



2º SEMINÁRIO INTERNACIONAL SESI DE SAÚDE SUPLEMENTAR

Integração da Informação Como Parte da Operação do Sistema de Saúde

Edilberto Amorim
Massachusetts Institute of Technology
University of California, San Francisco



edamorim@mit.edu



Serviço Social da Indústria
PELO FUTURO DO TRABALHO

Disclosures



Research training fellowship

Postdoctoral research fellowship

MIT-Philips Clinician Award

SCCM-Weil Research Grant

R01NS102574

Disclosures



University of California
San Francisco



HARVARD
MEDICAL SCHOOL



MASSACHUSETTS
GENERAL HOSPITAL

Opinions are my own and no not necessarily represent the official position of any other employer or company

Disclosures

As tecnologias demonstradas aqui não são recomendações minhas ou dos meus associados ou empregadores e são meramente ilustrativas

Essa é a Glória

Ela é diretora de
RH numa empresa
têxtil em Osasco

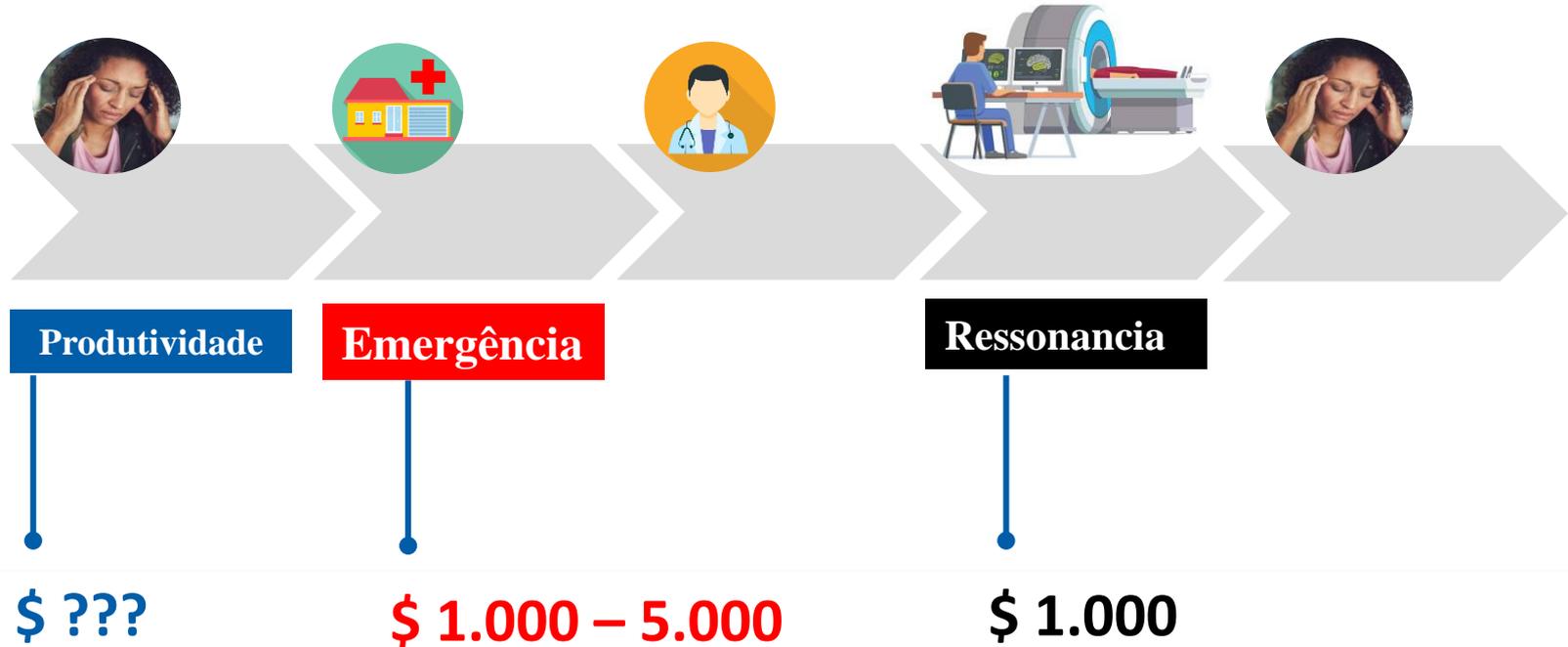


Essa é a Glória

Uma vez por
semana ela
tem uma crise de
enxaqueca.



Cuidando da Enxaqueca da Gloria



Por que a **Glória** esta com enxaqueca?

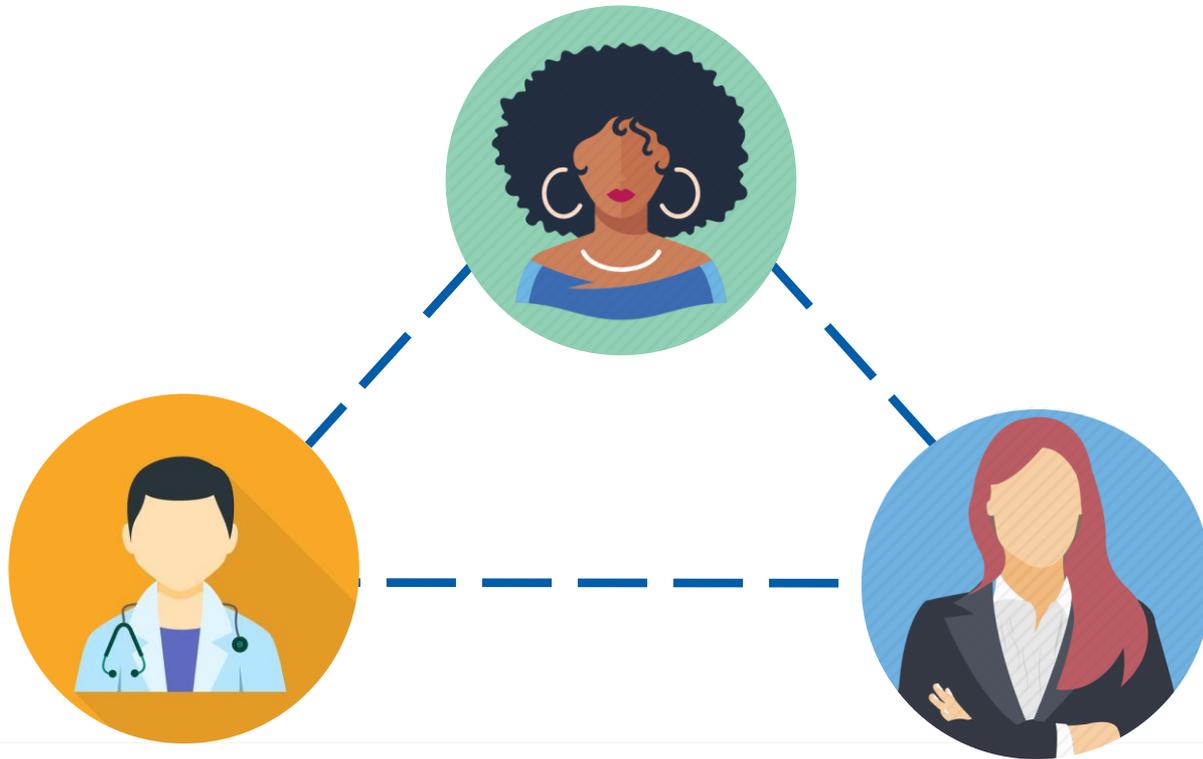
Por que a Glória esta com enxaqueca?

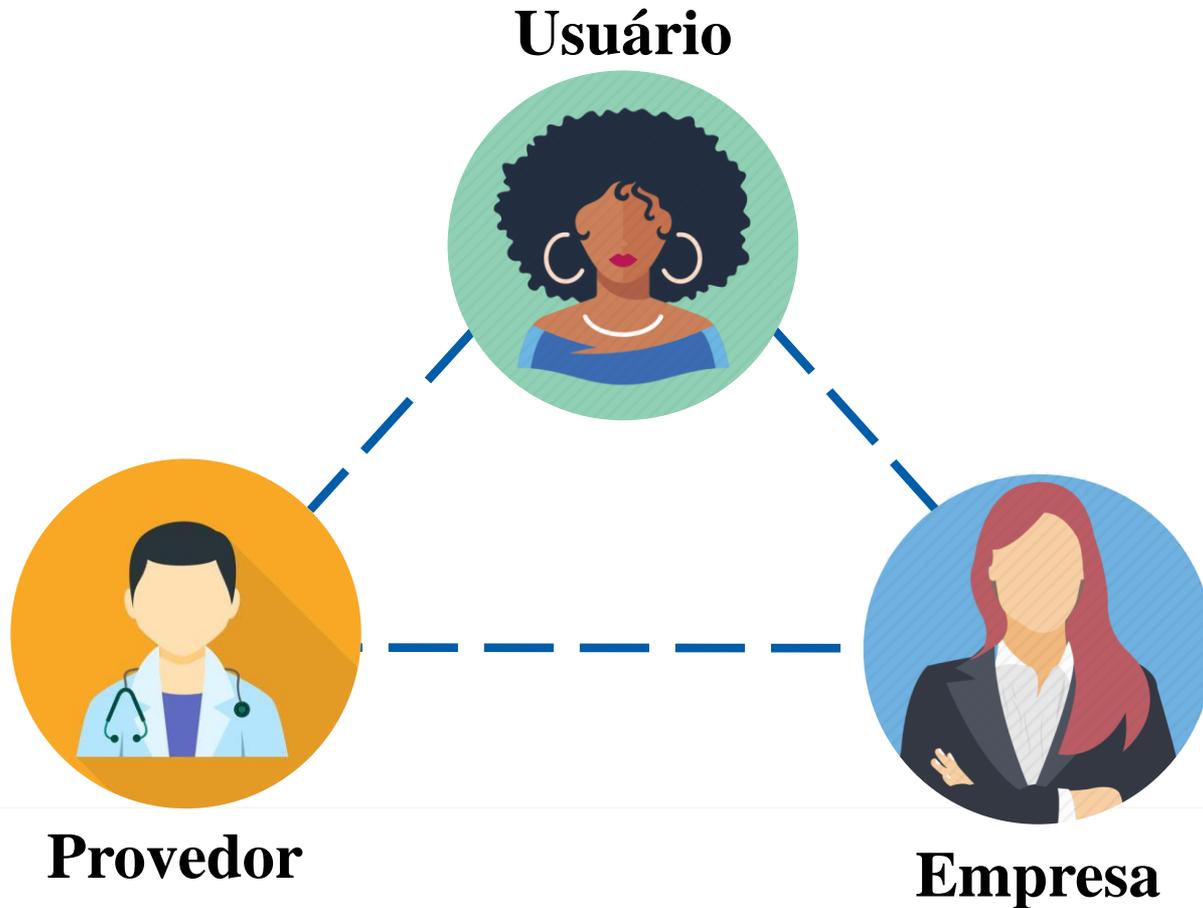
↳ Não sabe que existe **Prevenção**

↳ Não tem **Acesso** fácil ao médico

↳ **Stress** no trabalho/casa









2º SEMINÁRIO INTERNACIONAL SESI DE SAÚDE SUPLEMENTAR

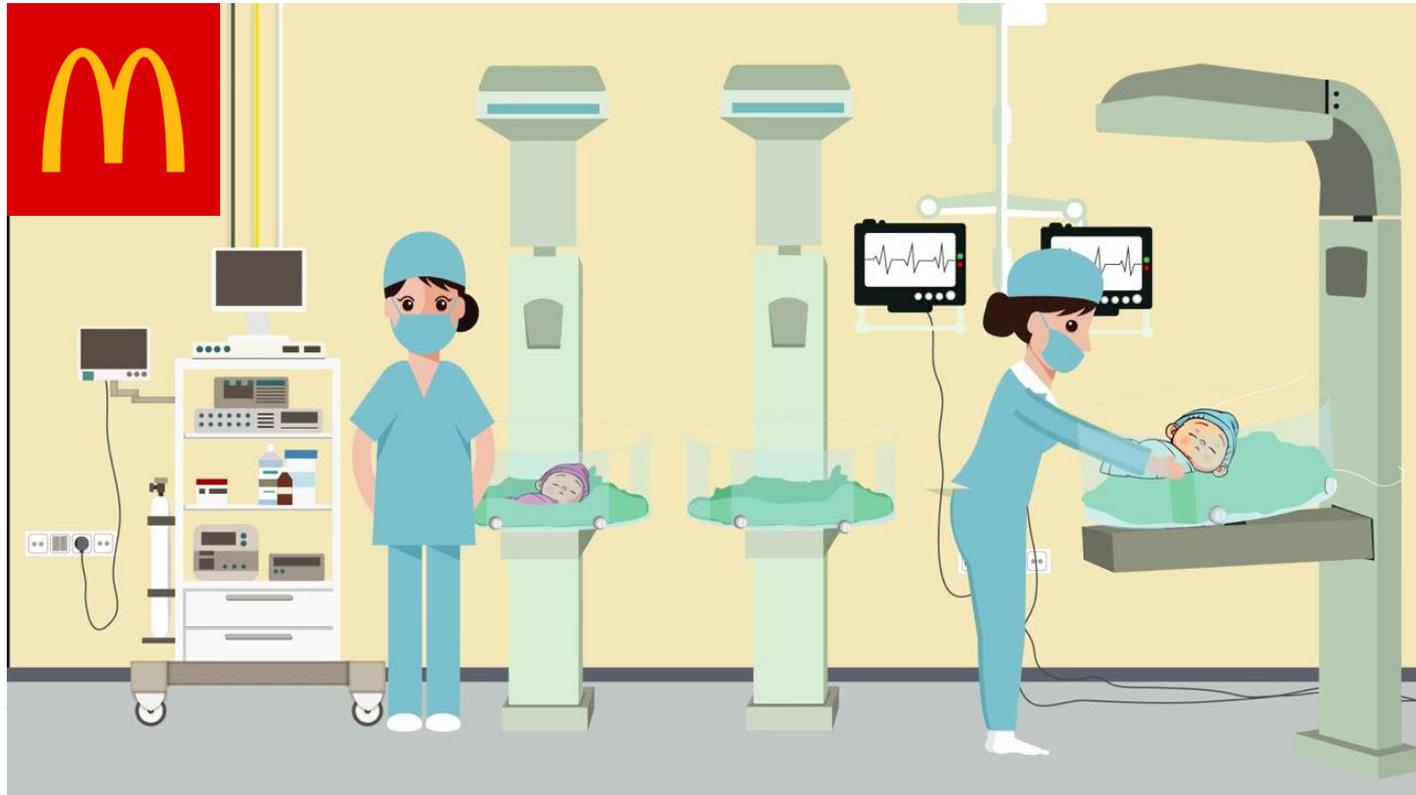
Integração da Informação Como Parte da Operação do ~~Sistema~~ ^{pessoa} de Saúde

