



Cooperation activity

VII Spring School
on

ICT, economical and organizational issues for e-health integration in the enlarged Europe

Koper, Slovenia 22nd - 24th May 2017

mHealth: promises, challenges, and experiences

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Università degli Studi di Trieste
Trieste, Italy



THE SMART WORLD



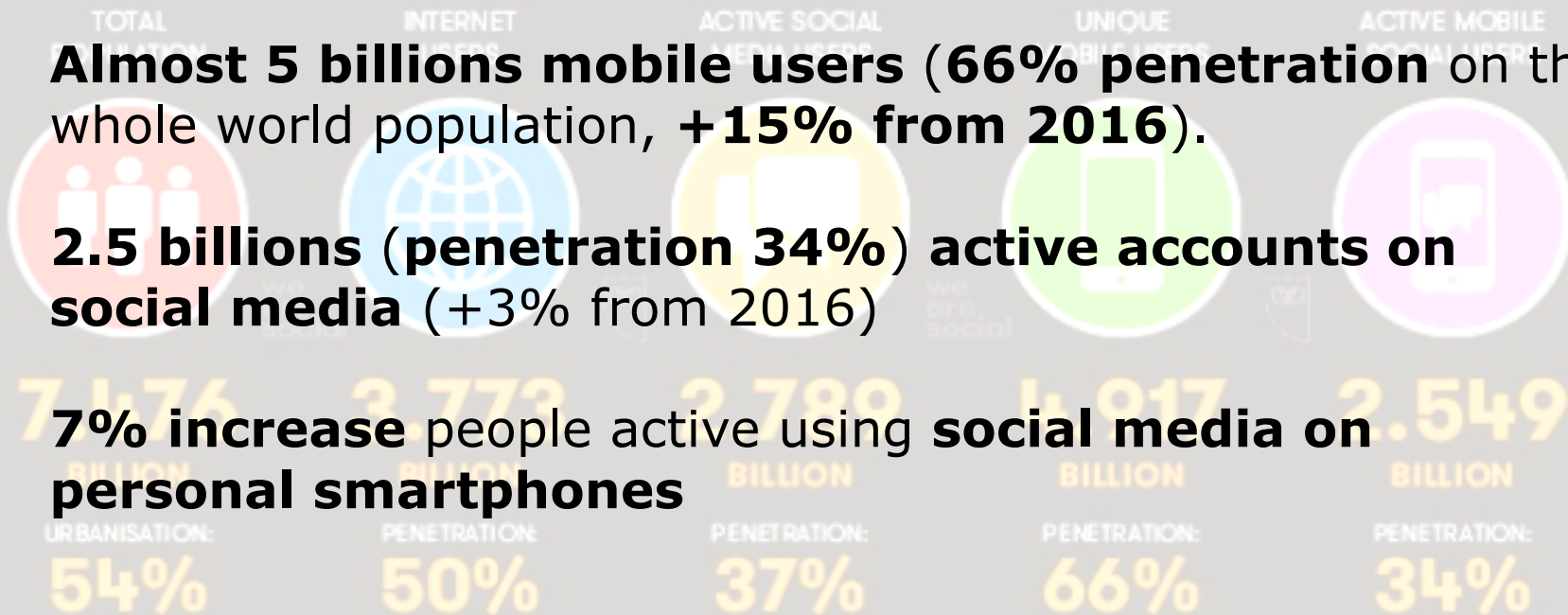
THE SMART WORLD

JAN 2017

GLOBAL DIGITAL SNAPSHOT

KEY STATISTICAL INDICATORS FOR THE WORLD'S INTERNET, MOBILE, AND SOCIAL MEDIA USERS

- **World population** from 7.3 to **7.5 billions**
- **Almost 5 billions mobile users (66% penetration on the whole world population, +15% from 2016).**
- **2.5 billions (penetration 34%) active accounts on social media (+3% from 2016)**
- **7% increase people active using social media on personal smartphones**



SOURCE: POPULATION - UN ESTIMATIONS, U.S. CENSUS BUREAU; INTERNET - INTERNETWORK DETAILS (I) INTERNETSTATS; CIA - WORLD FACTBOOK; NBC NEWS; NATIONAL TELEVISION AND SOUND BOARD; SOCIAL MEDIA AND MOBILE SOCIAL MEDIA - FACEBOOK, TWITTER, YOUTUBE, INSTAGRAM, PINTEREST, KAKAO, WEIBO, BILIBILI, SCHEER, CATERPILLAR, DELLINGER, DINO; INTERPOLATION OF THIS DATA; MOBILE - GOME, WELDONCE, EXTRAPOLATION OF EMERATER AND EMCISION DATA.

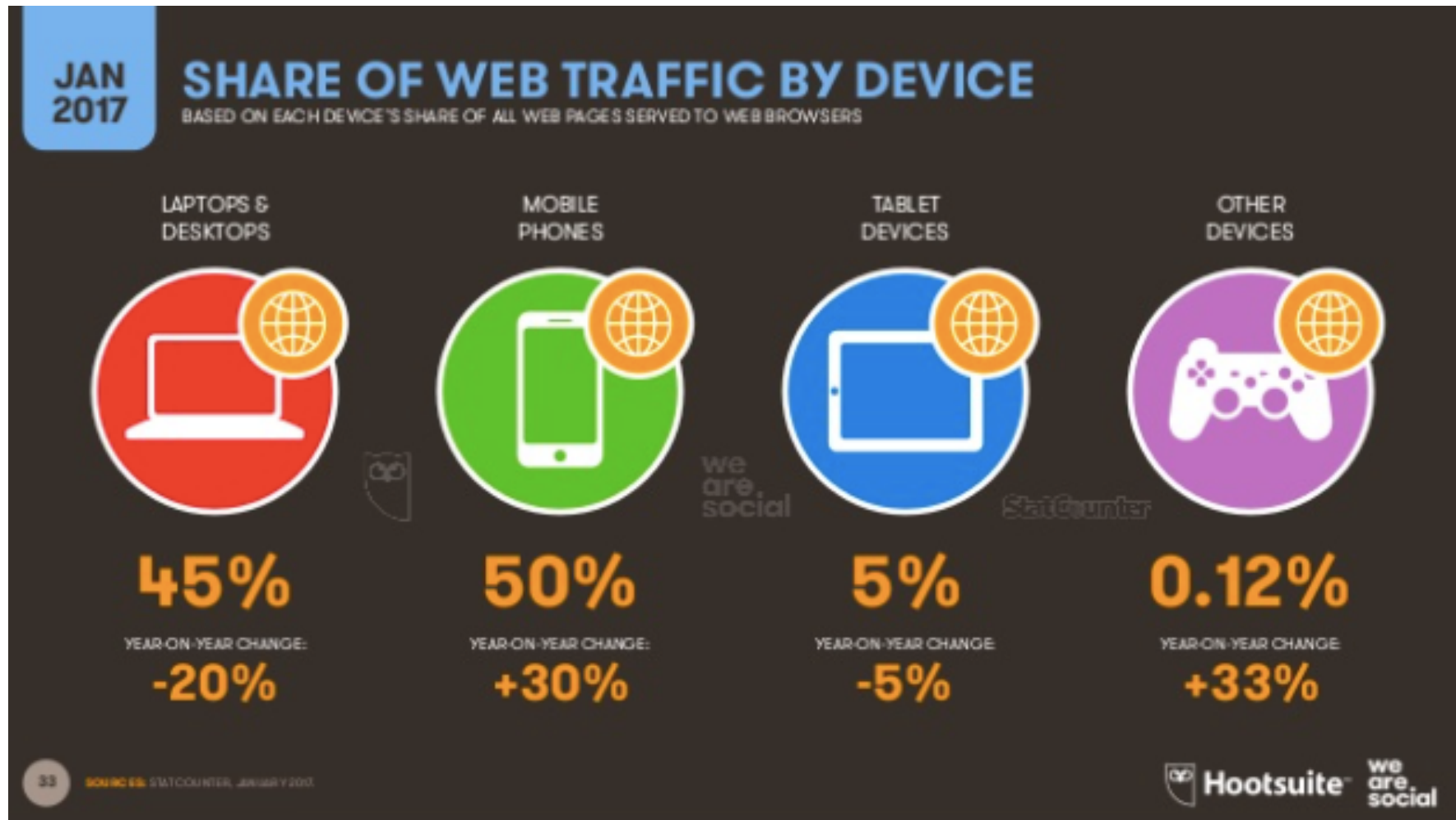


DIGITAL IN EUROPE



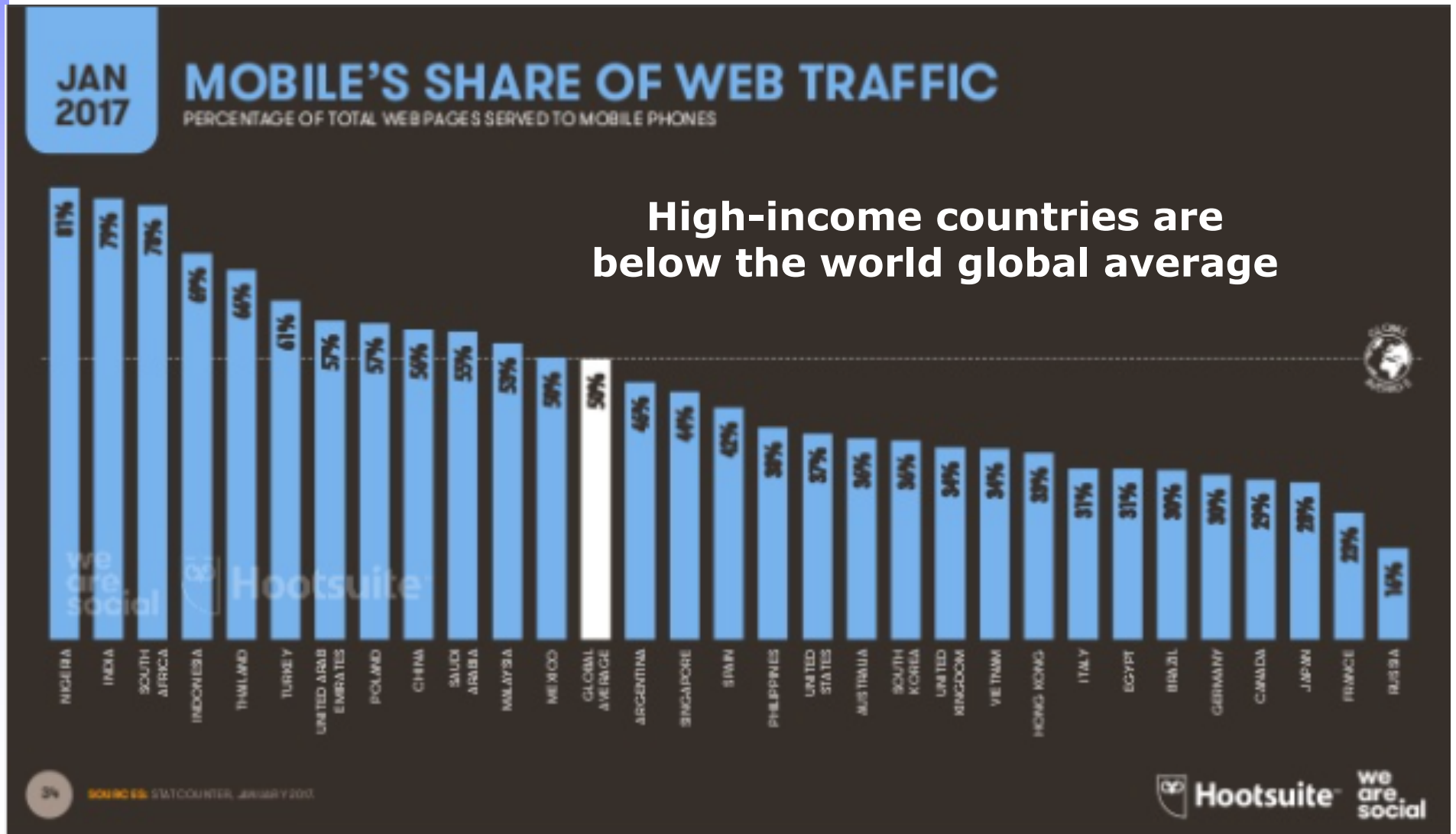
N of mobile connections > population

WEB TRAFFIC SHARE

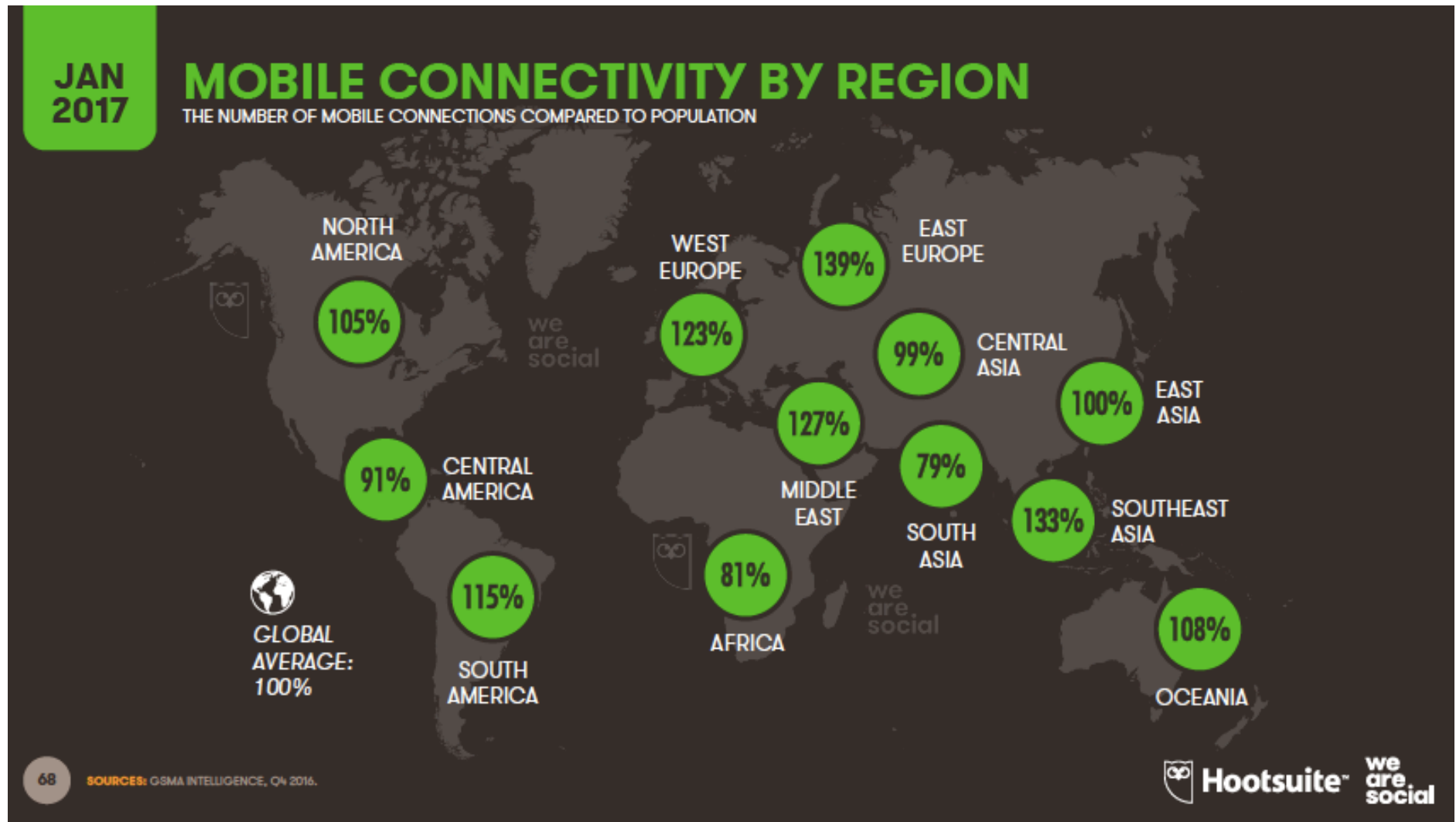


**Decrease in Laptop/Desktop users and
increase un mobile phone users**

WORLDWIDE DISTRIBUTION OF MOBILE TRAFFIC

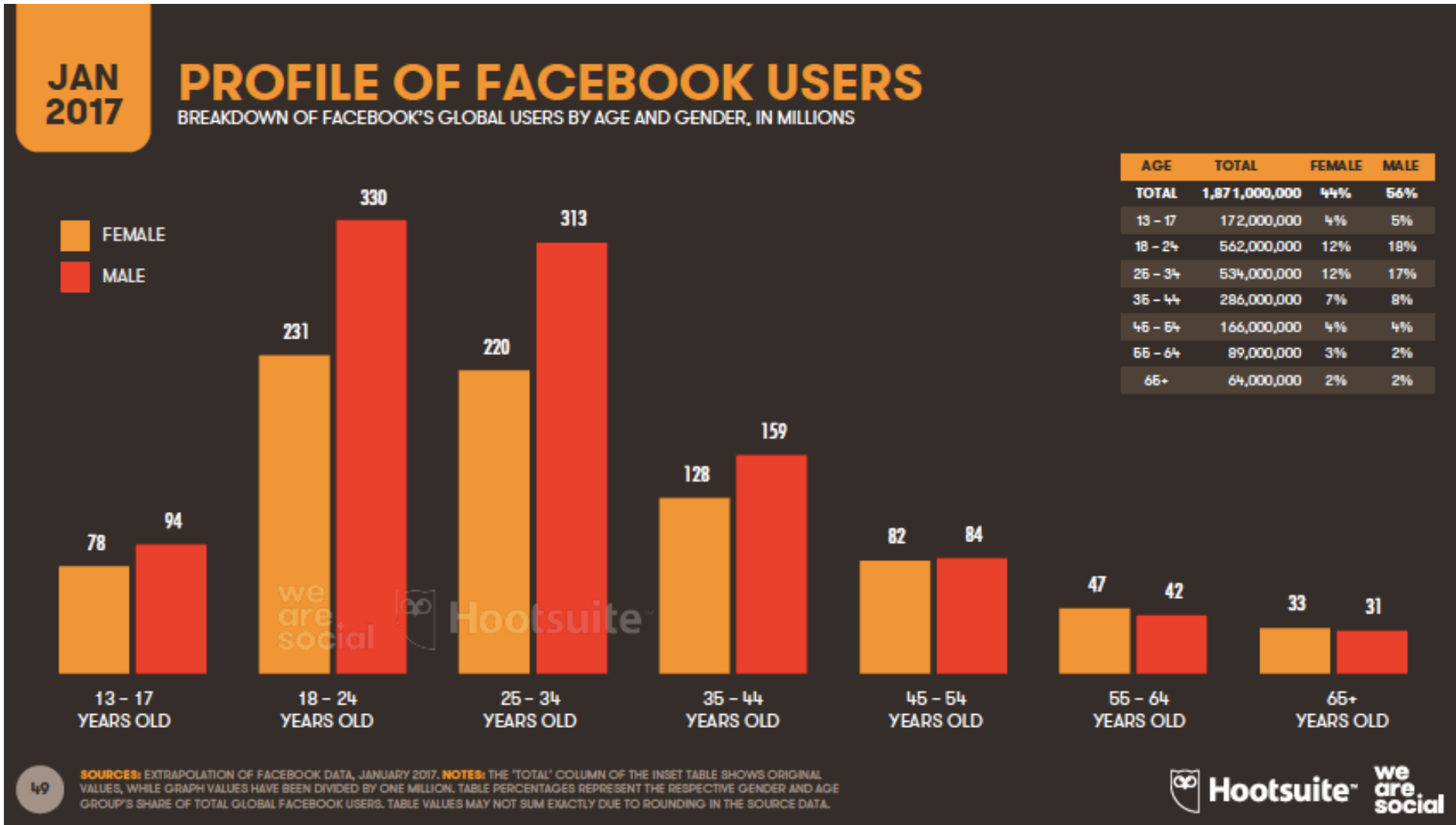


MOBILE USE



THE GLOBAL AVERAGE NUMBER O MOBILE CONNECTIONS COMPARED TO POPULATION IS 100%

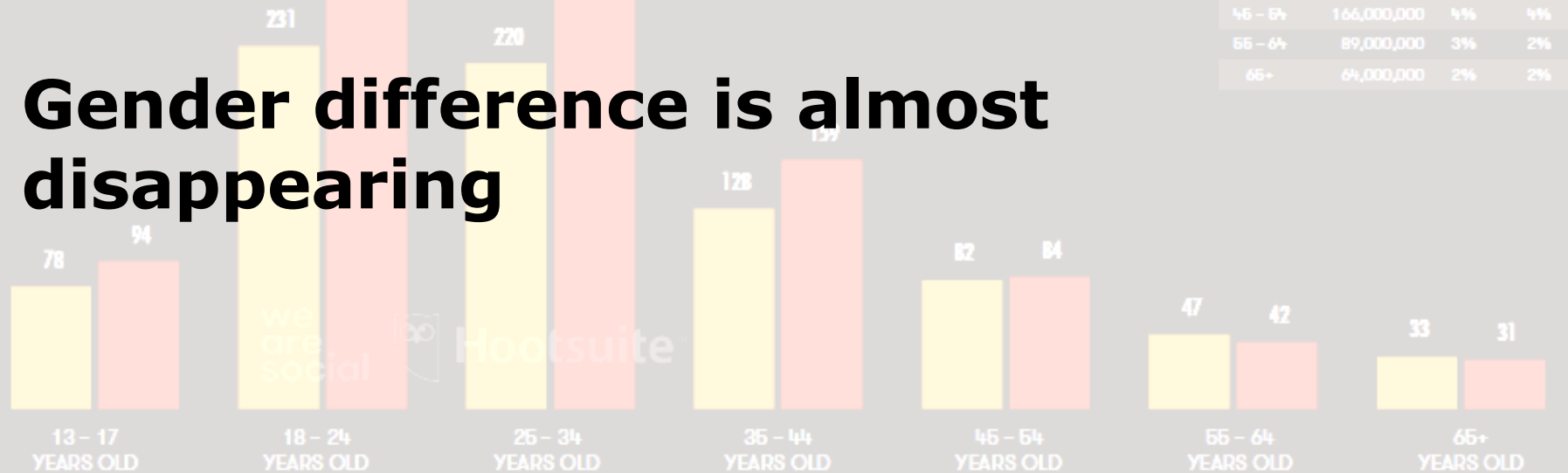
DIGITAL DIVIDE



DIGITAL DIVIDE

- Younger people use social media more than older people but **there are many users in older categories**

MALE



Age Group	Total	% of Total	% Male
TOTAL	1,271,000,000	100%	56%
13 - 17	172,000,000	4%	5%
18 - 24	562,000,000	12%	18%
25 - 34	534,000,000	12%	17%
35 - 44	286,000,000	7%	8%
45 - 54	166,000,000	4%	4%
55 - 64	89,000,000	3%	2%
65+	64,000,000	2%	2%

- **Gender difference is almost disappearing**



SOURCES: EXTRAPOLATION OF FACEBOOK DATA, JANUARY 2017. **NOTES:** THE "TOTAL" COLUMN OF THE INSET TABLE SHOWS ORIGINAL VALUES, WHILE GRAPH VALUES HAVE BEEN DIVIDED BY ONE MILLION. TABLE PERCENTAGES REPRESENT THE RESPECTIVE GENDER AND AGE GROUP'S SHARE OF TOTAL GLOBAL FACEBOOK USERS. TABLE VALUES MAY NOT SUM EXACTLY DUE TO ROUNDING IN THE SOURCE DATA.



