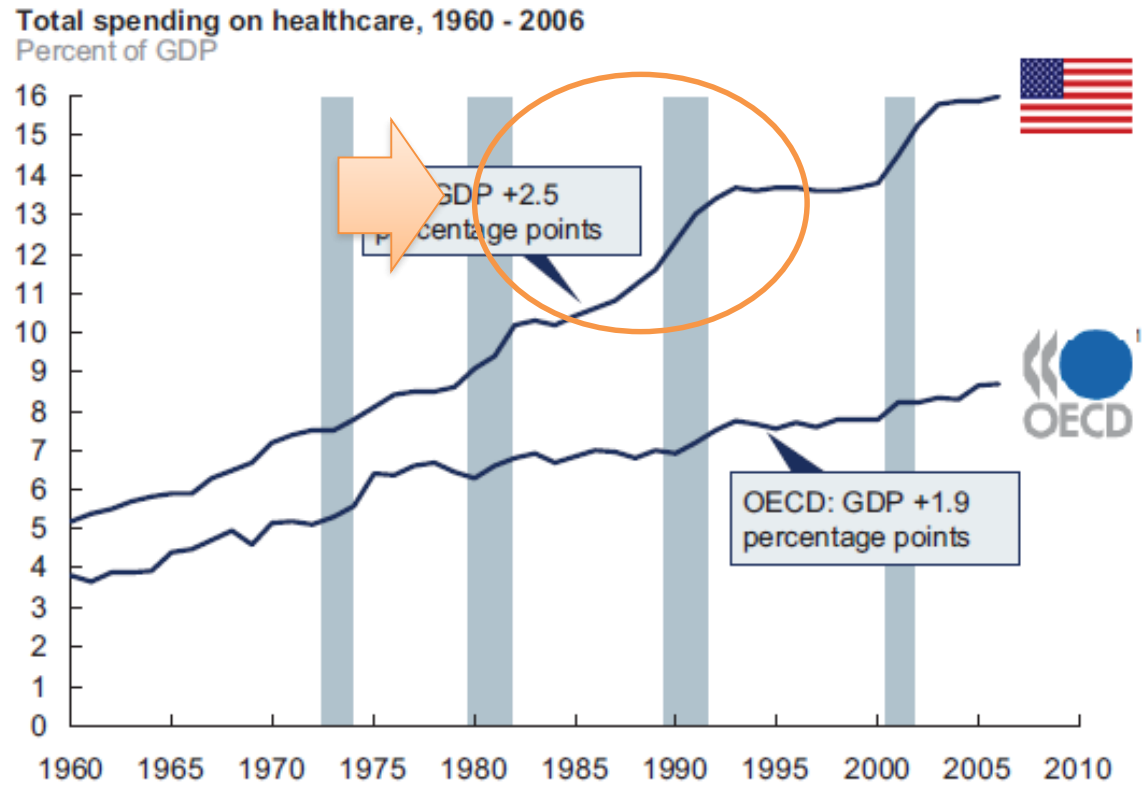


Bacteria name	You	Average	Compare
Firmicutes			
Bacteroidetes			

- Vegetarians
- Paleo Diet
- Healthy Omnivores
- Vegans
- Heavy Drinkers
- Weight Loss
- Weight Gain
- Antibiotics
- All Samples

Healthcare Spending is Unsustainable

OECD countries have seen healthcare growth exceed GDP by nearly 2 percentage points a year, with the US as a clear outlier



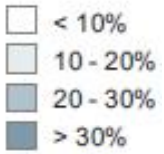
1 OECD median excluding US; sample size increased from 12 countries in 1960 to 29 in 2006

SOURCE: OECD Health Data 2008

Greenspan, HIMSS2009 Annual Conference & Exhibition

- *"Healthcare spending is unsustainable in the current economic climate"*
- *"If you cannot solve the overall funding problem, the [global] competitive issue will be quite secondary"*
- *"There's going to be a clash invariably because resources are not going to be as ample as they have been."*

If the trend continues, healthcare will consume an ever-growing and unsustainable proportion of the developed nations' wealth



Projected healthcare spend
Percent of GDP[1]

OECD countries	2005	2030	2050	2070
▪ US	15.3	24.9	36.7	65.6
▪ Switzerland	11.6	18.8	27.8	49.8
▪ France	11.1	18.0	26.6	47.6
▪ Germany	10.7	17.4	25.6	45.9
▪ Greece	10.1	16.4	24.2	43.3
▪ Canada	9.8	15.9	23.5	42.0
▪ Netherlands	9.2	14.9	22.0	39.5
▪ Denmark	9.1	14.8	21.8	39.0
▪ Italy	8.9	14.5	21.3	38.2
▪ UK	8.3	13.5	19.9	35.6
▪ Turkey	7.6	12.3	18.2	32.6
▪ Mexico	6.4	10.4	15.3	27.5

1 Linear extrapolation; assumes healthcare continues to grow at +2.0 percentage points above GDP

SOURCE: Forecast model assuming real GDP growth of 2.0%, healthcare spend growing at 0.95/1.9 percentage points above; OECD Policy Implications of the New Economy 2000 - 2050 (2001); Global Insight WMM 2000 - 2037

The Power of Healthcare Data

The Body as a Source of Big Data

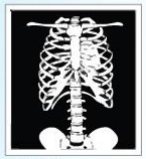
Today data storage is essential for healthcare providers to see a patient's complete story of care, make the most informed decisions and enhance treatment and outcomes.

Access to electronic patient data beyond the desktop

3D MRI 150MB

The human genome requires approximately **3GB** of data storage.[1]

MAMMOGRAMS 120MB



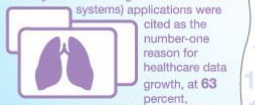
X-RAY 30MB

3D CT SCAN 1GB

0.5MB is generated

There are currently **425K** telehealth providers in the U.S.[3]

It is estimated that by 2015, the average hospital will generate **665TB** of data[2]



PACS (picture archiving and communication systems) applications were cited as the number-one reason for healthcare data growth, at **63** percent, followed by files held in the electronic health record (**54** percent) and scanned documents such as proof of insurance (**51** percent)[4]

The Medicare and Medicaid Electronic Health Record Incentive Program now includes a measure for recording imaging results via certified EHR technology.[5]

Common uses of health care analytics: More accurate diagnoses, streamlining the cost of care, revenue reimbursement, outcomes and business analysis to manage populations[6]