Edilberto Amorim
Massachusetts Institute of Technology



Serviço Social da Indústria
PELO FUTURO DO TRABALHO

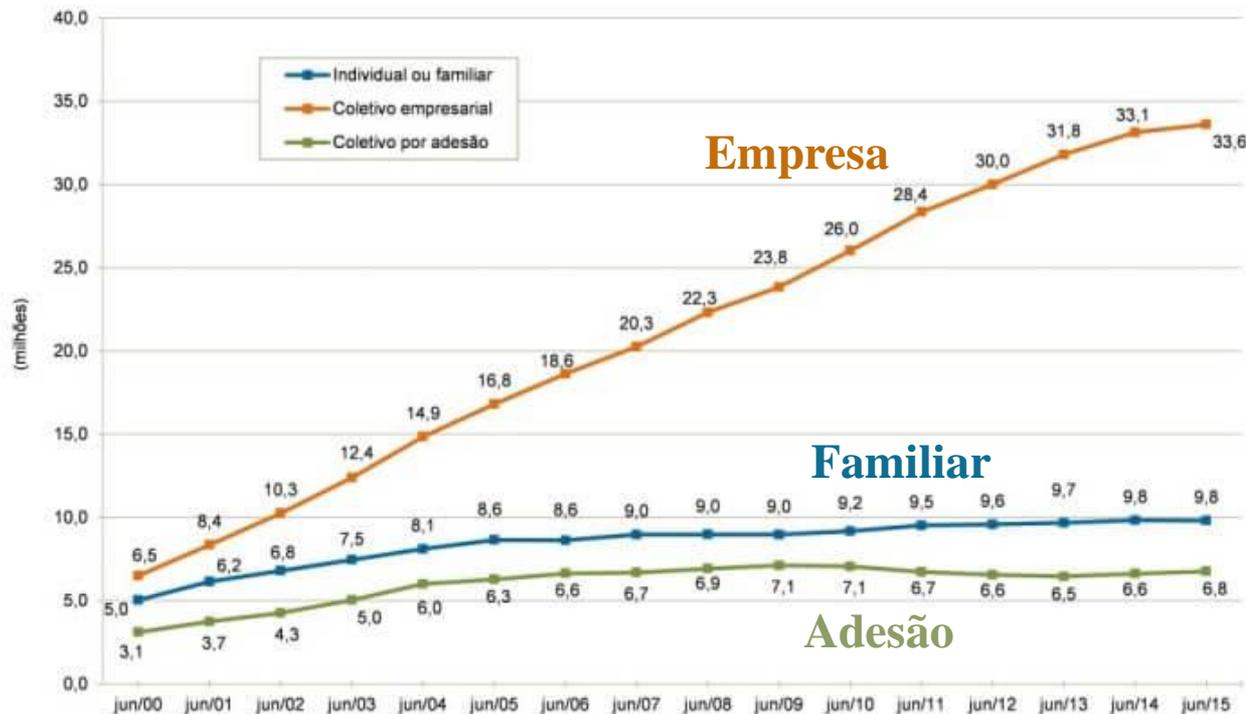
11 milhões → 3 milhões



8% Redução Plano de Saúde

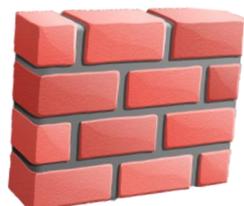


Planos de Saúde para Empresas

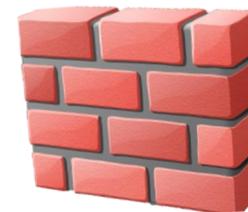


- ✓ 67% dos Planos
- ✓ 9% reajuste 2019

Clínica



Usuário



Empresa



Casa



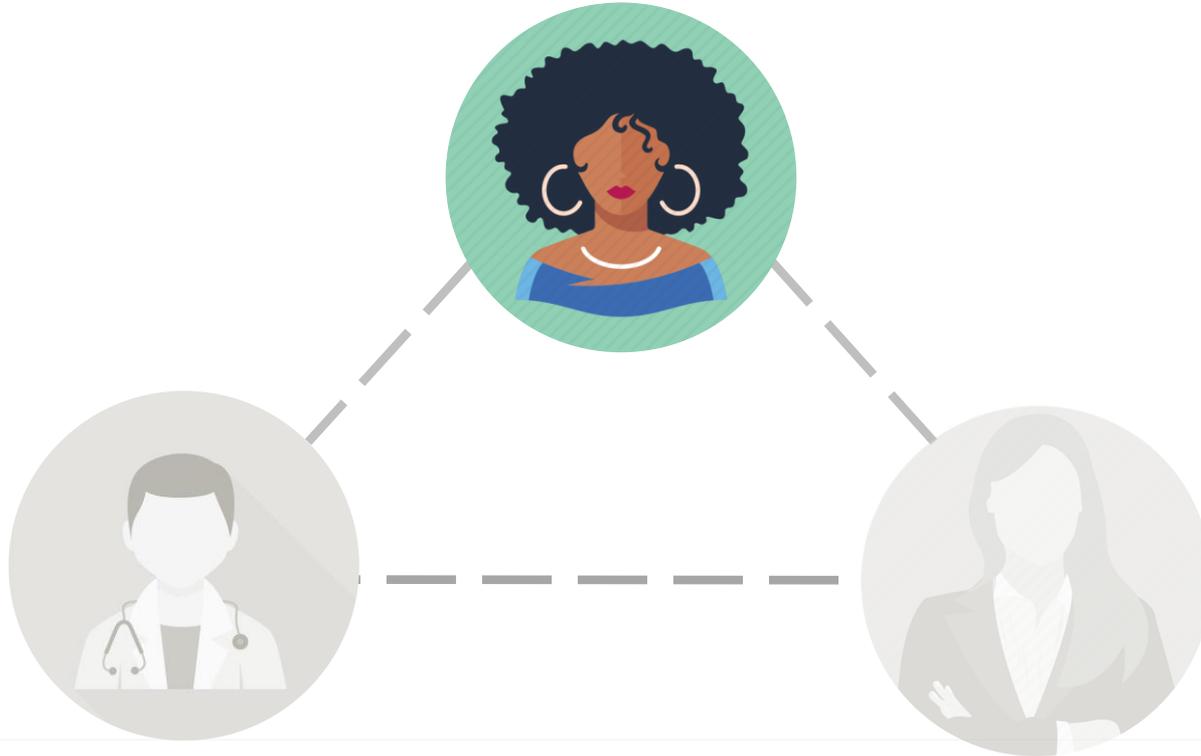
Trabalho



Temas

- ✓ Medicina de Precisão
- ✓ Administração de Databases
- ✓ Inteligência Artificial (Similaridade & Deep Learning)
- ✓ Telemedicina & Chat bots
- ✓ Ferramentas de Engajamento do Usuário
- ✓ Medicamentos de Alto Custo

a Glória



Enxaqueca



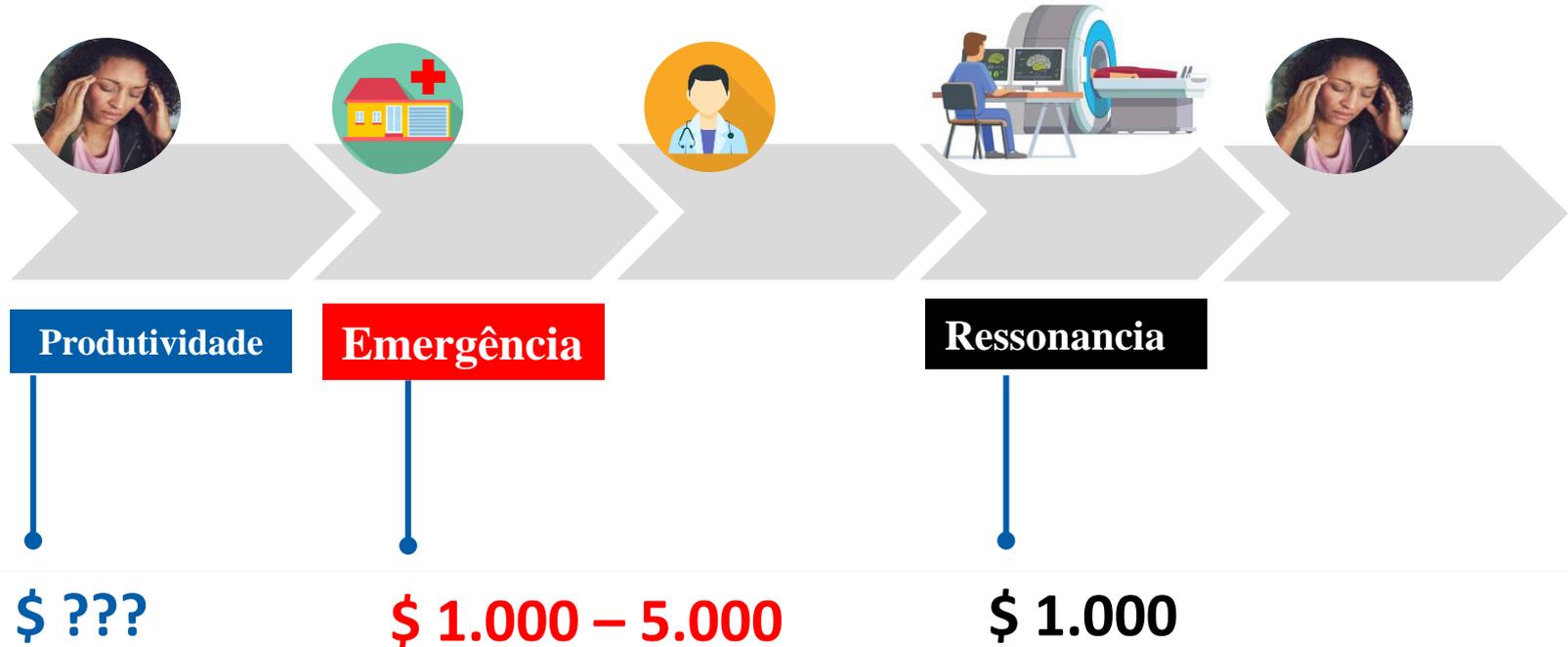
36 Bilhoes custo
por ano (USD) PIB Bolivia

113 Milhoes
dias de trabalho perdidos

31 Milhoes de
Brasileiros



Cuidando da Enxaqueca da Gloria



A Enxaqueca da Glória



Notas de
Provedores



Laboratorio



Imagem



EEG

A Enxaqueca da Glória Hoje



Notas de
Provedores



Apps



Laboratorio



Redes
Sociais



Imagem

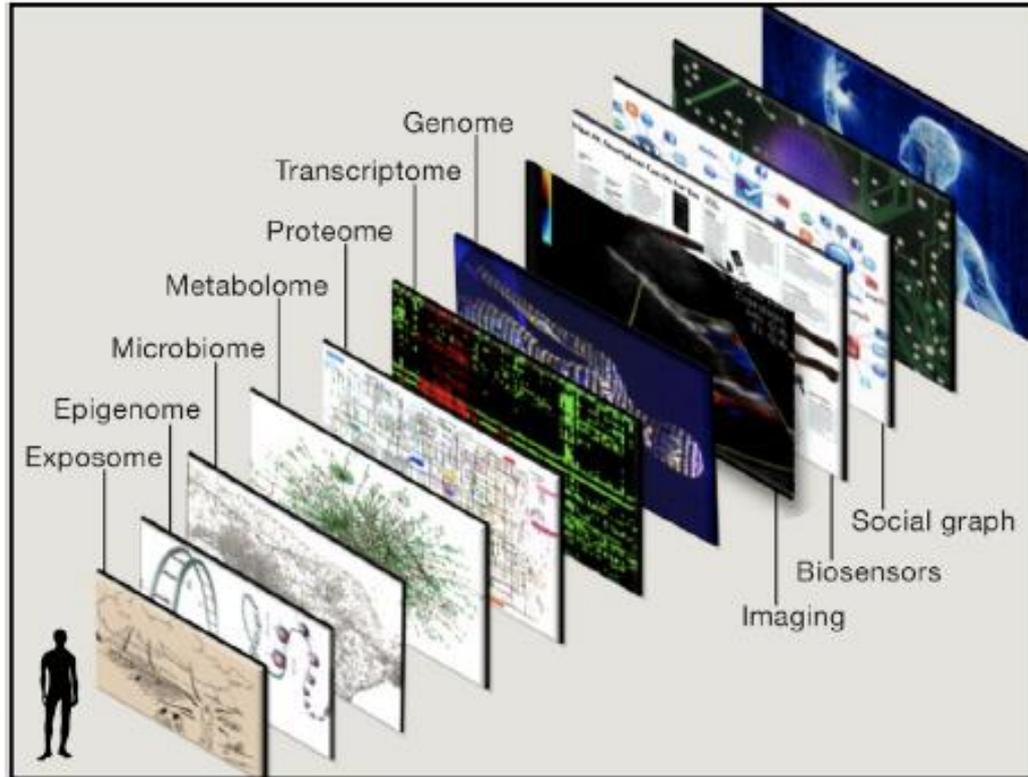


EEG



Wearables

Usuário é Multidimensional



Patient-Facing

AI Chatbots



Wearables & Devices



Personalized Genetics



Mental Health



Women's Health



Skin



Telehealth

Telemedicine



Lifestyle Management



Disease Management



Doctor-Facing

Medical Records



Data Analytics



Medical Imaging



Research

Drug Discovery



Information & Clinical Trials



Genetic Research

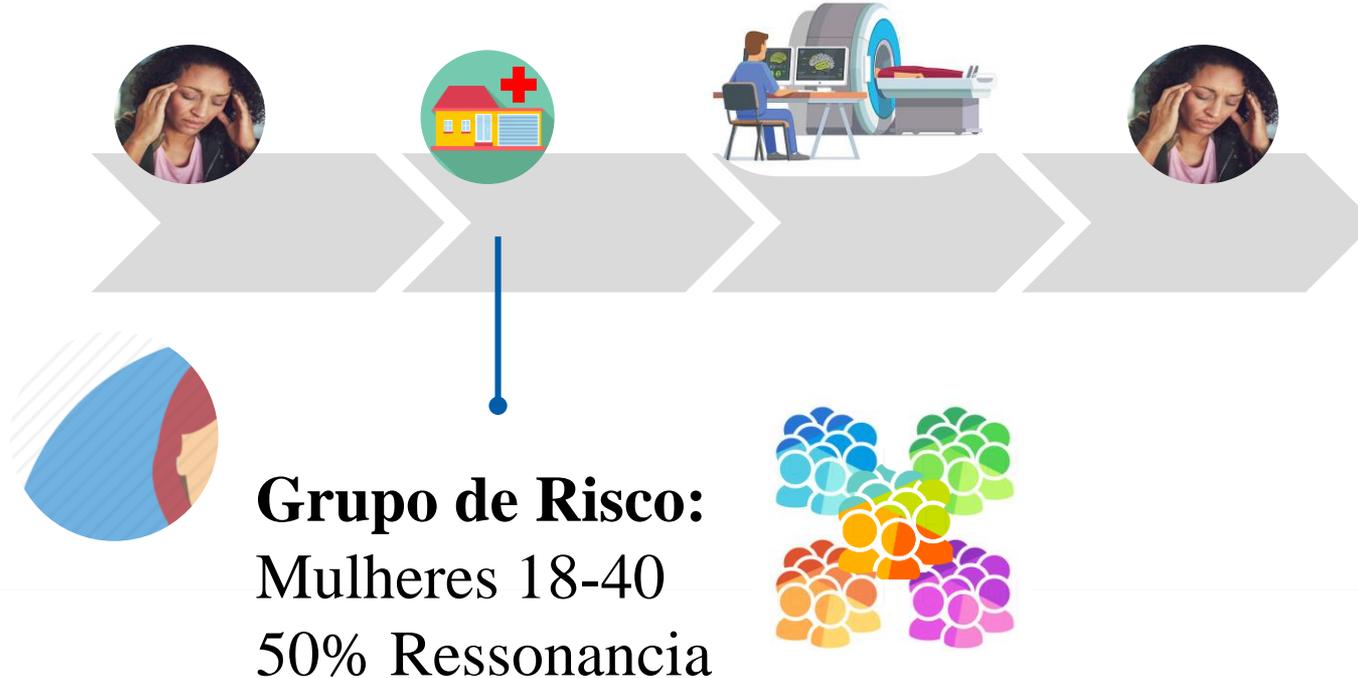


AI in Healthcare

Hospital

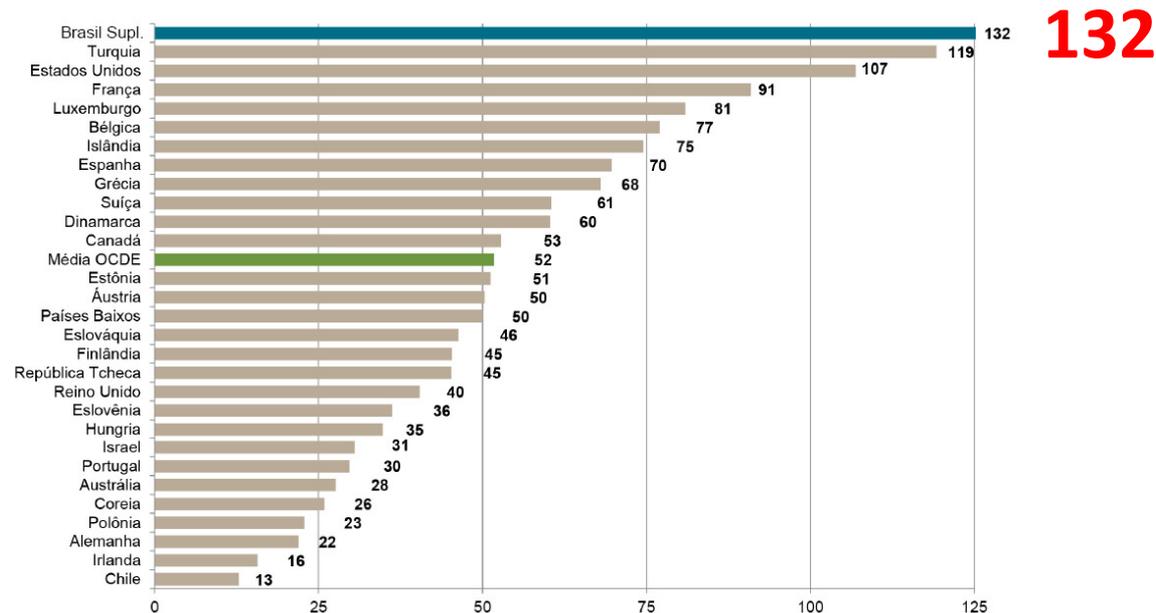
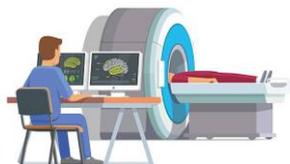


Descriptive Analytics



Ressonância por Mil Habitantes (com Plano)

Número total de exames de ressonância magnética, realizados em hospitais e na atenção ambulatorial, por 1.000 habitantes no ano de 2013 (ou mais recente), para os países membros e parceiros da OCDE.