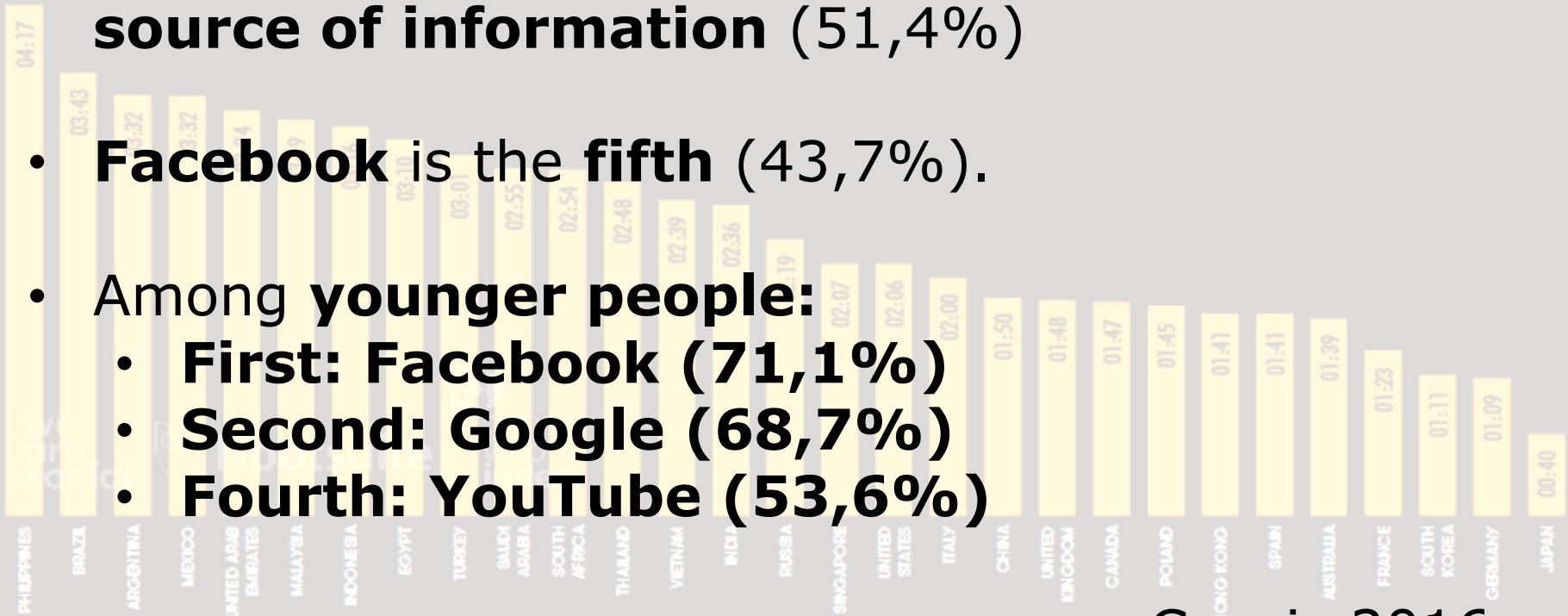
SOME SCARING DATA FROM ITALY

JAN 2017

TIME SPENT ON SOCIAL MEDIA

AVERAGE NUMBER OF HOURS THAT SOCIAL MEDIA USERS SPEND USING SOCIAL MEDIA EACH DAY [SURVEY BASED]

- Internet search engines like **Google** are the **3rd source of information** (51,4%)
- **Facebook** is the **fifth** (43,7%).
- Among **younger people**:
 - **First: Facebook (71,1%)**
 - **Second: Google (68,7%)**
 - **Fourth: YouTube (53,6%)**



Censis 2016

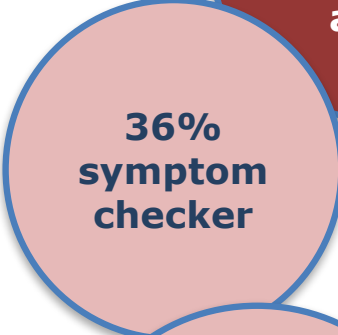
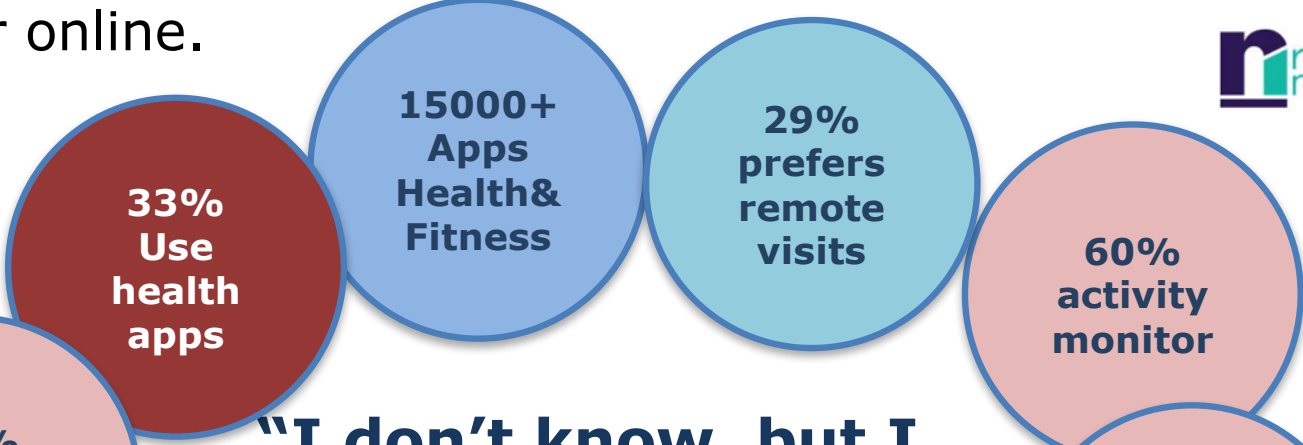
45

SOURCES: GLOBALWEBINDEX, Q3 & Q4 2016. BASED ON A SURVEY OF INTERNET USERS AGED 15-64.

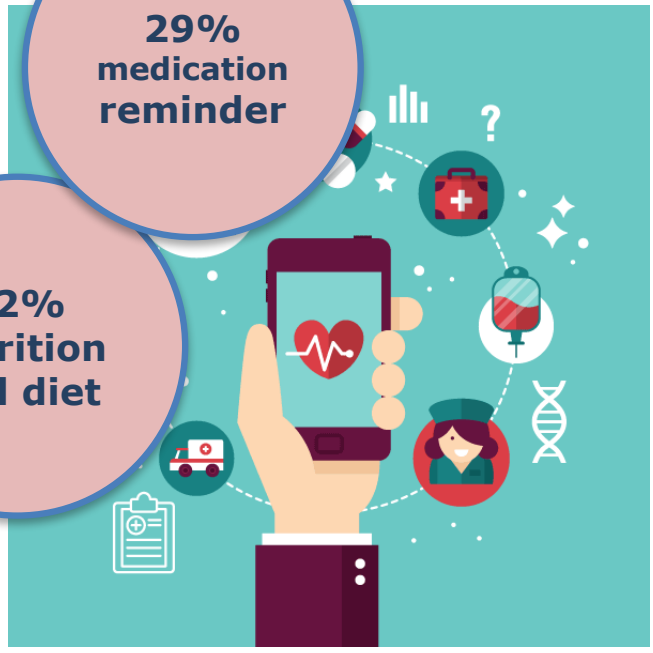
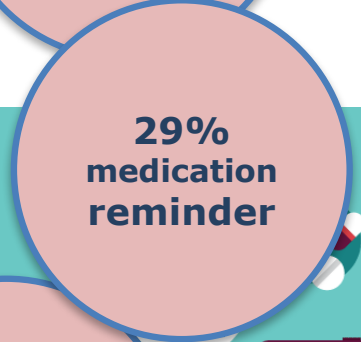
Hootsuite we are social

HEALTH MOBILE APPS

27% of internet users and 20 percent of adults have tracked their weight, diet, exercise routine, symptoms, or another health indicator online.



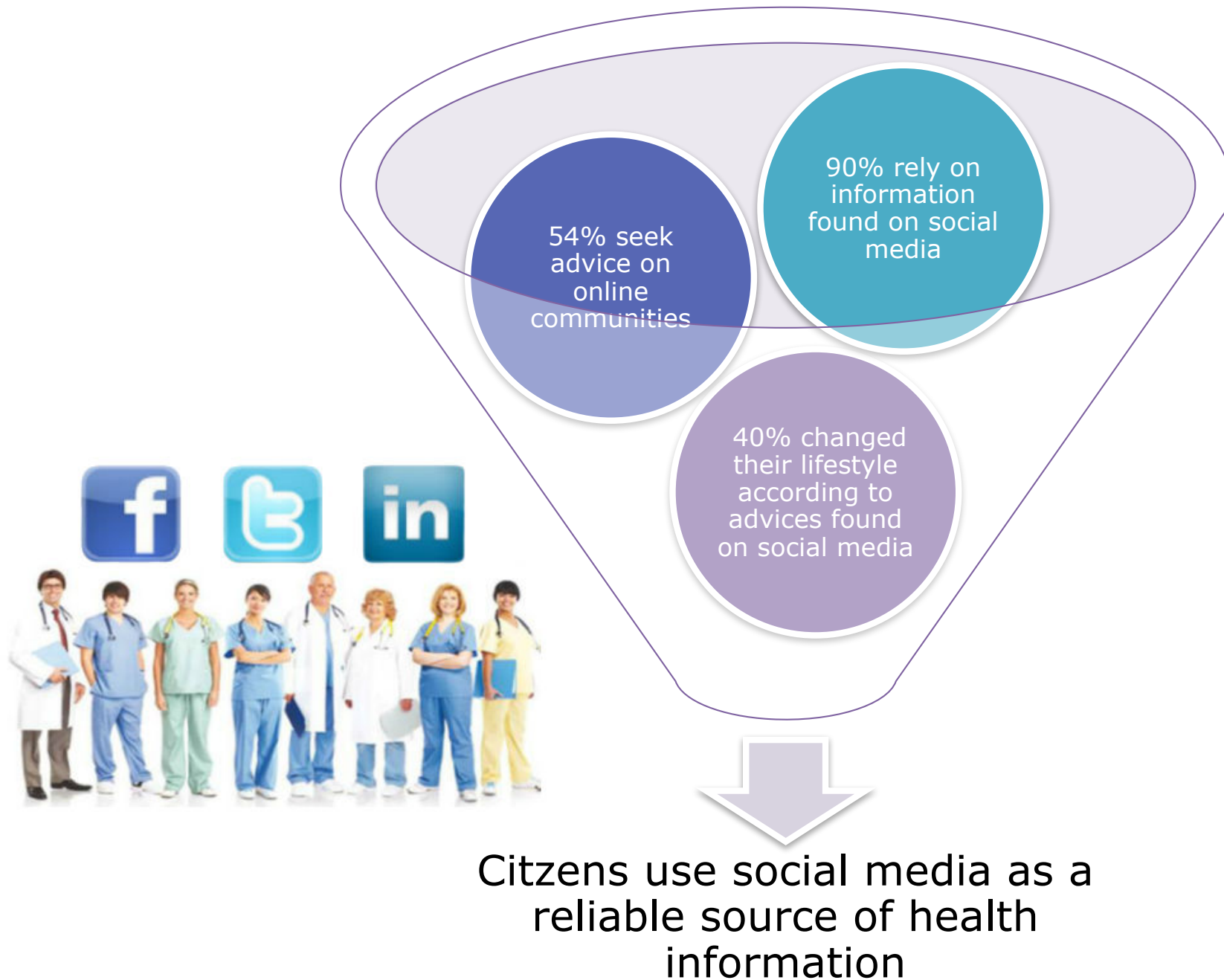
“I don’t know, but I can try to find out” is the default setting for people with health questions.



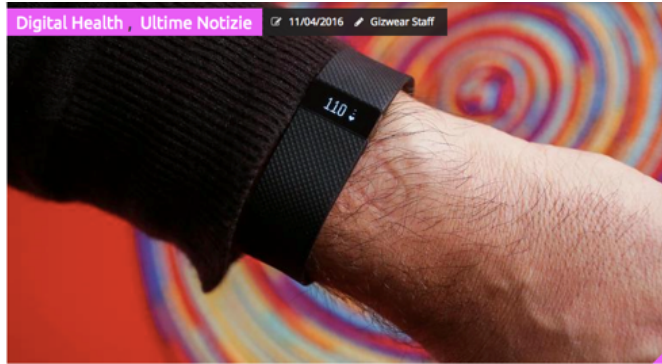
HEALTH MOBILE APPS

- Number of users:
 - 2014 →
 - 16% of consumers
 - 9% use health wearables
 - Today →
 - 33% of consumers
 - 21% use health wearables
- mHealth apps use:
 - 60% → weight loss and exercise tracking
 - 30% → monitor existing health conditions
 - 29% → medication reminder.
- mHealth apps apps help to improve quality of life for:
 - 96% of health app users
 - 37% of health professionals believe that they will improve their patients' lives.

HEALTH SOCIAL MEDIA



WEARABLES



Fitbit Charge HR salva la vita ad un malato di cuore!



SOWATCH: lo smartwatch che previene l'ictus

Una cartella clinica al polso

Oltre alle funzioni elencate poco sopra, sarà possibile registrare su **SOWATCH** il **gruppo sanguigno**, le **allergie**, i recenti **ricoveri** in ospedale, le **malattie croniche**, l'esito degli ultimi consulti medici.

The number of devices connected to the Internet was **12.5 billion in 2010**, making the number of connected devices **per person >1 (1.84)** for the first time in history. Now they are **25 billions**

You can be **100 percent identified**, as an individual, by **your Fitbit data.**



O'Ve: lo smartwatch che monitora i raggi UV e ci protegge dalle malattie della pelle!



THIM, il primo wearable al mondo "migliora-sonno" | Video

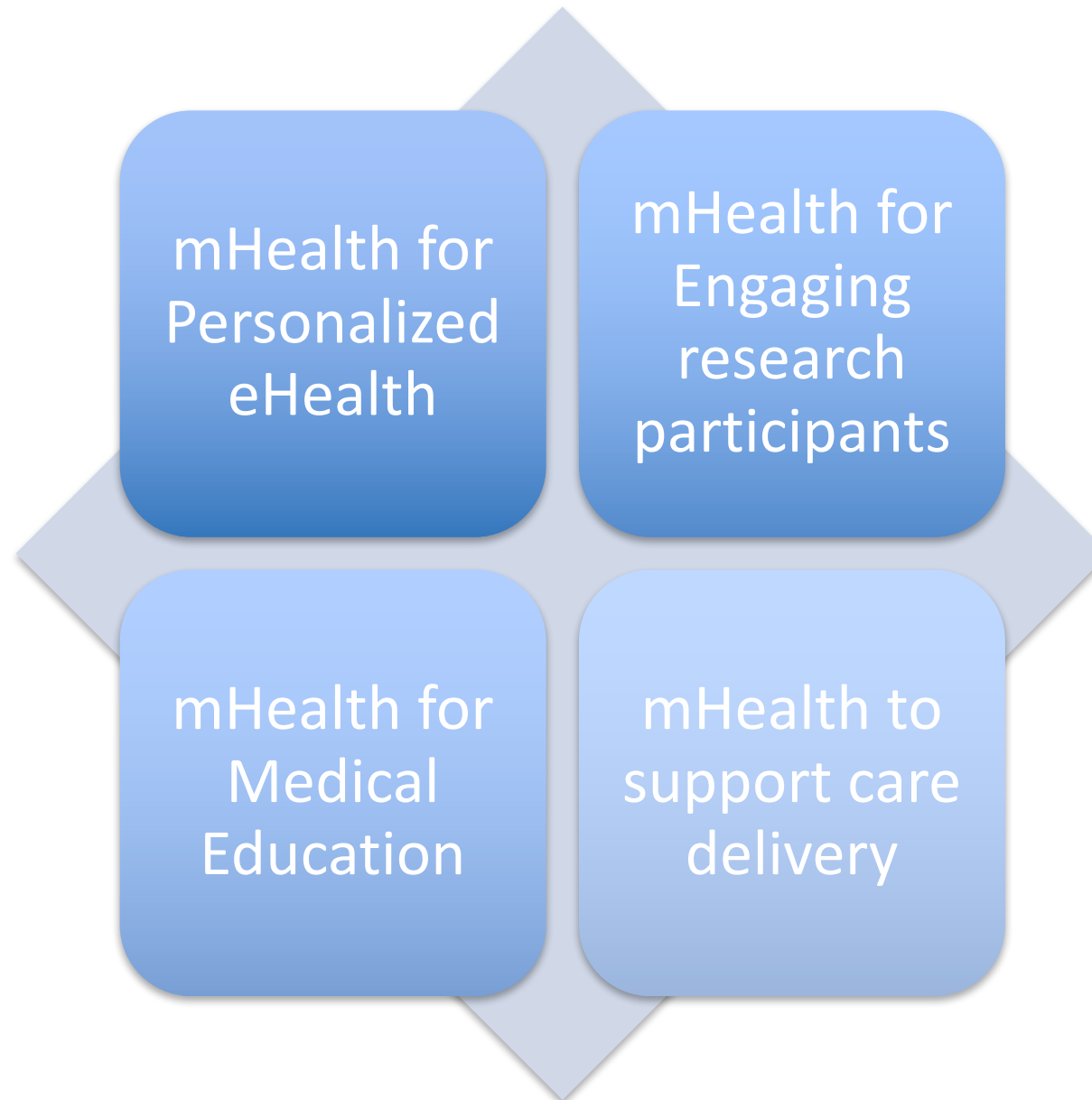


Quantified
self knowledge through

EXPECTATIONS

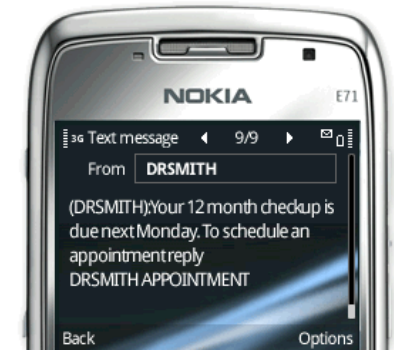
1. Real time communication and information (data&document) exchange between patient and healthcare delivery
2. Access capabilities able to jump the distance barrier between patients and docors
3. Healthcare inclusion for the majority
 1. digital inclusion also of developing countries
 2. Distributing healthcare benefits across society (equity)
4. Ability to reach many people in a short time due to the acute and emerging demographic challanges to healthcare systems
5. Patient-centered approach
 1. Patient inclusion in healthcare delivery
 2. Increased education capability
 3. Services for non-patients (wellness, healthy lifestyle)
 4. Moving some health responsibilites to patients

