

# The State of Digital Health

IntraHealth  
INTERNATIONAL  
Because Health Workers Save Lives.



Global Digital Health Network  
Formerly the mHealth Working Group

fhi360  
THE SCIENCE OF IMPROVING LIVES

 DAI  
Shaping a more livable world.

# What is Digital Health?

- (Digital Health, eHealth) Umbrella terms to encompass all concepts and activities at the intersection of health and information and communications technologies (ICTs), including mobile health (mHealth), health information technology, electronic health records (EHRs), and telehealth, and encompassing three main functions:
  - the delivery of health information, for health professionals and health consumers, through the Internet and telecommunications media,
  - using ICTs to improve public health services (e.g., through the education and training of health workers), and
  - using health information systems (HIS) to capture, store, manage or transmit information on patient health or health facility activities.

# Common Digital Health Interventions

1	Client education & behaviour change communication (BCC)	7	Provider-to-provider communication User groups, consultation
2	Sensors & point-of-care diagnostics	8	Provider workplanning & scheduling
3	Registries / vital events tracking	9	Provider training & education
4	Data collection and reporting	10	Human resource management
5	Electronic health records	11	Supply chain management
6	Electronic decision support Information, protocols, algorithms, checklists	12	Financial transactions & incentives

Labrique AB, Vasudevan L, Kochi E, Fabricant R, Mehl G. mHealth innovations as health system strengthening tools: 12 common applications and a visual framework. Glob Health Sci Pract. 2013;1(2):160-171. <http://dx.doi.org/10.9745/GHSP-D-13-00031>.

# CLASSIFICATION OF DIGITAL HEALTH INTERVENTIONS v1.0

A shared language to describe the uses of digital technology for health



## 1.0 CLIENTS

1.1 TARGET CLIENT COMMUNICATION	1.3 CLIENT TO CLIENT COMMUNICATION	1.5 DE-DEMAND INFORMATION LISTS FOR CLIENTS
1.1.1 Targeted health communication to specific population groups	1.3.1 Peer support for clients	1.5.1 One-to-one health communication
1.1.2 Targeted health communication to all clients based on health status or demographic	1.3.2 Peer support for clients	1.5.2 Peer support for clients
1.1.3 Targeted health communication to all clients based on health status or demographic	1.3.3 Peer support for clients	1.5.3 Peer support for clients
1.1.4 Targeted health communication to all clients based on health status or demographic	1.3.4 Peer support for clients	1.5.4 Peer support for clients
1.1.5 Targeted health communication to all clients based on health status or demographic	1.3.5 Peer support for clients	1.5.5 Peer support for clients
1.1.6 Targeted health communication to all clients based on health status or demographic	1.3.6 Peer support for clients	1.5.6 Peer support for clients
1.1.7 Targeted health communication to all clients based on health status or demographic	1.3.7 Peer support for clients	1.5.7 Peer support for clients
1.1.8 Targeted health communication to all clients based on health status or demographic	1.3.8 Peer support for clients	1.5.8 Peer support for clients
1.1.9 Targeted health communication to all clients based on health status or demographic	1.3.9 Peer support for clients	1.5.9 Peer support for clients
1.1.10 Targeted health communication to all clients based on health status or demographic	1.3.10 Peer support for clients	1.5.10 Peer support for clients



## 2.0 HEALTHCARE PROVIDERS

2.1 CLIENT IDENTIFICATION AND REGISTRATION	2.5 HEALTHCARE PROVIDER COMMUNICATION	2.8 HEALTHCARE PROVIDER TRAINING
2.1.1 Verify client unique identity	2.5.1 Communication from healthcare provider to client	2.8.1 Provider training on digital health interventions
2.1.2 Verify client unique identity	2.5.2 Communication from client to healthcare provider	2.8.2 Provider training on digital health interventions
2.1.3 Verify client unique identity	2.5.3 Communication from client to healthcare provider	2.8.3 Provider training on digital health interventions
2.1.4 Verify client unique identity	2.5.4 Communication from client to healthcare provider	2.8.4 Provider training on digital health interventions
2.1.5 Verify client unique identity	2.5.5 Communication from client to healthcare provider	2.8.5 Provider training on digital health interventions
2.1.6 Verify client unique identity	2.5.6 Communication from client to healthcare provider	2.8.6 Provider training on digital health interventions
2.1.7 Verify client unique identity	2.5.7 Communication from client to healthcare provider	2.8.7 Provider training on digital health interventions
2.1.8 Verify client unique identity	2.5.8 Communication from client to healthcare provider	2.8.8 Provider training on digital health interventions
2.1.9 Verify client unique identity	2.5.9 Communication from client to healthcare provider	2.8.9 Provider training on digital health interventions
2.1.10 Verify client unique identity	2.5.10 Communication from client to healthcare provider	2.8.10 Provider training on digital health interventions