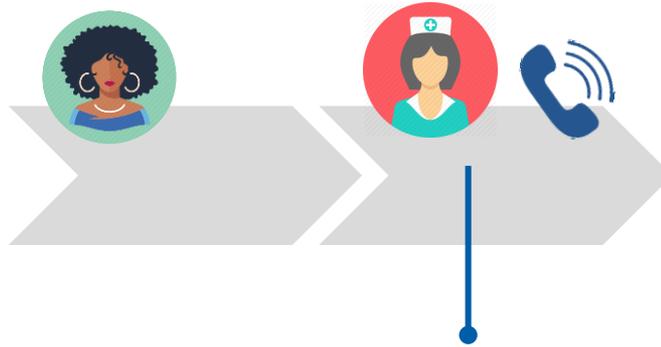


Fonte: OECD (2015b), SIP/ANS/MS - 03/2016 e SIB/ANS/MS - 03/2016

Nota: A barra em verde é a média da OCDE e a em azul petróleo representa o número de exames de ressonância magnética realizados em regime ambulatorial por 1.000 beneficiários da Saúde Suplementar (planos que incluem a segmentação ambulatorial) em 2015.

Predictive Analytics

Enxaqueca



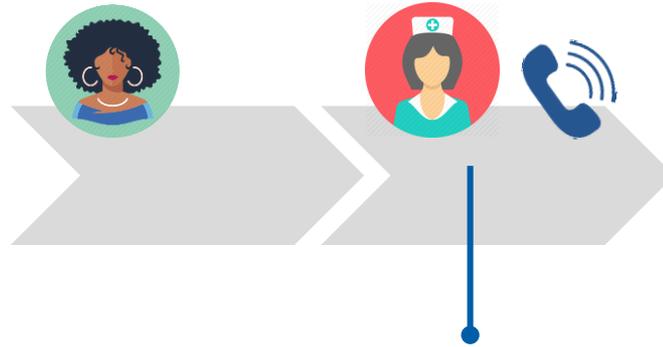
**Consulta
Rápida**



Neurologista

Prescriptive Analytics

Antes da
Enxaqueca



- ✓ Hidratação
- ✓ Exercício
- ✓ Dieta
- ✓ Remédio Diário
- ✓ Plano para Crise

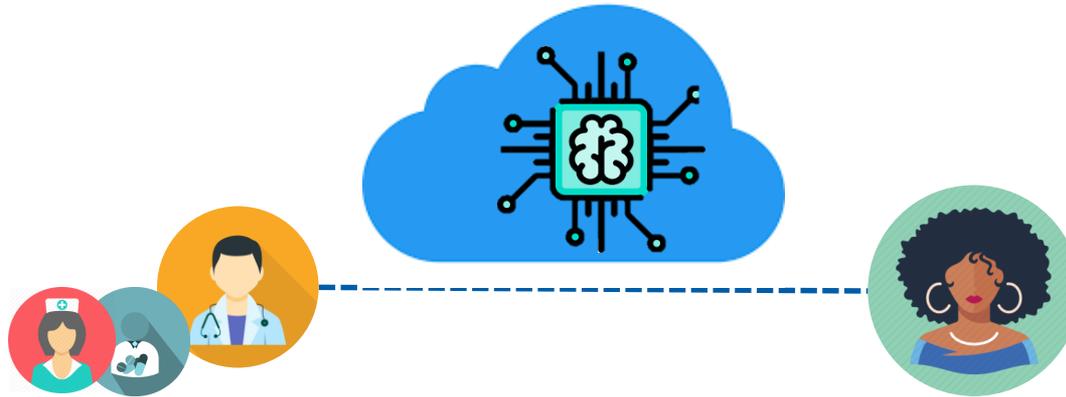


Educação Continuada

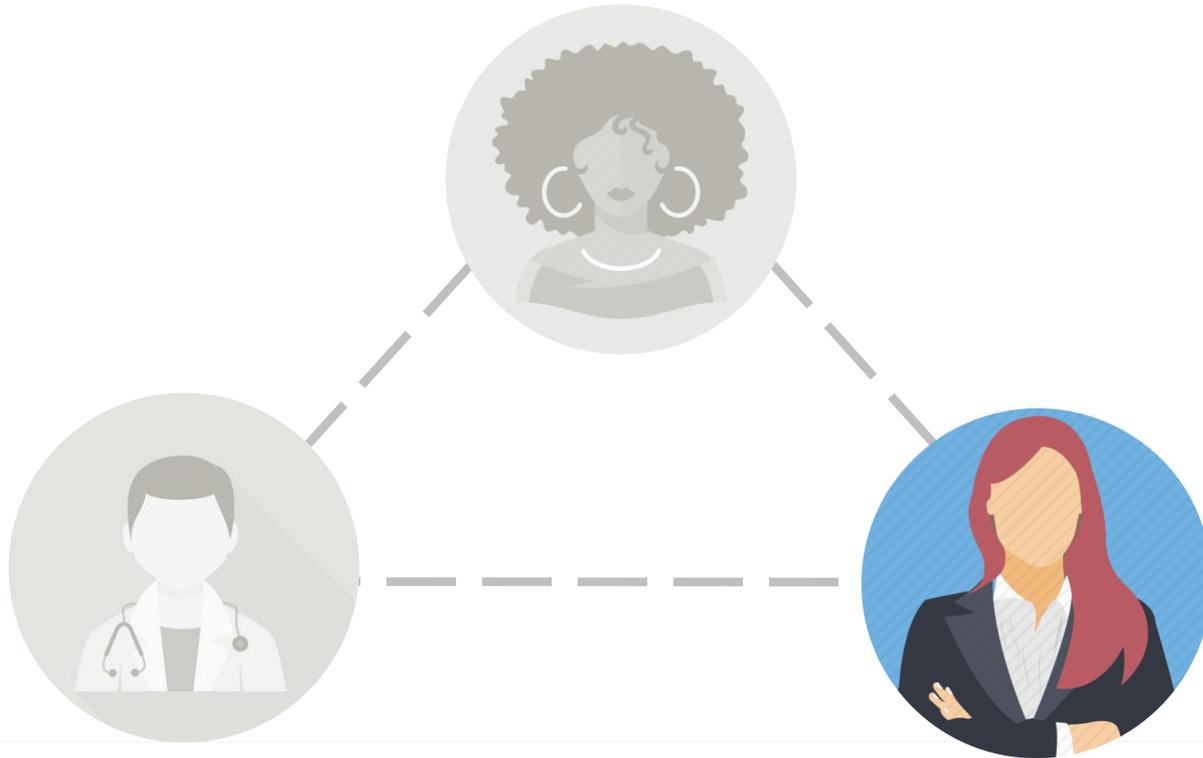
Analytics Framework

	 Tools used	 Limitations	 When to use
 <p>Descriptive Analytics What happened and why?</p>	<ul style="list-style-type: none"> › Data aggregation › Data mining 	<ul style="list-style-type: none"> › Snapshot of the past › Limited ability to guide decisions 	<ul style="list-style-type: none"> › When you want to summarize results for all/part of your business
 <p>Predictive Analytics What might happen?</p>	<ul style="list-style-type: none"> › Statistical models › Simulation 	<ul style="list-style-type: none"> › Guess at the future › Helps inform low complexity decisions 	<ul style="list-style-type: none"> › When you want to make an educated guess at likely results
 <p>Prescriptive Analytics What should we do?</p>	<ul style="list-style-type: none"> › Optimization models › Heuristics 	<ul style="list-style-type: none"> › Most effective where you have more control over what is being modeled 	<ul style="list-style-type: none"> • When you have important, complex or time-sensitive decisions to make

Mudando o Foco do Cuidado



- ✓ Bem-Estar
- ✓ Prevenção
- ✓ Integração (Dados e Pessoas)



a **Empresa**

O Que Queremos Oferecer?

APPLICATIONS



Statistical
Analysis



BI / Reporting,
Ad Hoc Analysis

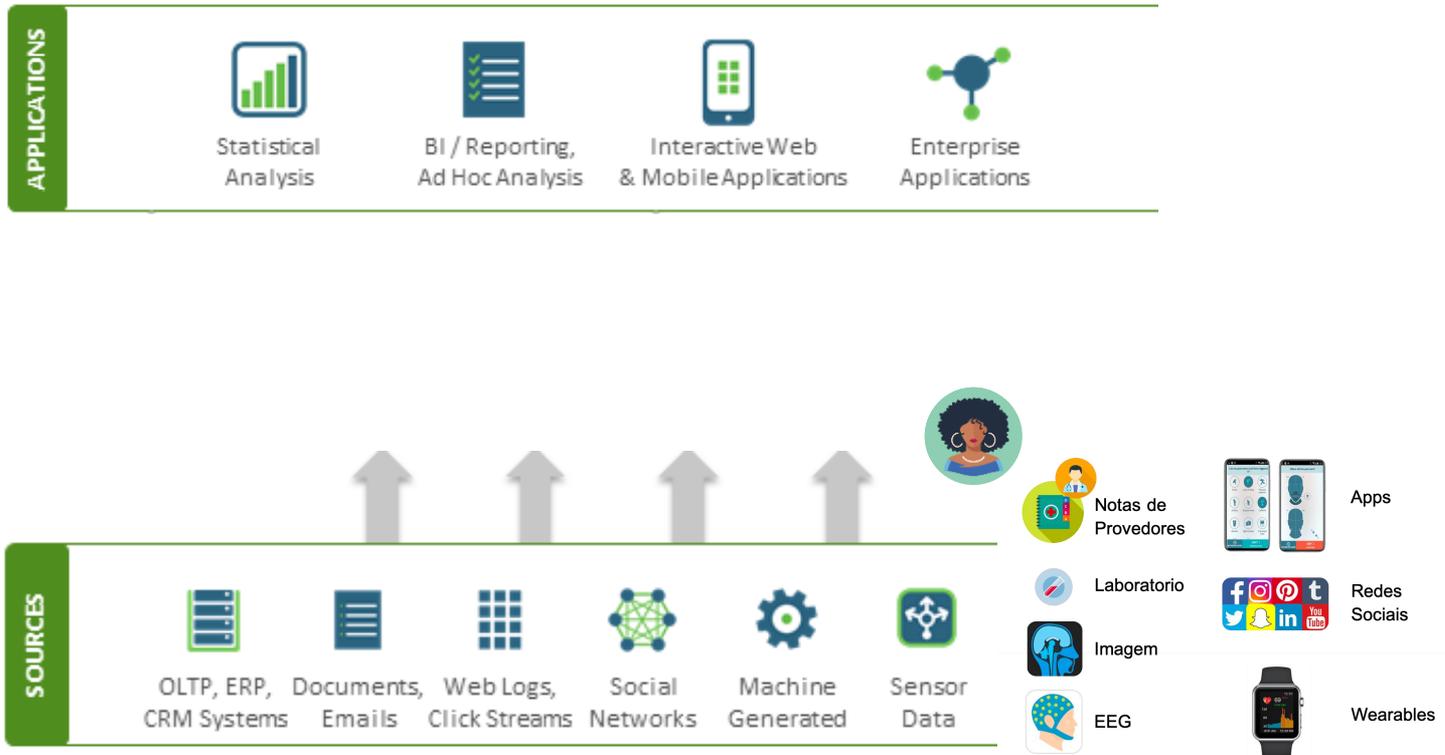


Interactive Web
& Mobile Applications



Enterprise
Applications

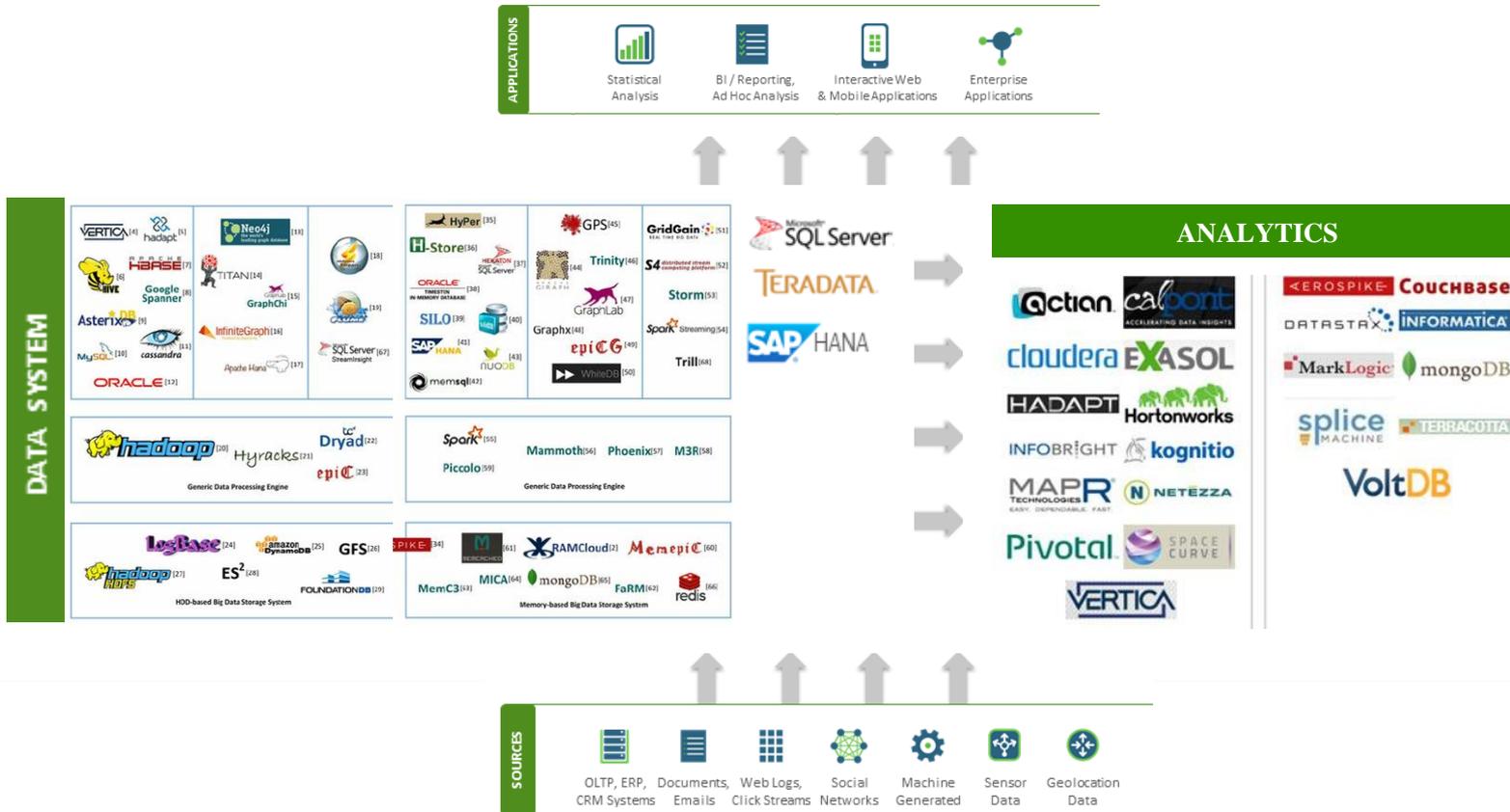
O Que Queremos Oferecer?