POSSIBLE APPLICATION SCENARIOS



PERSONALIZED MEDICINE

- Personal Health Records
- Personal Health Self-Management Systems
- Tailored health messaging
- Choice-based consulting
- Tailored telehealthcare



3G Doctor
The Doctor Can See You Now

Tell a friend Access your Health Record Consult with a Doctor

- Click "Consult with a Doctor"
- Register & credit your account with £35
- Sign in & tell a registered Doctor about your concerns
- An informed Doctor will review this before Video Calling you
- Sign in after your consult to access your written report

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DATE	STARTS	ENDS
	15/12/2010	16/12/2010
TIME	08:00	09:00
SYS	FROM 140 mmHg	TO 120 mmHg
DIA	FROM 80 mmHg	TO 60 mmHg
NUMBER	80	

MEDICAL PRACTICE



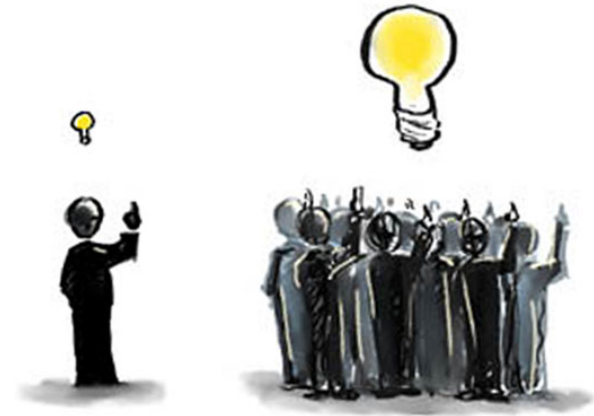
VisualDx
mobile

S

	Sarcoidosis	A
	Scabies	B
	Scabies (Pediatric)	C
	Scabies, Crusted	D
	Scar, Anogenital	E
	Scarlet Fever	F
		G
		H
		I
		J
		K
		L
		M
		N
		O
		P
		Q
		R
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		U
		V
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		X
		Y
		Z

ENGAGING RESEARCH PARTICIPANTS - CROWDSOURCING

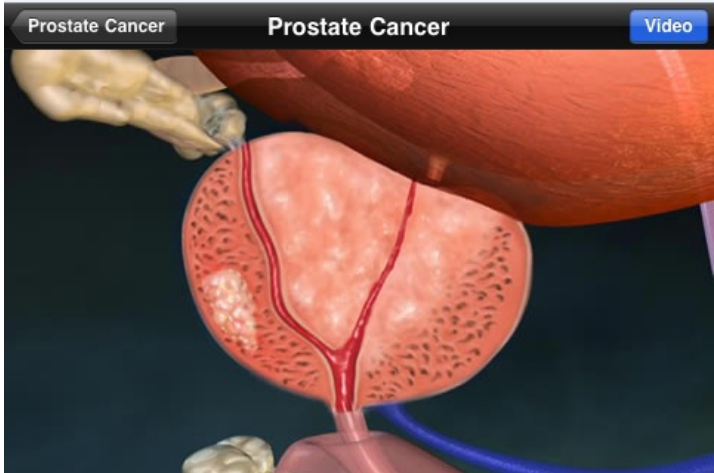
- Crowdsourcing for research
 - e.g. attitude surveys
- Mapping disease with GPS
 - e.g. Google health
- Pushing mass public health interventions?



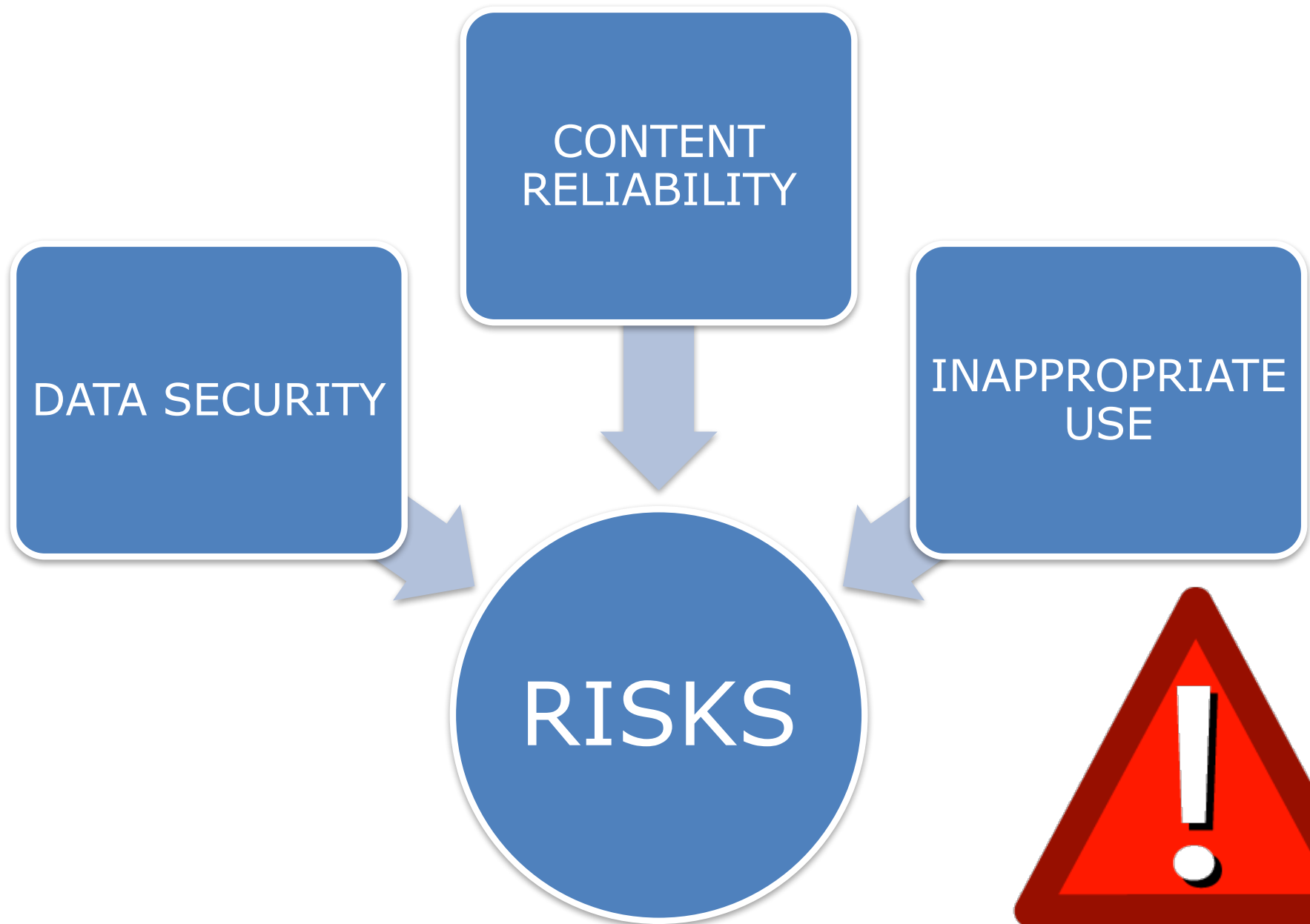
EDUCATION

The screenshot shows the Medscape mobile application interface. At the top, the status bar displays 'AT&T', '12:21 AM', and '26%' battery. The Medscape logo is prominently displayed. Below it is a search bar labeled 'Search Reference'. A news snippet titled 'Low-Dose Aspirin May Improve Sensitivity for Detecting Colorectal Cancer' is visible. Navigation options include 'Drugs, OTCs & Herbals', 'Diseases & Conditions', and 'Procedures & Protocols'. A second screenshot shows the article page for 'Aneurysm, Abdominal', with a 'Back' button and a 'Save' button. The article details the author (Robert E O'Connor, MD, MPH) and chief editor (David FM Brown, MD). A table of contents lists sections: Overview, Clinical, Differential Diagnoses, Workup, Treatment, Medication, and Follow-up. The bottom navigation bar includes icons for Reference, Interactions, News, CME, and More.

This screenshot shows a gallery of clinical images for Sarcoidosis. The title 'Sarcoidosis' is at the top. The gallery contains 15 small images arranged in a 5x3 grid, showing various skin manifestations such as erythema nodosum, acneiform eruptions, and facial lesions. A blue bar at the bottom indicates '58 Images'.



CONCERNS & CAVEATS



QUALITY, RELIABILITY, AND USEFULNESS

NIH U.S. National Library of Medicine



Search MedlinePlus

About

HealthDay

Is Web-Based Test for Prediabetes Faulty?

Assessment finds 8 in 10 Americans over 60 at risk, a conclusion questioned by several experts

Monday, October 3, 2016

JAMA | Original Investigation

Effect of Wearable Technology Combined With a Lifestyle Intervention on Long-term Weight Loss The IDEA Randomized Clinical Trial

John M. Jakicic, PhD; Kelliann K. Davis, PhD; Renee J. Rogers, PhD; Wendy C. King, PhD; Marsha D. Marcus, PhD; Diane Helse, PhD, RD; Amy D. Rickman, PhD, RD, LDN; Abdus S. Wahed, PhD; Steven H. Belle, PhD

September 20, 2016

Activity Trackers Are Ineffective at Sustaining Weight Loss

Newly released Pitt study, published today in JAMA, finds commercially available wearable devices for gauging physical activity are not useful tools for weight loss

STUDY

Diagnostic Inaccuracy of Smartphone Applications for Melanoma Detection

Joel A. Wolf, BA; Jacqueline F. Moreau, BA; Oleg Akilov, MD; Timothy Patton, DO; Joseph C. English III, MD; Jonhan Ho, MD; Laura K. Ferris, MD, PhD

Medical apps for smartphones: lack of evidence undermines quality and safety

Arthur Willem Gerard Buijink,¹ Benjamin Jelle Visser,² Louise Marshall³

BMJ

BMJ 2013;346:f1811 doi: 10.1136/bmj.f1811 (Published 20 March 2013)

Page 1 of 2

How do we know whether medical apps work?

Smartphone apps have the potential to transform the way the public manage their health and interact with health services, says Margaret McCartney, but regulation of medical apps has only just started

Margaret McCartney *general practitioner, Glasgow*

OPEN ACCESS Freely available online

PLOS ONE

mHealth: A Strategic Field without a Solid Scientific Soul. A Systematic Review of Pain-Related Apps



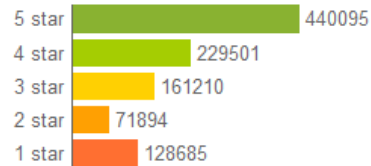
Rocío de la Vega, Jordi Miró*

Unit for the Study and Treatment of Pain - ALGOS, Research Center for Behavior Assessment, Department of Psychology and Institut d'Investigació Sanitària Pere Virgili, Universitat Rovira i Virgili, Tarragona, Spain

QUALITY EVALUATION (1)

WIRED APPS

User Reviews



Average rating:

3.8



1,028,105

Cerca

Cerca

LE MIGLIORI APP PER MOBILE PER SALUTE

Categoria: **salute**

Benessere e salute: le applicazioni che non possono mancare sul tuo smartphone se vuoi avere cura di te stesso.

marie claire PROFUMI Eterno Chanel N°5 TENDENZE Vestiamo alla marinara

MODA SFILATE BELLEZZA BENESSERE NEWS E PERSONE LIFESTYLE MAGAZINE MAISON CU



20



0



0

Le 10 migliori app per la salute per iPhone 6



23

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Le app per la nostra salute

Come monitorare il proprio stato di salute direttamente dallo smartphone? Ecco una raccolta delle migliori app gratuite disponibili per iPhone:

SPECIALIZED REVIEW SITES

<http://www.imedicalapps.com/>

Curated Health Apps & Devices

With a Focus on Clinical Relevance, Safety, and Efficacy

Reviews by Clinicians, Researchers, & Patients.

Led by Experts From Top Ranked Teaching Hospitals & Universities.

Hacking Medicine's consumer health review site launches

By [Jonah Comstock](#) | May 03, 2016

<http://www.rankedhealth.com>

PRESCRIBING APPS

Mount Sinai launches RxUniverse, a system-wide platform to prescribe medical apps

By Heather Mack (/content/heather-mack) | November 03, 2016



Mount Sinai RxUniverse RxU

Have you prescribed an app today?

Please choose your organization

Mount Sinai

Work Email

Password

[Forgot Password?](#)

Log in

[New User? Register Here](#)

GUIDELINES



Contains Nonbinding Recommendations

Mobile Medical Applications Guidance for Industry and Food and Drug Administration Staff



Document issued on February 9, 2015.

This document supersedes "Mobile Medical Applications: Guidance for Food and Drug Administration Staff" issued on September 25, 2013.

This document was updated to be consistent with the guidance document "Medical Devices Data Systems, Medical Image Storage Devices, and Medical Image Communications Devices" issued on February 9, 2015.

For questions about this document regarding CDRH-regulated devices, contact Bakul Patel at 301-796-5528 or by electronic mail at Bakul.Patel@fda.hhs.gov or contact the Office of the Center Director at 301-796-5900.

For questions about this document regarding CBER-regulated devices, contact the Office of Communication, Outreach and Development (OCOD), by calling 1-800-835-4709 or 240-402-7800.

U.S. Department of Health and Human Services
Food and Drug Administration
Center for Devices and Radiological Health
Center for Biologics Evaluation and Research

HEALTH AND CONSUMER
Directorate B, Unit B1 "Health Technology and Cosmetics"


MEDICAL DEVICES: Guidance document
Qualification and Classification of stand alone software

Software are medical devices

MEDDEV 2.1/6
January 2012

GUIDELINES ON THE QUALIFICATION AND CLASSIFICATION OF STAND ALONE REGULATORY FRAMEWORK OF MEDIC

Foreword




EUROPEAN
COMMISSION
Brussels, 10.4.2014
COM(2014) 219 final

GREEN PAPER

on mobile Health ("mHealth")

{SWD(2014) 135 final}



DIGITAL S Digital Economy & Society

European Commission > Code of Conduct on privacy for mHealth apps has been finalised

Home
The strategy
Economy
Society
Access & connectivity
Research & innovation
DG

Society

Skills & Jobs

eHealth and Ageing

eHealth

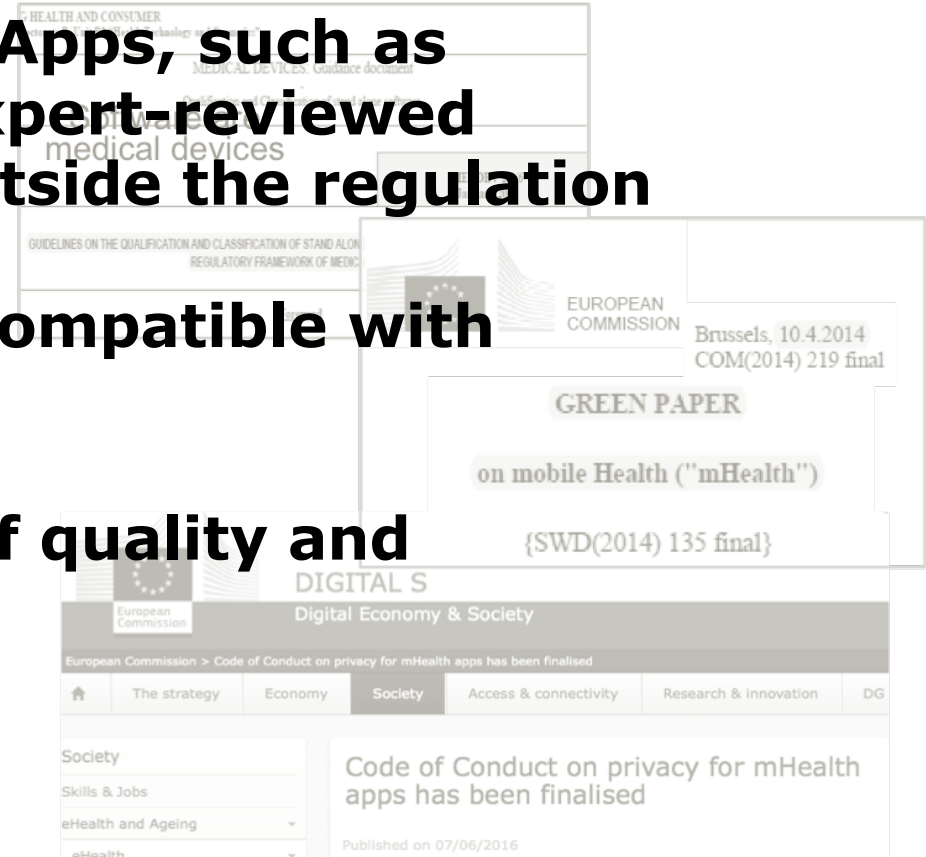
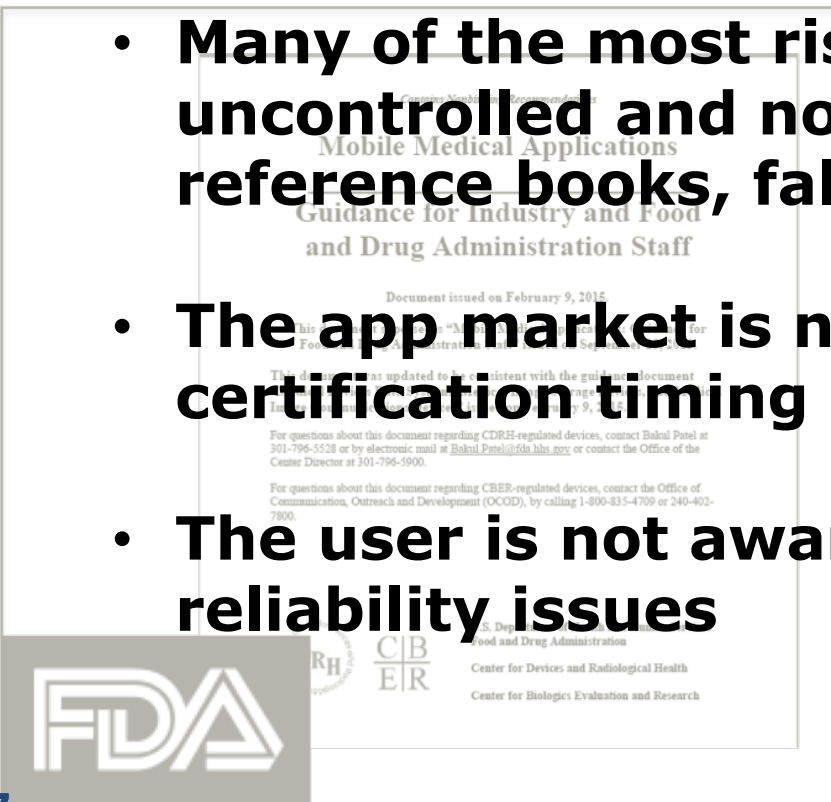
Code of Conduct on privacy for mHealth apps has been finalised

Published on 07/06/2016

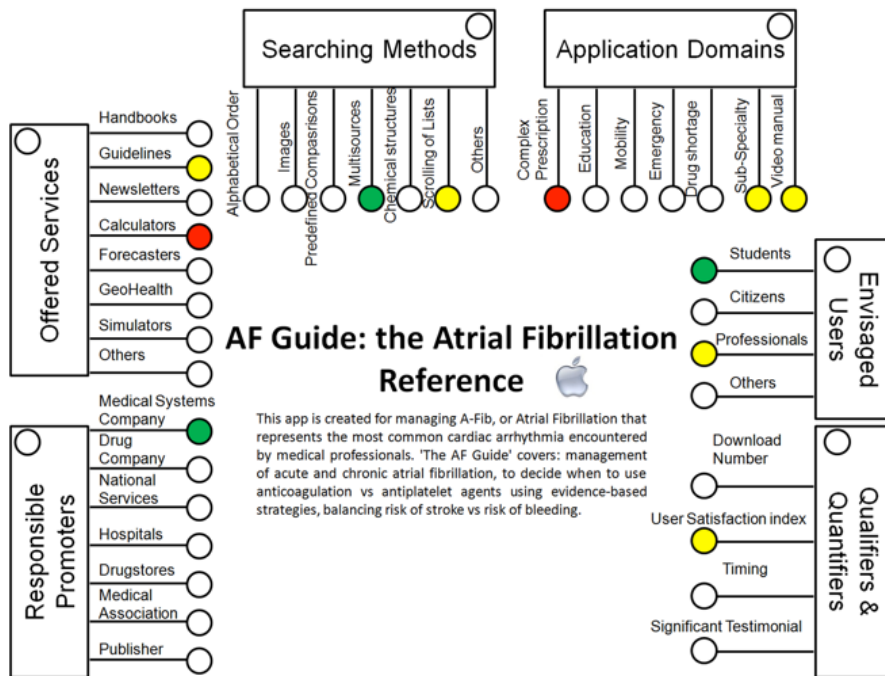
GUIDELINES

HOWEVER...