36.6M

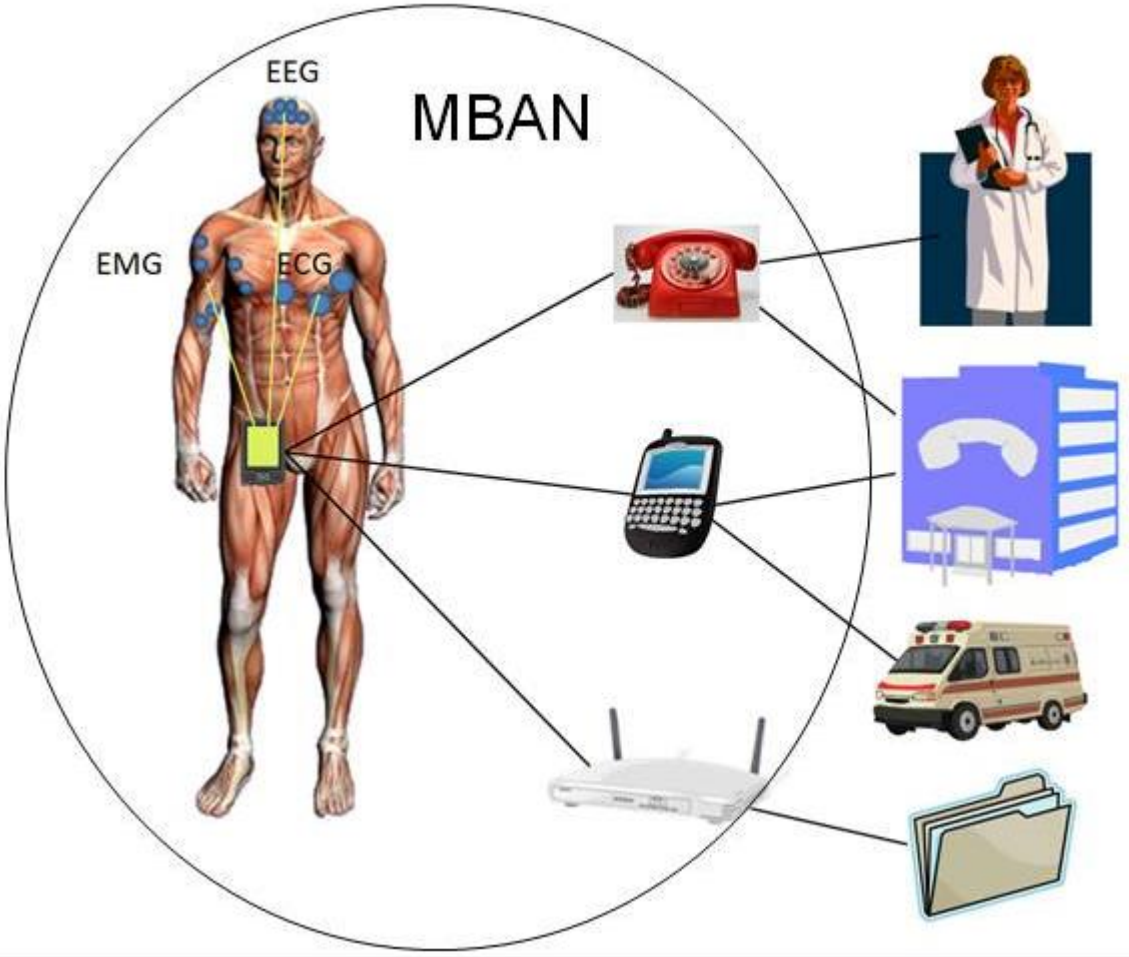
Total admissions in U.S. registered hospitals, according to the American Hospital Association[7]

Medical image archives are increasing by **20-40%** annually[4]

Today, **80%** of data is unstructured, such as images, video and email.[8]

Wearable Medical BAN Applications

- **Bio-Medical**
  - EEG Electroencephalography
  - ECG Electrocardiogram
  - EMG Electromyography (muscular)
  - Blood pressure
  - Blood SpO2
  - Blood pH
  - Glucose sensor
  - Respiration
  - Temperature
  - Fall detection
- **Sports performance**
  - Distance
  - Speed
  - Posture (Body Position)
  - Sports training aid

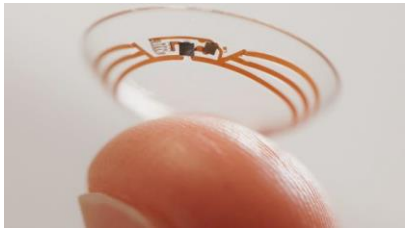


i-calQ has developed the world's first smartphone-based point-of-care integrated mobile diagnosis and decision support system

General Practitioner Toilet, gives you a full health report based on a urine sample it collects from the basin.

Biomeme is end-to-end mobile platform to isolate DNA

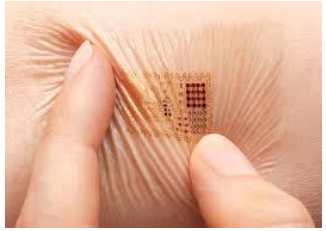
blood glucose "tattoo"



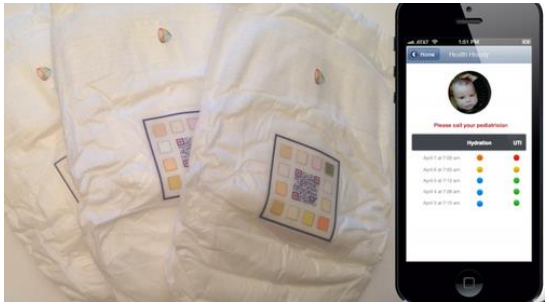
Google unveiled a prototype "smart" contact lens to monitor blood glucose levels

Biopatch is a wearable sensor for continuous monitoring by measuring ECG.

Emotiv Insight is a sleek, 5-channel, wireless headset that records your brainwaves and translates them into meaningful data you can understand.



BioStamp is a collection of sensors within collect data such as body temperature, heart rate, brain activity, and exposure to ultraviolet radiation.



Smart Diapers work with our app to keep track of your child's health

MobiSante's smartphone-based ultrasound

proteus
DIGITAL HEALTH

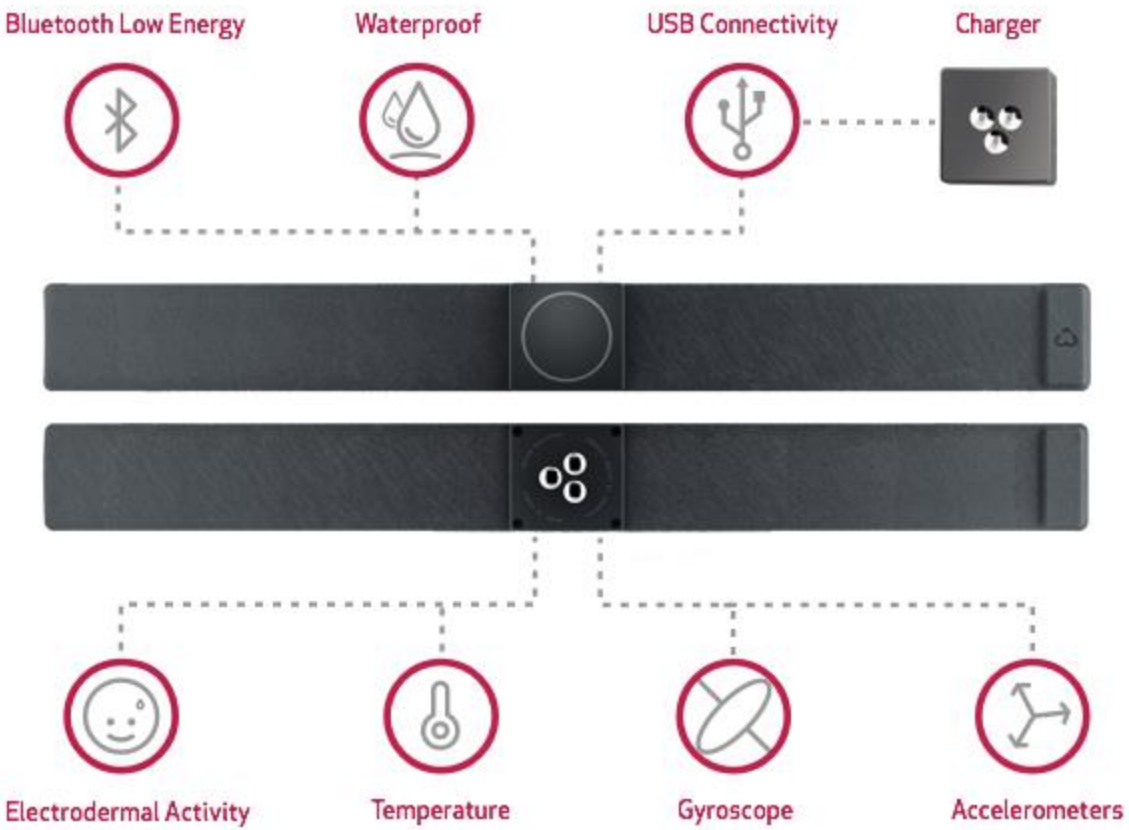
HEALTHCARE MONITORING

The FDA approval could foster the development and approval of other ingestible sensors