## 3.0 HEALTH SYSTEM MANAGERS

3.1 HUMAN RESOURCE MANAGEMENT	3.3 PUBLIC HEALTH EVENT NOTIFICATION	3.6 EQUIPMENT AND ASSET MANAGEMENT
3.1.1 Staff health workforce management and information	3.3.1 Notification of public health events	3.6.1 Equipment and asset management
3.1.2 Staff health workforce management and information	3.3.2 Notification of public health events	3.6.2 Equipment and asset management
3.1.3 Staff health workforce management and information	3.3.3 Notification of public health events	3.6.3 Equipment and asset management
3.1.4 Staff health workforce management and information	3.3.4 Notification of public health events	3.6.4 Equipment and asset management
3.1.5 Staff health workforce management and information	3.3.5 Notification of public health events	3.6.5 Equipment and asset management
3.1.6 Staff health workforce management and information	3.3.6 Notification of public health events	3.6.6 Equipment and asset management
3.1.7 Staff health workforce management and information	3.3.7 Notification of public health events	3.6.7 Equipment and asset management
3.1.8 Staff health workforce management and information	3.3.8 Notification of public health events	3.6.8 Equipment and asset management
3.1.9 Staff health workforce management and information	3.3.9 Notification of public health events	3.6.9 Equipment and asset management
3.1.10 Staff health workforce management and information	3.3.10 Notification of public health events	3.6.10 Equipment and asset management



## 4.0 DATA SERVICES

4.1 DATA COLLECTION, STORAGE AND USE	4.2 DATA ANALYSIS	4.3 LOCATION SERVICES
4.1.1 Data collection, storage and use	4.2.1 Data analysis	4.3.1 Location services
4.1.2 Data collection, storage and use	4.2.2 Data analysis	4.3.2 Location services
4.1.3 Data collection, storage and use	4.2.3 Data analysis	4.3.3 Location services
4.1.4 Data collection, storage and use	4.2.4 Data analysis	4.3.4 Location services
4.1.5 Data collection, storage and use	4.2.5 Data analysis	4.3.5 Location services
4.1.6 Data collection, storage and use	4.2.6 Data analysis	4.3.6 Location services
4.1.7 Data collection, storage and use	4.2.7 Data analysis	4.3.7 Location services
4.1.8 Data collection, storage and use	4.2.8 Data analysis	4.3.8 Location services
4.1.9 Data collection, storage and use	4.2.9 Data analysis	4.3.9 Location services
4.1.10 Data collection, storage and use	4.2.10 Data analysis	4.3.10 Location services

New Taxonomy...

<http://www.who.int/reproductivehealth/publications/mhealth/classification-digital-health-interventions/en/>

FOR QUESTIONS OR FEEDBACK, PLEASE CONTACT

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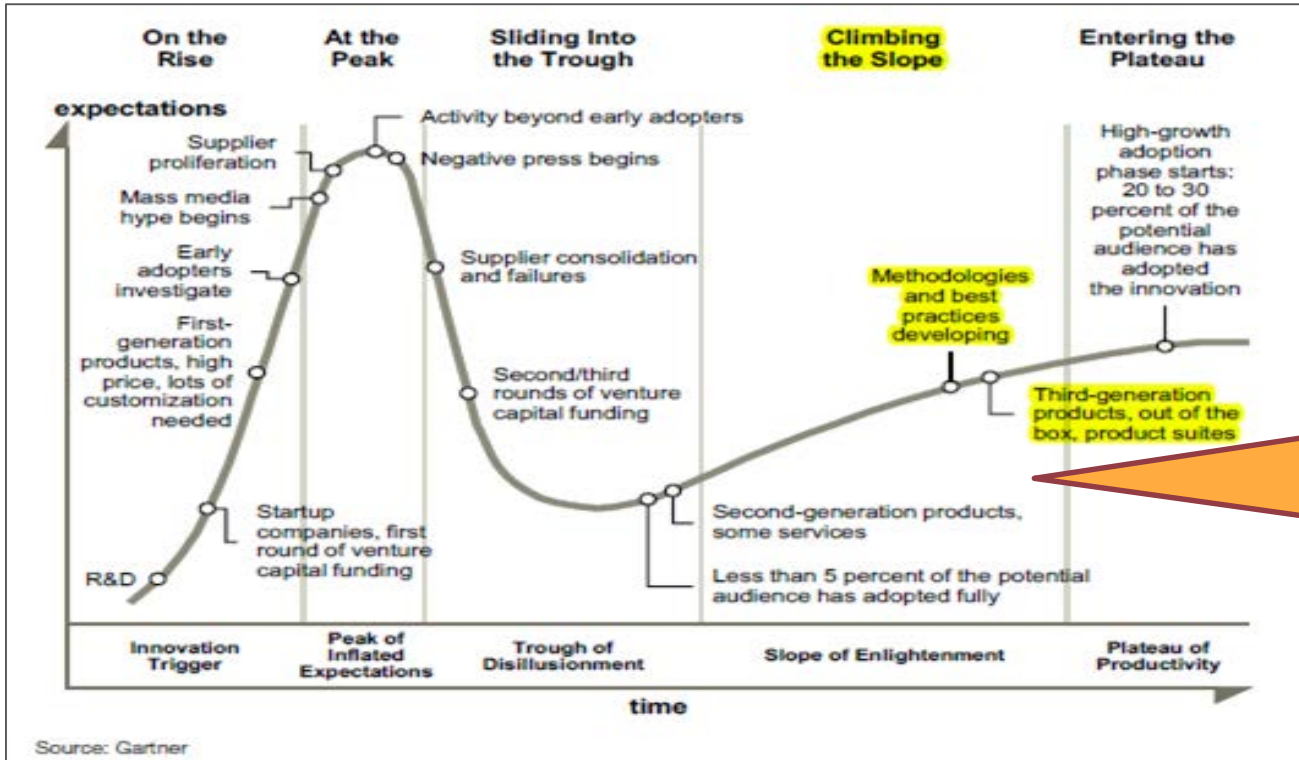
# HEALTH SYSTEM CHALLENGES