- There is a grey zone of Apps that are not medical devices and fall outside the regulation
- Many of the most risky Apps, such as uncontrolled and not expert-reviewed reference books, fall outside the regulation
- The app market is not compatible with certification timing
- The user is not aware of quality and reliability issues



SOLUTIONS FROM THE RESEARCH



**PICTORIAL SCHEMA
to represent risks and
benefits from
different users'
viewpoints**

app-synopsis

App-Synopsis for Health-Apps and Medical-Apps nach Albrecht UV, Pramann O, von Jan U. "Synopsis for Health-Apps - Transparency for Trust and Decision Making" (2013).

Item Category	Checklist Item	Sub Items
1. Imprint	1.1 Meta Data	<ol style="list-style-type: none"> Operating system Version number Web link (project pages and link to the app store) Category: Commercial project, non-commercial project, other Category: public access via an app store, only available to a restricted number of users/experts (in-house), other (please specify)
	1.2 Developer/Distributor	<ol style="list-style-type: none"> Information about the manufacturer/developer <ol style="list-style-type: none"> Name, address, web page, contact person(s), email address, phone and fax number Information about the distributor <ol style="list-style-type: none"> Name, address, web page, contact person(s), email address, phone and fax number
	1.3 Sponsoring/Advertising	<ol style="list-style-type: none"> Information about the funding used for developing the app <ol style="list-style-type: none"> Category: sponsoring, advertisements, other
2. Rationale	2.1 Category	<ol style="list-style-type: none"> Category: medical product or not, if yes: which class; has the app been certified voluntarily (by whom?), uncertified app

**APP-SYNOPSIS
to document and
certify the
development cycle**

(Albrecht et al, 2013)

SECURITY AND PRIVACY



- Individuals may have a limited or incorrect understanding of when data about their health is protected by law, and when it is not → some health-related information are stored in places that usually treat non-health information (e.g., Twitter, Facebook, etc) → HIPAA rule does not apply
- Health information collected in more places without consistent security standards may pose a cybersecurity threat (of which individuals may be unaware)
- Who owns the data? Will the makers of the fitness bands sell personal information? Will it be anonymous and aggregated or associated with us by name? What if we want to contribute our data—to a doctor? To a research study?

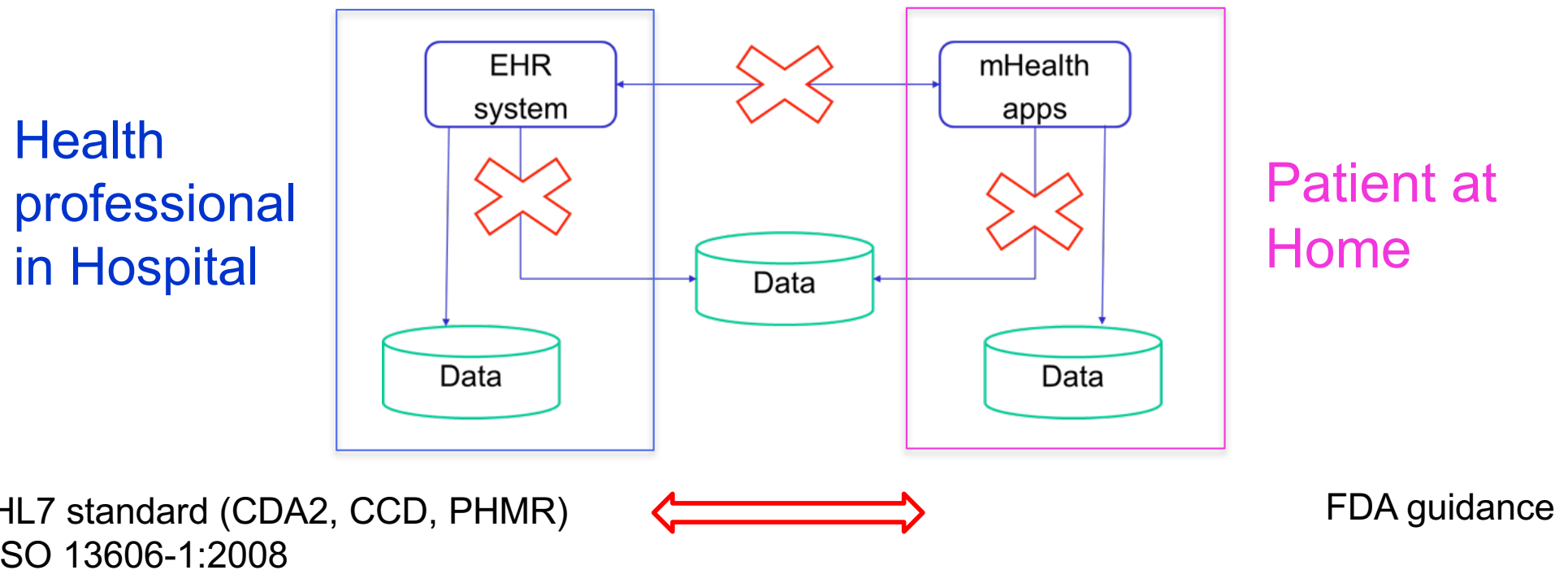


DATA COLLECTION

- Through mHealth apps and wearables terabytes of personal health data are collected daily
- They can potentially contribute to many health studies
- Data are however collected in a way that they cannot be used
- It is still unclear who can use/analyze these data
- There is the need to determine “how to find the gold in those data”

INFORMATION SHARING

Communication and data sharing between mobile personal health applications (**mHealth apps**) and ICTs used by health professionals are not subject to specific protocols or regulations.



Safety, communication and interoperability gaps

CHALLENGES

Integrating mHealth applications to EHRs has the potential to **enable patient-centered and home-settled care**, and to include patients, families, and communities in the care process.

HOWEVER:

- 1- mHealth Apps for patients and families need to be integrated in the “health-IT ecosystem” to allow data exchange with available healthcare information systems
- 2- Data should be collected and analyzed in a way that it allows using them for supporting decision making, both for patients and healthcare professionals

DATA EXCHANGE REQUIREMENTS

Exchange accurate information

- Preserve the original meaning intended by the author.

Data protection

- Confidentiality (protection from unwanted access), Integrity (transmission and maintenance of accurate data), Availability (data accessibility and usability upon demand by authorized request), Accountability (traceability of responsibility on data content) and Disaster Recovery.

Interoperability and flexibility

- Technological interoperability (e.g., standard communication architectures), and Semantic interoperability (e.g., shared terminologies/ontologies).

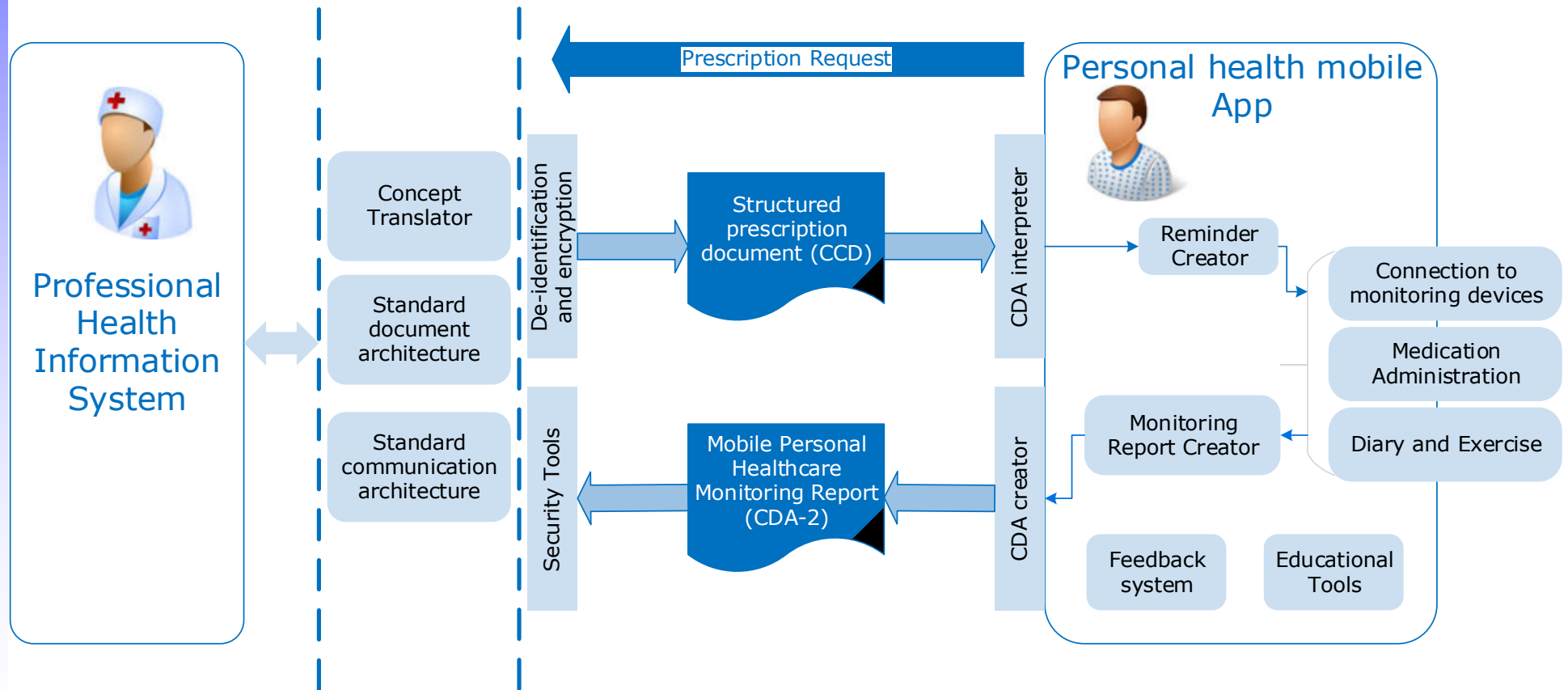
Patient education

- Support patients to both enhance their “health literacy” and to create a “culture of custodianship” related to the nature of personal health information.

Research and evidence-based practice

- Ensure the availability of information necessary for establishing the benefits and limitations mHealth App-EHR two-way exchange.

THE STANDARDS-BASED ARCHITECTURE



- Data exchange based on structured standards-based documents
- No data storage on the mHealth App
- Only de-identified data are transmitted
- The mHealth App provides access to health information for patients (e.g., Medline Plus)

IMPLEMENTING INTEGRATION

CHALLENGE 1

- CASE STUDY 1 - Integrated platform for home monitoring and support for congestive heart failure patients
- CASE STUDY 2 – A prototype of a telemonitoring system for patients with Parkinson's disease treated with deep brain stimulation (DBS)

CHALLENGE 2

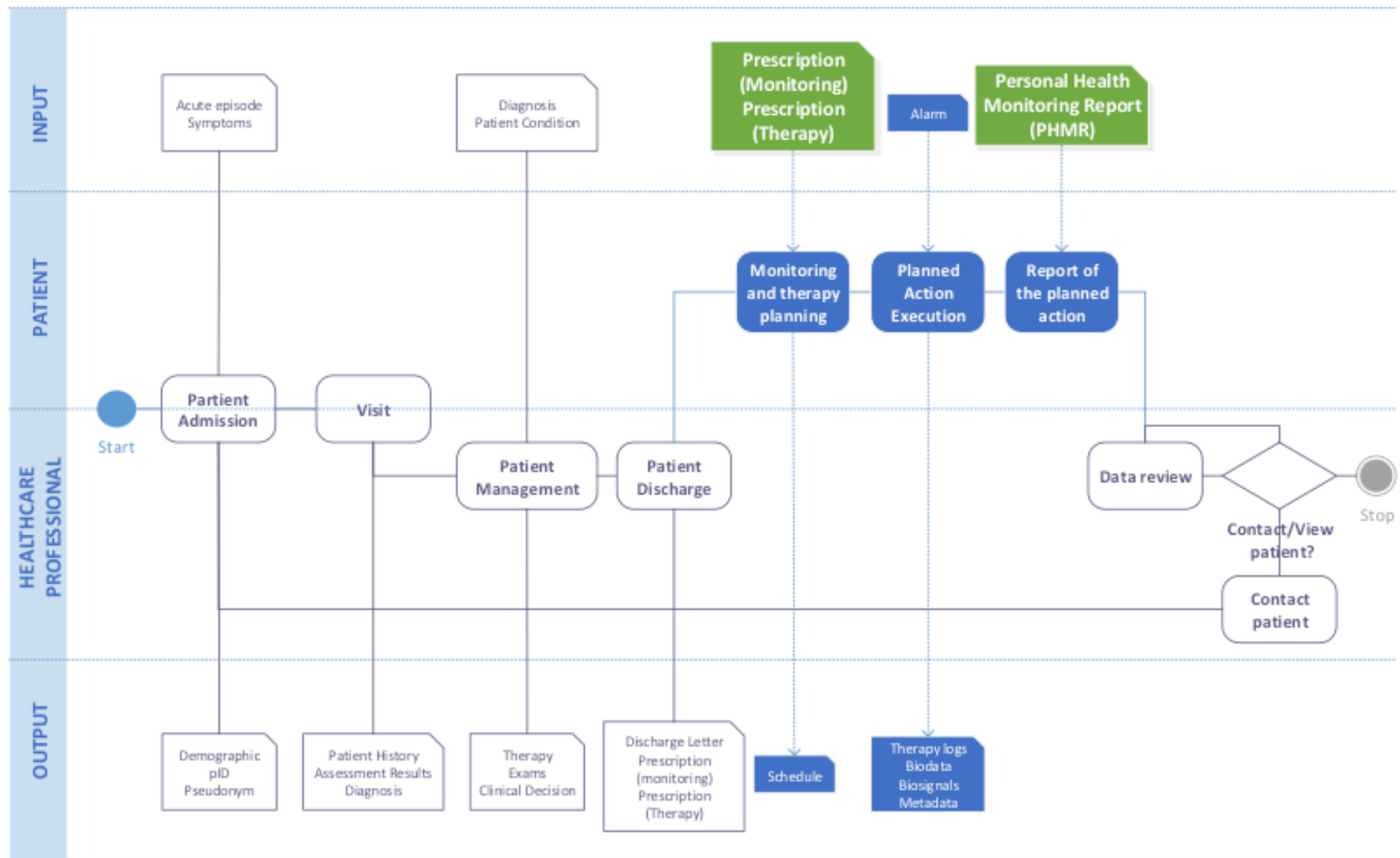
- CASE STUDY 3 – Integrated platform for nutrigenomic research



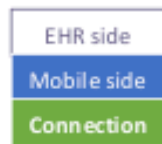
Case study 1

HOME MONITORING FOR CONGESTIVE HEART FAILURE PATIENTS

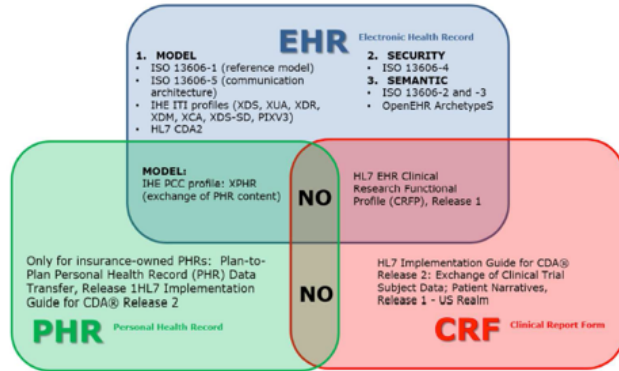
PROCESS OVERVIEW



Legend



DEFINITION OF THE STANDARD DOCUMENT



Marceglia et al. 2015

Implementation Guide for CDA Release 2.0
Personal Healthcare Monitoring Report (PHMR)
(International Realm)
Draft Standard for Trial Use
Release 1.1
October 2010

Publication of this draft standard for trial use and comment has been approved by Health Level Seven International (HL7). This draft standard is not an accredited American National Standard. The comment period for use of this draft standard shall end 24 months from the date of publication. Suggestions for revision should be submitted at <http://www.hl7.org/dnnc/comments/index.cfm>.

Following this 24 month evaluation period, this draft standard, revised as necessary, will be submitted to a normative ballot in preparation for approval by ANSI as an American National Standard. Implementations of this draft standard shall be viable throughout the normative ballot process and for up to six months after publication of the relevant normative standard.

PHMR CDA-2 template Personal Healthcare Monitoring Report

recordTarget

author

custodian

Information Recipient

.....

Header

Body

```

<<component>
  <structuredBody>
    <component>
      <section>
        <templateId root="2.16.840.1.113883.10.20.1.16"/>
        <templateId root="2.16.840.1.113883.10.20.9.27"/>
        <code code="7116-3" codeSystem="2.16.840.1.113883.6.1"/>
        <title>Vital Signs</title>
        <text...</text>
        <entry typeCode="COMP"...</entry>
        <entry typeCode="COMP"...</entry>
      </section>
    </component>
    <component>
      <section>
        <templateId root="2.16.840.1.113883.10.20.1.14"/>
        <templateId root="2.16.840.1.113883.10.20.9.14"/>
        <code code="36954-4" codeSystem="2.16.840.1.113883.6.1"/>
        <title>Results</title>
        <text...</text>
        <entry typeCode="COMP"...</entry>
      </section>
    </component>
    <component>
      <section>
        <templateId root="2.16.840.1.113883.10.20.1.77"/>
        <templateId root="2.16.840.1.113883.10.20.9.17"/>
        <code code="34204-4" codeSystem="2.16.840.1.113883.6.1"/>
        <title>Medical Equipment</title>
        <text...</text>
        <entry typeCode="COMP"...</entry>
        <entry typeCode="COMP"...</entry>
      </section>
    </component>
  </structuredBody>
</component>
</ClinicalDocument>
  
