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# COVID-19 and the 'new normal'

Diógenes Firmiano

2020-05-15

**The 'new normal'  
transforms the  
future into present.  
Our present is,  
now, past and will  
never comeback.**





# Challenges

Pandemic and healthcare

## Brazil's scenario

Brazil is a **continental** country with **federated** states, **209M** population and **different** conditions in each state.



# COVID in Brazil

## NOTIFICATIONS

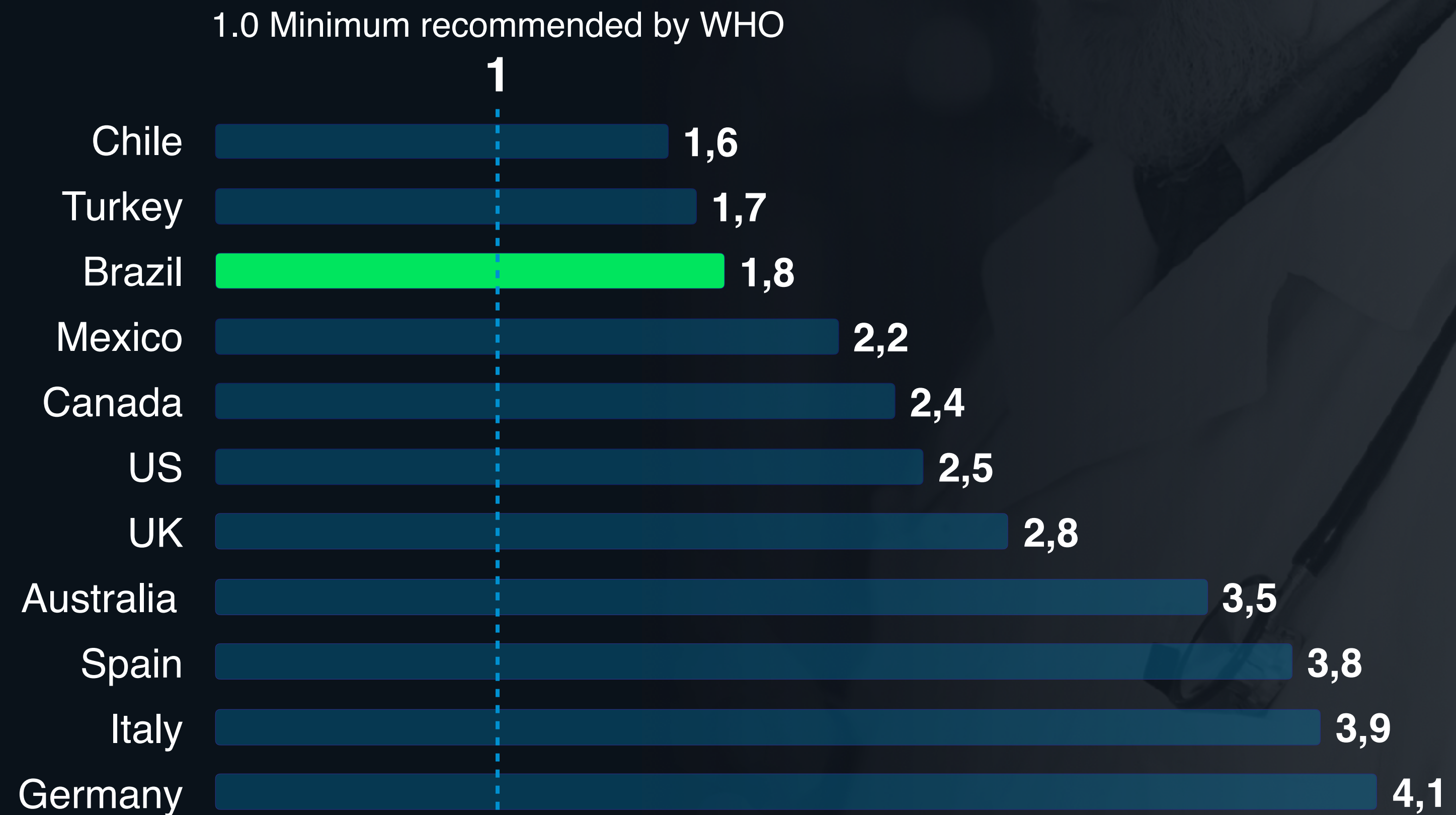
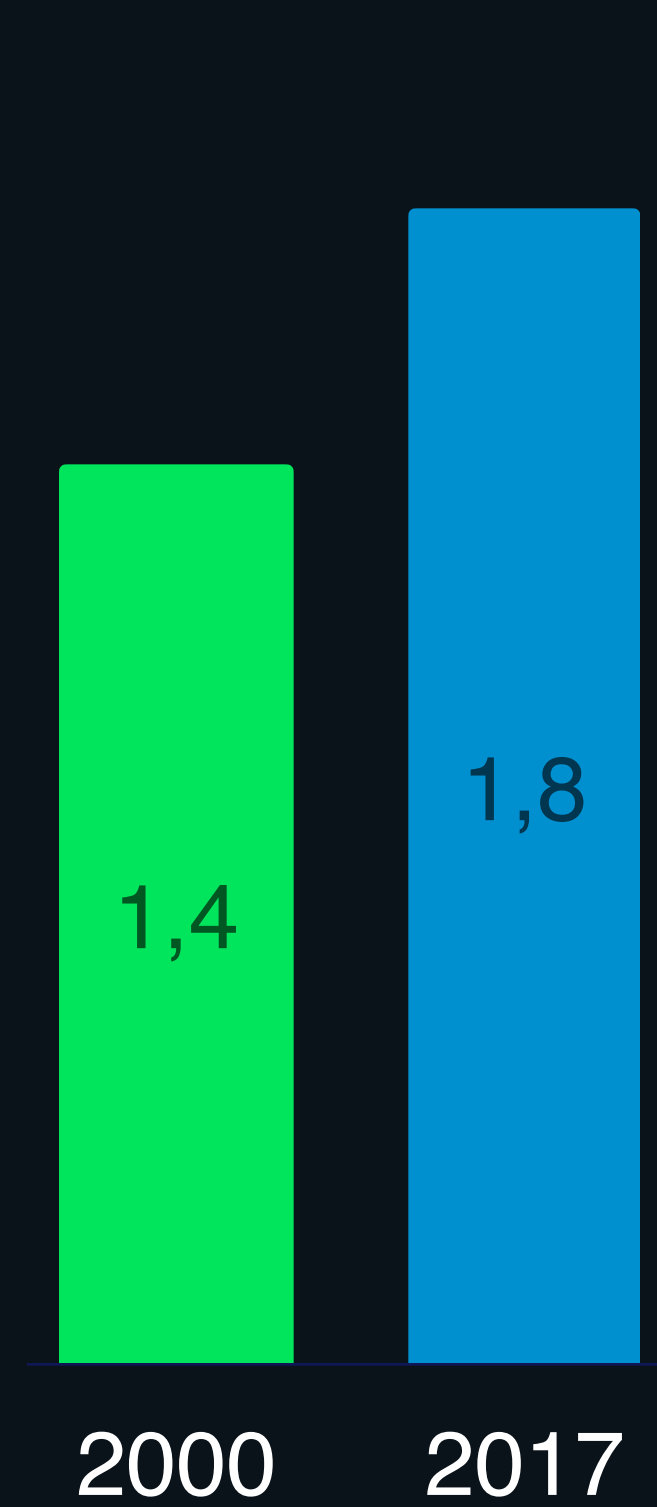