1	INFORMATION	3	QUALITY	6	EFFICIENCY
1.1	Lack of population denominator	3.1	Poor patient experience	6.1	Inadequate workflow management
1.2	Delayed reporting of events	3.2	Insufficient health worker competence	6.2	Lack of or inappropriate referrals
1.3	Lack of quality/ reliable data	3.3	Low quality health commodities	6.3	Poor planning and coordination
1.4	Communication roadblocks	3.4	Low health worker motivation	6.4	Delayed provision of care
1.5	Lack of access to information or data	3.5	Insufficient continuity of care	6.5	Inadequate access to transportation
1.6	Insufficient utilization of data and information	3.6	Inadequate supportive supervision		
1.7	Lack of unique identifier	3.7	Poor adherence to guidelines		
2	AVAILABILITY	4	ACCEPTABILITY	7	COST
2.1	Insufficient supply of commodities	4.1	Lack of alignment with local norms	7.1	High cost of manual processes
2.2	Insufficient supply of services	4.2	Programs which do not address individual beliefs and practices	7.2	Lack of effective resource allocation
2.3	Insufficient supply of equipment			7.3	Client-side expenses
2.4	Insufficient supply of qualified health workers			7.4	Lack of coordinated payer mechanism
5	UTILIZATION	8	ACCOUNTABILITY		
5.1	Low demand for services	8.1	Insufficient patient engagement		
5.2	Geographic inaccessibility	8.2	Unaware of service entitlement		
5.3	Low adherence to treatments	8.3	Absence of community feedback mechanisms		
5.4	Loss to follow up	8.4	Lack of transparency in commodity transactions		
		8.5	Poor accountability between the levels of the health sector		
		8.6	Inadequate understanding of beneficiary populations		