```

Vital Signs

Result

Medical Equipment

Purpose*

Medication*

THE mPHMR TEMPLATE PROTOTYPE

ORIGINAL PHMR		mHealth-PHMR		Filled by	
PHMR FIELD	CONTENT	INCLUDED	NEW CONTENT	Mobile app	EHR system
ClinicalDocument/ id	@root: the organization's OID @extension: the ID of the document within the organization.	Yes, it is the Document OID	/id: @root="wbb.IDEHR"		X
			/id: @extension="yyymmddhhmmss+ -ZZzz"	X	
ClinicalDocument/ recordTarget/ patientRole	Id, Addr, Telecom, patient/name, patient/administrativeGenderCode, patient/birthTime	Yes, but de-identified and biographical information are masked.	/id: @extension = "pID"	X	X
			/addr: @nullFlavor="MSK"		X
			/telecom: @nullFlavor="MSK"		X
			/patient: @nullFlavor="MSK"		X
ClinicalDocument/ author	time, assignedAuthor/id assignedAuthor/addr assignedAuthor/telecom assignedAuthor/assignedPerson assignedAuthor/representedOrganization	Yes but de-identified. It can be patient or caregiver. The phone number refer to the device where the mobile app is installed for the use at home	/id: @extension = "uID" (pID or cID)	X	
			/telecom: @value="tel:+39xxx-xxxxxxx"	X	
ClinicalDocument/ custodian	assignedCustodian/representedCustodianOrganization (id,name, telecom,addr)	Yes, it is the EHR system that will receive the document. WebBioBank is organized into Operative Unit (O.U.)	/id: @extension="IDOU"		X
			/name: @extension="OName"		X
			/addr: @nullFlavor="MSK"		X
			/telecom: @nullFlavor="MSK"		X
ClinicalDocument/ InformationRecipient	ClinicalDocument/InformationRecipient/intendedRecipient (id, telecom,addr) ClinicalDocument/InformationRecipient/intendedRecipient/informationRecipient (name)	Yes, it is the EHR system that will receive the document. WebBioBank is organized into Operative Unit (O.U.)	/id: @extension="IDOU"		X
			/name: @extension="OName"		X
			/addr: @nullFlavor="MSK"		X
			/telecom: @nullFlavor="MSK"		X
DocumentationOf/ ServiceEvent	@classCode = "MPROT" (Monitoring Program) /effectiveTime/low /effectiveTime/high	Yes, it does not refer to a doctor's appointment but to a home monitoring program using mHealth app.	/serviceEvent: @classCode="MOBILE"		X
			/id: @extension="IDtDCS_app_APPcontent"		X
			/effectiveTime/low @value="dd/mm/yyyy hh:mm:ss AM"/>	X	

mPHMR TEMPLATE: HEADER

- «Clinical Document»/element ->
Anonymous patient and author

```
<ClinicalDocument xmlns="urn:hl7-org:v3" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  <realmCode code="IT" />
  <typeId root="2.16.840.1.113883.1.3" extension="POCD_HD000040" />
  <templateId root="2.16.840.1.113883.10.XX.YY" />
  <setId root="wbb.381" extension="2015-08-11T175157+02:00" />
  <versionNumber value="1" />
  <id root="wbb.381" extension="2015-08-11T175155+02:00" />
  <code code="53576-5" codeSystem="2.16.840.1.113883.6.1" />
  <title>Mobile Document: tDCS home monitoring</title>
  <effectiveTime value="2015-08-11T175155+02:00" />
  <confidentialityCode code="L" codeSystem="2.16.840.1.113883.5.25" />
  <languageCode code="en-US" />
  - <recordTarget>
  - <patientRole classCode="PAT">
  - <id root="wbb_pID" extension="153" assigningAuthorityName="WebBioBank" />
  - <addr nullFlavor="MSK" />
  - <telecom nullFlavor="MSK" />
  - <patient>
  - <name nullFlavor="MSK" />
  - <administrativeGenderCode nullFlavor="MSK" />
  - <birthTime nullFlavor="MSK" />
  - </patient>
  - </patientRole>
  - </recordTarget>
  - <author>
  - <time value="2015-08-11T175155+02:00" />
  - <assignedAuthor>
  - <id root="wbb_uID" extension="153" assigningAuthorityName="WebBioBank" />
  - <telecom use="WP" value="tel:+39123456789" />
  - </assignedAuthor>
  - </author>
```

mPHMR TEMPLATE: BODY

- Section «Result» / element «Observation» -
> patient evaluation result

```
<structuredBody>
  <component>
    <section>
      <templateId root="2.16.840.1.113883.10.20.9.2"/>
      <code code="55284-4" codeSystem="2.16.840.1.113883.6.1"/>
      <title>Blood Pressure Systolic and Diastolic</title>
      <entry typeCode="COMP">
        <organizer typeCode="CLUSTER" moodCode="EVN">
          <templateId root="tBD"/>
          <id root="tBD"/>
          <code code="55284-4" codeSystem="2.16.840.1.113883.6.1"/>
          <statusCode code="completed"/><component>
            <observation classCode="OBS" moodCode="EVN">
              <templateID root="2.16.840.1.113883.10.20.1.31"/>
              <templateID root="2.16.840.1.113883.10.20.9.8"/>
              <id root="openMRSServer.XXX.YYYY"/>
              <code code="271649006" codeSystem="2.16.840.1.113883.6.96" codeSystemName="SNOMED
                CT" displayName="Systolic Blood Pressure"/>
              <statusCode code="completed"/>
              <effectiveTime value="20161114203636+0100"/>
              <value xsi:type="PQ" value="115" unit="mmHg"/>
            </observation>
          </component>
        </organizer>
      </entry>
    </section>
  </component>
</structuredBody>
```

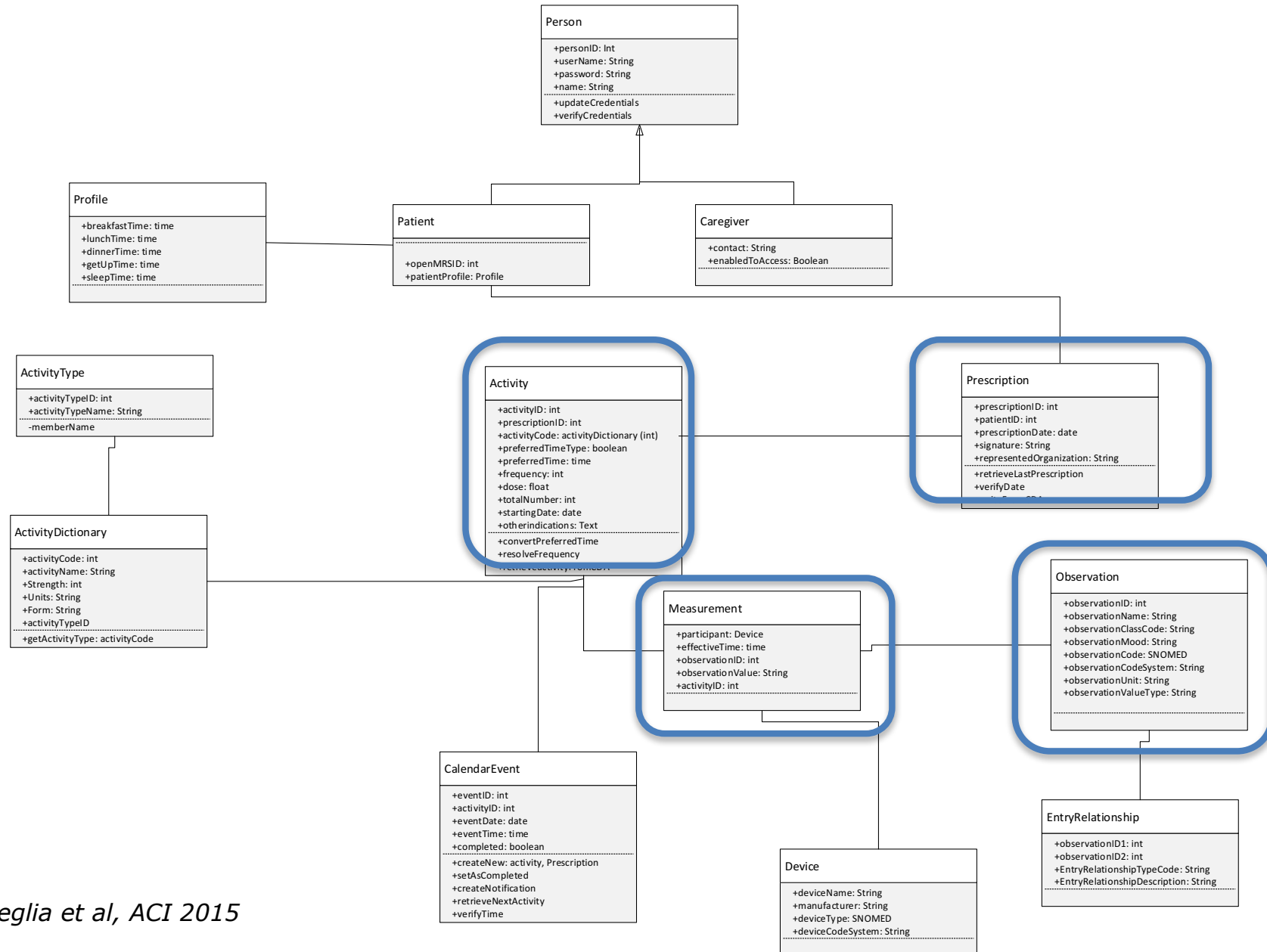


mPHMR TEMPLATE: BODY

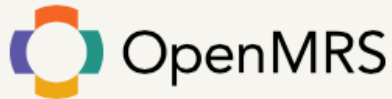
- Section «Medical Equipment» -> **smartphone and app details**

```
<participant typeCode="SBJ">
  <participantRole classCode="MANU">
    <templateId root="2.16.840.1.113883.10.20.1.52"/>
    <templateId root="2.16.840.1.113883.10.20.9.9"/>
    <id root="1.2.840.10004.1.1.1.0.0.1.0.0.1.2680" assigningAuthorityName="EUI-64"
      extension="1F-3E-46-78-9A-BC-DE-F1"/> <!--PHMR:EUI-64 device ID in extension-->
    <code nullFlavor="OTH">
      <originalText>Unregulated Device</originalText>
    </code>
    <playingDevice>
      <code code="469022007" codeSystem="2.16.840.1.113883.6.96"
        codeSystemName="SNOMED CT" displayName="Entry phone"/>
      <manufacturerModelName>
        Manufacturer:Nokia
        Model: Nokia Lumia
        phone ID: 1F-3E-46-78-9A-BC-DE-F1
        mobile App name: tDCS_home_WP
        mobile App revision: 1.0.0.0
      </manufacturerModelName>
    </playingDevice>
    <scopingEntity>
      <desc>Nokia</desc>
    </scopingEntity>
  </participantRole>
</participant>
```

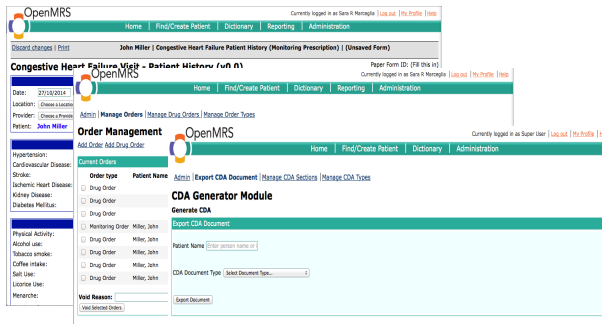

DATA MODEL



IMPLEMENTATION



The physician visits the patient and prescribes the monitoring program



Mobile Personal Healthcare Monitoring Report (CDA-2)



Once there is a notification, the App shows the activities to be done according to the schedule. When all the activities scheduled are completed, the mPHMR report is generated and sent to the EHR



The patient accesses to App



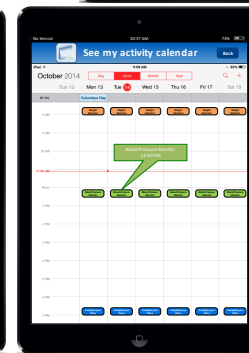
with App requesting the new prescription



The patient accesses the prescription document in the EHR



The prescription document is retrieved, the monitoring sessions are scheduled in the calendar, and the notifications are allocated

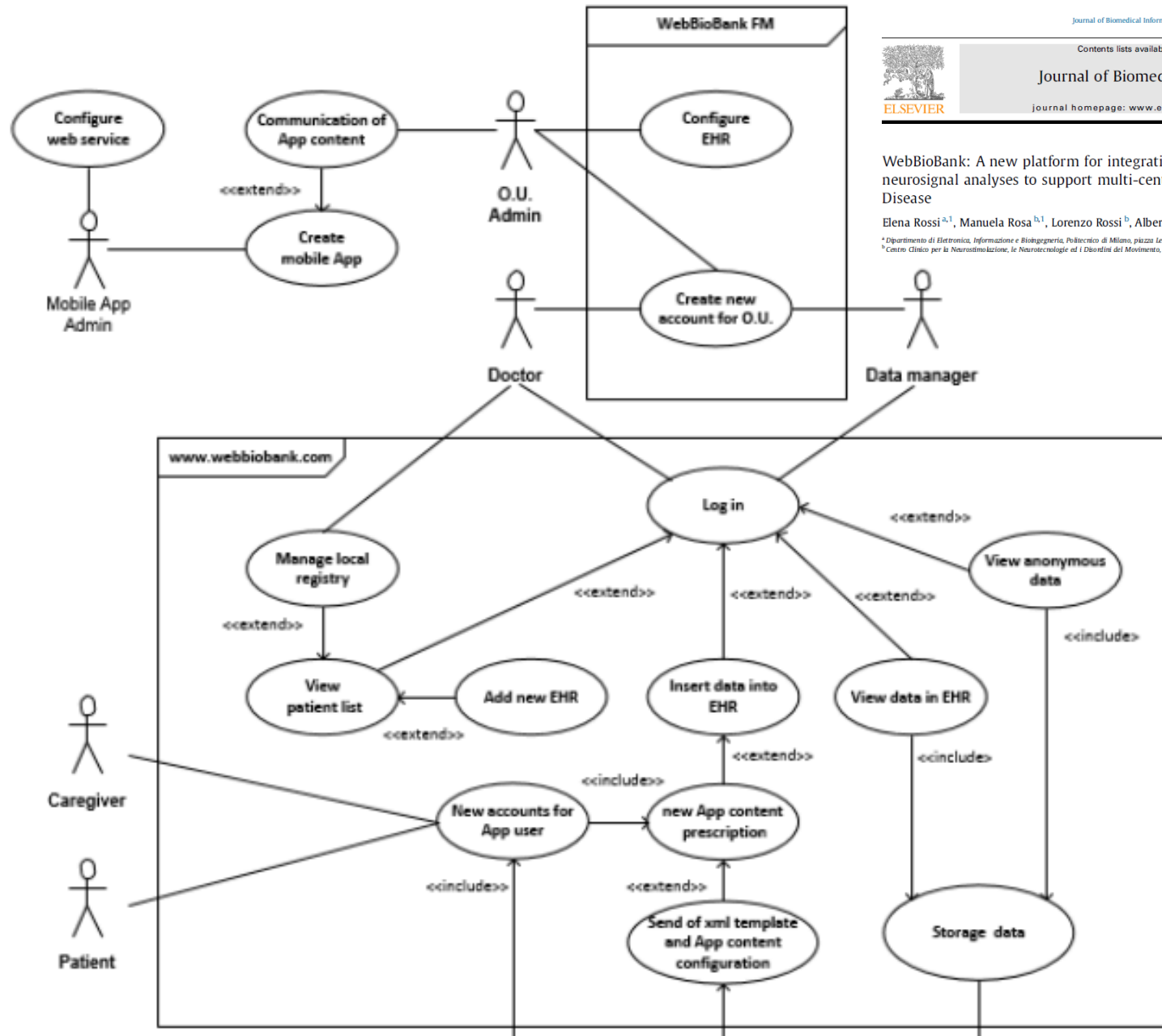




CASE STUDY 2

TELEMONITORING OF PARKINSON'S PATIENTS WITH DBS IMPLANT

OVERALL PROCESS – CLINICAL SIDE



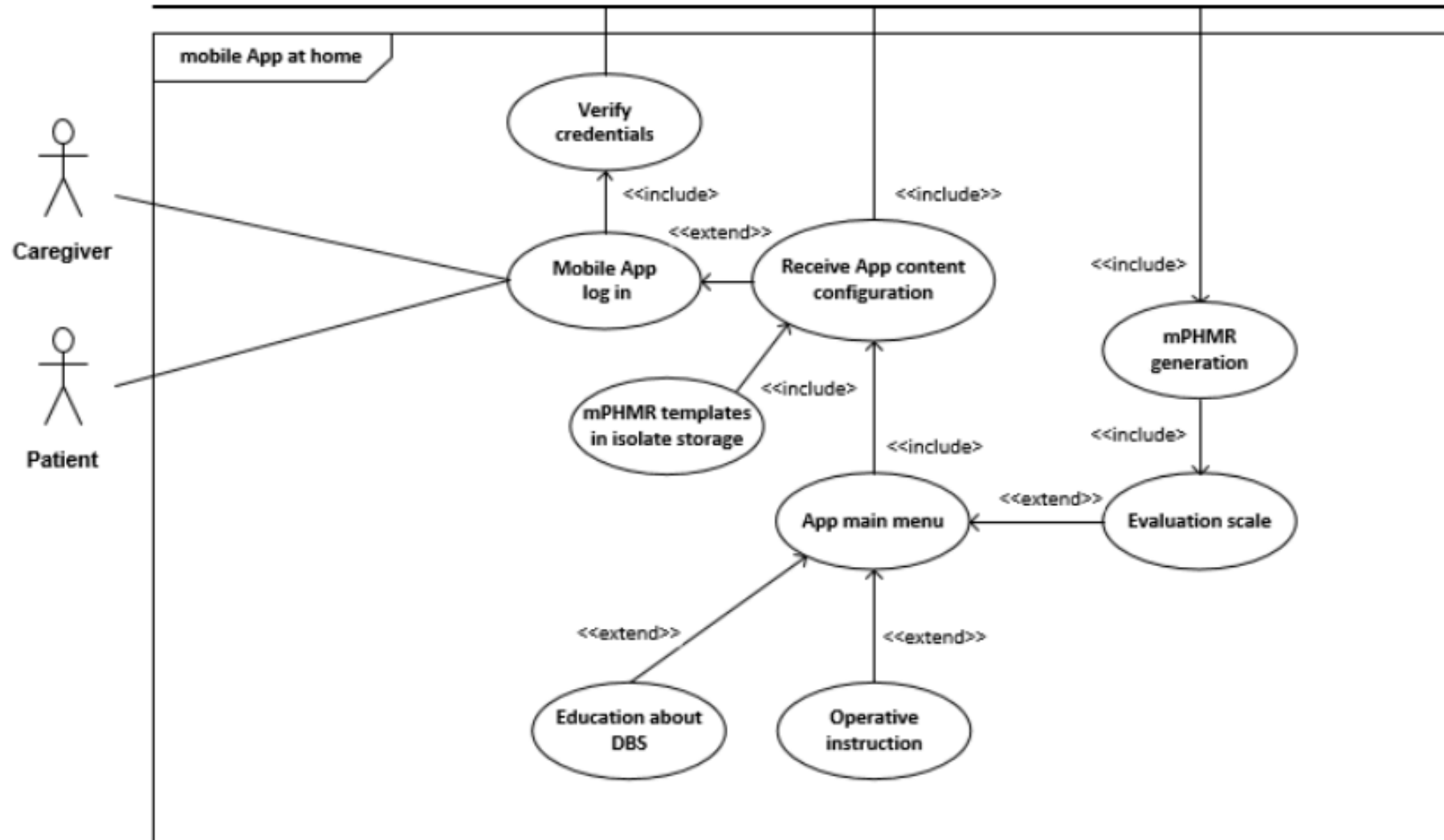
WebBioBank: A new platform for integrating clinical forms and shared neurosignal analyses to support multi-centre studies in Parkinson's Disease

Elena Rossi ^{a,1}, Manuela Rosa ^{b,1}, Lorenzo Rossi ^b, Alberto Priori ^b, Sara Marceglia ^{a,*}

^a Dipartimento di Elettronica, Informazione e Biogeegneria, Politecnico di Milano, piazza Leonardo da Vinci 32, 20133 Milan, Italy
^b Centro Clinico per la Neurostimolazione, le Neuroscienze ed i Disturbi del Movimento, Fondazione IRCCS Ca' Granda, Ospedale Maggiore Policlinico, Milan, Italy