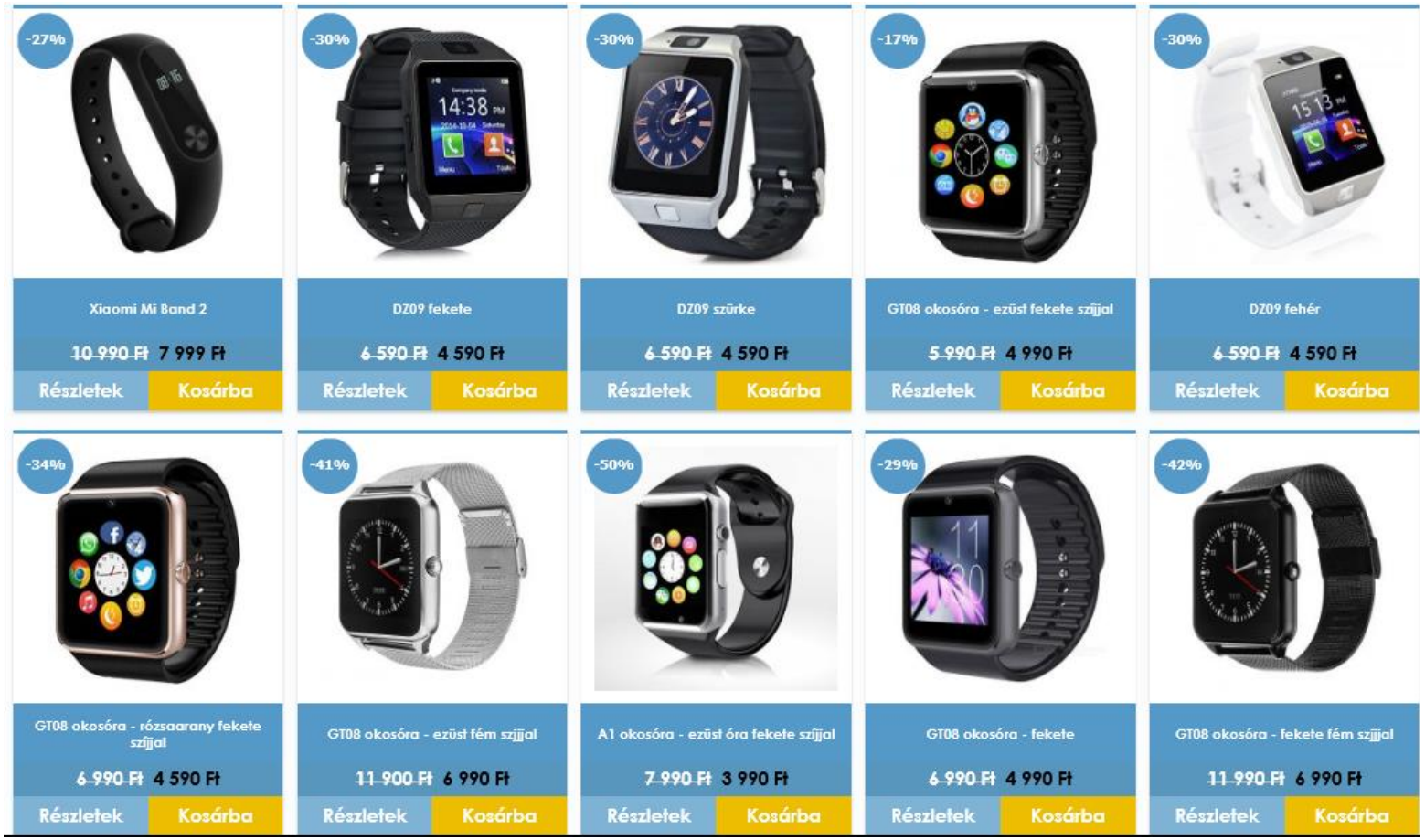
Source: proteusdigitalhealth.com

Images courtesy of Cisco

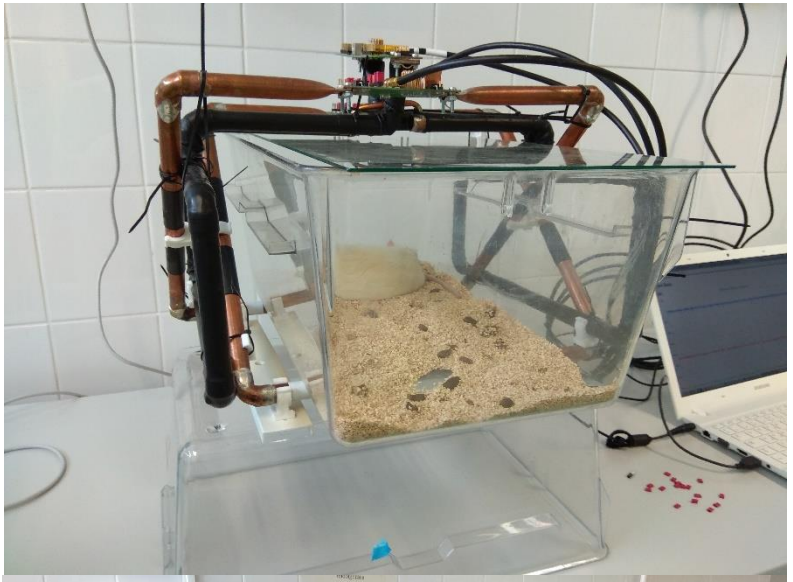
embrace


Bluetooth Low Energy
Waterproof
USB Connectivity
Charger
Electrodermal Activity
Temperature
Gyroscope
Accelerometers

Okoscucc.hu


-27%
Xiaomi Mi Band 2
10 990 Ft 7 999 Ft
Részletek Kosárba
-30%
DZ09 fekete
6 590 Ft 4 590 Ft
Részletek Kosárba
-30%
DZ09 szürke
6 590 Ft 4 590 Ft
Részletek Kosárba
-17%
GT08 okosóra - ezüst fekete szíjjal
5 990 Ft 4 990 Ft
Részletek Kosárba
-30%
DZ09 fehér
6 590 Ft 4 590 Ft
Részletek Kosárba
-34%
GT08 okosóra - rózsaarany fekete szíjjal
6 990 Ft 4 590 Ft
Részletek Kosárba
-41%
GT08 okosóra - ezüst fém szíjjal
11 900 Ft 6 990 Ft
Részletek Kosárba
-50%
A1 okosóra - ezüst óra fekete szíjjal
7 990 Ft 3 990 Ft
Részletek Kosárba
-29%
GT08 okosóra - fekete
6 990 Ft 4 990 Ft
Részletek Kosárba
-42%
GT08 okosóra - fekete fém szíjjal
11 990 Ft 6 990 Ft
Részletek Kosárba