# Brazil has fewer physicians per person than most developed countries

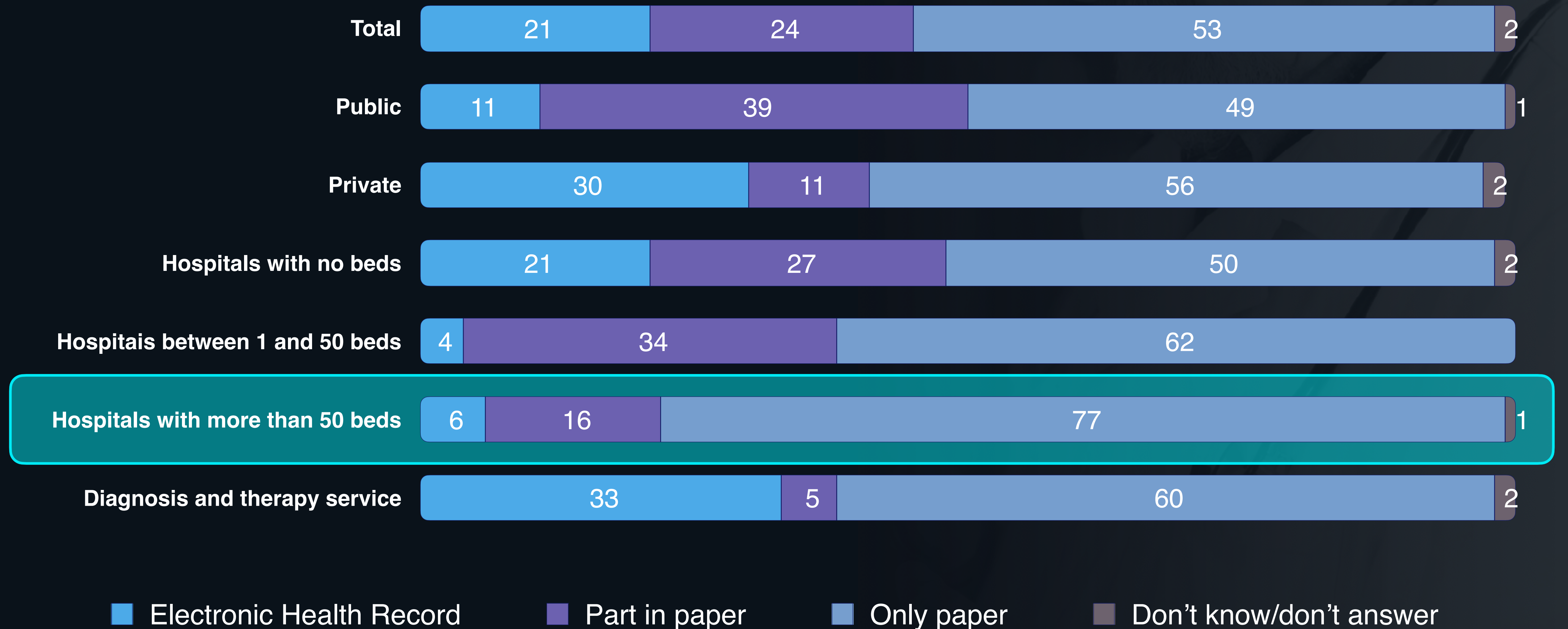


## Physicians

Per thousand inhabitants



# Health facilities, by use of electronic health records - 2017



**5 Bi**

**RECORDS/YEAR**

**50K+**

**LABS**

**8K+**

**HOSPITALS**

**SOURCE: BRAZILIANS MINISTRY OF HEALTH**



# Interoperability and silos

Distributed Timeline and federated clinical documents

# Patterns and guidelines

INTEROPERABILITY  
NEW STANDARDS

## Medical Standards



SNOMED-CT, TISS,  
DICOM, LOINC, ISBT  
128, CID, CIAP-2,  
TUSS, CBHPM.

## Architectural guidelines



FHIR - RES  
REST(Communication)  
JSON( Document)