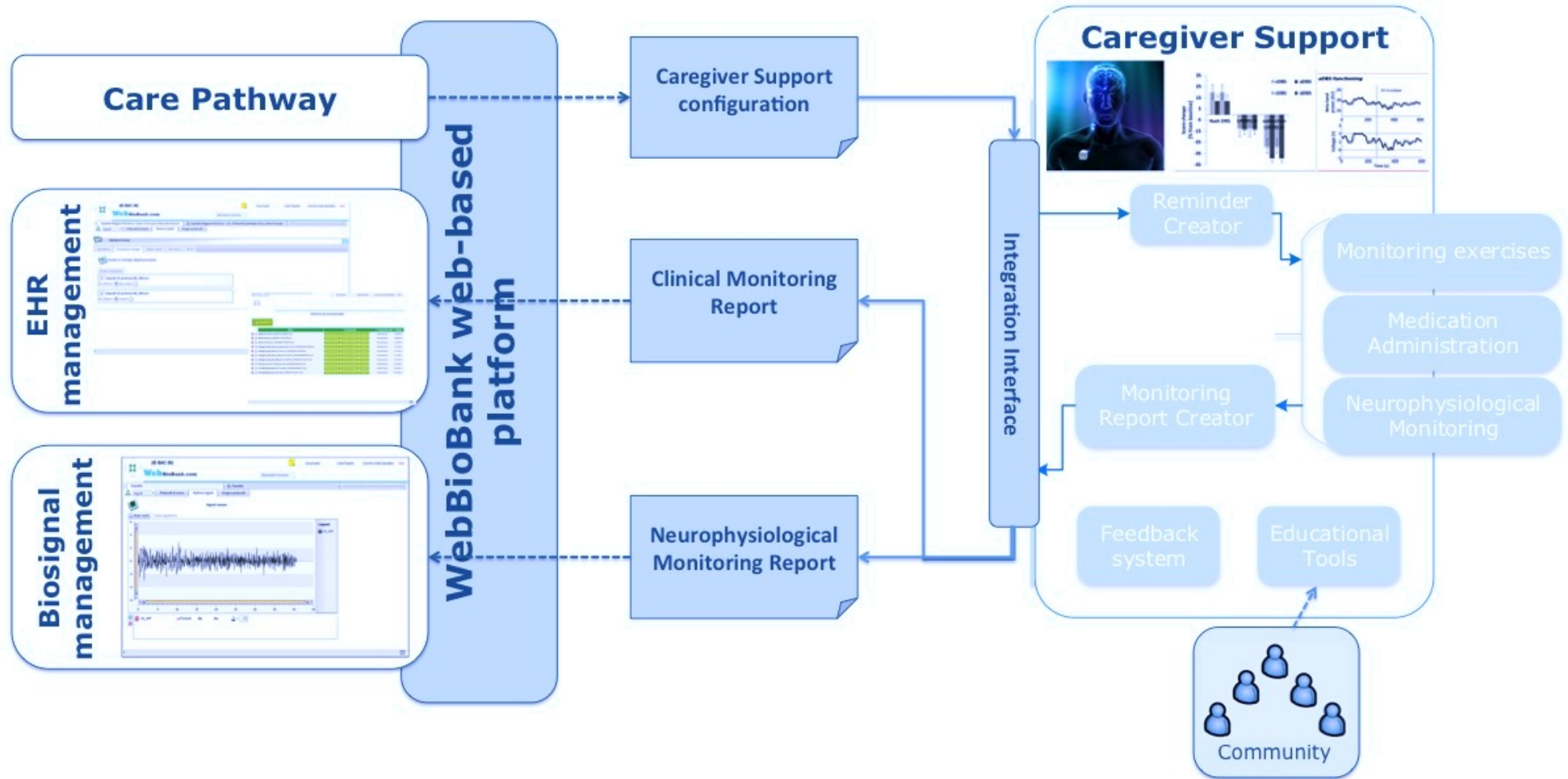
OVERALL PROCESS – PATIENT SIDE



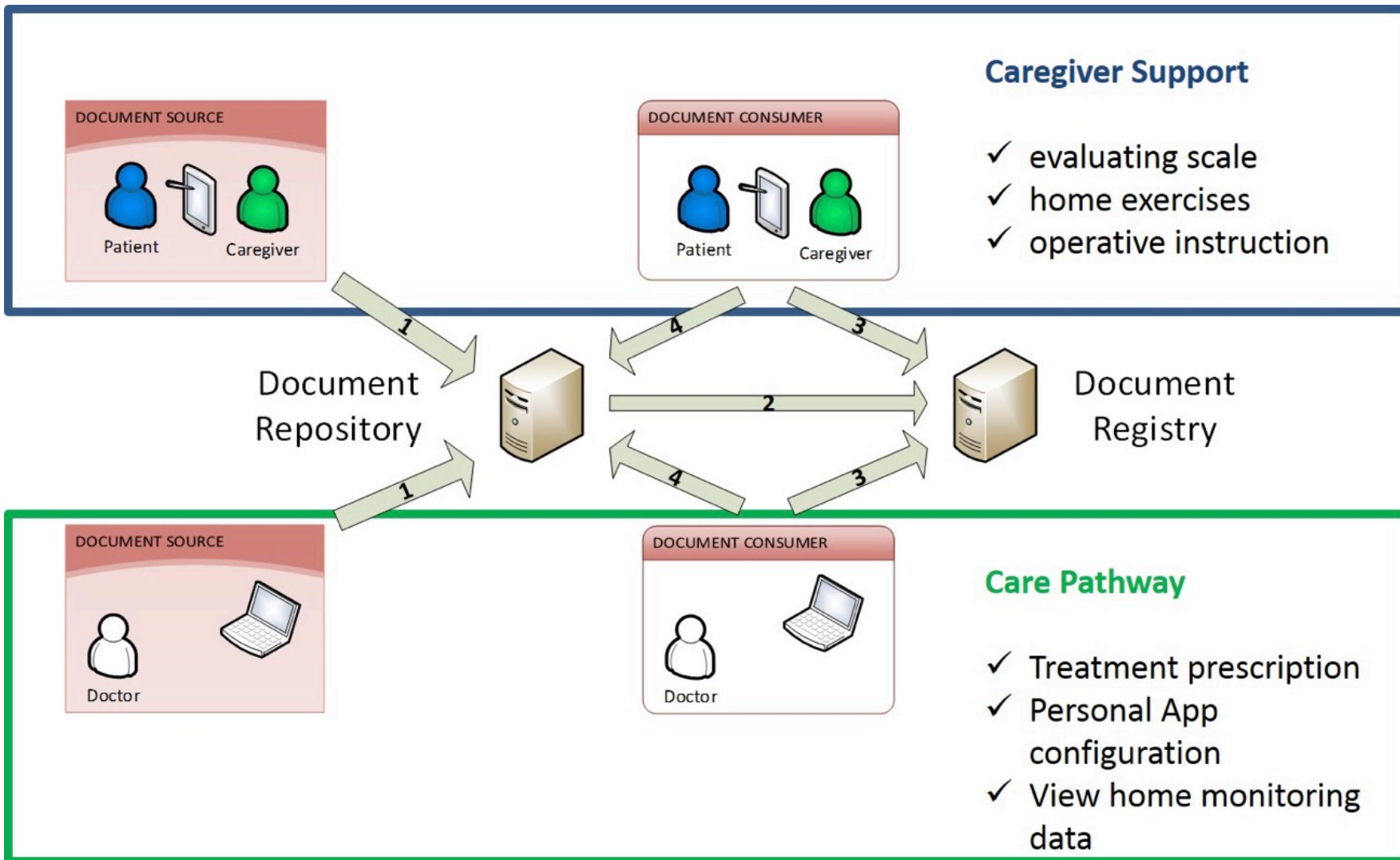
REQUIREMENTS

- **Document-centric** (compliance, where applicable, to HL7 CDA2 and PHMR)
- Technical and semantic **interoperability**
- **Anonymous data** transmission and **de-identified data** stored inside the EHR system
- App content and EHR template **configurable** (fulfills the fourth AMA priority)
- **No data storage inside the mobile app**
- **Unique database** (fulfills the first AMA priority)
- **Team-based care** (fulfills the second AMA priority)
- **Continuum of care** (fulfills the third AMA priority)
- **Data Liquidity** (fulfills the sixth AMA priority)
- **Traceability of author** of shared messages

OVERALL ARCHITECTURE



ARCHITECTURE: XDS PROFILE



CARE PATHWAY MODULE

Sync of server Associate registry New patient Read only Select all Deselect all Save selected data Save registry

Trascina l'intestazione di colonna della griglia per raggruppare

IdEhr	ID BAC	Date	O.U.	Surname	Name	Date of birth	Gender	Tax code	Group	Protocol	HDCstim serial (↑)
> Open EHR	152	24/07/2013	UO_tDCS								hs0174101-05
Open EHR	151	24/07/2013	UO_tDCS								hs0173101-05
Open EHR	202	10/10/2013	UO_tDCS								
Open EHR	154	31/07/2013	UO_tDCS								hs0100101-09
Open EHR	153	24/07/2013	UO_tDCS								hs0001101-18
Open EHR	157	02/05/2013	UO_tDCS								hs0137101-05
											hs0136101-05
											hs0141101-05
											hs0140101-05
											hs0139101-05

De-identified data visualization

EHR sections

(ID BAC:118)

WebBioBank.com

Generale PD Det Clinico - Parkinson SPDS

Esordio Malattia di Parkinson

Visite

Intervento DBS

Visite post DBS

Decesso

Selezionare Accesso

Documents Lista Pazienti Cambia Unità Operativa Escl

Clinical Data Form

data decesso

causa primaria di morte Seleziona... Note

causa secondaria di morte Seleziona... Note

ricorrenza autoptica Note

Save Save appunti Ripristina Annulla

(ID BAC:36)

WebBioBank.com

Selezionare Accesso

Ospedale Ospedale Ospedale

Segnali Protocolli di ricerca Gestione segnali Gruppi e protocolli

Signal viewer

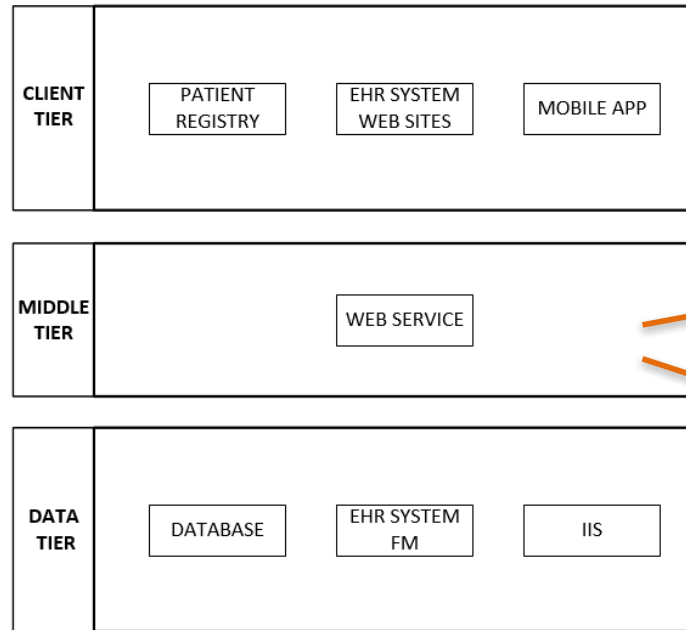
Reset cache Scala logaritmica

Legend SX_OFF

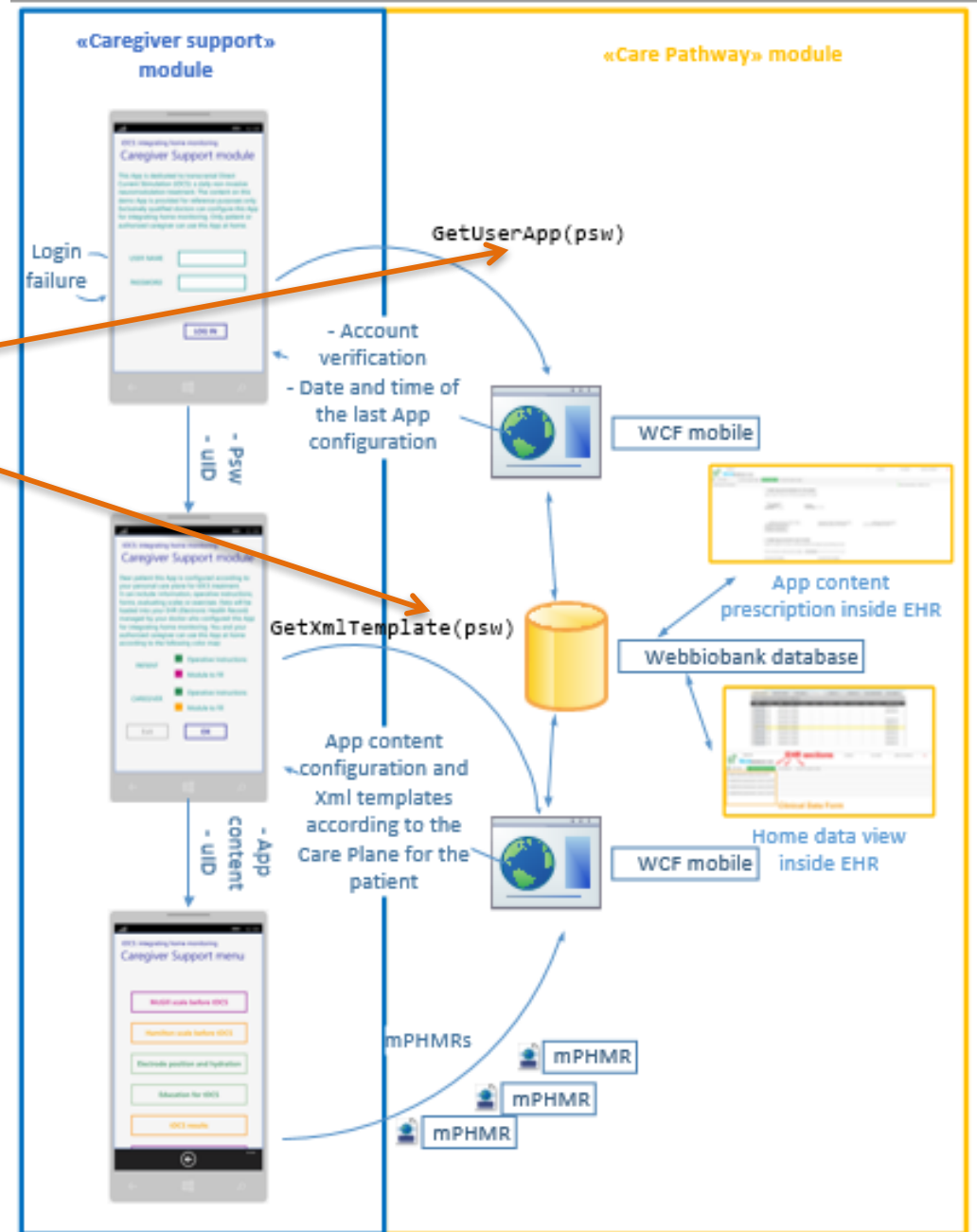
SX_OFF 154240 Ch. Ev. 1.00

Signal Processing

MODULE INTEGRATION



Three-Tier architecture model of the integrated home care system.



CAREGIVER SUPPORT MODULE: WEARABLE DEVICE

- Commercially available bracelet with a three-axis accelerometer sensor
- Paired with a mobile phone or tablet
- Aims:
 - providing a correct time-based estimate of the status of the patient (ON and OFF states) in a homecare environment
 - automatically detecting the motor symptoms of the PD patient during daily living activities.

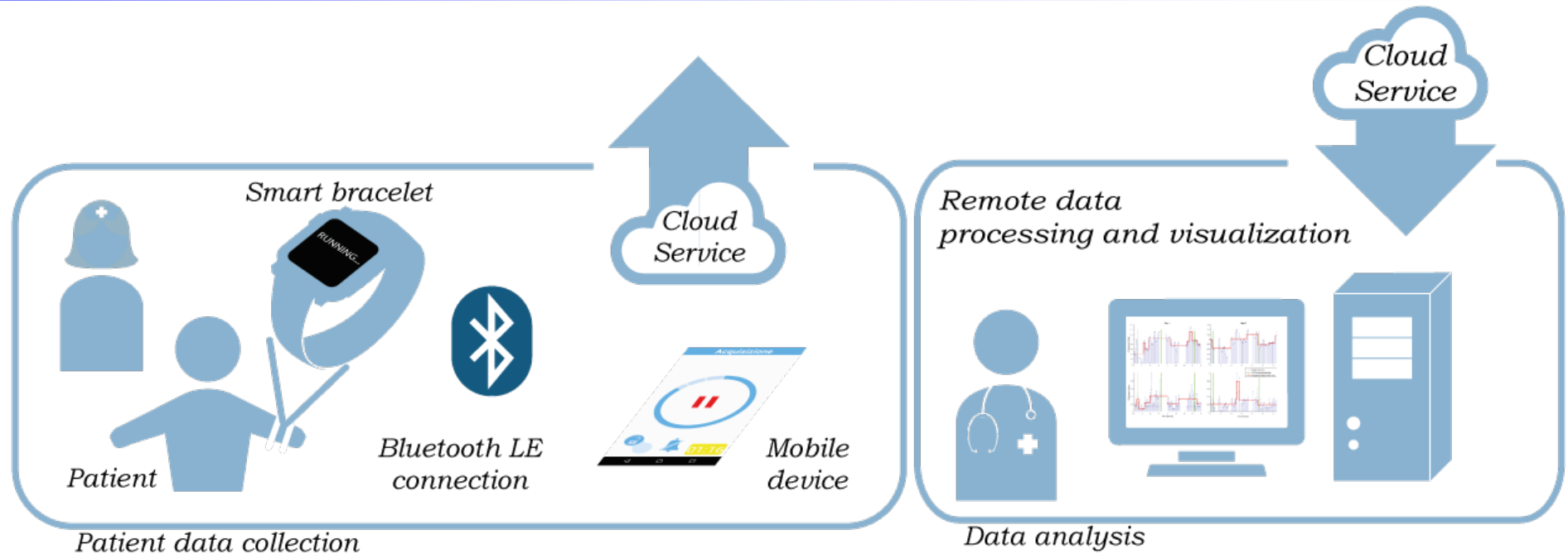


Figure 1: Pebble Time SmartWatch



Figure 2: Android acquisition app

SYSTEM DESIGN



Data analysis is performed by the WebBioBank platform, using an algorithm proposed in the literature

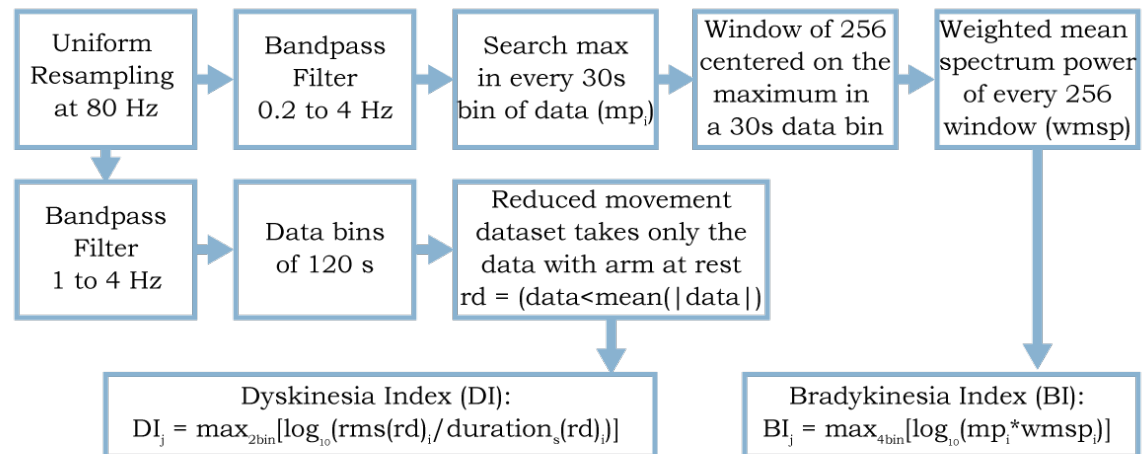


Figure 7: Dyskinesia (DI) and Bradykinesia (BI) index processing

RESULTS IN PATIENTS

The system was tested on 3 patients undergoing surgery for DBS electrode placement during a long-term monitoring with an external DBS device in the hospital.



Figure 5:
Patient during
UPDRS III
motor assessment

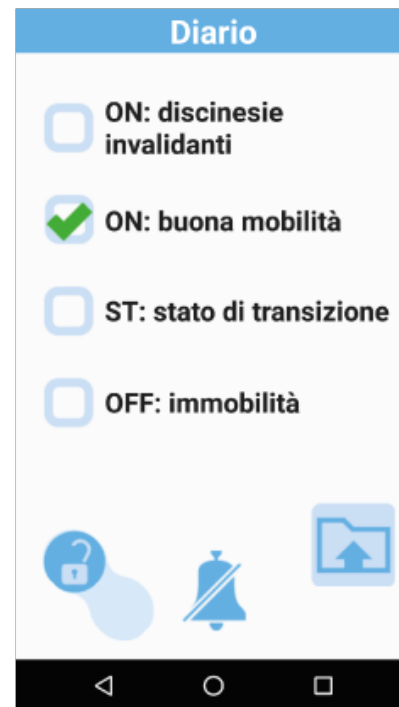


Figure 6:
App diary
questionnaire

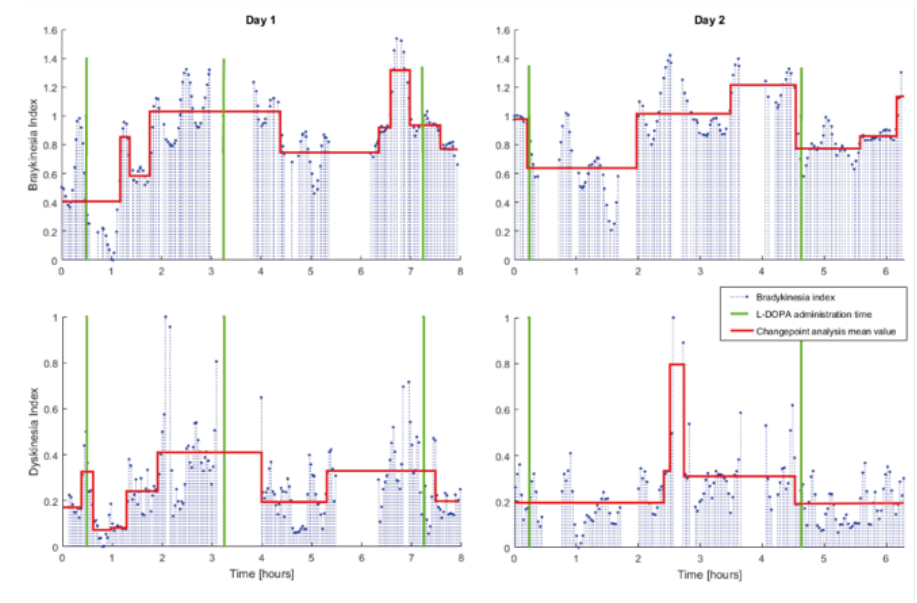


Figure 8: Bradykinesia and dyskinesia indexes
of two days data collecting session on one patient.