RatBand

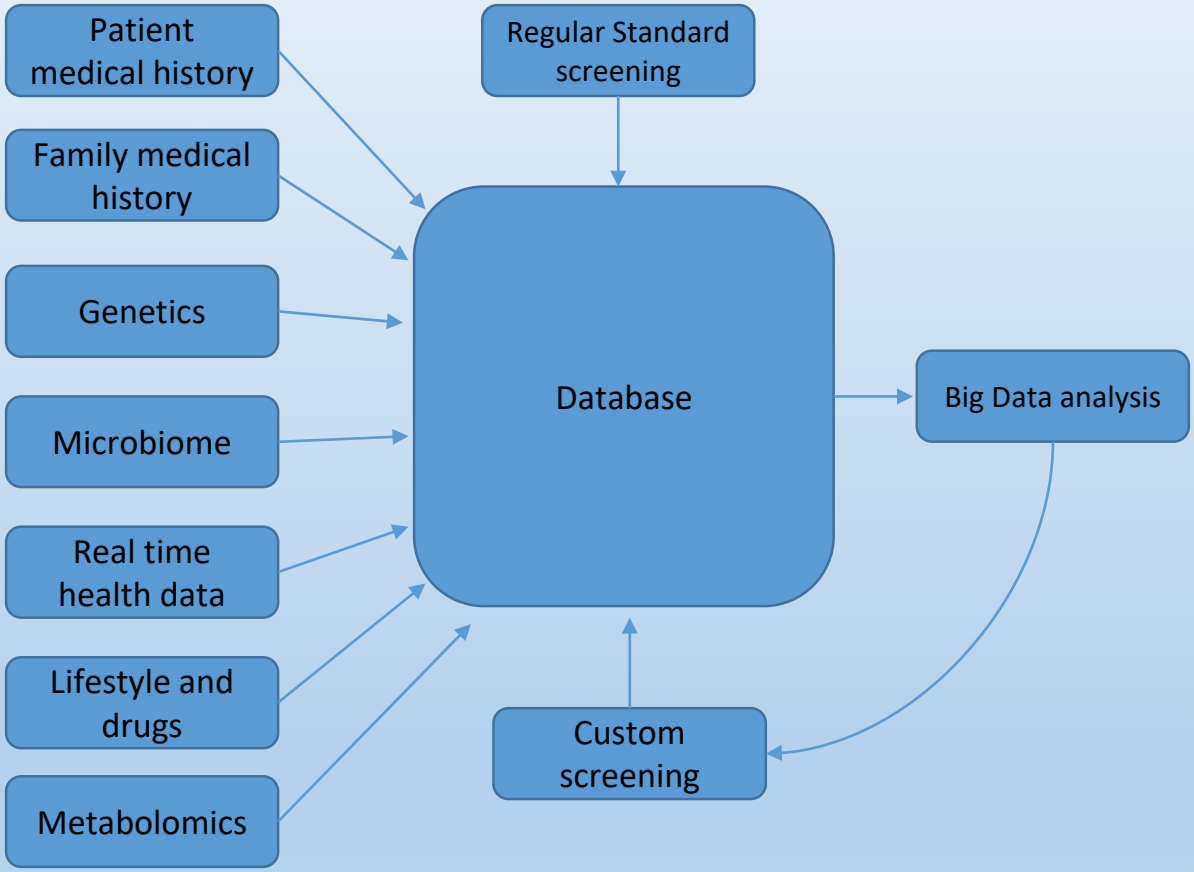


MEDIPREDICT

What are the issues?

- Doctors are trained (and compensated) to cure disease, not to prevent it
- Doctors are highly specialized (100+ specializations)
- ~30.000 known diseases of which ~8.000 are rare diseases
- Medline has 26m+ publications
- We don’t have really good biomarkers (yet)
- Most diagnostics procedures are still weak on specificity and selectivity
- AI is successfully used in specific areas, such as Watson in oncology

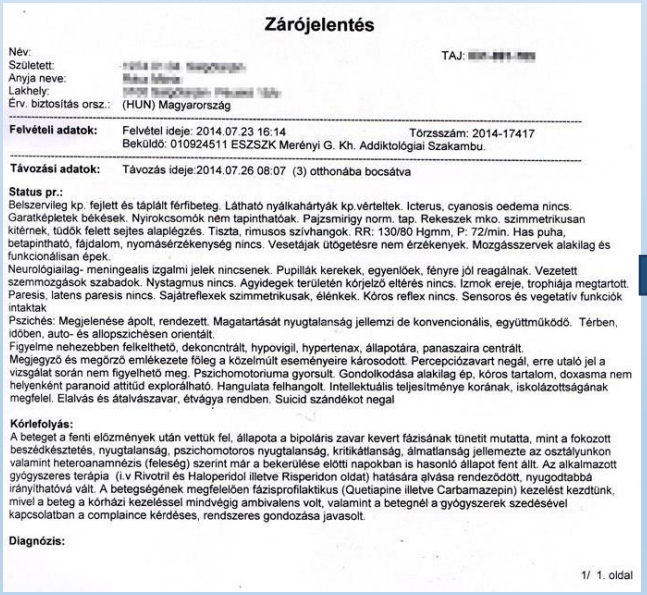
Software


Patient medical history
Family medical history
Genetics
Microbiome
Real time health data
Lifestyle and drugs
Metabolomics
Regular Standard screening
Database
Big Data analysis
Custom screening

Separated databases

Processing medical history

With consent from the client, we collect medical history results about the individual (hospitals, clinics, outpatient clinics, general practitioners, private clinics, etc.). Data that is currently in different locations and formats needs to be standardized and merged into a single database in order to be interpretable for our medical team as well as the artificial intelligence.



Zárójelentés

Név: TAJ:
Született:
Anyja neve:
Lakhely:
Érv. biztosítás orsz.: (HUN) Magyarország

Felvételi adatok: Felvétel ideje: 2014.07.23 16:14 Törzsszám: 2014-17417
Beküldő: 010924511 ESZSZK Merényi G. Kh. Addiktológiai Szakambu.

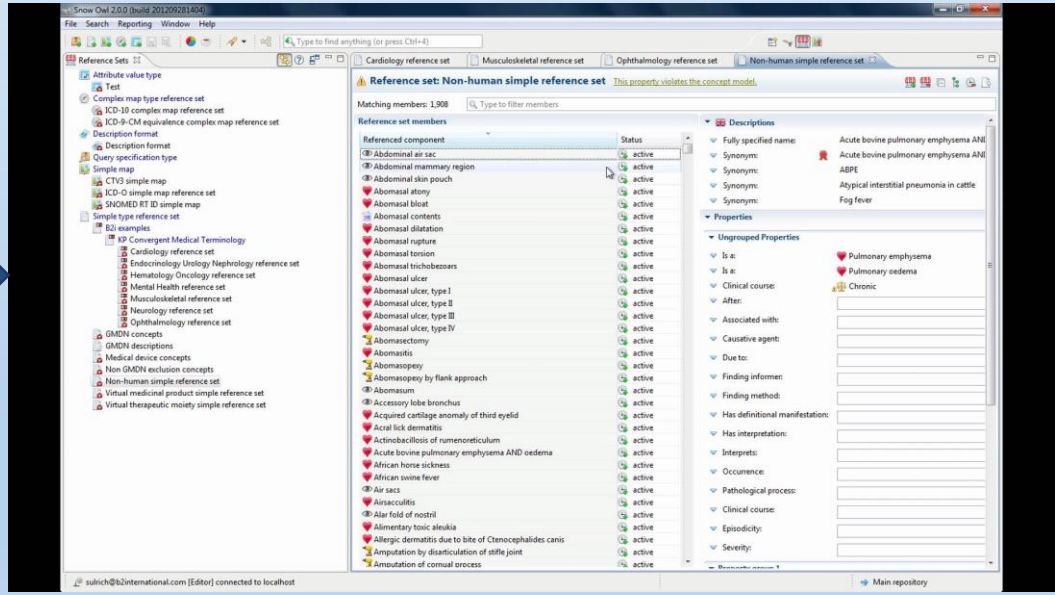
Távozási adatok: Távozás ideje:2014.07.26 08:07 (3) otthonába bocsátva