## Interoperability Standards

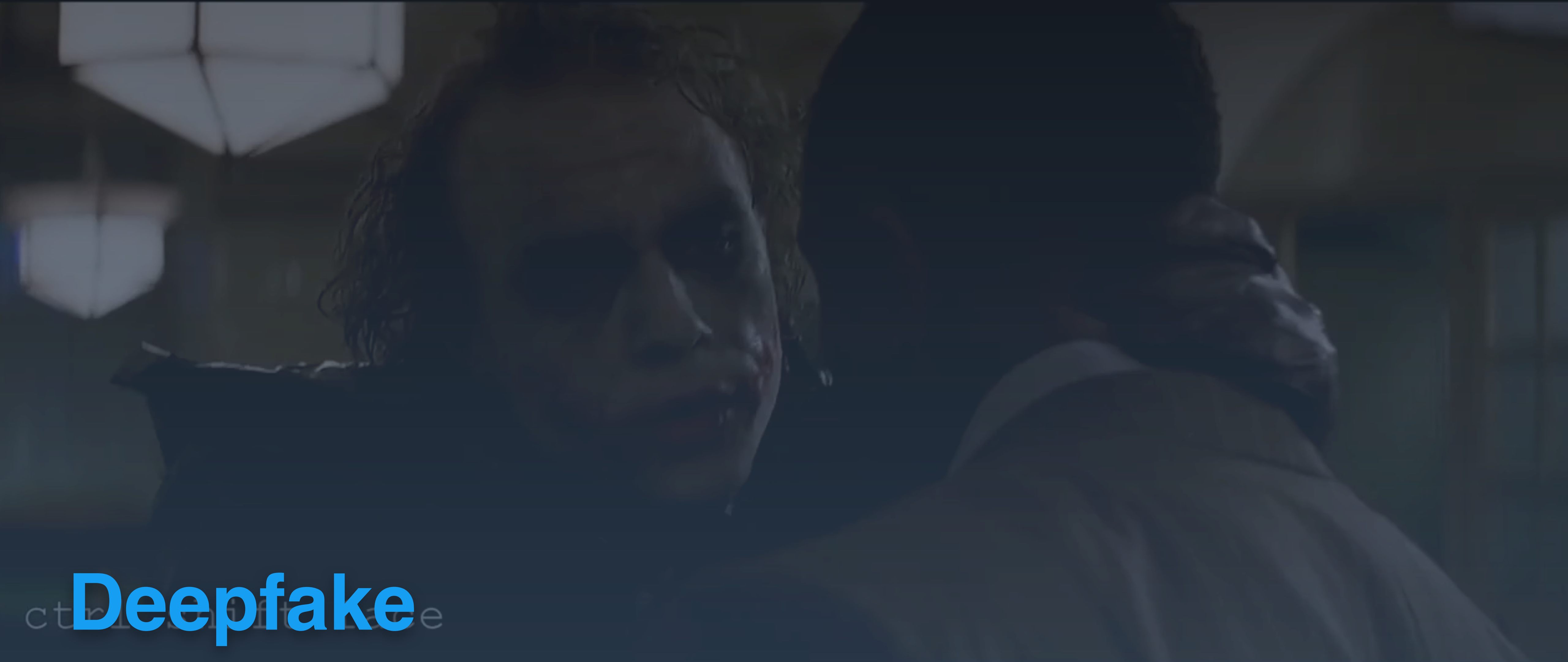


HL7 FHIR -  
Integration

## Standard patient data

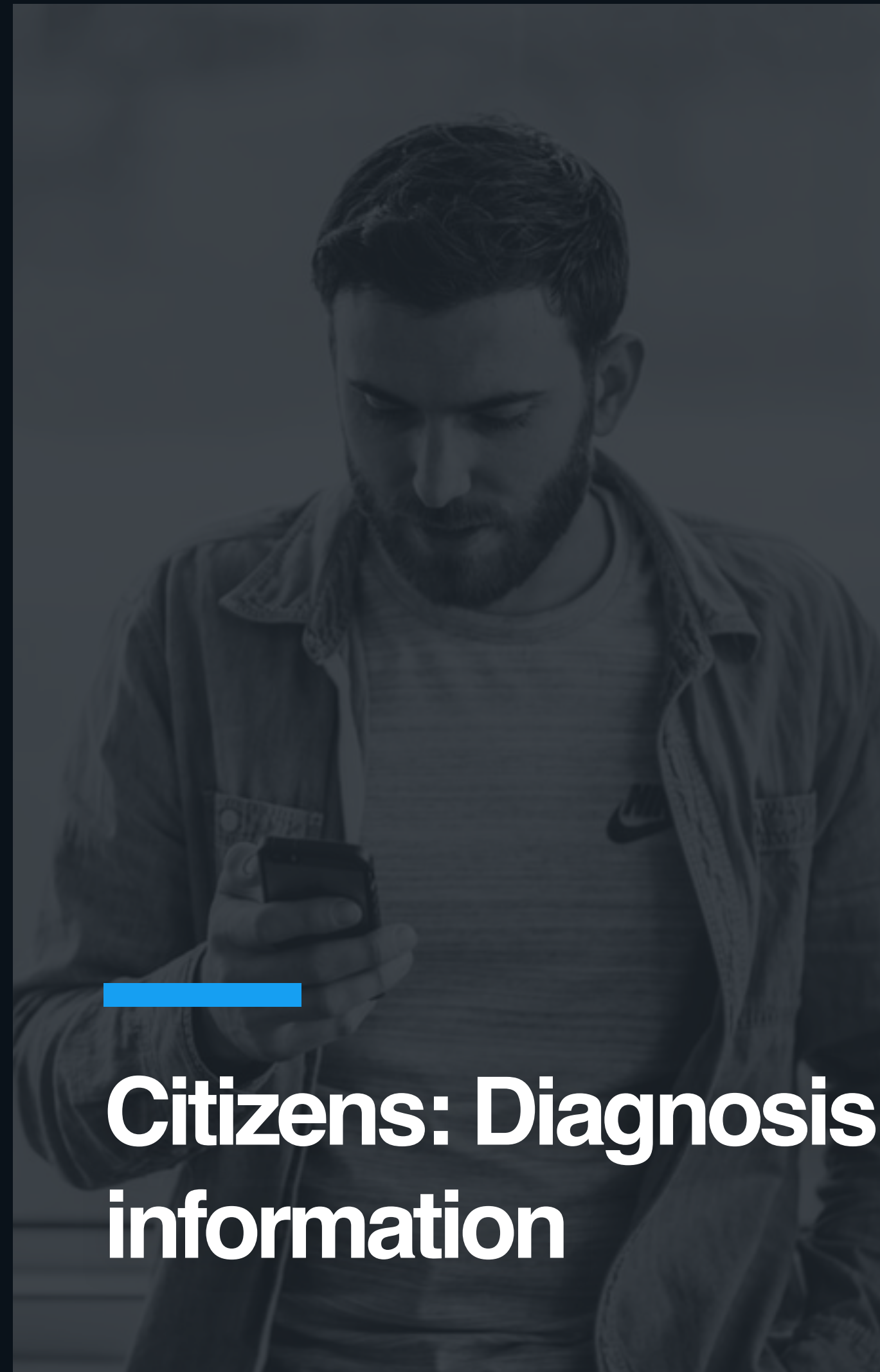


IHE PIX

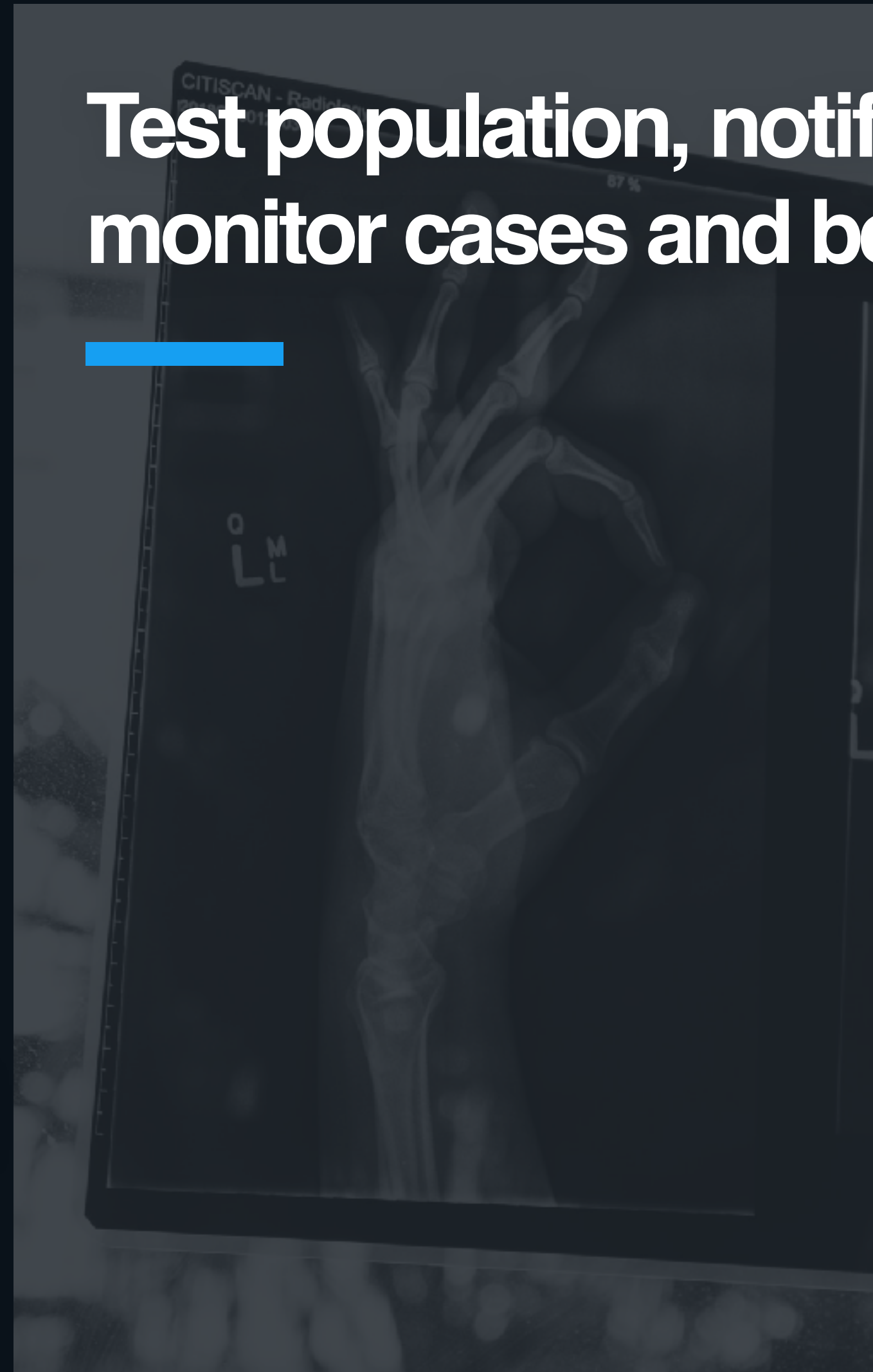


# Deepfake

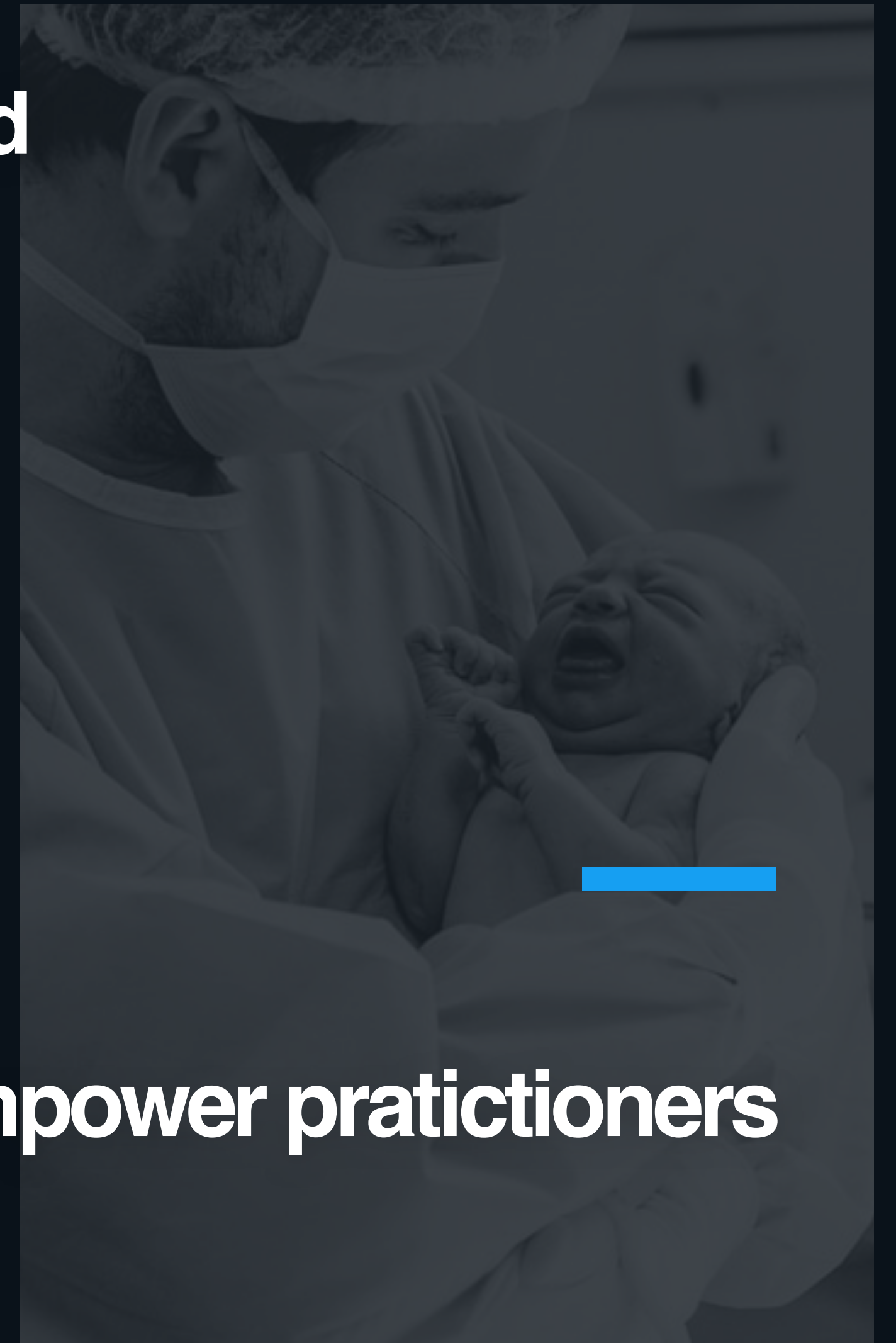
POST TRUTH ERA



**Citizens: Diagnosis and information**



**Test population, notify and monitor cases and beds**



**Empower practitioners**

**FIGHTING AGAINST COVID-19**

# Coronavirus SUS

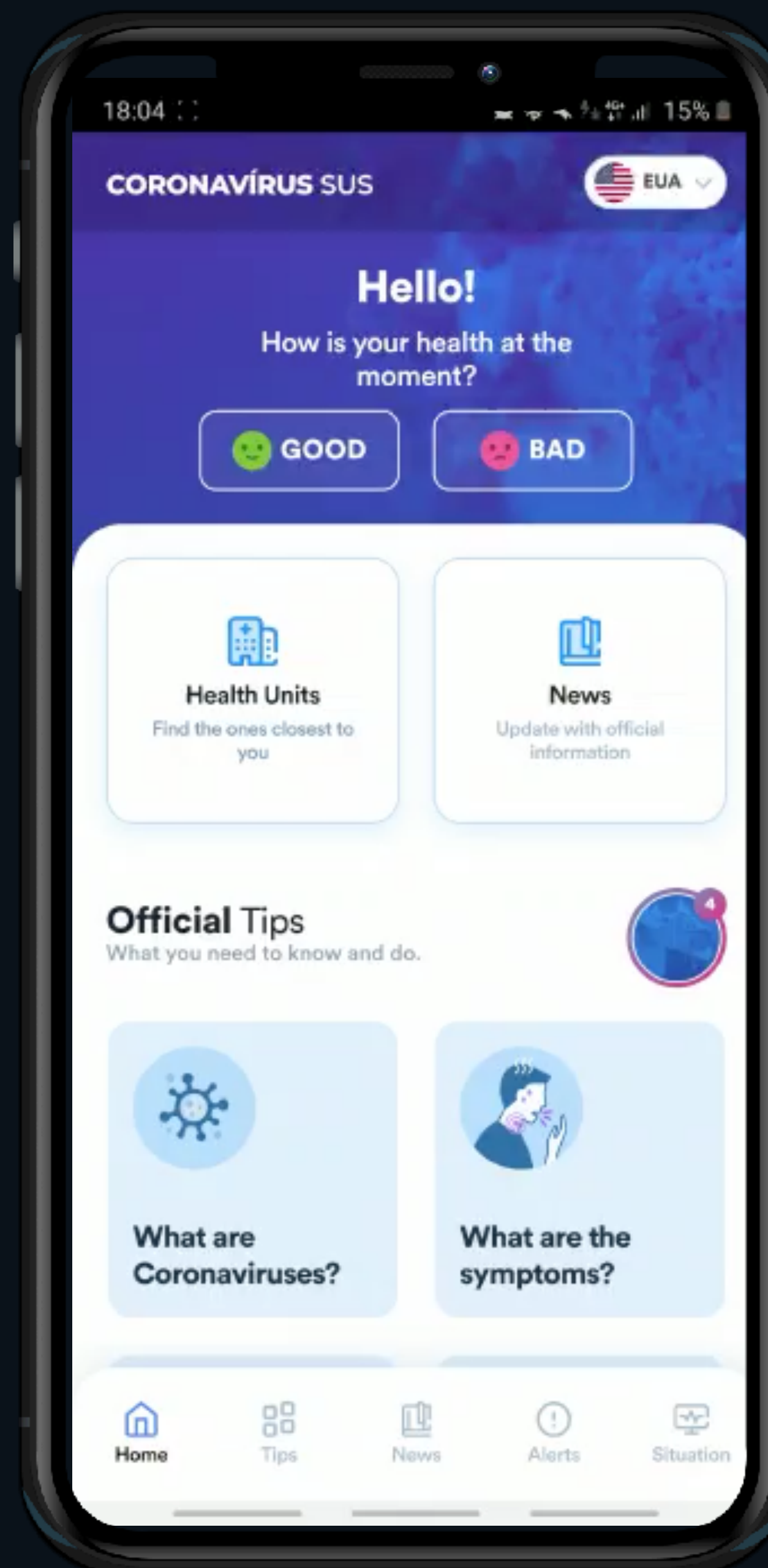
Diagnosis App/PWA

Chatbot

Calling robot