CASE STUDY 3

NUTRIGENOMIC PLATFORM

NUTRIGENOMIC RESEARCH

- Diet has a key role in influencing the risk of chronic diseases
- The genetic background can alter the host's physiological response to diet

→ NUTRIGENOMIC RESEARCH to provide personalized dietary/lifestyle guidelines:

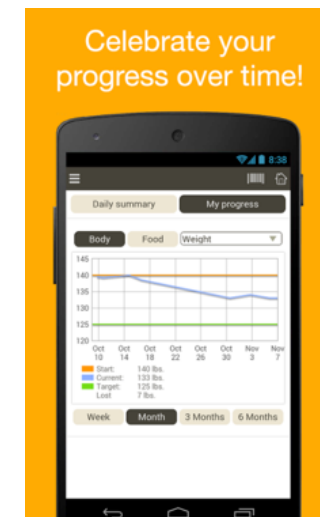
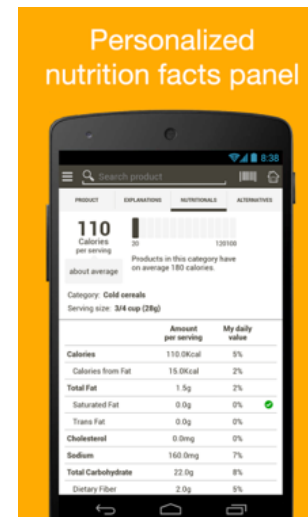
- To protect public health
- To reduce modifiable risk factors
- To indicate choice of food



OPEN ISSUES

Apps for diet management **exist**

...However...



- Data fragmentation → They do not provide a **systematic collection** and analysis of **nutritional data**
- **Lack of correlation to genotypes, phenotypes and lifestyle**
- Lack of standards for data use in the context of **epidemiological and clinical studies.**

THE DIET MONITORING SOLUTION

DMS is aimed to systematically collect nutrigenomic and lifestyle data from patients and citizens in the context of a large epidemiological study

Web-based platform for healthcare professionals:

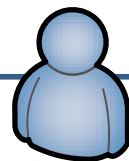
- Management of the food atlas.
- Monitoring of patient dietary habits
- Trends and statistics.
- Anonymous data management



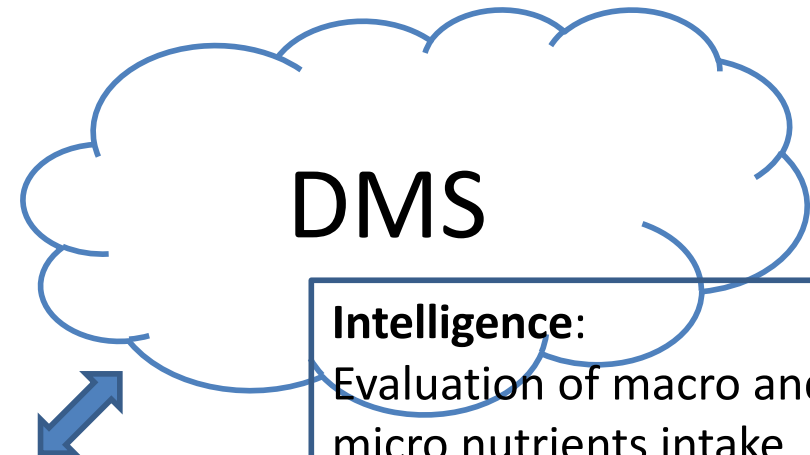
Clinician

mHealth tool for the patient at home:

- Daily diet fill in
- Daily lifestyle fill in



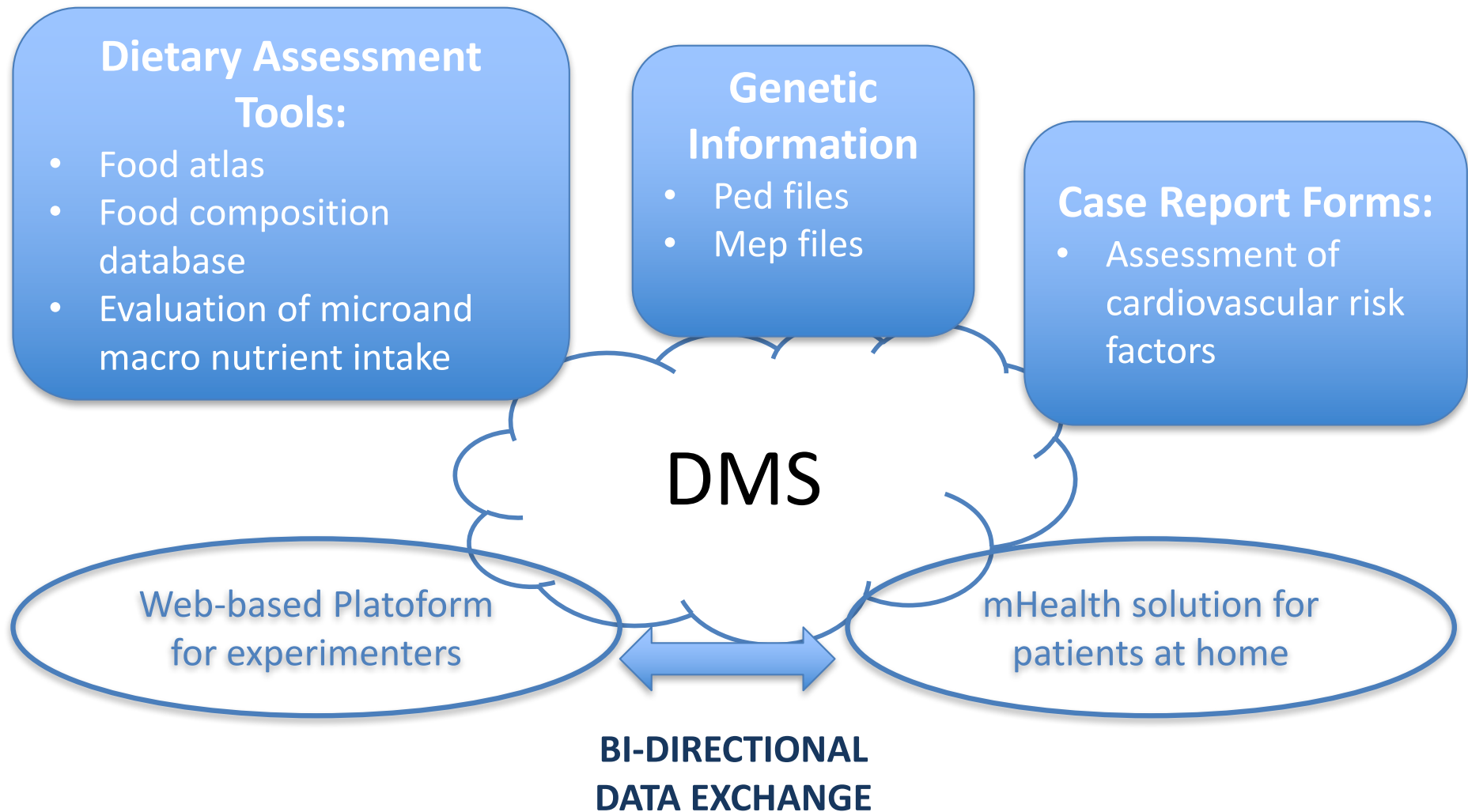
Patient



Intelligence:

Evaluation of macro and micro nutrients intake

DMS design



DATA COLLECTION: The ATHENA project

ATHENA project

funded by European Commission, 7FP
14 Partners



Epidemiological study to determine interaction between anthocyanin consumption, genetic structure and cardiovascular risk

Thorough clinical
assessment (N=500)

Dietary assessment
24h recall
4 times: one per season

Genotyping

Side-project: Collaboration in the validation of a questionnaire to assess adherence to mediterranean diet

DIETARY ASSESSMENT TOOLS:

Food Composition Database

Food Composition Database for Epidemiological Studies in Italy (IEO) enriched with: anthocyanins contents of additional foods and food items used by vegans/vegetarians

Food Code	Food Name	edible part	Energy, recalculated	Total protein	Vegetable protein	Total fat	Animal fat	Vitamin B1, Thiamin	Vitamin B2, Riboflavin
		g	kcal	g	g	g	g	mg	mg
381	POTATOES	83	85	2,1	2,1	1	0	0,1	0,04
50399	BATATAS or SWEETPOTATOES	84	87	1,2	1,2	0,3	0	0,17	-2
380	POTATOES, YOUNG or EARLY	96	67	2	2	0	0	0,12	0,03
3002	STARCH, POTATO	100	349	1,4	1,4	0	0	-2	-2
100219	POTATO, POWDER	100	318	9,1	9,1	0,8	0	0,04	0,14
382	POTATO CRIPS, PLAIN	100	531	7	7	34,6	0	0,17	0,2
18	TAPIOCA	100	363	0,6	0,6	0,2	0	0	0,1
303	ASPARAGUS, WILD FROM WOOD	57	35	4,6	4,6	0,2	0	0,13	0,43
304	ASPARAGUS, WILD FROM FIELD	87	29	3,6	3,6	0,2	0	0,21	0,29
305	ASPARAGUS, GREENHOUSE	52	24	3	3	0,1	0	0,27	0,25
700484	ASPARAGUS, canned	100	18	2,1	2,1	0,7	0	0,06	0,1
8035	ALFA ALFA SPROUTS	100	24	4	4	0,7	0	0,04	0,06
350	SOYA, SPROUTS	98	49	6,2	6,2	1,4	0	0,23	0,2
306	BEETROOT	82	19	1,1	1,1	0	0	0,03	0,02
312	CARROTS	95	33	1,1	1,1	0	0	0,04	0,04
8032	DAIKON	87	15	0,8	0,8	0,1	0	0,03	0,02
64	TURNIP	69	18	1	1	0	0	0,02	0,07

DIETARY ASSESSMENT TOOLS: the Food Atlas to select quantities



GLASBERGEN

“Today I ate two bowls of dog food, a sandwich crust, some spaghetti that fell on the floor, half of your cat food, a wet tea bag, three bugs and the inside of a sneaker. How many grams of fat is that?”



DIETARY ASSESSMENT TOOLS: the Food Atlas to select quantities

What the interviewed subject sees:



What the dietician sees:

		grams
▲	Mixed salad	50
●	Mixed salad	100
■	Mixed salad	150

Evaluation of micro- and macro-nutrients

- ADDA (Athena diet data analysis) allows calculating the composition in micro and macro nutrients of the diet.
- It combines input data collected during dietary interview and the micro and macro nutrient composition for each food from food databases.

ID	Date	TIME	g Water	g Proteins	g Vegetable proteins	g Total lipids	mg Vitamine C	mg Anthocyanins
GAL-11	15/05/2013	Breakfast	510,45	6,01	2,29	3	1,35	0
GAL-11	15/05/2013	Snack	22,61	19,95	0	19,6	0	0
GAL-11	15/05/2013	Lunch	259,68	15,48	6,6	28,18	81,5	0
GAL-11	15/05/2013	Snack	2,73	0,84	0,84	0	0	0
GAL-11	15/05/2013	Dinner	1914,13	43,24	8,34	39,91	14	9,05
GAL-11	15/05/2013	TOTAL	2709,6	85,52	18,07	90,69	96,85	9,05

GENOTYPING DATA: ped and map files

Genotyping data: ped and map files (e.g. Illumina Infinium HumanCore)

- ped: Individuals genetica data

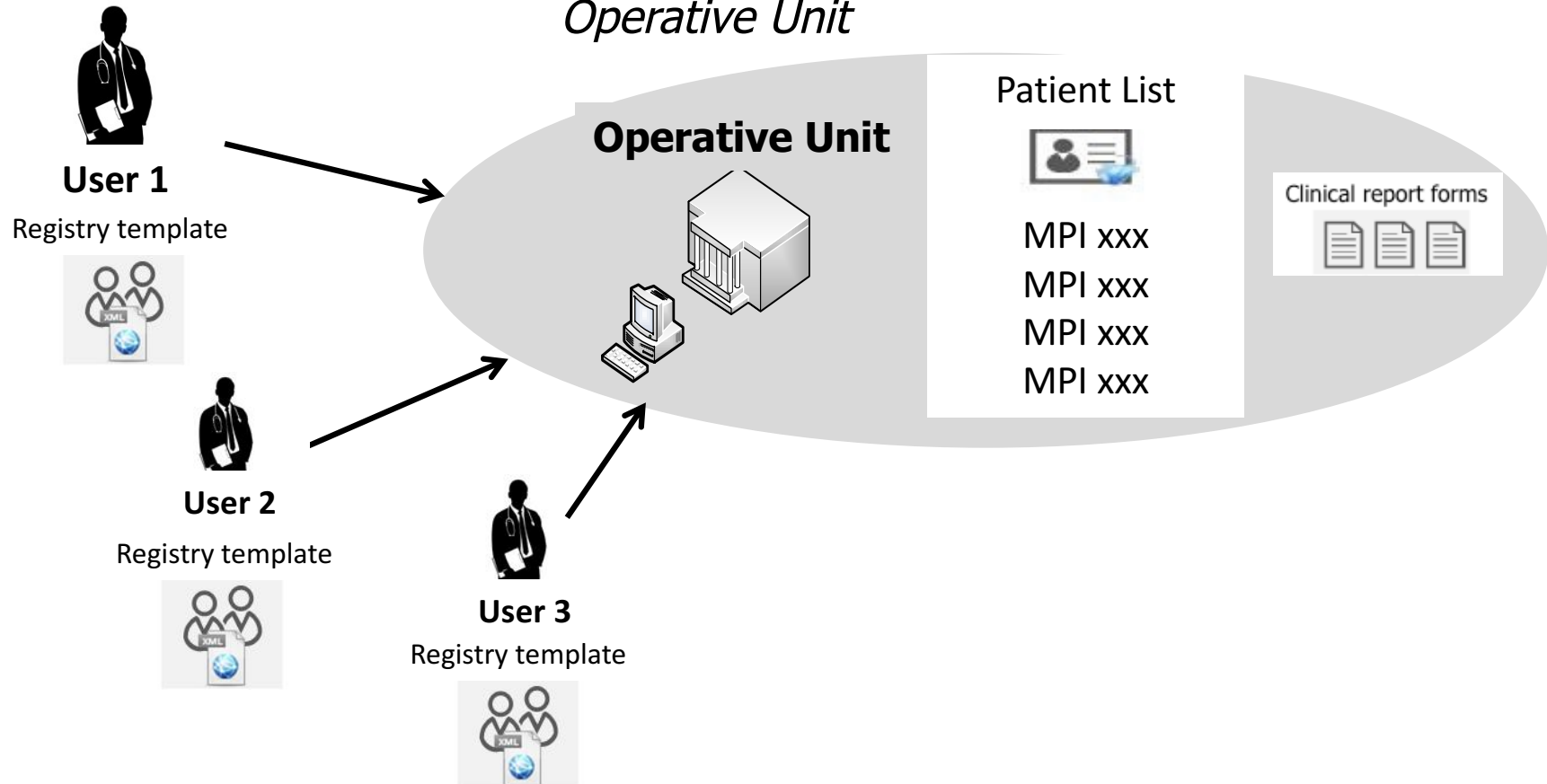
Standard heading						SNPs described in map file				
family ID, individual ID, father, mother, sex, affection status, Genotypes										
GAL_11	GAL_11	0	0	2	0	G G	C C	T T	C C	G G

- map: SNPs heading

Chr	SNP	cM	pb
1	rs12565286	0	711153
1	rs28659788	0	713170
1	rs11804171	0	713682
1	rs2977670	0	713754
1	rs12138618	0	740098
1	rs3094315	0	742429
1	rs3131972	0	742584
1	rs3131968	0	744055
1	rs1048488	0	750775
1	rs12562034	0	758311
1	rs2905035	0	765522
1	rs12124819	0	766409
1	rs2980319	0	766985

The DMS web-based platform

*Work Environment on web-based platform:
Operative Unit*



✓ Local registry (.xml file) of patients, managed by the clinician.

anonymity

✓ Web platform stores only unique identifiers associated with patients (MPI).

Anonymous data collection in DMS

Sync of server Associate registry New patient Read only Select all Deselect all Save selected data Save registry

Trascina l'intestazione di colonna della griglia per raggruppare

IdEhr	MPI	Data	U.O.	Cognome	Nome	Data di nascita	Sesso	CF	Gruppi	Protocolli
> Apri cartella	129	02/11/2012	UO test 1							
Apri cartella	130	02/11/2012	UO test 1							
Apri cartella	124	26/10/2012	UO test 1							
Apri cartella	128	02/11/2012	UO test 1							

✓ Web platform stores only unique identifiers associated with patients (PMI).



✓ Local registry (.xml file) of patients, managed by the clinician.

Cartel1 - Microsoft Excel

Home Inserisci Layout di pagine Formule Dati Revisione Visualizza Progettazione

Nome tabella: Tabella1

Riepiloga con tabella pivot Rimuovi duplicati

Ridimensiona tabella Converti in intervallo

Proprietà Strumenti

Esporta Aggiorna

Dati tabella esterna

Opzioni stile tabella

Stili veloci

Stili tabella

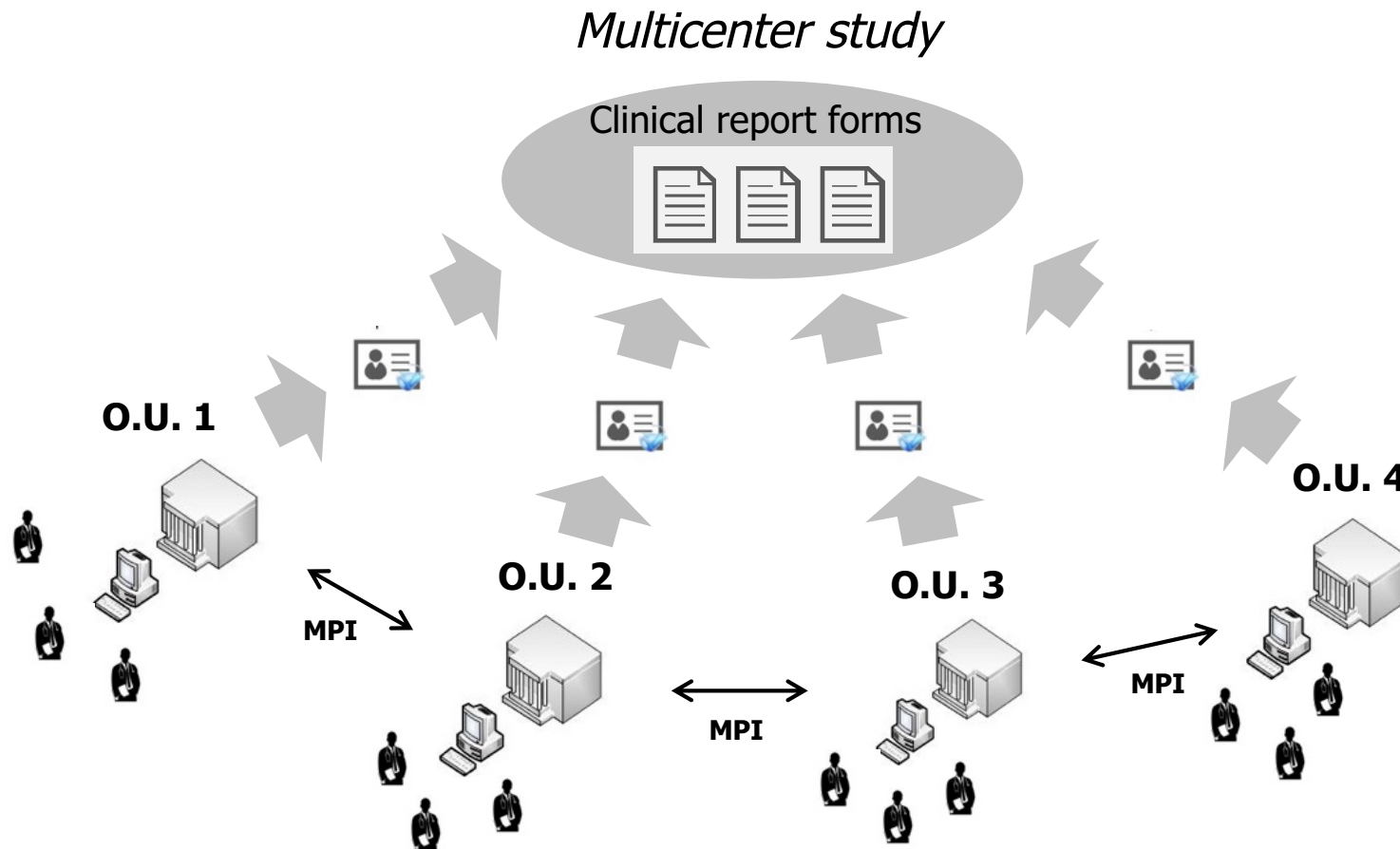
F4 M

	A	B	C	D	E	F
1	MPI	Surname	Name	CF	DateOfBirth	Sex
2	130	Giallo	Marco	gllmrc12g56m203h	11/14/2012 00:00:00	M
3	131	Rossi	Egidio	RSSLNZ78H12F205T	11/02/1900 00:00:00	M
4	132	Rossi	Egidio	RSSLNZ78H12F205T	11/02/1900 00:00:00	M
5	124	Rossi	Mario	rssmra83b09f205u	02/09/1983 00:00:00	M
6	129	Bianchi	Luca	bnclcu44s80s276h	03/07/1844 00:00:00	M
7						
8						
9						
10						
11						
12						

Foglio1 Foglio2 Foglio3

Invio

Multicenter data collection through DMS



- ✓ In a Multicenter study different O.U.s have access to the same CRFs and share their data;
- ✓ CFR templates can be configured according to the study protocol;
- ✓ Data sharing occurs through the exchange MPI of patients between different users.