Status pr.:
Belszervileg kp. fejlett és táplált férfibeteg. Látható nyálkahártyák kp.vérteltek. Icterus, cyanosis oedema nincs. Garatképletek békések. Nyirokcsomók nem tapinthatóak. Pajzsmirigy norm. tap. Rekeszek mko. szimmetrikusan kitérnek, tüdők felett sejtes alaplégzés. Tiszta, rimusos szívhangok. RR: 130/80 Hgmm, P: 72/min. Has puha, betapintható, fájdalom, nyomásérzékenység nincs. Vesetájak ütögetésre nem érzékenyek. Mozgásszervek alakilag és funkcionálisan épek.
Neurológiailag- meningealis izgalmi jelek nincsenek. Pupilláik kerekek, egyenlőek, fényre jól reagálnak. Vezetett szemmozgások szabadok. Nystagmus nincs. Agyidegek területén kórjelző eltérés nincs. Izmok ereje, trophiája megtartott. Paresis, latens paresis nincs. Sajátreflexek szimmetrikusak, élénkek. Kóros reflex nincs. Sensoros és vegetatív funkciók intaktak
Pszichés: Megjelenése ápolt, rendezett. Magatartását nyugtalanság jellemzi de konvencionális, együttműködő. Térben, időben, auto- és allopszichésen orientált.
Figyelme nehezebben felkelthető, dekoncntrált, hypovigil, hypertenax, állapotára, panaszaira centrált.
Megjegyző és megőrző emlékezete főleg a közelmúlt eseményeire károsodott. Percepciózavart negál, erre utaló jel a vizsgálat során nem figyelhető meg. Pszichomotoriuma gyorsult. Gondolkodása alakilag ép, kóros tartalom, doxasma nem helyenként paranoid attitűd explorálható. Hangulata felhangolt. Intellektuális teljesítménye korának, iskolázottságának megfelel. Elalvás és átalvászavar, étvágya rendben. Suicid szándékot negal

Kórlefolyás:
A beteget a fenti előzmények után vettük fel, állapota a bipoláris zavar kevert fázisának tünetit mutatta, mint a fokozott beszédkészletés, nyugtalanság, pszichomotoros nyugtalanság, kritikátlanság, álmatlanság jellemezte az osztályunkon valamint heteroanamnézis (feleség) szerint már a bekerülése előtti napokban is hasonló állapot fent állt. Az alkalmazott gyógyszeres terápia (i.v Rivotril és Haloperidol illetve Risperidon oldat) hatására alvása rendeződött, nyugodtabbá irányíthatóvá vált. A betegségének megfelelően fázisprofilaktikus (Quetiapine illetve Carbamazepin) kezelést kezdtünk, mivel a beteg a kórházi kezeléssel mindvégig ambivalens volt, valamint a betegnél a gyógyszerek szedésével kapcsolatban a complaince kérdéses, rendszeres gondozása javasolt.

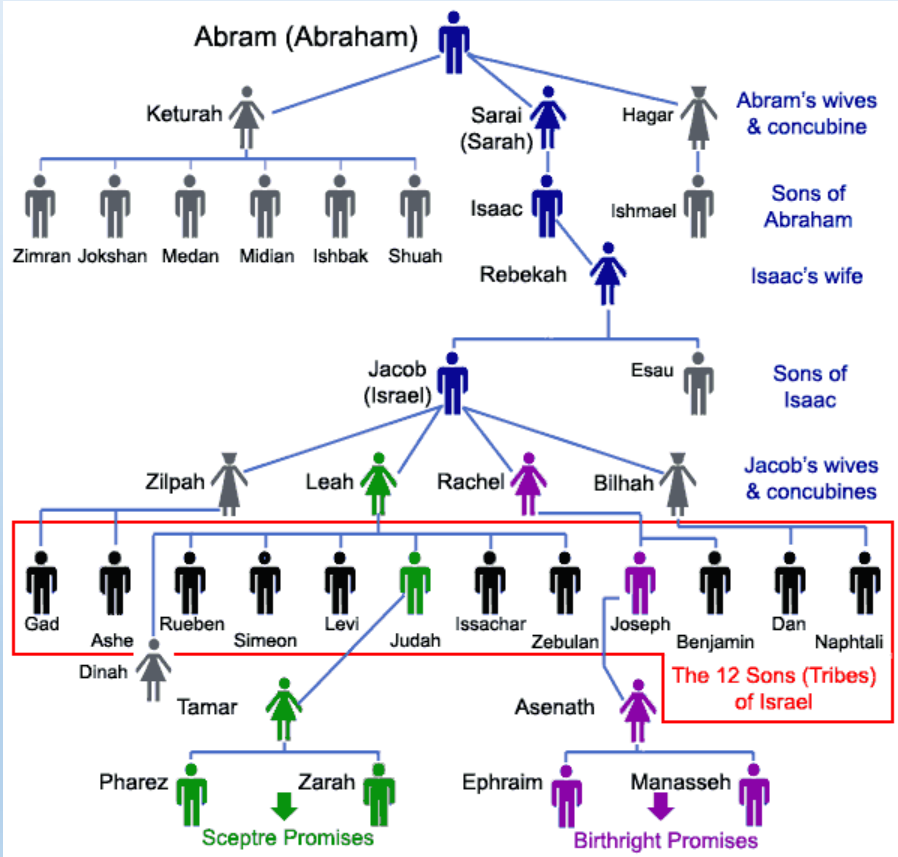
Diagnózis:

1/ 1. oldal



Family medical history

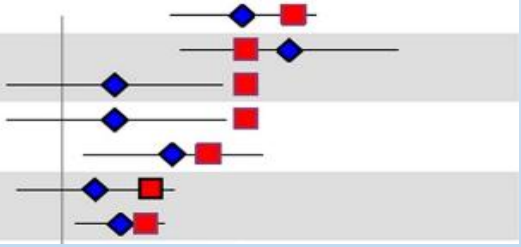
With the same procedure as in the case of the individual, we process the available medical history of the family (mainly the ascendants and siblings).



Genetics

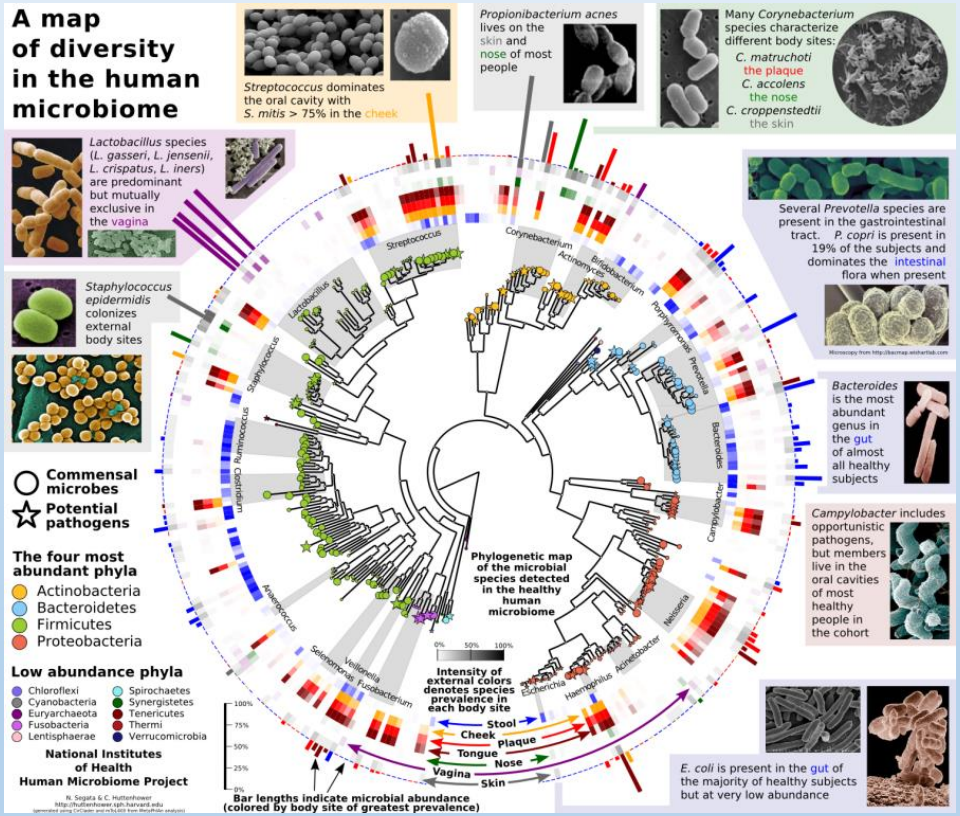
The next step is the analysis of genetic risk factors. If the client has already had a genetic test, the results are recorded in our database. If the client has not had any type of genetic testing done, we will arrange such tests as well, through our contracting partners.