...to address  
persistent  
challenges

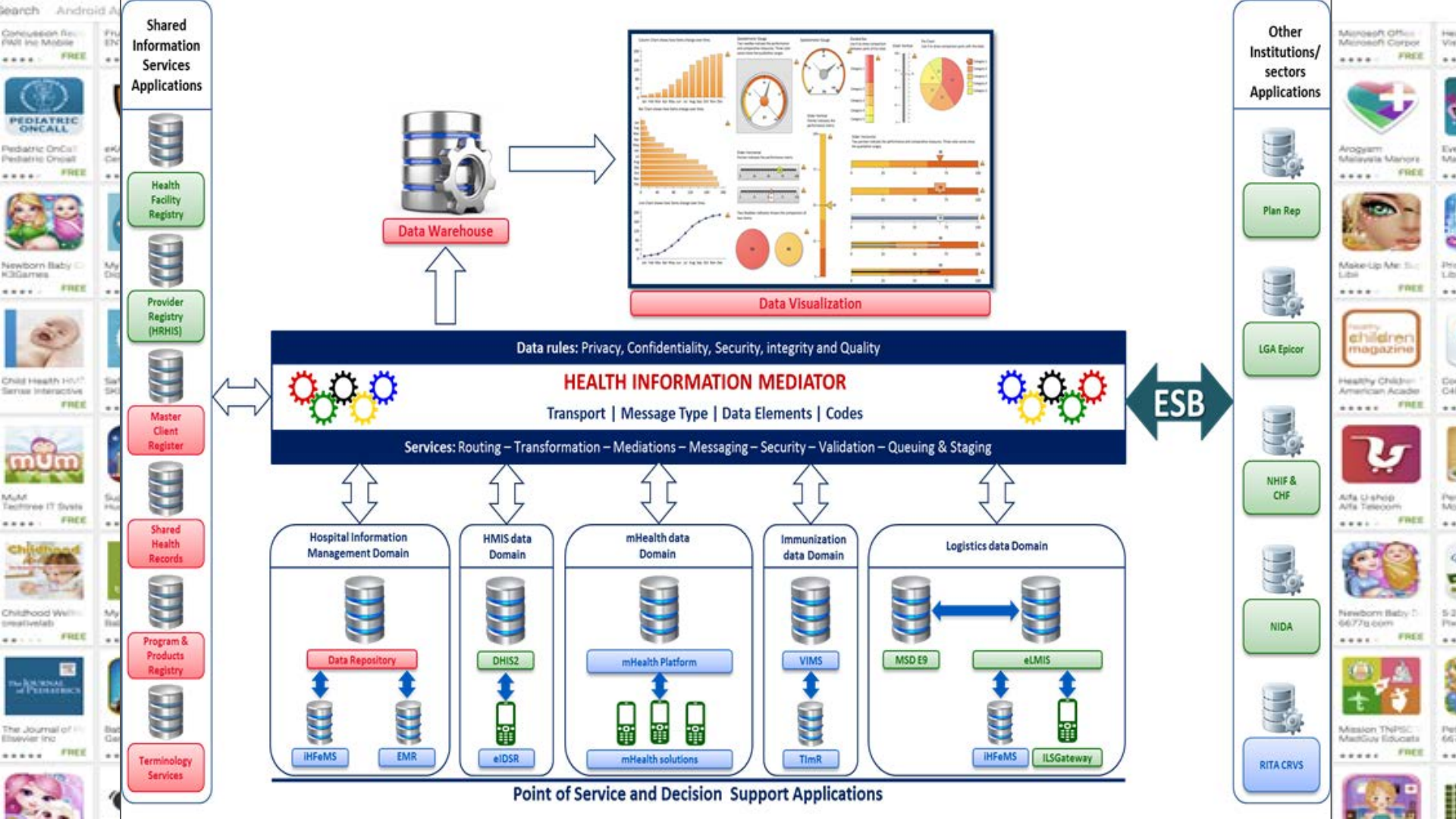
# Trends in Digital Health

- Climbing the slope?



- Toolkits and Frameworks
- Standards and Interoperability
- Collaboration
- Global Goods
- Productization









SONY

+278393009001...

Babies can be hard work  
if you need some rest,  
ask your partner or family  
for help. They may enjoy  
playing with your baby while  
you rest.

They will.

I listen to the sounds your  
baby makes. Talk to him  
he needs Vitamin A from  
the clinic at 6 months, then  
every 6 months until he  
turns 5.



# Digital Investment Principles



## 1. Collaborate

**Collaborate to align investments** with national digital health strategies.



## 2. Invest in national plans

Prioritise investments in **national plans that incorporate “digital global goods”** and avoid bespoke systems.



## 3. Enable sustainable investment

Engage early to **determine and quantify long-term costs** of operating, maintaining, and supporting digital health systems for sustainable country ownership.



## 4. Track & measure

**Track** investments, progress, learnings and successes in digital health systems in a transparent manner.



## 5. Strengthen skills

**Strengthen donor technical skills** and core capacities, including awareness of the Principles for Digital Development.



## 6. Creation and evolution

The **creation and evolution** of a country's national digital health strategy, policies and regulatory framework. Strategies include components such as architecture, standards, investment frameworks, privacy protection, and detailed operational and monitoring plans.



## 7. Maturity continuum

Systems at a level appropriate to the country's progress along the **digital health maturity continuum**.



## 8. Country capacity

**Sustainable country capacity** for digital health leadership, governance, implementation, oversight, global good adoption, and donor coordination.



## 9. Global goods

Scalable, sustainable, accessible, interoperable, and evidence-based **digital health global goods** that meet country priorities.



## 10. Information and peer-learning

Diverse stakeholder **information-sharing and peer-learning networks** at country and regional levels to foster coordination and alignment of implementation activities.