# Coronavirus SUS

CITIZENS



A low-angle photograph of a woman with dark hair, wearing a white t-shirt, talking on a mobile phone. She is standing in front of a brick wall. The image is overlaid with a semi-transparent blue filter. The text 'TeleSUS' is positioned in the bottom left corner.

**TeleSUS**

SOCIAL INCLUSION

# COVID Case's Notification

NOTIFY, TEST AND MONITOR



# Notifica SUS

MONITOR CASES  
AND BEDS

The screenshot displays the 'e-SUS VE' interface for COVID-19 monitoring. The left sidebar shows the user 'Marcus Fellipe de ... Federal' and navigation options like 'Notificações', 'Leitos', 'Gestão de Usuários', and 'Sair com segurança'. The main content area is titled 'Leitos COVID19' and includes a 'Criar notificação' button and two filter tabs: 'Leitos pactuados' and 'Leitos ocupados'. A table displays the following data:

Estado	Município	CNES	DATA	OCUPAÇÃO HOSPITALAR		OCUPAÇÃO SRAG/COVID-19		
				CLI	UTI	CLI	UTI	
Distrito Federal	Brasília	1234567890	29/04/2020	999	999	999	999	⋮
Distrito Federal	Brasília	1234567890	29/04/2020	50	25	48	22	⋮
Distrito Federal	Teste	1234567890	29/04/2020	30	10	28	8	⋮