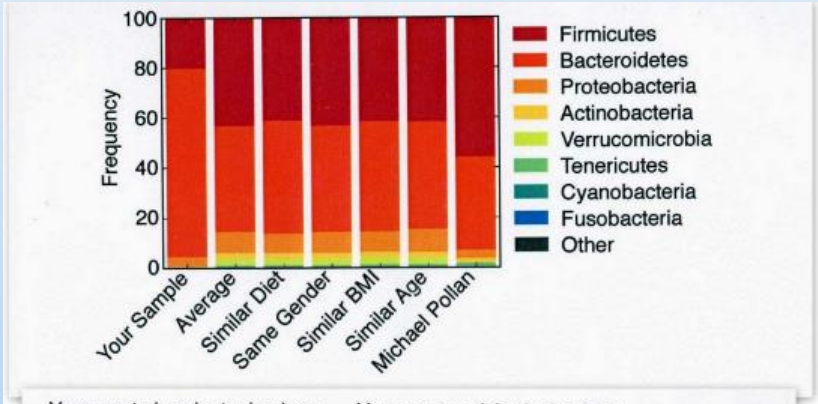
disease	marker	gene / region	number needed	number identified
RA	rs6457620	Intergenic Chr. 6	75	138
MS	rs3135388	DRB1*1501	108	61
RA	rs6679677	RSBN1	238	134
RA	rs2476601	PTPN22	238	134
AF	rs2200733	Chr. 4q25	292	147
CD	rs11805303	IL23R	493	107
T2D	rs4506565	TCF7L2	503	532



#Chr	Position	Ref	Alt	Depth	Zygosity	Effect	Gene_Name	HGVS.c	HGVS.p	dbSNP142	1000G_EUR
chr3	121976253	G	A	9	HOM	intron_variant	CASR	c.492+19G>A	.	rs9869985	0.9632
chr3	122000871	C	T	54	HOM	intron_variant	CASR	c.1609-59C>T	.	rs4678174	0.6839
chr3	122003045	G	C	166	HOM	synonymous_variant	CASR	c.2274G>C	p.Pro758Pro	rs2036400	1
chr3	122003832	G	C	123	HOM	missense_variant	CASR	c.3061G>C	p.Glu1021Gln	rs1801726	0.9632
chr3	122004098	A	T	15	HOM	3_prime_UTR_variant	CASR	c.*60A>T	.	rs4677948	0.9632
chr19	3110349	T	G	81	HET	intron_variant	GNA11	c.321+18T>G	.	rs11085000	0.4245
chr19	3113305	G	C	26	HET	intron_variant	GNA11	c.322-23G>C	.	rs1682811	0.8638
chr19	3119184	T	G	24	HET	intron_variant	GNA11	c.736-20T>G	.	rs308046	0.8638
chr19	3119239	C	T	50	HET	synonymous_variant	GNA11	c.771C>T	p.Thr257Thr	rs4900	0.4324

Microbiome





Your most abundant microbes:

Taxonomy	Sample
Genus *Bacteroides*	45.7%
Family Rikenellaceae	16.1%
Genus *Paraprevotella*	6.0%
Family Ruminococcaceae	5.2%

Your most enriched microbes:

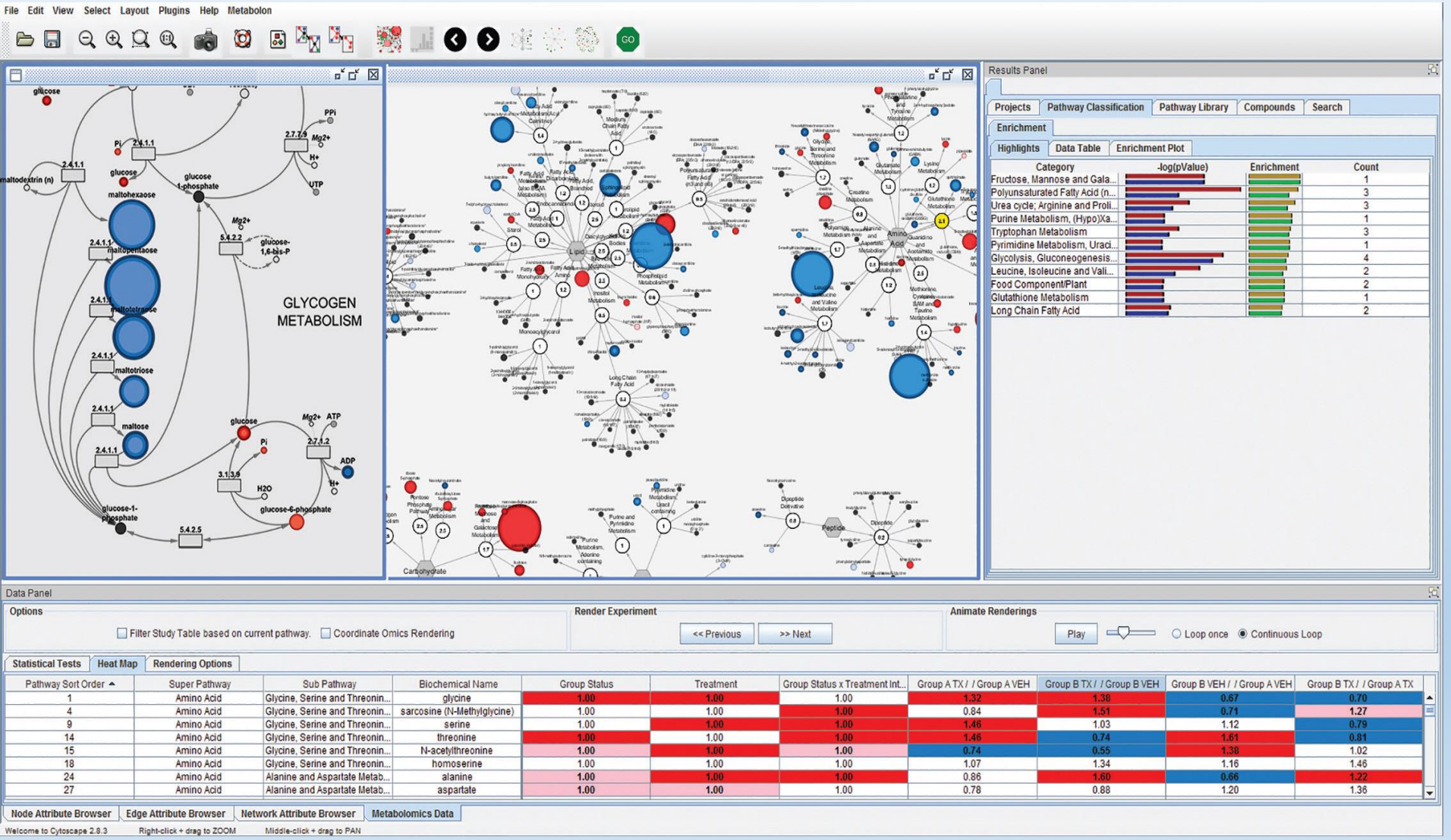
Taxonomy	Sample	Population	Fold
Genus *Paraprevotella*	6.0%	0.39%	15x
Family Barnesiellaceae	5.1%	0.63%	8x
Family Rikenellaceae	16.1%	1.81%	9x
Family Oxalobacteraceae	0.1%	0.01%	20x

Your sample contained the following rare taxa: Genus *Stenotrophomonas*.