# More resources

- [Global Digital Health Network](#)
- [Global Digital Health Index](#)
- [WHO Digital Health Atlas](#)
- [Digital Square - Global Goods](#)
- [Open HIE](#)
- [Asian eHealth Information Network](#)



digital  
square

# GLOBAL GOODS

## **Global Utility**

- Country Utilization
- Country Strategy
- Digital Health Interventions
- Source Code Accessibility
- Funding and Revenue

## **Community Support**

- Developer, Contributor and Implementor Community Engagement
- Community Governance
- Software Roadmap
- User Documentation

## **Software Maturity**

- Multi-Lingual Support
- Technical Documentation
- Software Productization
- Interoperability and Data Accessibility
- Security
- Scalability



# iHRIS

## Global Good Maturity





# Global Good Maturity



## Global Good Maturity



# Principles *for* Digital Development



Design with the User



Understand the Existing Ecosystem



Design For Scale



Build For Sustainability



Be Data Driven



Use Open Standards, Open Data,  
Open Source and Open Innovation



Reuse and Improve



Address Privacy and Security



Be Collaborative



# The State of Digital Health in International Development; New Technologies

## Private Sector



Bobby Jefferson,

VP, Chief Technology Officer, DAI

Accredited Investor, Judge, Panelist (6) Social Innovation Funds

Board Member (4) Health Tech Startups, Board Advisor (2) Nonprofit



# Business Models



# Which is a Medical Device ?



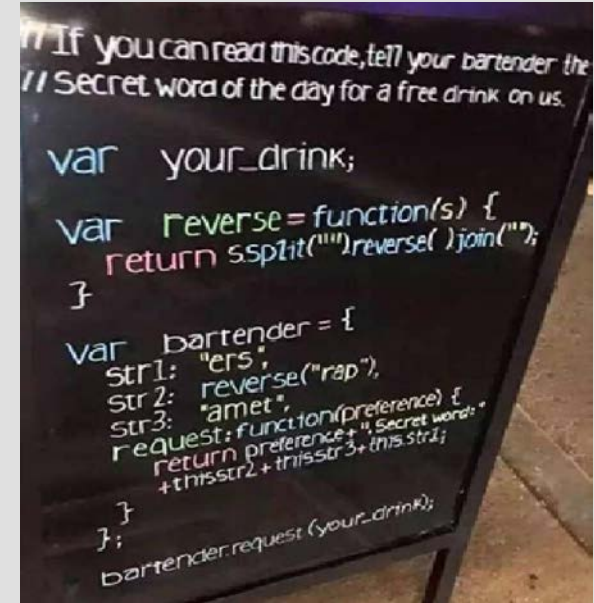
Infusion Pump



Blood Glucose Meter



Pulse Oximeter



Software Code

# Which is a Medical Device ?



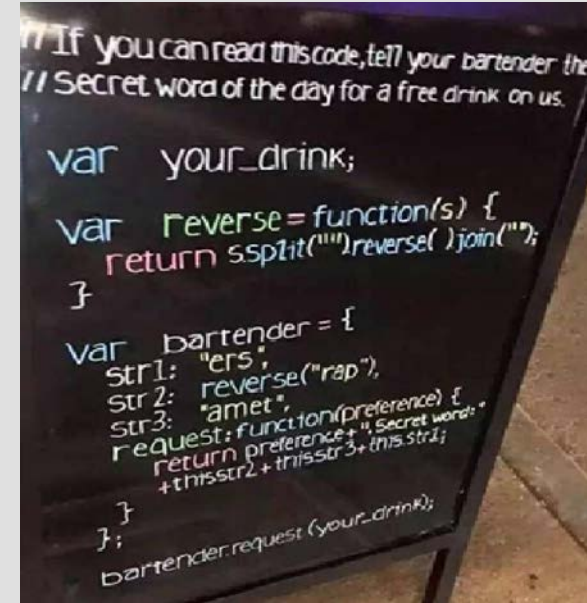
Infusion Pump



Blood Glucose Meter



Pulse Oximeter

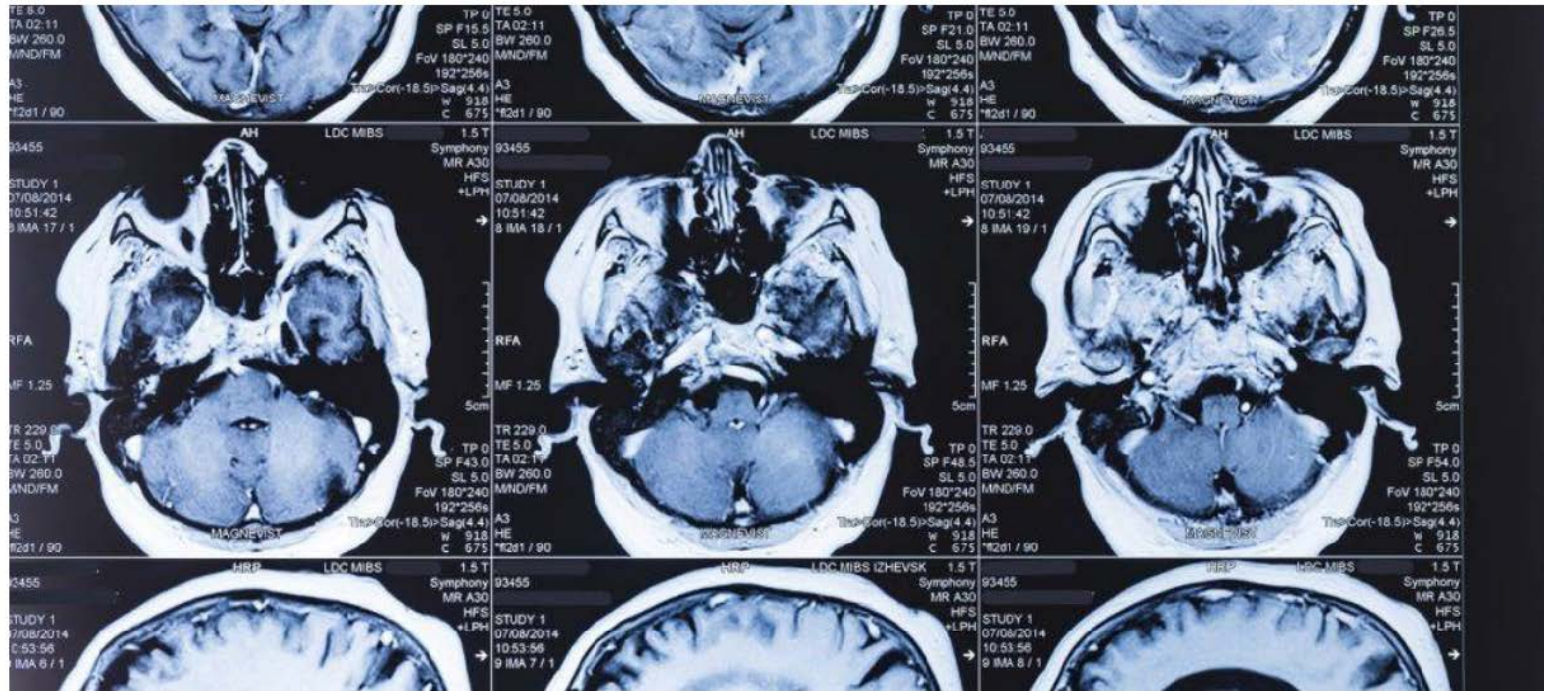


Software as Medical Device  
(SaMD)



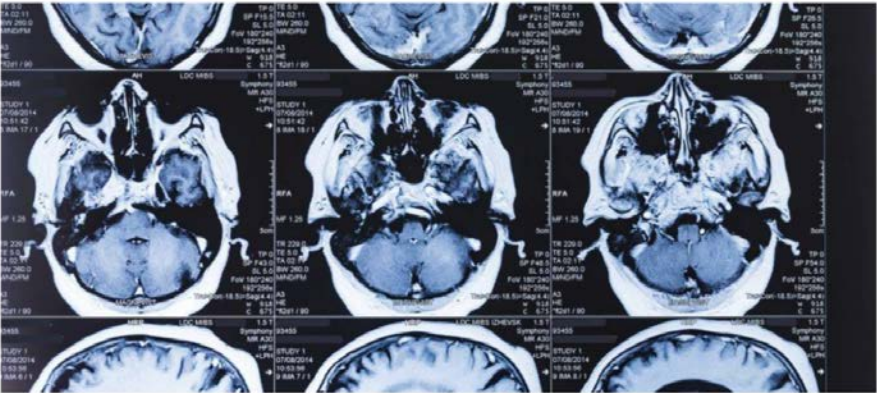
Software as a Medical Device (SaMD) International Medical Device Regulators  
<https://www.fda.gov/medicaldevices/digitalhealth/softwareasamedicaldevice/default.htm>

# Rise of AI-as-a-medical-device



*The FDA is fast-tracking approvals of artificial intelligence software for clinical imaging & diagnostics.*

Rise of AI-as-a-medical-device



The FDA is fast-tracking approvals of artificial intelligence software for clinical imaging & diagnostics.