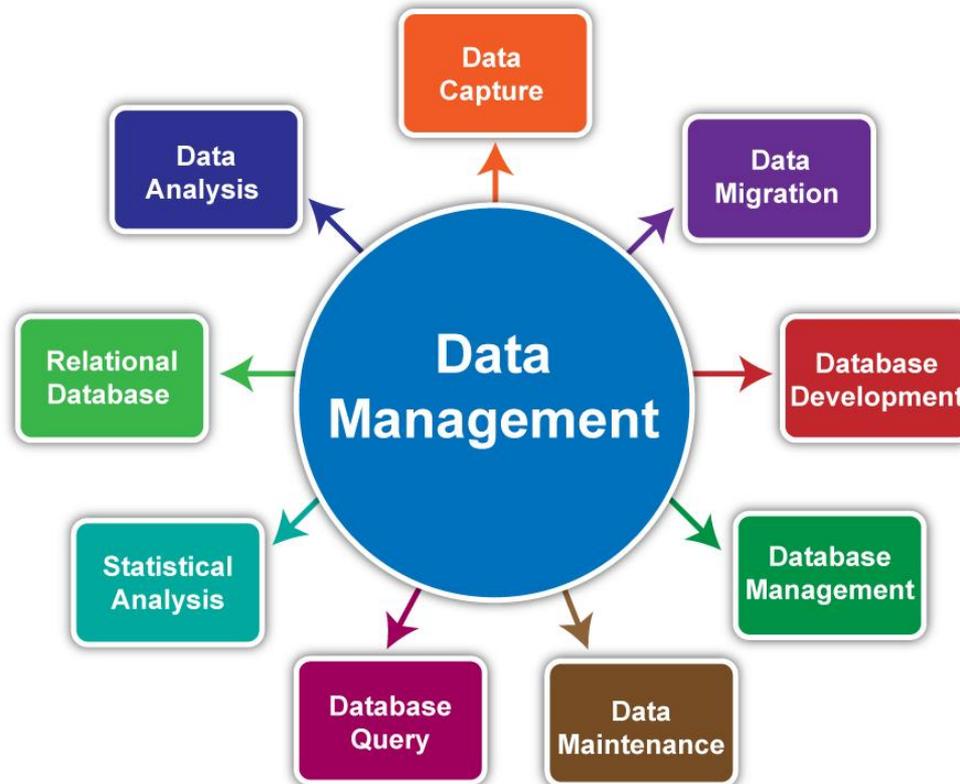
O Que Queremos Oferecer?



O Que Queremos Oferecer?



Big Data = Big Headache?