Metabolomics

Amino Acid Metabolism	Cofactor & Vitamin Metabolism	Nucleotide Metabolism	Microbiome Metabolism
Amino Acid catabolism Bioactive intermediates & trace amines Glutathione metabolism Inflammatory mediators Microbiome metabolism Polyamines/ornithine metabolism Urea Cycle	Ascorbate metabolism CoA metabolism FAD metabolism Folate metabolism NAD/NADP metabolism PLP metabolism SAM metabolism Many other cofactors and vitamins (tocopherol, B12, Biotin)	Degradation of nucleotides Deoxyribonucleotides DNA damage FAD metabolism Modified nucleotides Nucleotide Coenzymes Purine and pyrimidine de novo synthesis Purine and pyrimidine salvage synthesis Ribose metabolism	2o Bile acids Aromatic amino acids Energy Choline/carnitine Xenobiotics Fatty acids/short chain & medium chain Vitamins Polyamines
Carbohydrate Metabolism	**Energy Metabolism**	**Lipid Metabolism**	**Novel Metabolites**
Gluconeogenesis Glucose metabolism Glycogen metabolism Glycosylation pathways Metabolism of other carbon sources Metabolism of sugars (fructose, galactose) Polyol metabolism Pyruvate metabolism	Acyl-carnitines Beta-oxidation Creatine metabolism FAD metabolism Glycolysis Mitochondrial function Pentose phosphate pathway	Bile acids Bioactive lipids Cholesterol Fatty acids Sphingosine Inflammatory mediators Lysolipids Sterols Oxidized lipids (COX, LOX)	Novel drug metabolites Novel xenobiotics Novel microbiota metabolites Novel by-products of non-canonical host metabolism

Metabolomics



Regular check-ups

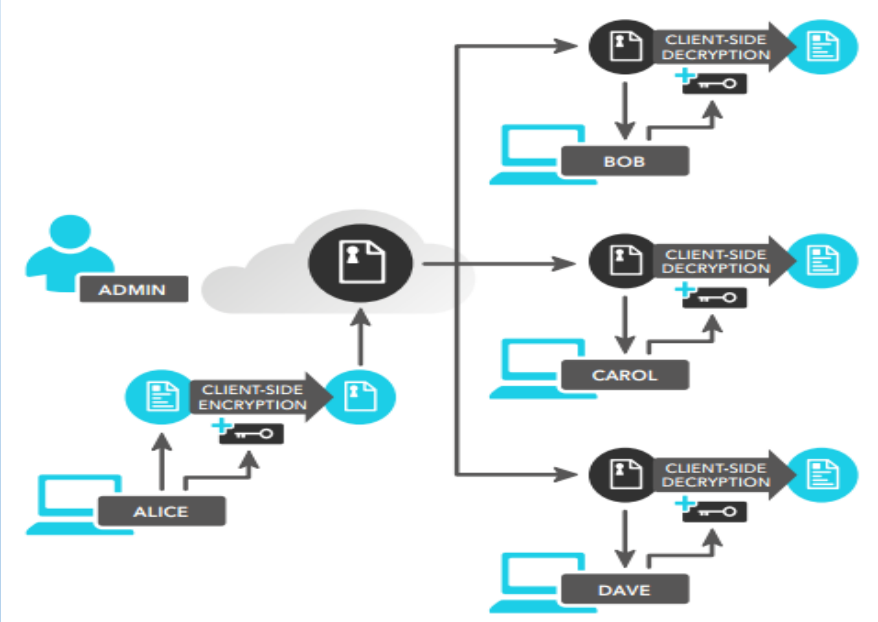
We perform frequent regular checkups (blood- and urine tests, EKG, internal medicine, neurological, sensory, dermatologic screenings, etc.), at time and location specified by the client.