Startups, Early Stage Companies



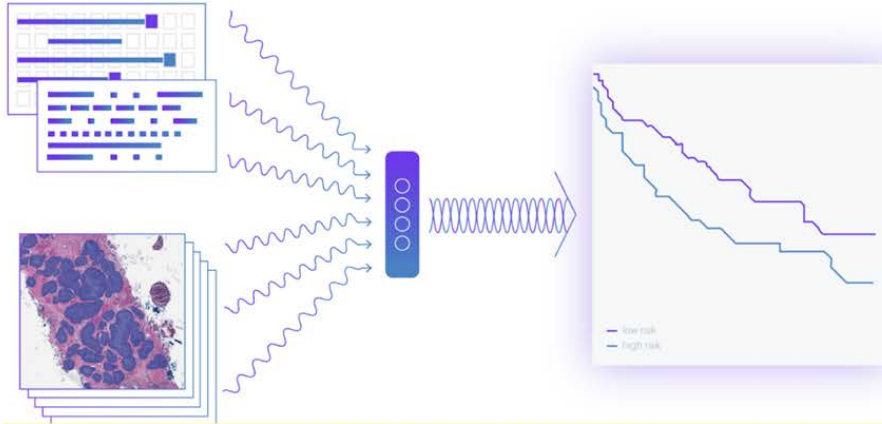
TOGETHER,  
WE CAN REACH  
EVERY PATIENT,





# Paige.AI Created to Transform Cancer Diagnosis and Treatment by Applying Artificial Intelligence to Pathology

*Backed by \$25 Million Equity Investment and Exclusive Data Licensing Agreement with Memorial Sloan Kettering Cancer Center*



1. Data at an entirely new scale.
2. Unparalleled clinical domain expertise
3. An AI Team.

exclusive access to MSK's intellectual property in the field of computational pathology, as well as a library of 25 million pathology slides. This de-identified data set represents one of the world's largest pathology archives and will be invaluable to Paige.AI as it builds out a suite of AI applications in pathology.

# Human Centered Design EMR

NextGen EMR: John Dokes : [06/26/2007 12:00 PM : "Master Im"]

File Edit Default View Tools Utilities Window Help

Main Office Barclay, Joseph MD

Print History Notes EHR App Chat

**Patient:** John Dokes **Age:** 47 **DOB:** 03/14/1960  
**Current Provider:** Joseph Barclay MD **Gender:** Male **Current Encounter:** 06/26/2007

**How patient**  
☒ New patient  
☐ Established patient

**Reason(s) for visit**  
 cough FU  
 headache FU  
 FU  
 FU  
 FU

**Brief Visit**  
 FU  
 FU  
 FU  
 FU  
 FU

**Chronic Problem List**  
 Chronic Problem Code  
 Add new problem

**Specialty:** IM  
**Visit Type:** Office Visit  
**Historian:** self  
**Referring MD / PCP Info:**  
 Alerts Patient Service Info

**Add to today's assessments**

**Vitals** **Vital Signs Outside Normal Range** **Add New Vital Signs** **Expand Vital Signs**

Date / Time	Temp F	Temp C	BP	Pulse	Rhythm	Respiration	HE In	HE Out	WE Lb	WE Kg	Cont
06/26/2007 12:00 PM	96.4		130/90	80	regular	16	71.0		216.00		direct

**Medications** **No Medications** **Comment** **Allergies** **No Known Allergies** **Comment**

Medication	Dose	Sig Codes	Start Date	Stop Date	Ingredient/Allergen	Brand Name
Simvastatin	10MG	1T PO QD	11/11/00	11/11/00		

**Health Monitor:** **Set Health Maintenance Protocols** **Set Disease Management Protocols** **Tobacco User:** ☒ yes ☐ no

Physical Exam	Tetanus	Eye Exam	ALT/AST
Due: 11/11/00	Due: 11/11/00	Due: 11/11/00	Due: 11/11/00
Lipid Panel 06/05/2007	TSA Test 11/11/00	Foot Exam 11/11/00	CPK 11/11/00
Colonoscopy 11/11/00		HgbA1C 11/11/00	Urinalysis 06/26/2007
Sigmoidoscopy 11/11/00		EMP Fasting 11/11/00	Urine Micro 11/11/00
FOBT x3 11/11/00		ERG 06/26/2007	TSH 11/11/00
Influenza Vac 11/11/00		Stress Test 11/11/00	PFT 11/11/00
Pneumo Vac 11/11/00		Echocardiogram 06/26/2007	Chest X-ray 11/11/00

**Comradin**  
 Adult Office Visit  
 Echocardiogram  
 Nutrition Assessment  
 Stress Master  
 Stress Nuclear  
 Preview Offline