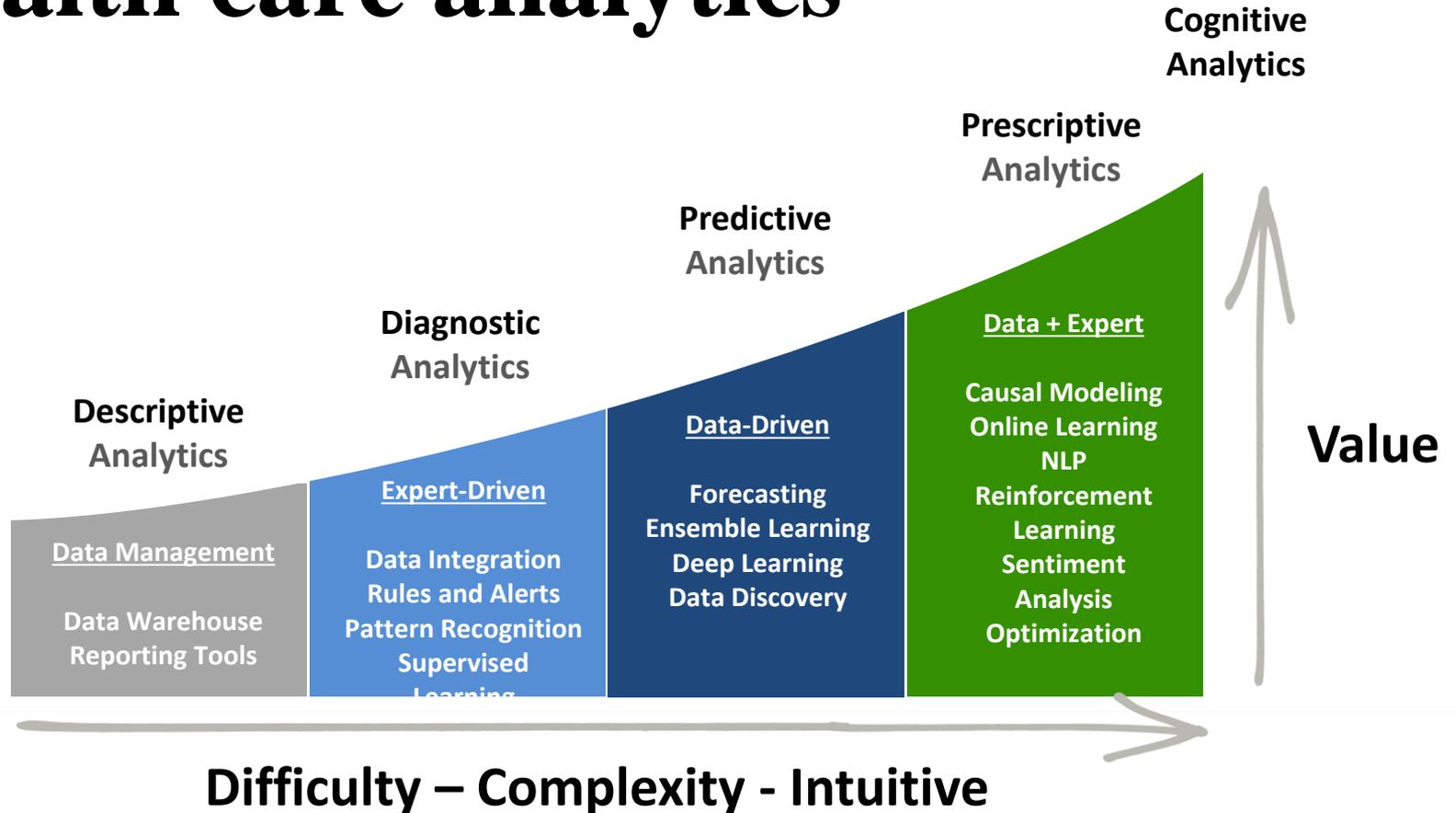


Interoperabilidade

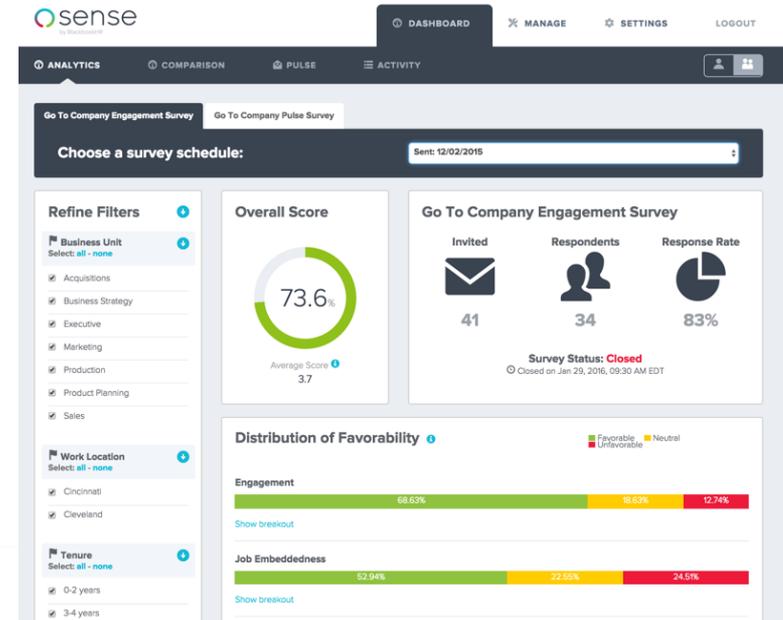




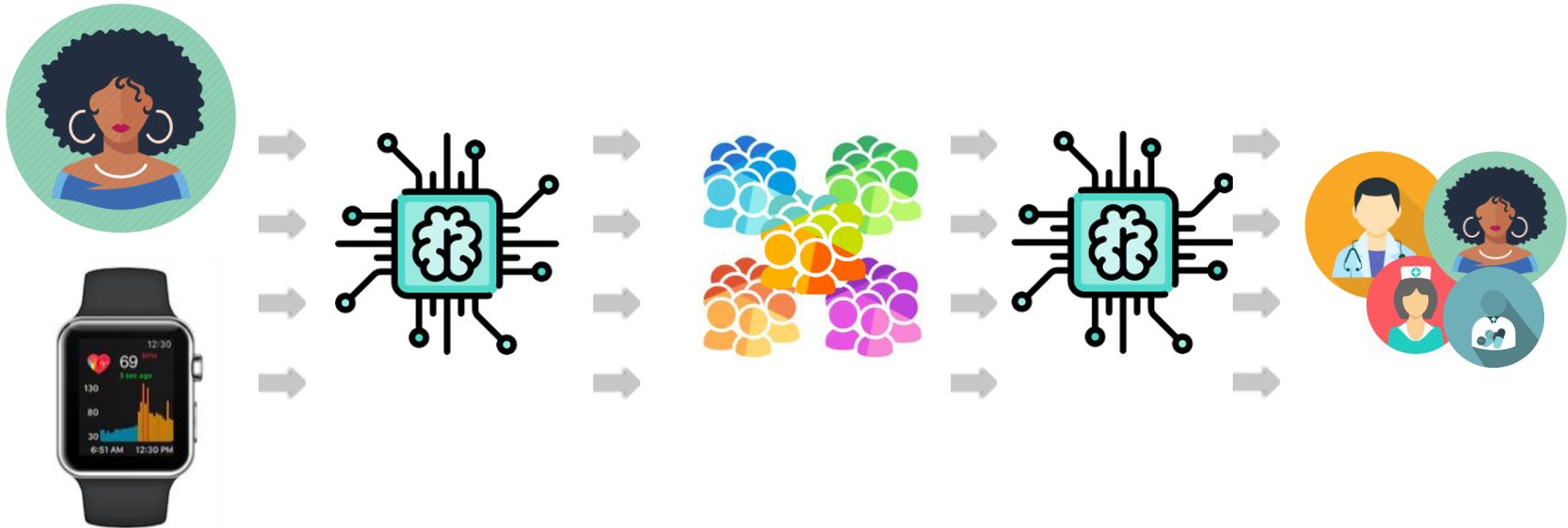
Health care analytics



Use Case: Exercício

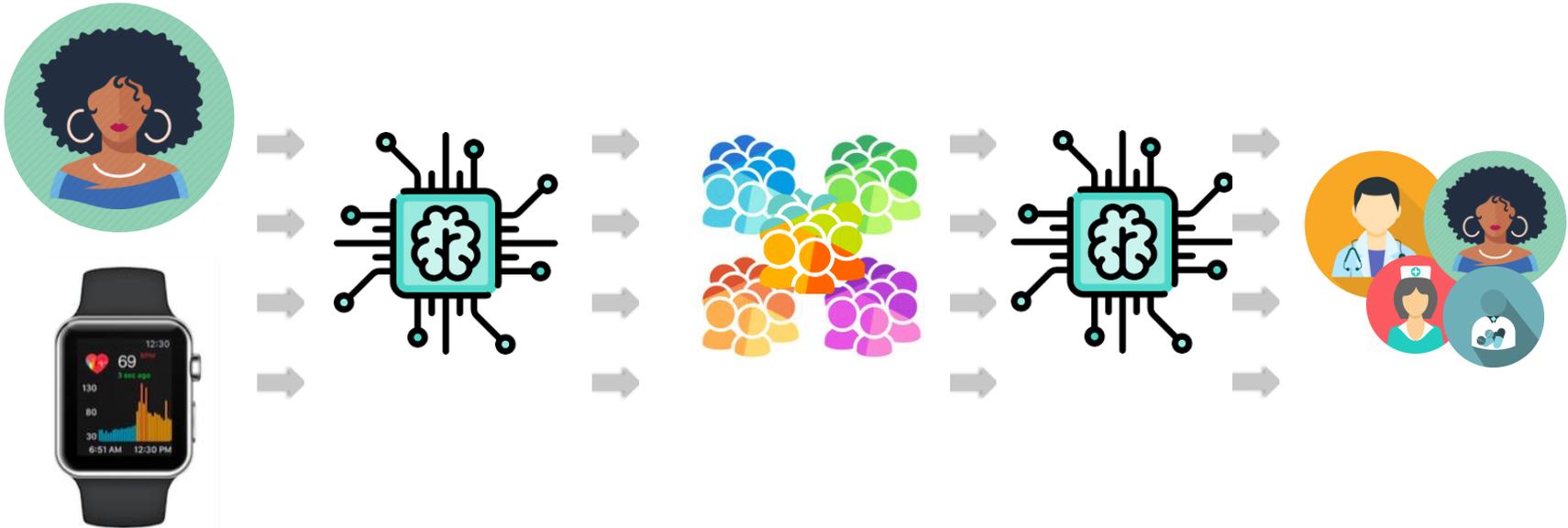


Análise de Dados: Wearables



Análise de Dados

2018 → 2023
4.5 milhoes → 130 milhoes



NETFLIX

Home TV Shows Movies Recently Added My List



KIDS

DVD



TV Comedies



Trending Now



Everything is a Recommendation

CASSANDRA
SUMMIT 2016

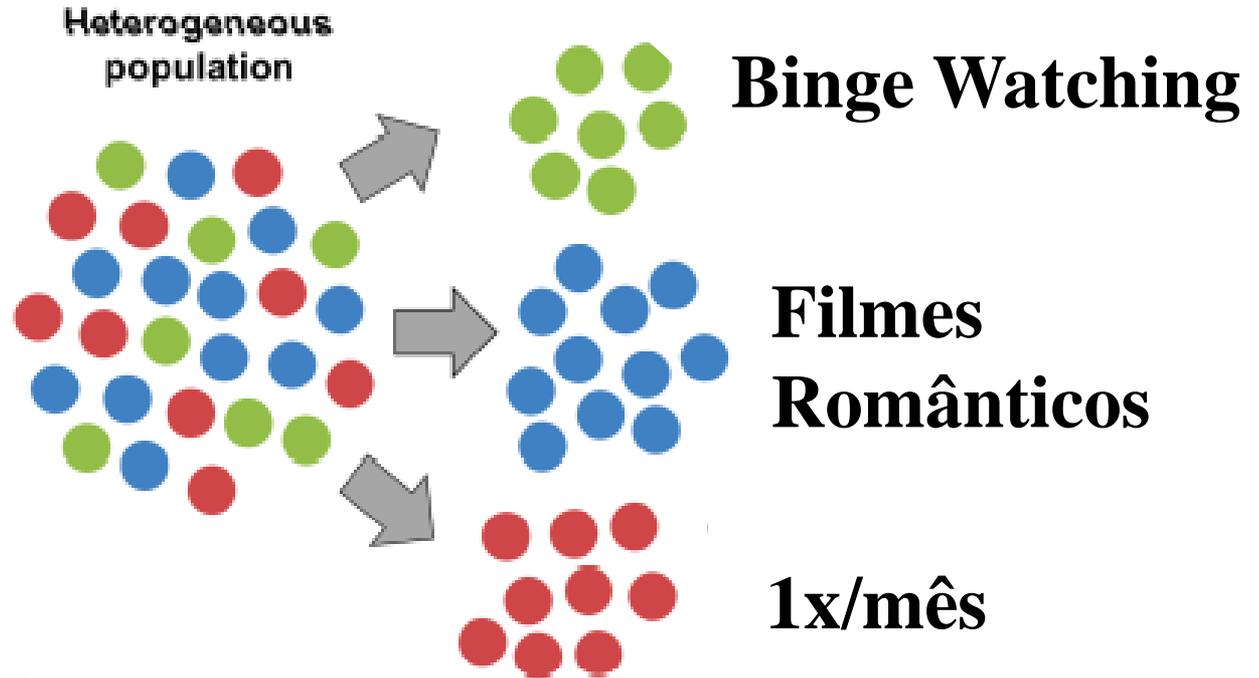


Over 80% of what members watch comes from our recommendations

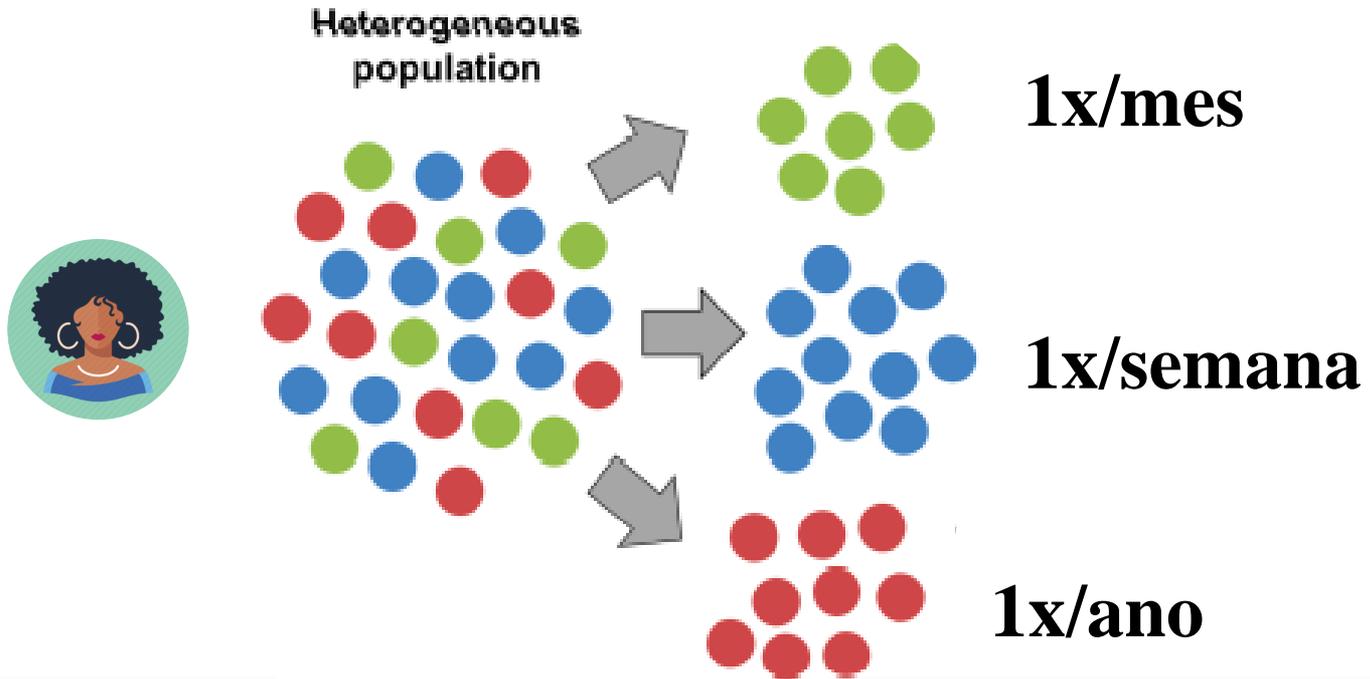
Recommendations are driven by **Machine Learning Algorithms**

NETFLIX

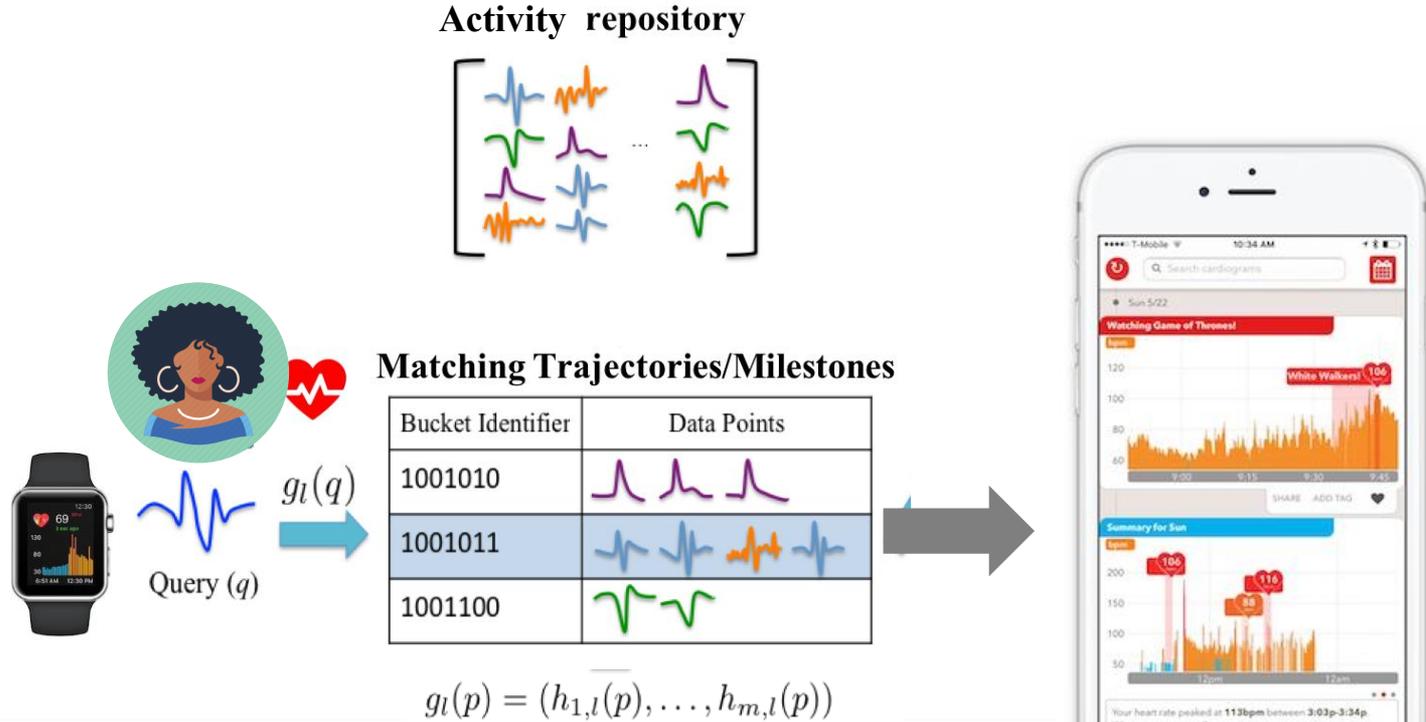
Similaridade

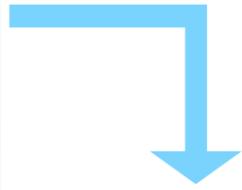
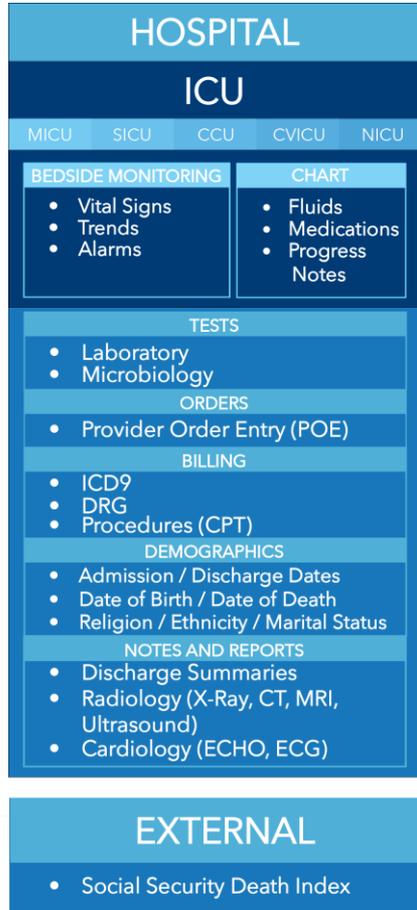


Similaridade

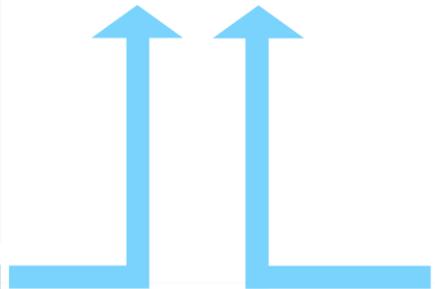
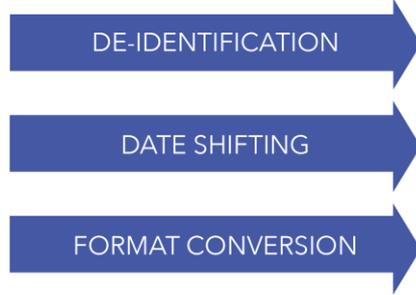