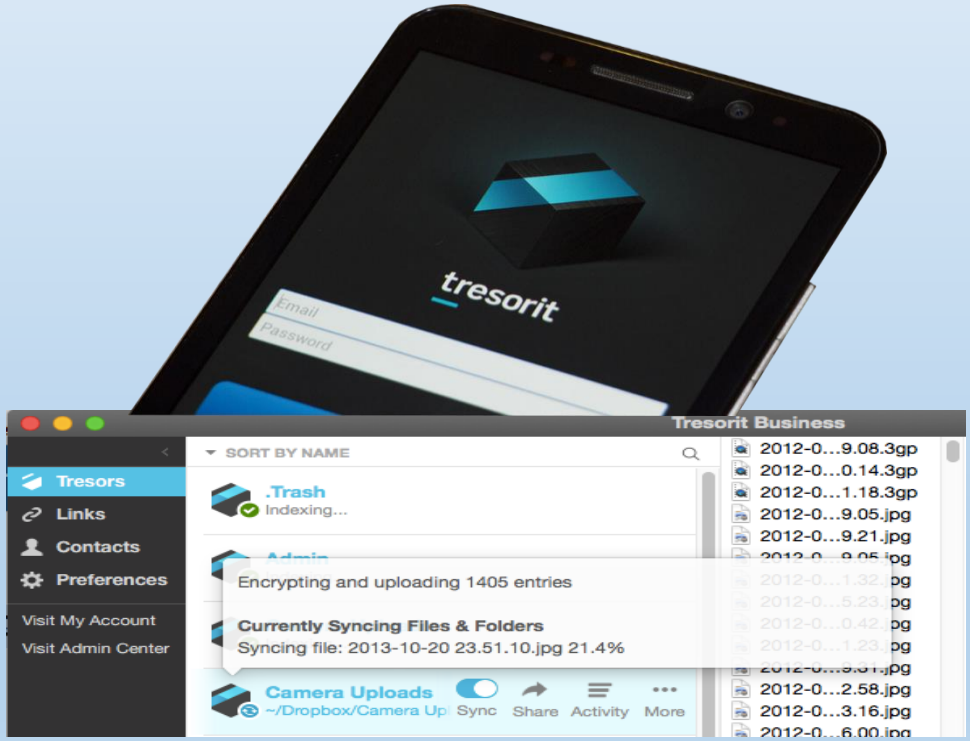
Wearable data

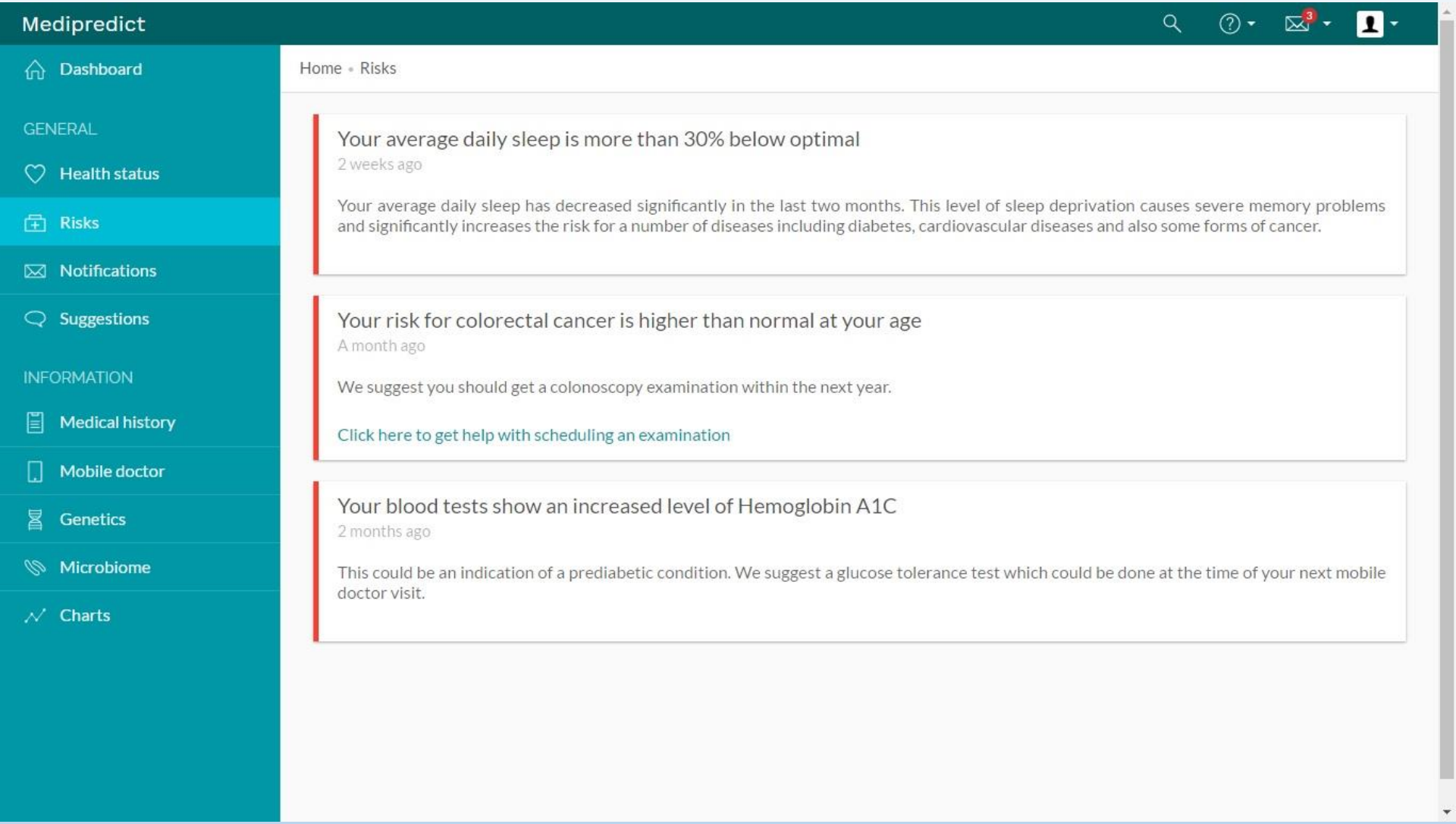
If our client owns a digital medical device (blood pressure monitor, blood glucose monitor, etc.) or wearable medical device that tracks or monitors health data (smart watch, fitness band), then data recorded is synchronized with formerly collected data contained in our database.

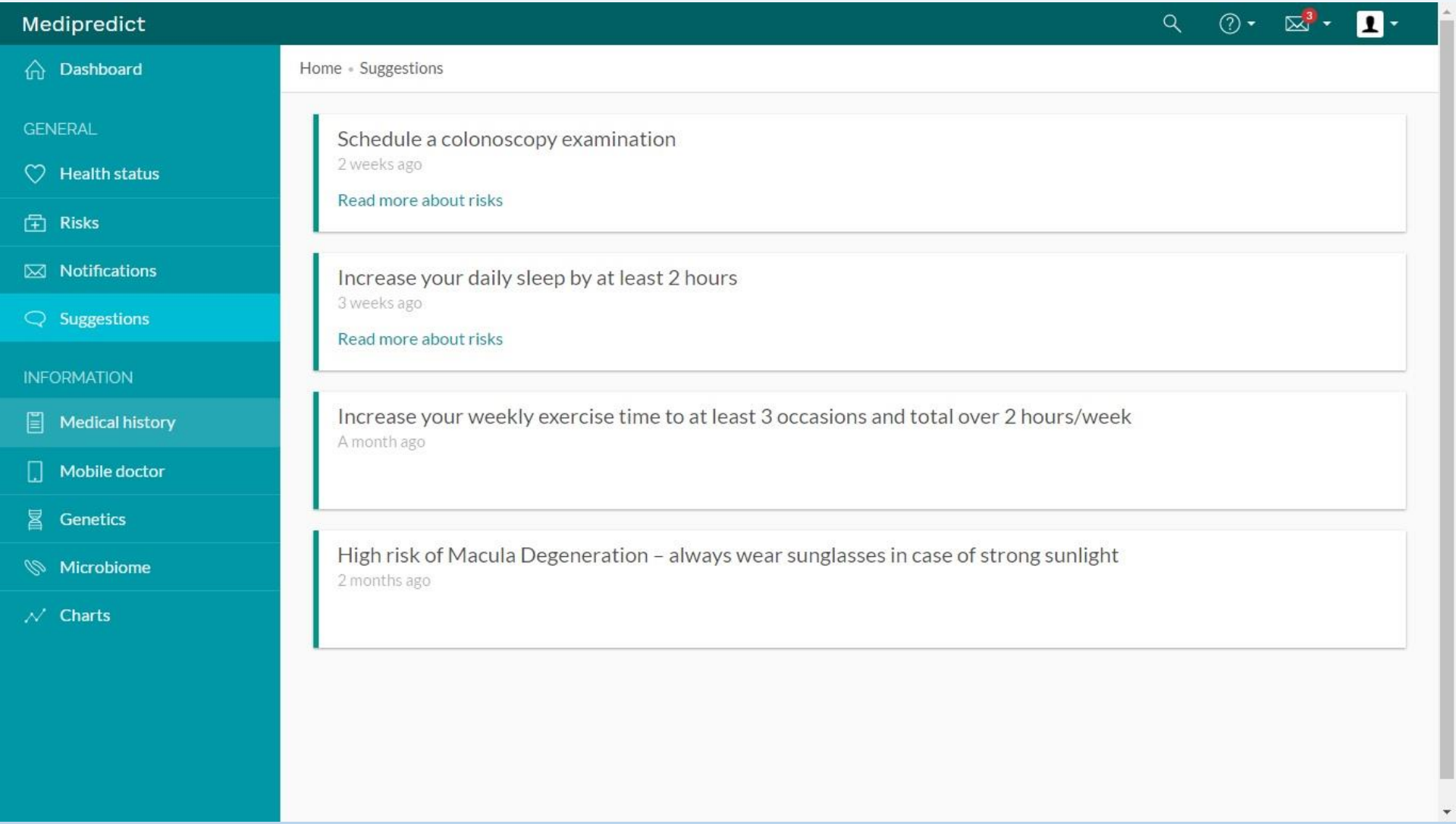
Data security & safety

We protect our clients' data with high-level encryption. Clients can view their own data through our secure website or mobile app, and the client may also grant access to their own data to family members or doctors.






Medipredict
3
Dashboard
GENERAL
Health status
Risks
Notifications
Suggestions
INFORMATION
Medical history
Mobile doctor
Genetics
Microbiome
Charts
Home • Risks
Your average daily sleep is more than 30% below optimal
2 weeks ago
Your average daily sleep has decreased significantly in the last two months. This level of sleep deprivation causes severe memory problems and significantly increases the risk for a number of diseases including diabetes, cardiovascular diseases and also some forms of cancer.
Your risk for colorectal cancer is higher than normal at your age
A month ago
We suggest you should get a colonoscopy examination within the next year.
Click here to get help with scheduling an examination
Your blood tests show an increased level of Hemoglobin A1C
2 months ago
This could be an indication of a prediabetic condition. We suggest a glucose tolerance test which could be done at the time of your next mobile doctor visit.


Medipredict
3
Dashboard
GENERAL
Health status
Risks
Notifications
Suggestions
INFORMATION
Medical history
Mobile doctor
Genetics
Microbiome
Charts
Home • Suggestions
Schedule a colonoscopy examination
2 weeks ago
Read more about risks
Increase your daily sleep by at least 2 hours
3 weeks ago
Read more about risks
Increase your weekly exercise time to at least 3 occasions and total over 2 hours/week
A month ago
High risk of Macula Degeneration – always wear sunglasses in case of strong sunlight
2 months ago

Conclusions

- Focus is on predicting and preventing disease + early diagnosis
- Target group is healthy people
- This service is NOT cost effective and not meant to be
- Technological development will decrease the price
- Accuracy will constantly improve as database grows + additional data sources are included

Thank you for your attention

www.medipredict.com