Patient selection and CRF opening

Sync of server Associate registry New patient Read only Select all Deselect all Save selected data Save registry

Trascina l'intestazione di colonna della griglia per raggruppare

CRF	MPI	Data	U.O.	Cognome	Nome	Data di nascita	Sesso	CF	Gruppi	Protocolli
> Apri cartella	129	02/11/2012	UO test 1							
		02/11/2012	UO test 1							
Apri cartella	129	26/10/2012	UO test 1							
Apri cartella	129	01/11/2012	UO test 1							

Registry **Medical history** Medical Examination Medical exams Therapy Diet Lifestyle

Anamnesis

Professional Anamnesis

Standard Physiological Anamnesis

Standard Pathological Anamnesis

Standard Anamnesis - Conclusion

Standard Family Anamnesis

Family Anamnesis - kin

Dietary assessment module

Registry Medical history Medical Examination Medical exams Therapy **Diet** Lifestyle

Mediterranean diet

Breakfast

Snack in the morning

Lunch

Snack in the afternoon

Dinner

Daily Diet

Date of dietary recall: 01/10/2014

MD notes

Moment: Pranzo

Quantity:

Food description	Food table	Image	Food code
a Sativa]. Brillato	20	T	ALI-5
Riso [Oryza Sativa]. Brillato			
Riso [Oryza Sativa]. Brillato			
Riso [Oryza Sativa]. Brillato			
Farina Di Riso			
Riso. Tipo Parboiled			
Riso. Tipo Parboiled			

Genomic data in DMS

- The string reporting patient's individual mutation is analyzed and the relevant SNPs are mapped into the CRF as parameters (biodata)
- The full string is also saved in DMS as a .txt file that can be treated by the signal analysis toolbox available in the platform

The mHealth App for the patient at home

Diet Monitor System - Login

DMS LOGIN

[CONTACT US](#)

USERNAME
eg. test1

PASSWORD
eg. test1234

[LOGIN](#)



Profile

Diary


Diet

Stats

Diet Monitor System - PROFILE

DMS PROFILE

[Delete Profile](#)




PAUL SMITH
Age: 32yo

MEAL HABITS [+](#)

Breakfast	Snack	Lunch	P.M. Snack	Dinner
07:30	10:00	12:20	16:45	20:00


[CHANGE ID PHOTO](#)

ID_EHR: 235146

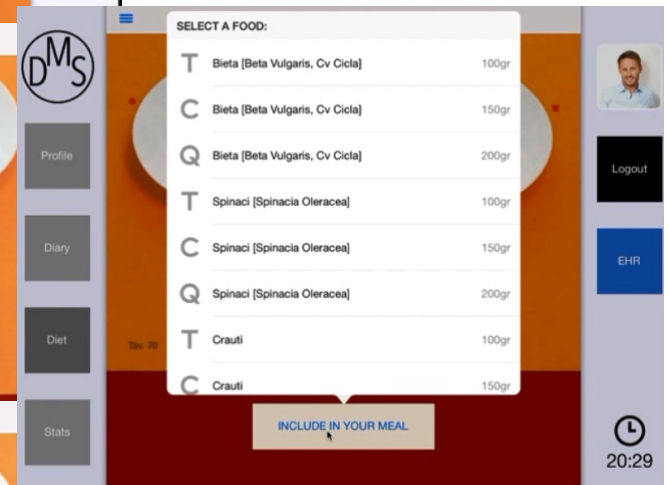
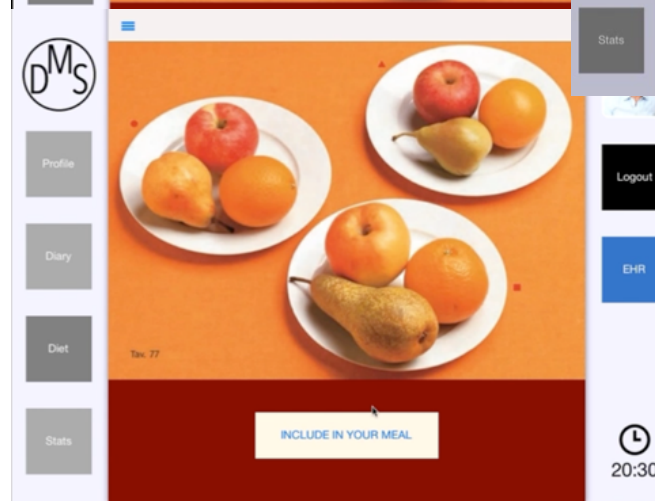
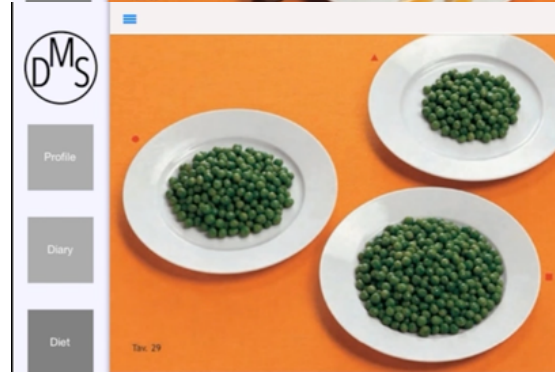
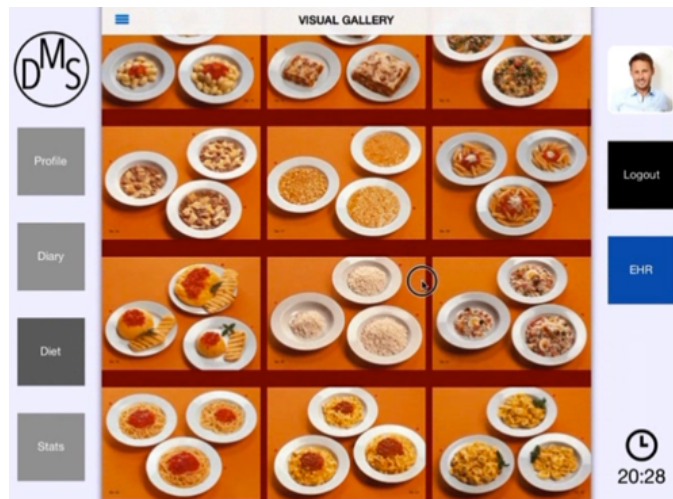
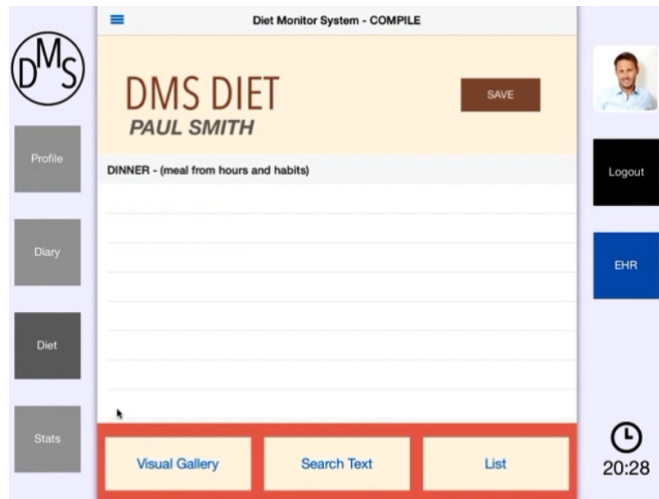


[Logout](#)

[EHR](#)

 20:28

The mHealth App for the patient at home



The mHealth App for the patient at home

Diet Monitor System - COMPILE

DMS DIET
PAUL SMITH

SAVE

Profile

Logout

EHR

DINNER - (meal from hours and habits)

1. Trota [Salmo Trutta] - Portions: 2	Tot. quantity: 300gr
2. Spinaci [Spinacia Oleracea] - Portions: 1	Tot. quantity: 100gr
3. Mela [Pyrus Malus] - Portions: 1	Tot. quan

Visual Gallery Search Text List

Diet Monitor System - STATS

DMS STATS
PAUL SMITH

SEND

Profile

Logout

EHR

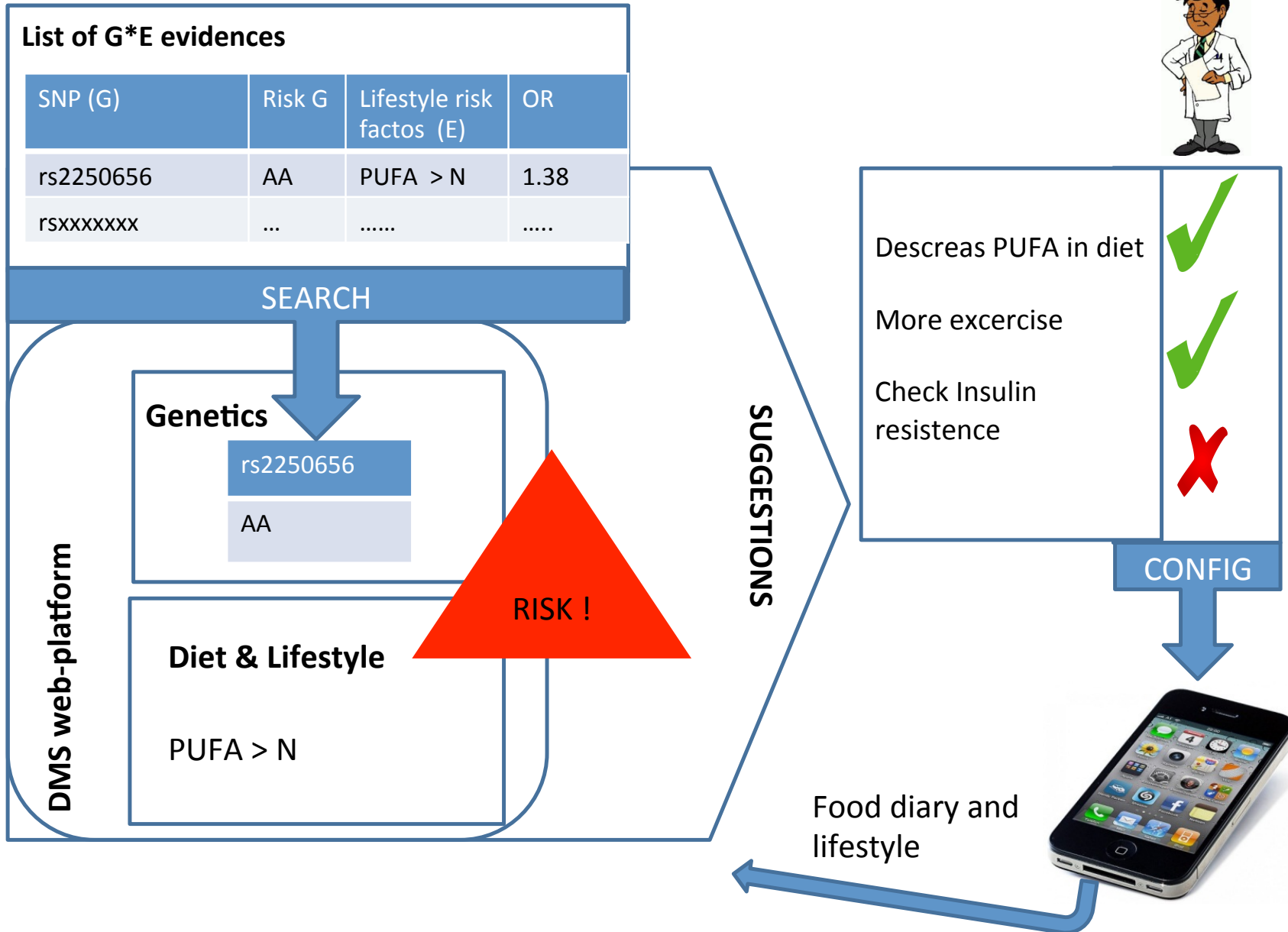
20:30

Line graph showing data for 2012 and 2013 across months Jan to Sep. The Y-axis ranges from 20 to 70.

Month	2012	2013
Jan	31	31
Feb	36	36
Mar	37	39
Apr	38	37
May	42	42
Jun	50	50
Jul	58	58
Aug	63	63
Sep	50	50

Each meal is sent to the DMS web-based platform and enters the patient's CRF

THE DSS IDEA



PERSONALIZED SUGGESTIONS



DIET AND LIFESTYLE



GENETIC DATA



CLINICAL DATA



MULTI-DIMENSIONAL DATA ANALYSIS

LITERATURE ANALYSIS

SUGGESTION

IBM WATSON FOR DSS?



Marketplace

Search



IBM Watson Health

Life sciences

Oncology

Value-based care

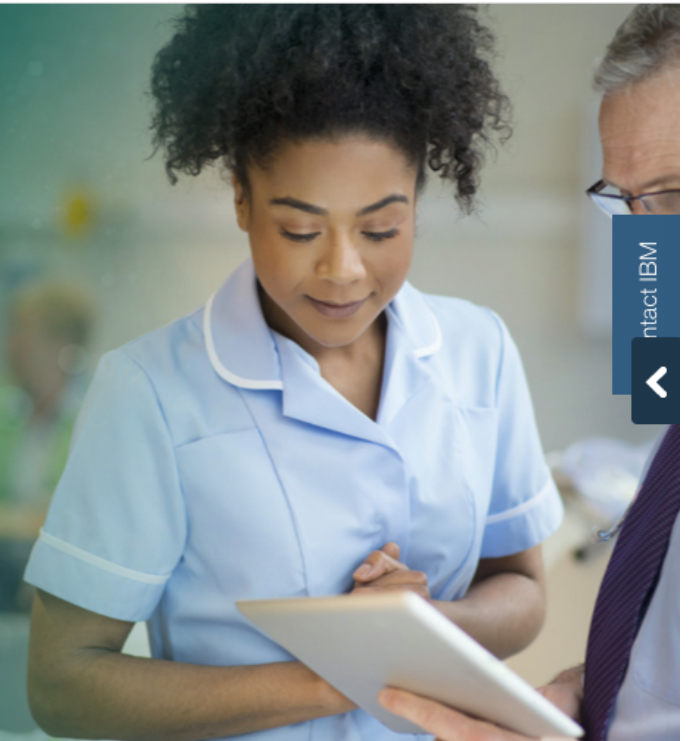
Government

Imaging

Blog

IBM Watson Health

Our mission is to empower leaders, advocates and influencers in health through support that helps them achieve remarkable outcomes, accelerate discovery, make essential connections and gain confidence on their path to solving the world's biggest health challenges.



Contact IBM



IBM WATSON POSSIBLE USE: INPUT



Visual Recognition

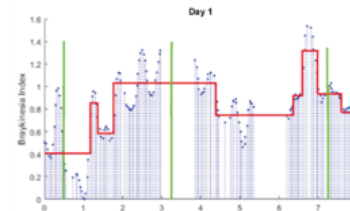
Understand the contents of images. Create custom classifiers to develop smart applications. Create custom collections to search for similar images.

Food type
Quantity
Portion

Food Code	Food Name	edible part	energy, kcal	Total protein	Vegetable protein	Total fat	Animal fat	Vitamin B1, Thiamin	Vitamin B2, Riboflavin
		g	100g	g	g	g	g	mg	mg
381	POTATOES	83	95	2.1	2.1	1	0	0.11	0.04
50399	BATATAS or SWEETPOTATOES	84	87	1.2	1.2	0.3	0	0.17	-2
380	POTATOES, YOUNG or EARLY	96	67	2	2	0	0	0.12	0.03
3002	STARCH, POTATO	100	349	1.4	1.4	0	0	-2	-2
100219	POTATO, POWDER	100	318	9.1	9.1	0.8	0	0.04	0.14
382	POTATO CRISPS, PLAIN	100	531	7	7	34.6	0	0.17	0.2
18	SPINACH	100	363	0.8	0.8	0.2	0	0	0.1
303	ASPARAGUS, WILD FROM WOOD	57	35	4.6	4.6	0.2	0	0.13	0.43
304	ASPARAGUS, WILD FROM FIELD	87	29	3.6	3.6	0.2	0	0.21	0.29
305	ASPARAGUS, GREENHOUSE	52	24	3	3	0.1	0	0.27	0.25
700484	ASPARAGUS, canned	100	18	2.1	2.1	0.7	0	0.06	0.11
8035	ALFA ALFA SPROUTS	100	24	4	4	0.7	0	0.04	0.06
390	SOY, SPROUTS	95	49	6.2	6.2	1.4	0	0.33	0.2
306	BEETROOT	82	19	1.1	1.1	0	0	0.03	0.02
312	CARROTS	95	33	1.1	1.1	0	0	0.04	0.04
802	GARLIC	87	15	0.8	0.8	0.1	0	0.03	0.02
341	TURNIP	89	18	1	1	0	0	0.02	0.07



Food
Composition



Activity
level



Personality Insights

Uncover a deeper understanding of people's personality characteristics, needs, and values to drive personalization.



Document Conversion

Use the Document Conversion Service to prepare documents for the Retrieve and Rank Service and to convert PDF, Word, or HTML documents into HTML, Plain Text, or JSON Answer Units.



Retrieve and Rank

Enhance information retrieval with machine learning.

GENERAL AVAILABILITY

CLINICAL
DATA

DIET AND
LIFESTYLE DATA

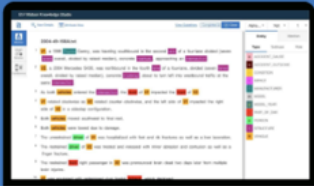
LITERATURE ANALYSIS



Supervised machine learning
IBM Watson Knowledge Studio

Teach Watson to discover meaningful insights in unstructured text without writing any code.

Starting at \$3,998.00 USD per month per 10 authorized users



**TRAINED
MODEL**

ANNOTATED ABSTRACTS/PAPERS



AlchemyLanguage

AlchemyLanguage is a collection of APIs that offer text analysis through natural language processing. The AlchemyLanguage APIs can analyze text and help you to understand its sentiment, keywords, entities, high-level concepts and more.

GENERAL AVAILABILITY

METADATA

OUTPUT

SUGGESTION



Conversation

Add a natural language interface to your application to automate interactions with your end users. Common applications include virtual agents and chat bots that can integrate and communicate on any channel or device.

GENERAL AVAILABILITY



Dialog

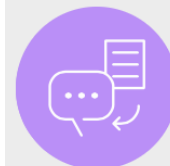
Script conversations any way you like to answer questions, walk through processes, or just to chat! Note: The Dialog service is deprecated as of August 15, 2016. See its documentation for more information.



Language Translator

Translate and publish content in multiple languages.

GENERAL AVAILABILITY



Text to Speech

Designed for streaming low-latency synthesis of audio from written text. The service synthesizes natural-sounding speech from input text in a variety of languages and voices that speak with appropriate cadence and intonation.

...HOWEVER...

- Watson works with a pay-per-service model
- Even though research/protoyping programs are available, they do not include all the services needed
- The services available have limited knowledge sources in the medical area (dictionaries, literature)
- Most of the work has been done by IBM for Watson Health→
 - They are sold as full applications
 - IBM Watson Health is not provided as collection of services
- All the models have to be trained from the scratch

CONCLUSIONS



CONCLUSIONS

- mHealth is a promising field that would promote inclusion of patients in the healthcare process
- Integrating patient-generated information to EHRs will
 - enable patient-centered and home-settled care
 - provide inclusion of patients, families, and communities in the care process.

...HOWEVER...

- There are **concerns about data security, app quality**
- There are challenges still to be addressed
 - There is the **technological challenge** of creating a standards-based architecture for data exchange (HL7-FHIR)
 - There is the **analytic challenge** of collecting information appropriately and finding powerful tools for creating personalized suggestions for families/patients

THANK YOU FOR THE ATTENTION!

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