Similaridade Wearables





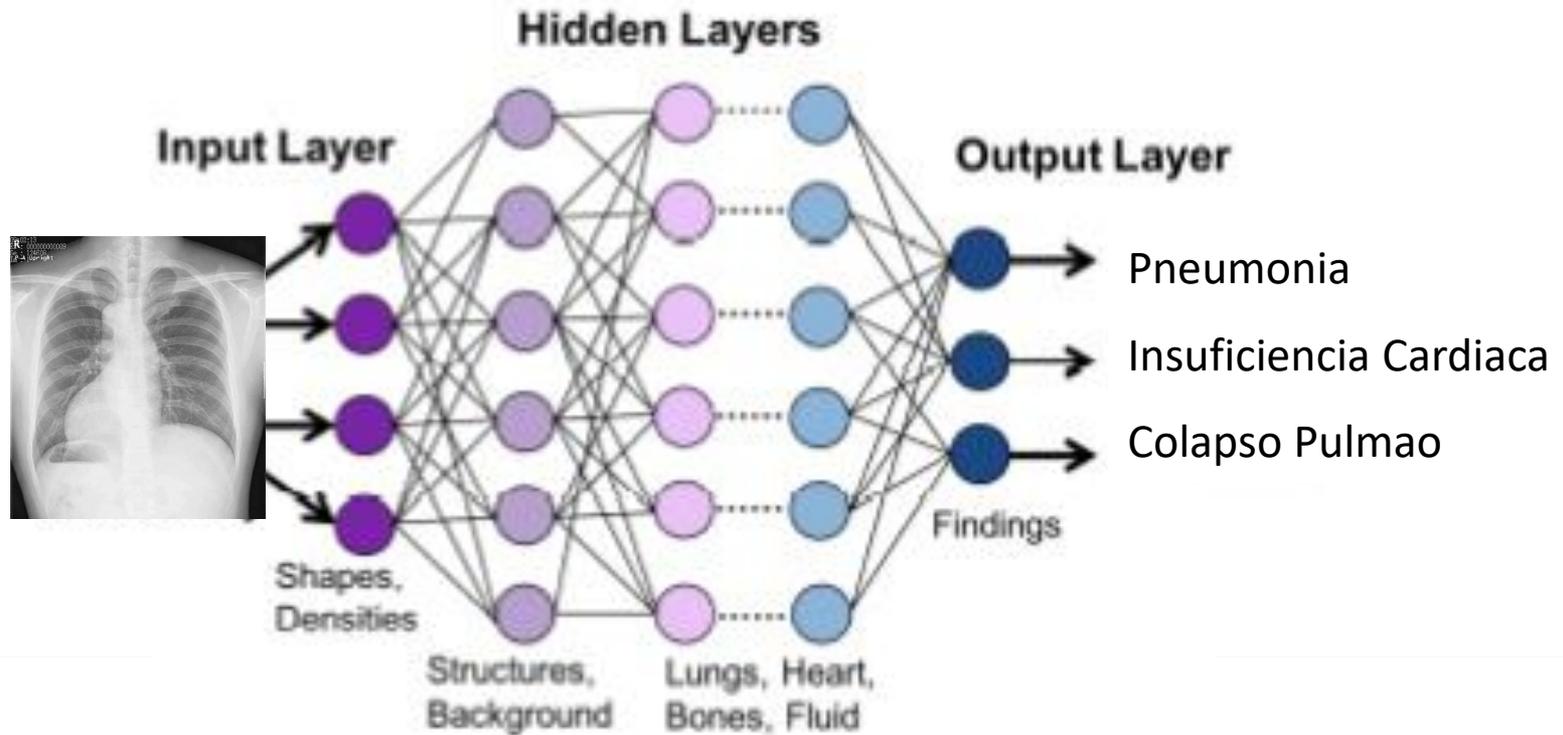
>60,000



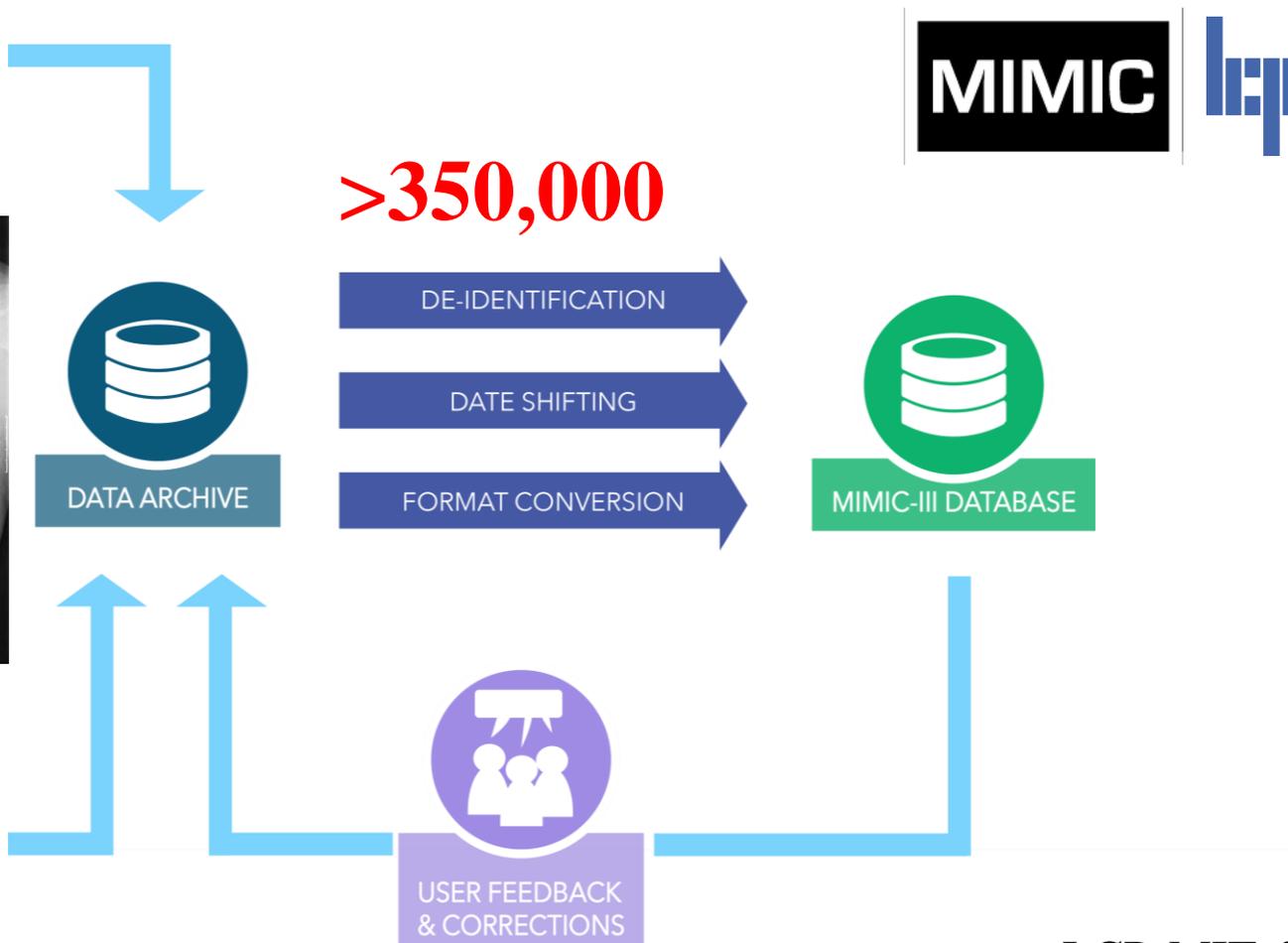
Deep Learning

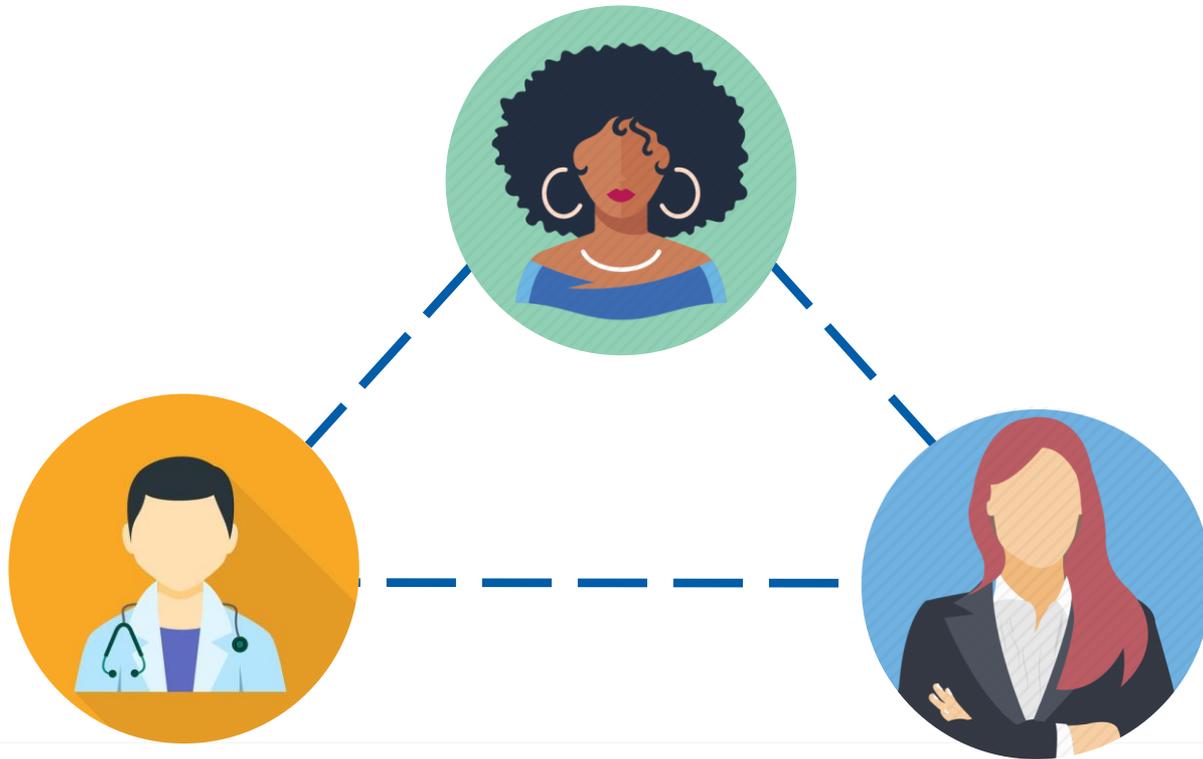


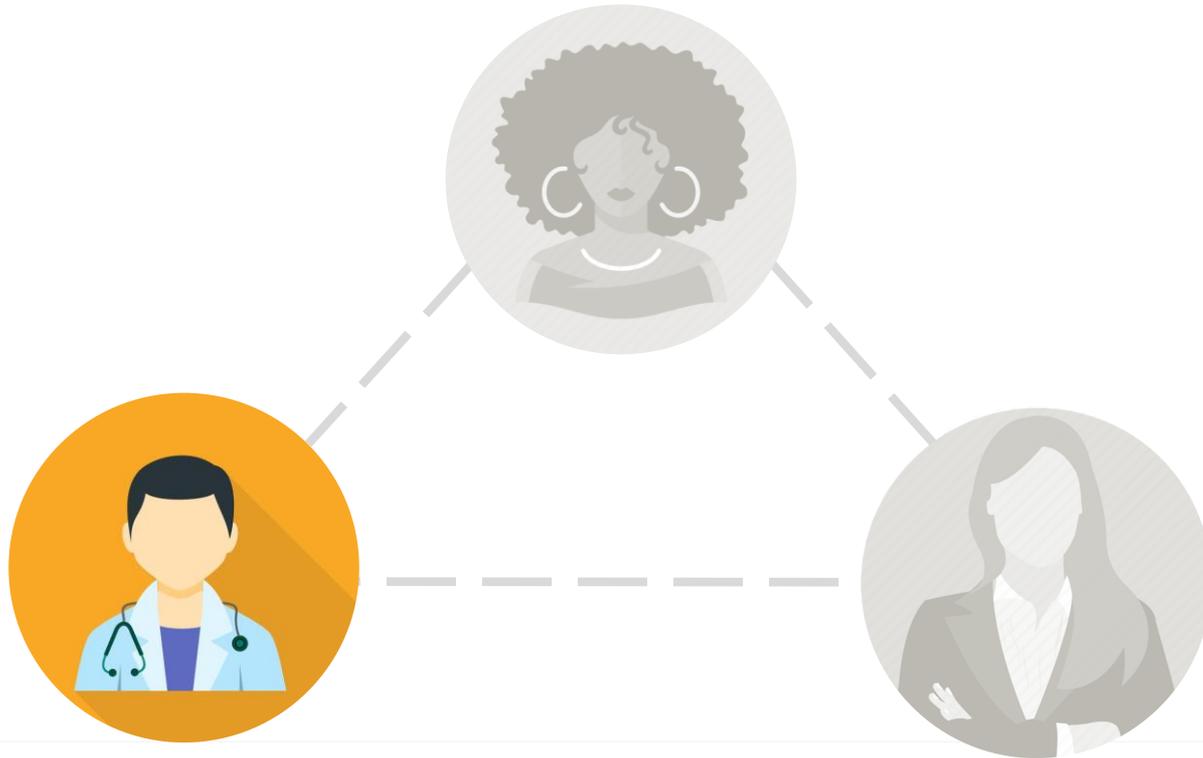
Deep Learning



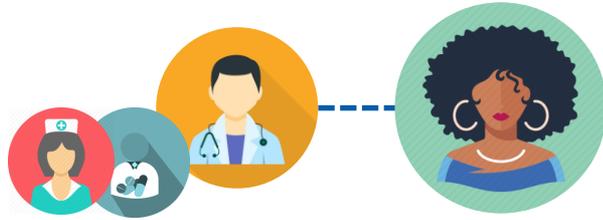






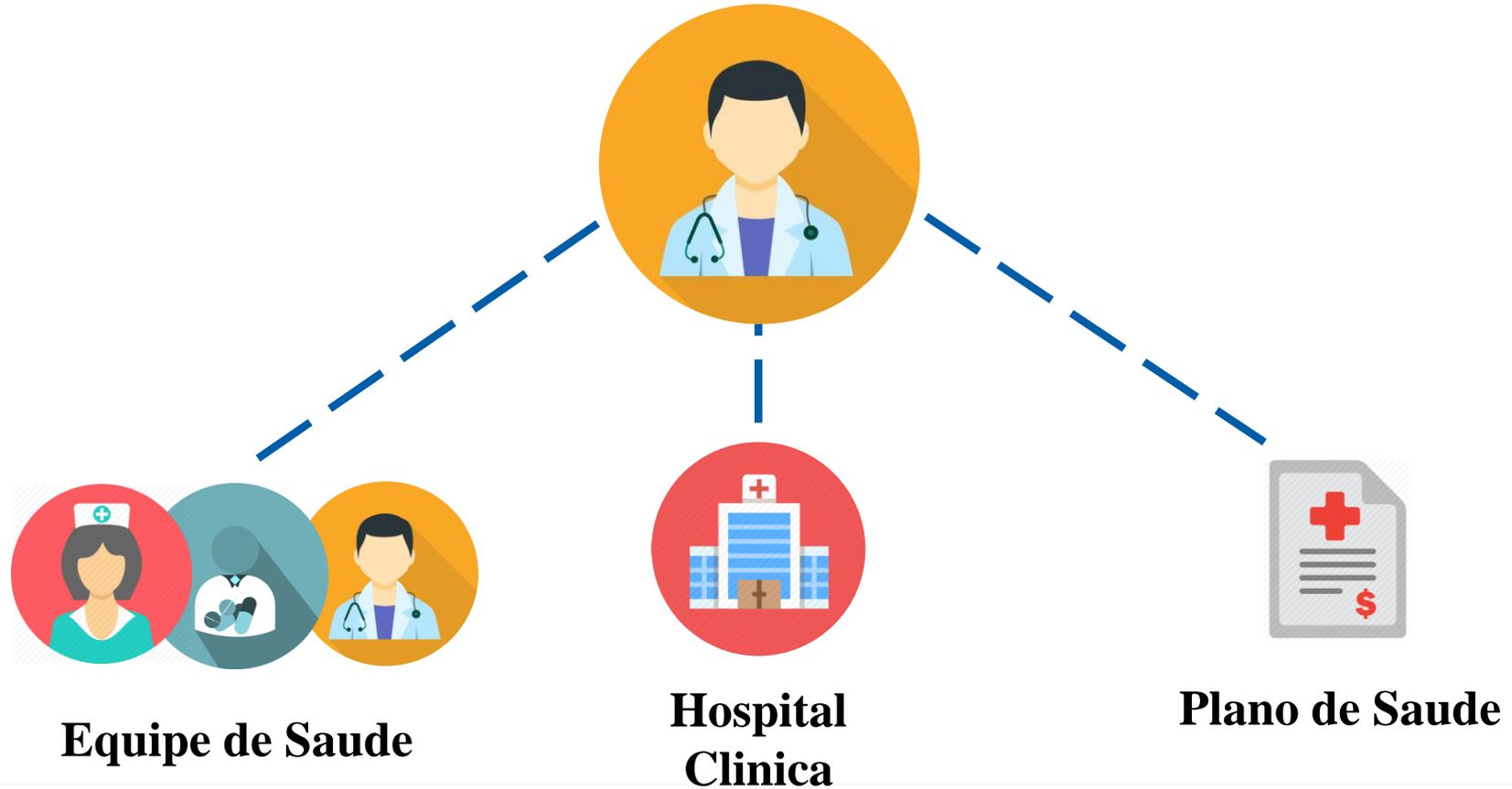


o Provedor





- ✓ Informacao do paciente é **desconectada**
- ✓ Contato superficial
- ✓ Exames nao disponiveis
- ✓ Nao ha integracao com outros medicos/farmacia
- ✓ Nao existe em escala



Prontuario Eletronico

Hyperspace - FAMILY MEDICINE, VCC - CASEY BILLINGS

Acct Snapshot Appts Billing Billing Tools Billing Reports Print Log Out

PETERSON,CINDY
 26491, PersonalFamily
 EPIC MEDICAL CENTER
 DOB: 12/22/1985
 Status: None
 Last Stmt: 01/18/2012
 Home Phone: 608-555-2344
 Work Phone: 608-555-4012
 Insurance: 319.00
 Self-pay: 20.00

Guarantor Snapshot - 1 of 1 Account

Refresh Acct List Prev Acct Next Acct Find Contact History Demand Bill Add Activity Ngte Report

Guarantor Overview



Gloria Oliveira
 xxx-xx-7256
 Female
 DOB: 12/22/1985 (26 yrs)
 7816 First Ave
 Apt 216
 Madison WI 53711

Home: 608-555-2344
 Work: 608-555-4012
 Mobile: 608-555-2896

Next statement date: 02/16/2012
 MyChart: Guarantor uses MyChart.
 Receives paperless billing.

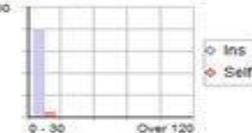
Patients and Coverages

Peterson,Cindy - Patient is the guarantor
 Epic Us Healthcare - Point Of Service
 Effective from: 1/1/2012

Phone	608-555-9000	Fax	608-555-9500
Group	Gold	Group #	1500
Subscriber	Peterson,Cindy	Subscriber #	12398987

Balances

Insurance	319.00
Self-pay	20.00
Acct bal	339.00



Visits (Last 3)

Date	Physician	Insurance	Self-pay
01/16/2012	Anna Gold, M.D.	101.00	0.00
01/10/2012	Maryl Seeger, M.D.	192.00	20.00
01/04/2012	Anna Gold, M.D.	26.00	0.00

Workqueues

Credit

Statements (Last 5)

Date	Invoice #	Charged	Outbid
01/16/2012	516841	20.00	20.00
07/13/2010	515693	108.00	0.00
06/21/2010	514279	108.00	0.00
02/23/2010	513689	108.00	0.00
09/13/2009	513305	54.00	0.00

Enter a New Activity

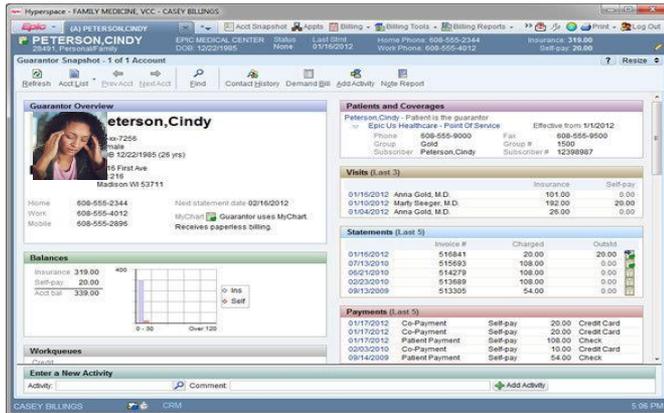
Activity: Comment: Add Activity

Payments (Last 5)

Date	Type	Self-pay	Credit Card
01/17/2012	Co-Payment	20.00	Credit Card
01/17/2012	Co-Payment	20.00	Credit Card
01/17/2012	Patient Payment	108.00	Check
02/03/2010	Co-Payment	10.00	Credit Card
09/14/2009	Patient Payment	54.00	Check

CASEY BILLINGS CRM 5:06 PM

Prontuario Eletronico



- ✓ Centraliza Informacao
- ✓ Acesso Facil para Equipe Medica
- ✓ Clinica e Hospital
- ✓ Farmacia
- ✓ Pagamentos

Appropriateness rankings for a 35 year old Female

Indication(s): Headache, chronic, neuro deficit ✕

Appropriateness	Service	Display Evidence...
4	CT ANGIOGRAM HEAD	Select this service
8	MRI BRAIN	Select this service
7	CT HEAD BRAIN	Select this service

Portal do Paciente

 PARTNERS HEALTHCARE |  PATIENT GATEWAY

 Edilberto

 Health

 Visits

 Messaging

 Billing

 Resources

 Profile

Edilberto Amorim ...
Log Out

Ver en Español

What's New

 Schedule your Flu Vaccine.

Interested In?



Updated Partners Patient Gateway

Click [here](#) to learn more about the new features of Patient Gateway.



Share your record

You can share your medical record with organizations across the world. [Learn more](#)



Release of Information

Medical records include, but are not limited to, a patient's medical history, test results, office visit notes, discharge summary, and operative reports of treatments and medical services. The Medical Records Department can provide you with copies of your medical records related to care at the facility. [Learn more](#)



Linking Applications to your Health Record

Did you know you can link your health record to 3rd party applications (apps)? [Learn more](#)

Quick Links

-  View test results
-  Ask a question
-  Schedule an appointment
-  Refill medications
-  Learn about Research
-  View/Pay Bills

Provider List

-  Elizabeth R Roth, MD
Primary Care Provider
Internal Medicine



Portal do Paciente

 PARTNERS HEALTHCARE |  PATIENT GATEWAY

 Edilberto

 Health

 Visits

 Messaging

 Billing

 Resources

 Profile

Edilberto Amorim ...
Log Out

Ver en Español

What's New



 Schedule your Flu Vaccine.

Interested In?



Updated Partners Patient Gateway

Click [here](#) to learn more about the new features of Patient Gateway.



Share your record

You can share your medical record with organizations across the world. [Learn more](#)



Release of Information

Medical records include, but are not limited to, a patient's medical history, test results, office visit notes, discharge summary, and operative reports of treatments and medical services. The Medical Records Department can provide you with copies of your medical records related to care at the facility. [Learn more](#)



Linking Applications to your Health Record

Did you know you can link your health record to 3rd party applications (apps)? [Learn more](#)

Quick Links



View test results



Ask a question



Schedule an appointment



Refill medications



Learn about Research



View/Pay Bills

Provider List



Elizabeth R Roth, MD
Primary Care Provider
Internal Medicine



Test Results



Search this list

Show Hospital Results

Test	Ordered By	Date ▼
 Lipid panel	Elizabeth R Roth, MD	Feb 11, 2019
 HIV-1/2 antigen/antibody	Elizabeth R Roth, MD	Feb 11, 2019
 Vitamin B12	Elizabeth R Roth, MD	Apr 17, 2017
 Magnesium	Elizabeth R Roth, MD	Apr 17, 2017
 CLO test	Braden Kuo, MD	Nov 2, 2016
 Endoscopy, colon, diagnostic	Elizabeth R Roth, MD	Nov 2, 2016
 Historical Lab	Elizabeth R Roth, MD	Dec 18, 2014

[BACK TO THE HOME PAGE](#)

Here you can see your lab results, along with the person who asked for the lab test to be done. Click a row to view more details.