Ready

06/26/2007





Power BI



Commercial Software Models, SaaS, DaaS

**MINISTRY OF HEALTH**



amazon  
web services™





The Health Improvement Network (THIN) database



MACHINE LEARNING



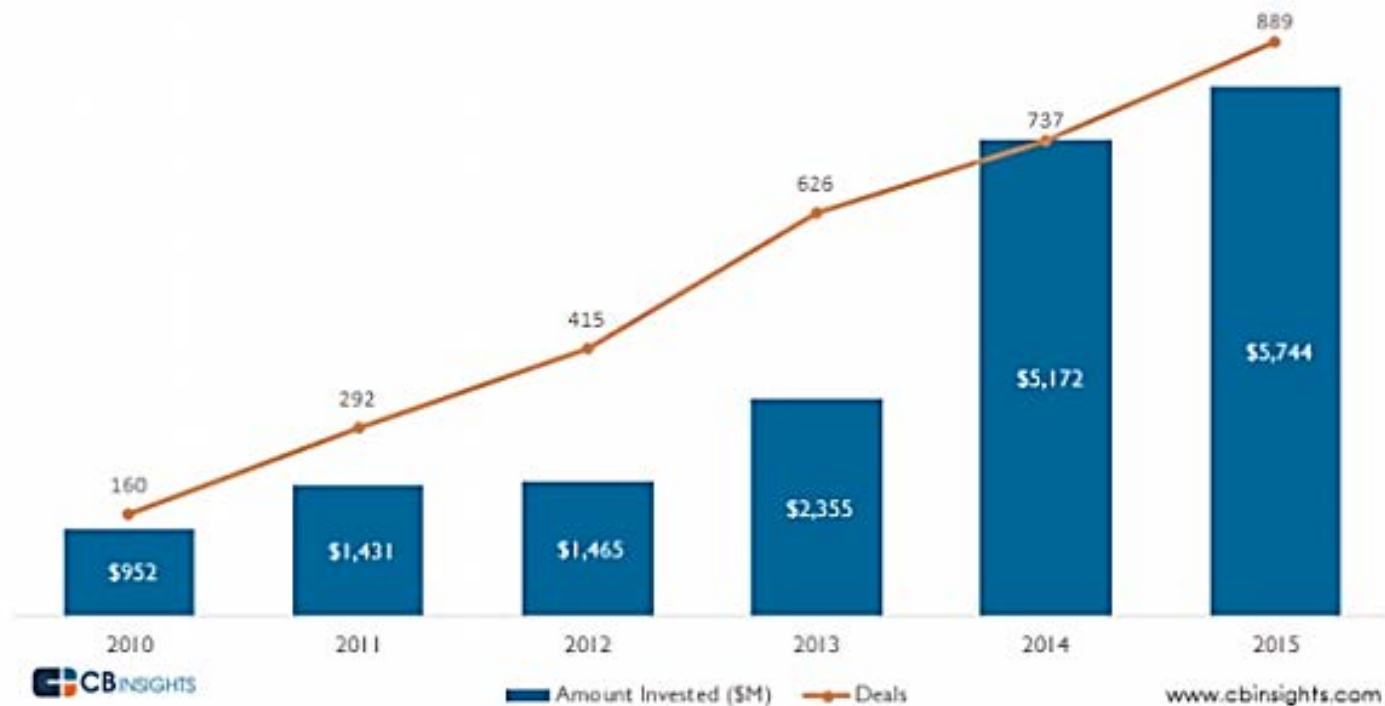
THIN data electronic medical records of 11.1 million patients (3.7 million active patients) collected from 562 general practices in the UK, covering 6.2% of the UK population. All data are fully anonymised, processed and validated by CSD Medical Research UK.

<http://www.ucl.ac.uk/iehc/research/primary-care-and-population-health/research/thin-database/database>

# DIGITAL HEALTH CONTINUES TO PICK UP STEAM

Digital health as a whole continues to grow, with nearly 900 deals being closed in 2015 as well as more than \$5.7B invested

Digital Health Funding Trends: Deals and Dollars Invested  
2010 - 2015



# WHO ARE THE TOP DIGITAL HEALTH INVESTORS?

Investors from different parts of the ecosystem are active in the digital health space

Most Active Digital Health Investors of 2015

Rank	Investor	Select Companies
1	Y Combinator	Circle Health, MicroHealth, Akido Labs
2	DreamIt Ventures	Redox, Oncora Medical, CareCierge
2	Rock Health	Sano Intelligence, Amino, Collective Health
4	Qualcomm Ventures	WellTok, goBalto, MediSafe
4	Ben Franklin Technology Partners	Fitly, Grand Rounds, MedStatix
6	Rockstart Accelerator	Med Angel, MOUNT, Cognilab
6	TechStars	Owlet, iDoc24, HealthID
6	Google Ventures	23andMe, One Medical Group, TinyRX
6	True Ventures	Deep Genomics, Lumity, Athos Works
6	Norwest Venture Partners	TigerText, Omada Health, CareCloud
6	Lux Capital	Hometeam, Zipdrug, Pager
6	Merck Global Health Innovation Fund	QueueDr, Ayogo, medCPU
6	GE Ventures	Caremerge, Predixion Software, Aver

# Challenges to scale and sustainability of digital health innovations

- Interoperability
- Siloed interventions
- Sustainable financial models
- Digital health literacy/capacity among policymakers
- Guidance/coordination
- Evidence v. evolution







Thank You!