O paciente é dono da informação



PATIENT GATEWAY



Edilberto



Health



Visits



Messaging



Billing



Resources



Profile

Edilberto Amorim ...

Log Out

Ver en Español

What's New



Schedule your Flu Vaccine.

Interested In?



Upd
Click
Patie



Share your record

You can share your medical record with organizations across the world. [Learn more](#)

Rele



Medical records include, but are not limited to, a patient's medical history, test results, office visit notes, discharge summary, and operative reports of treatments and medical services. The Medical Records Department can provide you with copies of your medical records related to care at the facility. [Learn more](#)



Did you know you can link your health record to 3rd party applications (apps)? [Learn more](#)

Quick Links



View test results

Provider List



Elizabeth R Roth, MD
Primary Care Provider
Internal Medicine





[< Home](#)
[< Back](#)

Enter search term.



[En español](#)

Migraine Headaches



[Taking Medicine to Stop a Migraine](#)



[Headaches: Avoiding Triggers](#)



[Headaches: Keeping a Diary](#)



[Rebound Headaches](#)

[Topic Overview](#)

[Health Tools](#)

[Cause](#)

[Symptoms](#)

[What Increases Your Risk](#)

[When to Call a Doctor](#)

[Exams and Tests](#)

[Treatment Overview](#)

[Prevention](#)

[Living With Migraine Headaches](#)

[Medications](#)

[Other Treatment](#)

[Related Information](#)

[References](#)

[Credits](#)

Is this topic for you?

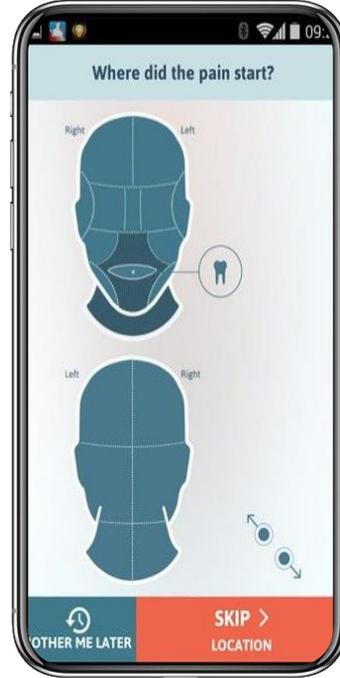
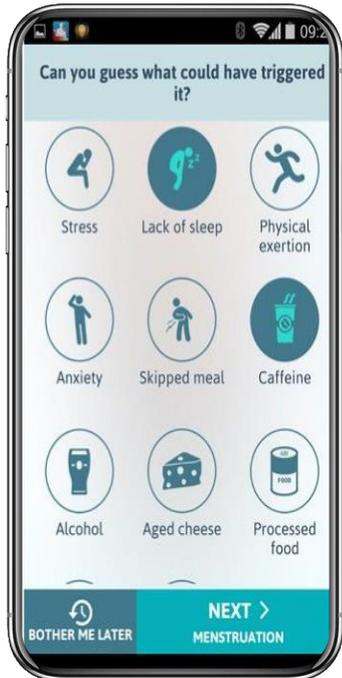
This topic is about migraine headaches. If you are looking for information about tension headaches, see [Tension Headaches](#).

If you are looking for information about headaches in children, see [Headaches in Children](#).

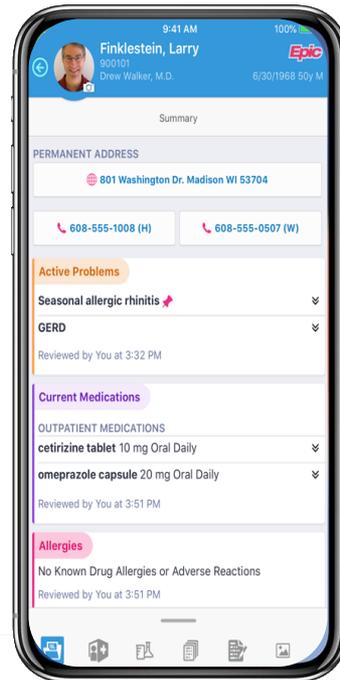
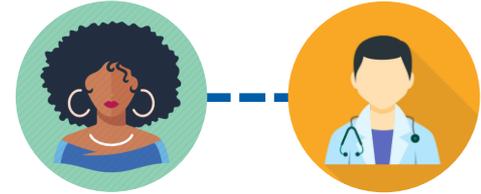
What are migraine headaches?

Migraines are painful, throbbing headaches that last from 4 to 72 hours. When you have a migraine, it may be so painful that you are not able to do your usual activities. But even though migraines make you feel bad, they don't cause long-term damage.

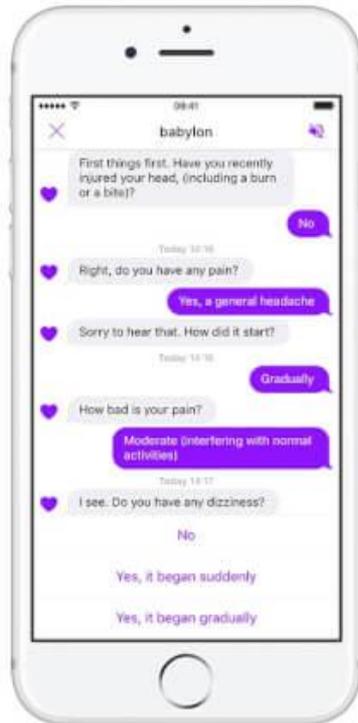
Migraines are a health problem that can be treated. Talk to your doctor about your migraines.



Prontuario Eletronico



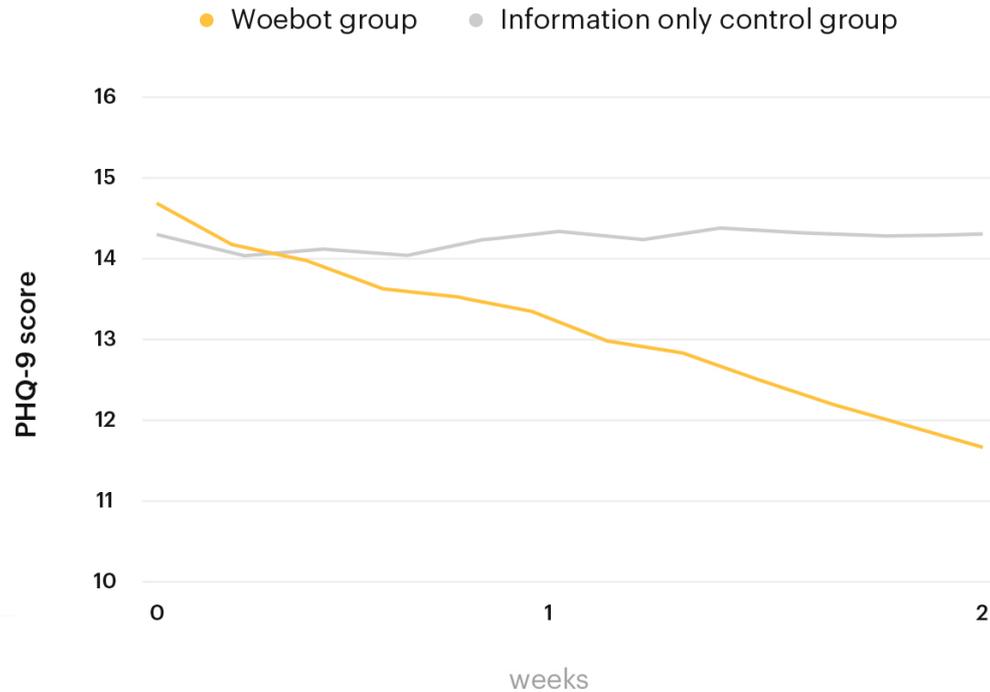
Chat bots e Telemedicina



Chat bots: Depressão

Reduction in depression symptoms

Study conducted over two week period





EPIC NATIVE DATA



NON-EPIC SOURCE MARTS



Administrativ

a



Doenças



Plano



Conectando Informacao

The dashboard displays various health and fitness data sources and categories. At the top, four major providers are listed: University of Michigan Health System, UC San Diego Health System, Scripps, and Cleveland Clinic, each with a 'Last Synced' timestamp. Below these are categories for Allergies, Doctor Visits, Health Conditions, Immunizations, Lab Results, Medications, Procedures, and Vital Signs. A central section features 'Fitness' and 'DNA' icons. To the right, three more providers are shown: 23andMe, myfitnesspal, and fitbit, with their respective sync times. At the bottom right, a lab result for WBC is displayed with a corresponding line graph showing historical data.

University of Michigan Health System
Last Synced: 08/21/2018, 11:15am

UC San Diego HEALTH SYSTEM
Last Synced: 08/20/2018, 02:15pm

Scripps
Last Synced: 08/20/2018, 02:28pm

Cleveland Clinic
Last Synced: 08/20/2018, 02:41pm

Allergies (0)

Doctor Visits (6)

Health Conditions (23)

Immunizations (3)

Lab Results (20)

Medications (16)

Procedures (6)

Vital Signs (8)

Fitness

DNA

23andMe
Last Synced: 08/20/2018, 02:20pm

myfitnesspal
Last Synced: 08/20/2018, 02:48pm

fitbit
Last Synced: 08/21/2018, 09:08am

seqster™

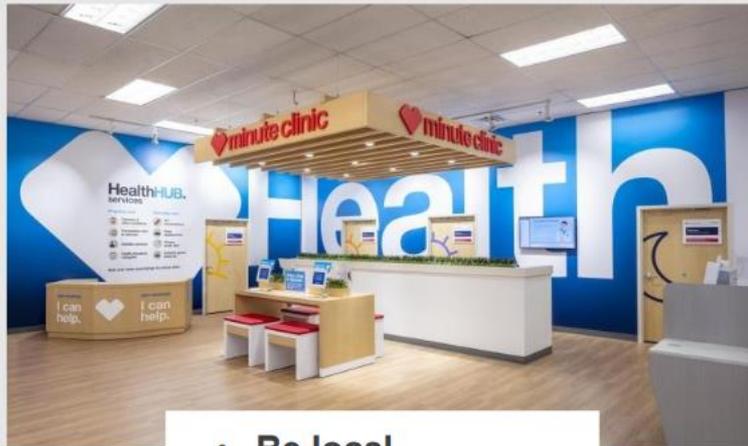
CBC WITH DIFFERENTIAL (CBC AND AUTO DIFFERENTIAL) - Final result (21 lab results)

Lab Test: WBC
Lab Date: 06/19/2017
Your Result: 6 K/mcL
Normal Range: 3.8-11.0 K/mcL

Date	WBC (K/mcL)
06/22/2016	~5.5
07/02/2016	~6.0
06/19/2017	6.0



Transforming the consumer health experience starts with HealthHUB®



- **Be local**
- **Make it simple**
- **Improve health**



Risk stratification



Personalized engagement

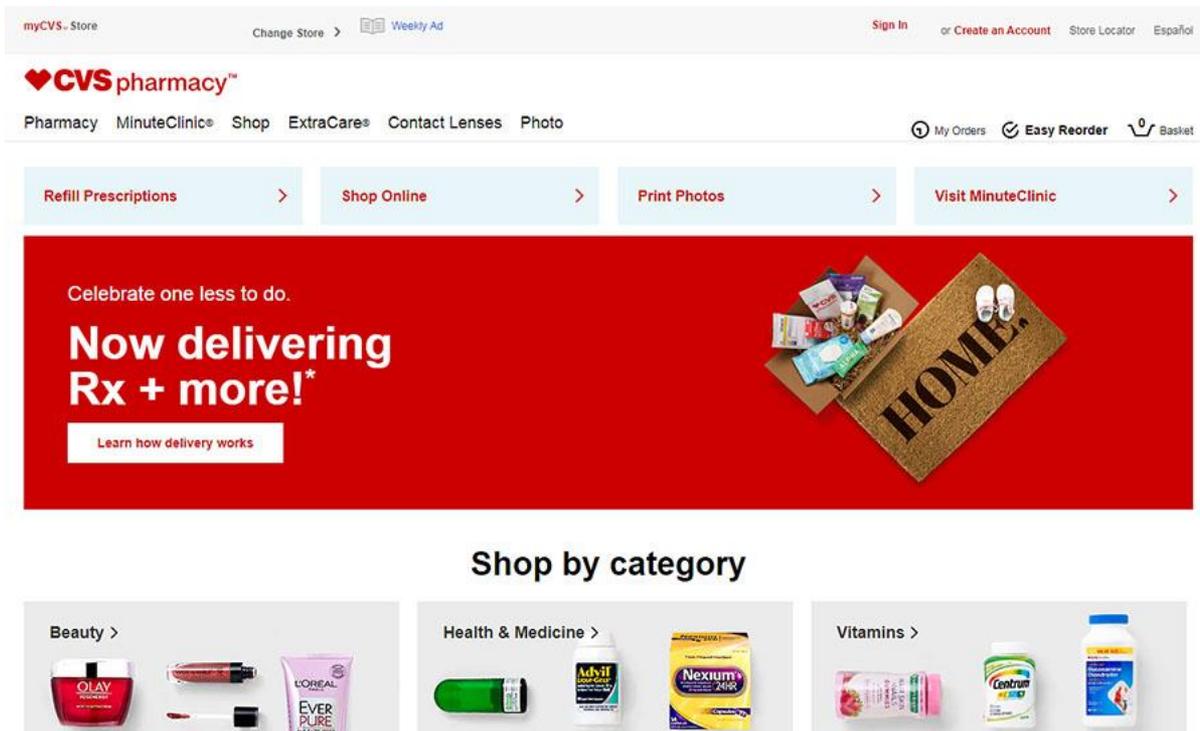


Impactful interventions

- Coordinate care
- Integrate member context
- Influence meaningful moments

In consumers' daily lives

Portal do Consumidor



myCVS - Store Change Store > Weekly Ad Sign In or Create an Account Store Locator Espa/ol

CVS pharmacy™

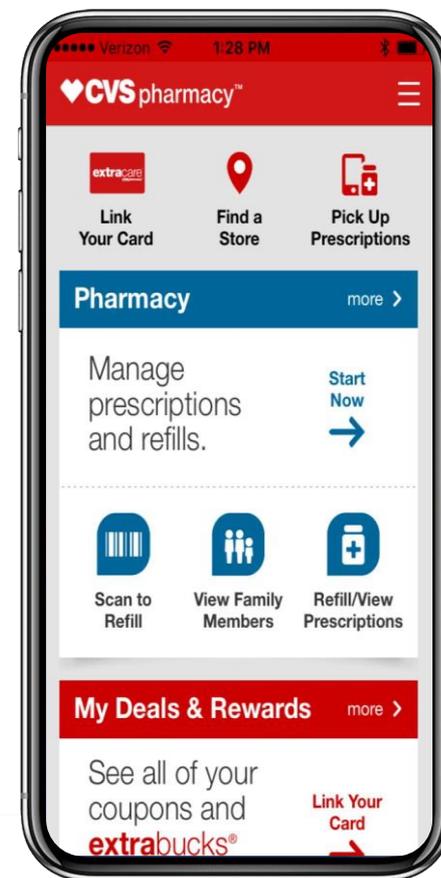
Pharmacy MinuteClinic® Shop ExtraCare® Contact Lenses Photo My Orders Easy Reorder Basket

[Refill Prescriptions >](#) [Shop Online >](#) [Print Photos >](#) [Visit MinuteClinic >](#)

Celebrate one less to do.
Now delivering Rx + more!*
[Learn how delivery works](#)

Shop by category

- Beauty > 
- Health & Medicine > 
- Vitamins > 



Verizon 1:28 PM

CVS pharmacy™

[extraCARE](#) [Find a Store](#) [Pick Up Prescriptions](#)

Pharmacy [more >](#)

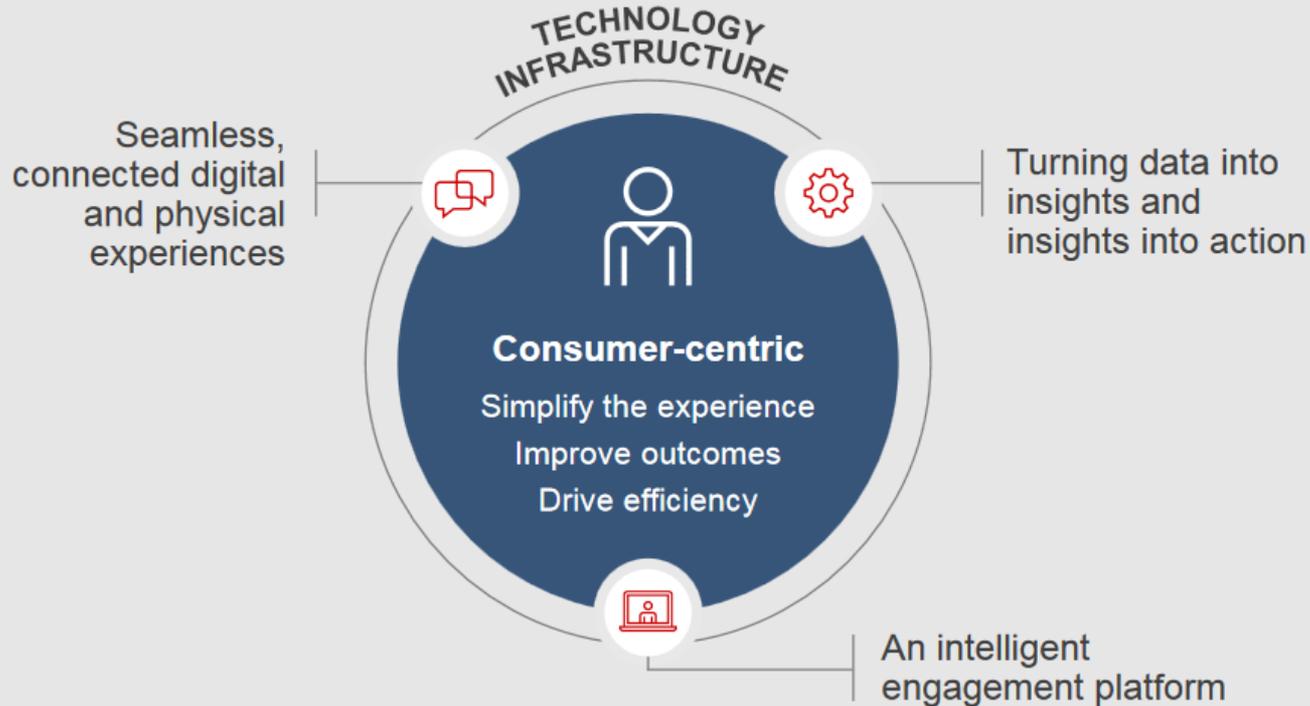
Manage prescriptions and refills. [Start Now](#)

[Scan to Refill](#) [View Family Members](#) [Refill/View Prescriptions](#)

My Deals & Rewards [more >](#)

See all of your coupons and **extrabucks®** [Link Your Card](#)

Creating a consumer-centric technology infrastructure



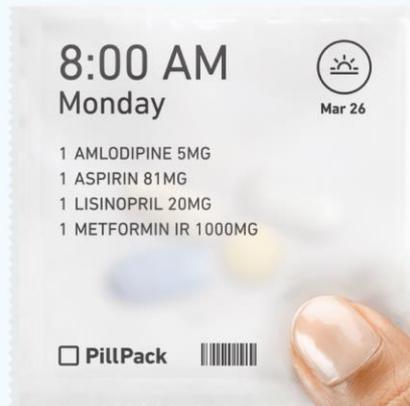


PillPack Pharmacy

[HOME](#) [HOW IT WORKS](#) [PRICING](#) [SIGN-UP](#)

Your medication, delivered

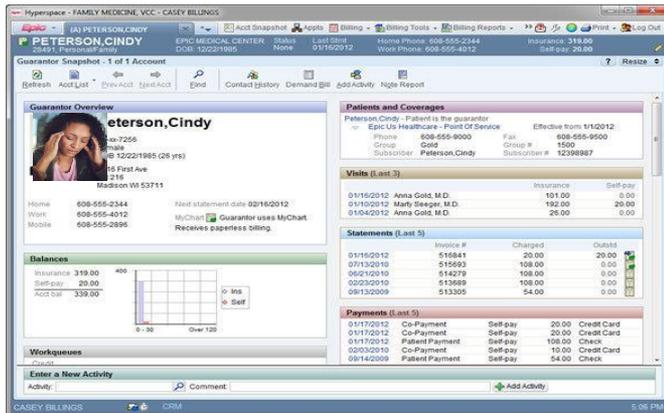
[Introducing PillPack \(0:35\) >](#)





- ✓ Portal do Paciente
- ✓ Informacao Individualizada
- ✓ Telemedicina
- ✓ Wearables

Prontuario Eletronico



- ✓ Centraliza Informacao
- ✓ Acesso Facil para Equipe Medica
- ✓ Clinica e Hospital
- ✓ Farmacia
- ✓ Pagamentos



1.2 Bilhao em um hospital

Procedimentos Desnecessarios



- ✓ 34% Proteses de Joelho
- ✓ 23% Marcapassos
- ✓ 12% Angiograma Cardiaco
- ✓ 70% Histerectomias

Parceria Provedores e Empresas

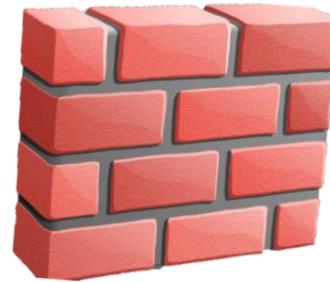


- ✓ Analises de Muitos Pacientes
- ✓ Mantem Privacidade
- ✓ Avaliacao de Resultados

Privacidade



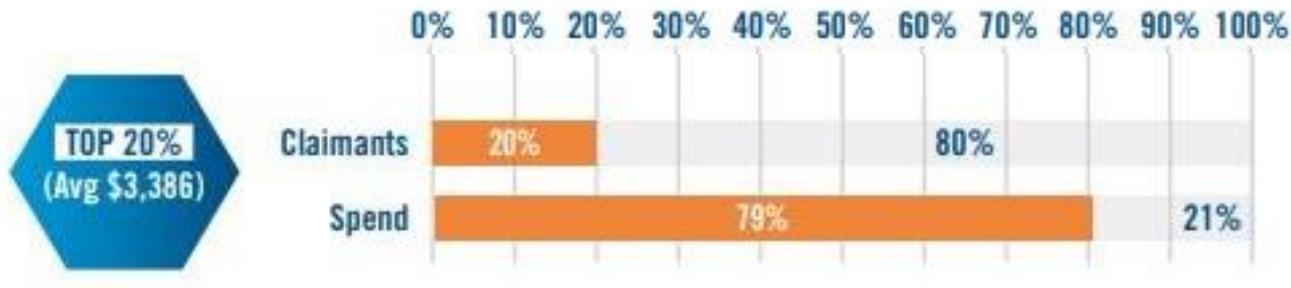
Gloria



Empresa

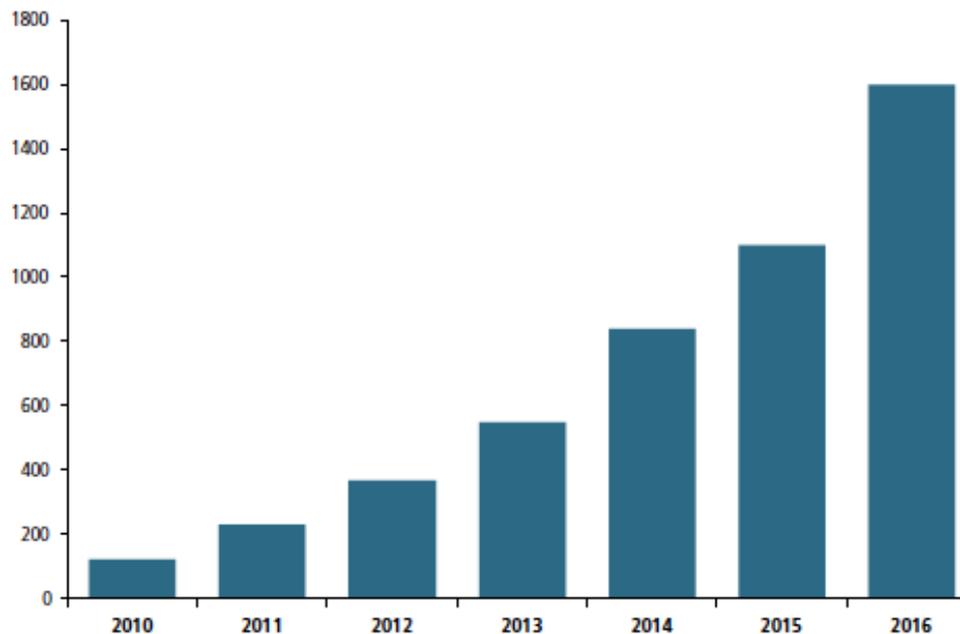
Medicamentos de Alto Custo

20% Pacientes Responsáveis por 80% Custos



Medicamentos de Alto Custo

Gráfico 6 – Gastos do governo federal com a compra de medicamentos por determinação judicial, 2010 – 2016



Fonte: Ministério da Saúde apud Plerro, 2017, p. 19.

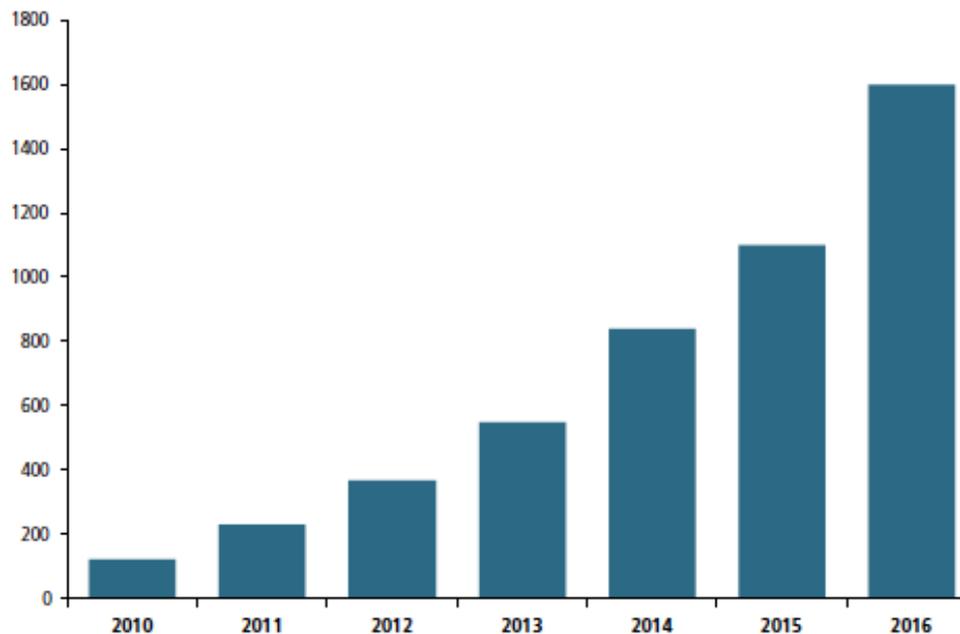
Medicamentos de Alto Custo



R\$ 28,615



Gráfico 6 – Gastos do governo federal com a compra de medicamentos por determinação judicial, 2010 – 2016



Fonte: Ministério da Saúde apud Pierro, 2017, p. 19.

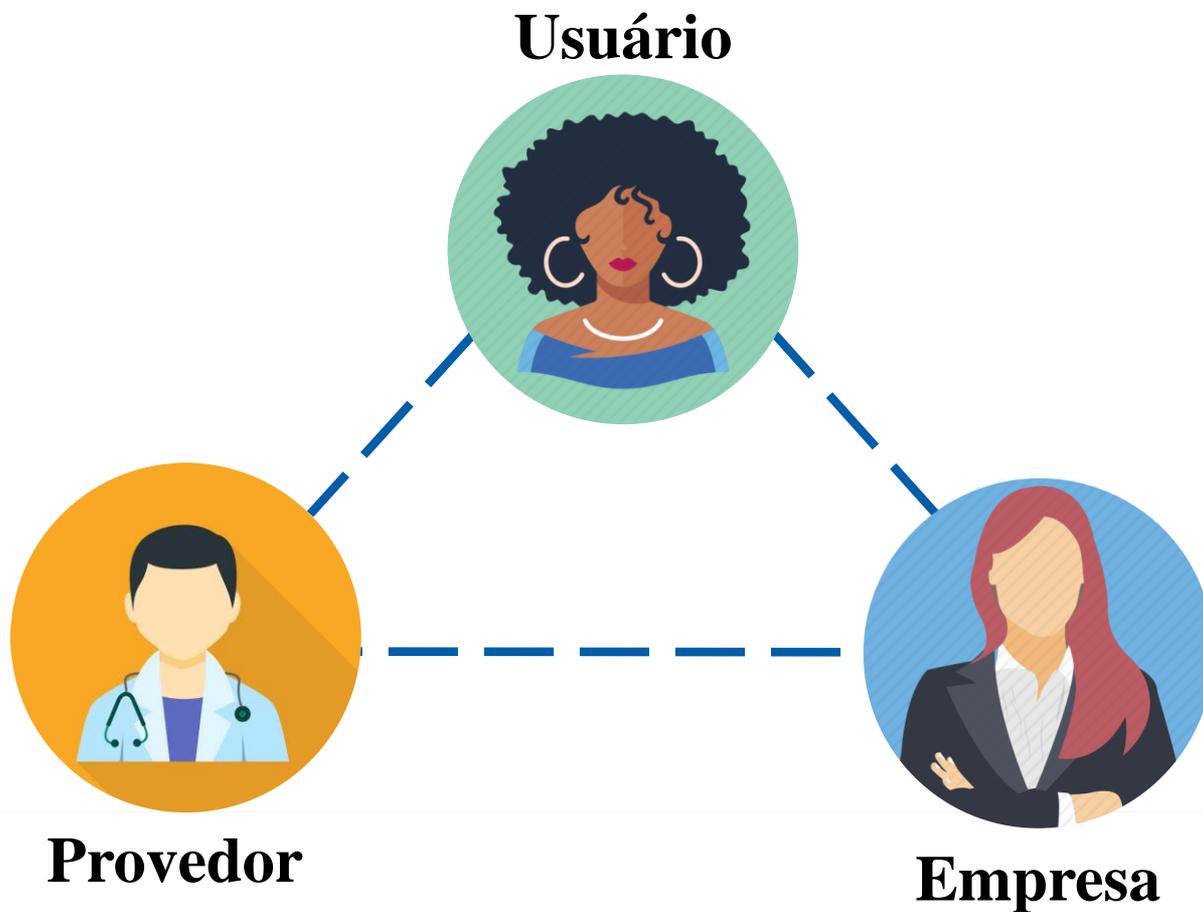
Medicamentos de Alto Custo

- ✓ Análise de Utilização
- ✓ Programas Específicos
- ✓ Autorização Prévia
- ✓ Farmácia Especializada
- ✓ Administração Fora do Hospital

Investindo no Usuário



- ✓ Participar de Tecnologias
- ✓ Messages Individualizadas
- ✓ Administracao de Saude da Populacao
- ✓ Farmacias e Beneficios Integrados



10 Formas de Melhorar a Eficiência e Custos do Cuidado

1. Value-Based Care Design
2. Custos de Farmacia
3. Foco no Bem-estar
4. Usuário Decide Plano
5. Análise da População
6. Análise de Gastos com Plano
7. Administração do Cuidado
8. Telemedicina
9. Telefonias com Enfermeiras
10. Autorização Prévia Medicamentos



edamorim@mit.edu



ZUCKERBERG
SAN FRANCISCO GENERAL
Hospital and Trauma Center



HARVARD
MEDICAL SCHOOL



MASSACHUSETTS
GENERAL HOSPITAL