Minas Gerais	Belo Horizonte	2200422	28/04/2020	0	0	11	0	⋮
Distrito Federal	Brasília	11111111	28/04/2020	2	2	2	2	⋮
Distrito Federal	Brasília	11111111	28/04/2020	1	1	1	1	⋮

At the bottom of the table, there is a 'Linhas por página' dropdown set to '10' and a pagination indicator '1-10 de 68'. A legend at the bottom left defines 'CLI - Clínicos/Enfermarias' and 'UTI - Unidade de Terapia Intensiva'. The footer includes logos for 'SUS', 'DATASUS', 'MINISTÉRIO DA SAÚDE', and 'PÁTRIA AMADA BRASIL'.

# Dashboard

CASES AND  
RESOURCES

The dashboard displays COVID-19 data for various locations. The table below summarizes the data shown in the screenshot:

Estado	Município	CNES	DATA	OCUPAÇÃO HOSPITALAR		OCUPAÇÃO SRAG/COVID-19		
				CLI	UTI	CLI	UTI	
Distrito Federal	Brasília	1234567890	29/04/2020	999	999	999	999	⋮
Distrito Federal	Brasília	1234567890	29/04/2020	50	25	48	22	⋮
Distrito Federal	Teste	1234567890	29/04/2020	30	10	28	8	⋮
Minas Gerais	Belo Horizonte	2200422	28/04/2020	0	0	11	0	⋮
Distrito Federal	Brasília	111111111	28/04/2020	2	2	2	2	⋮
Distrito Federal	Brasília	111111111	28/04/2020	1	1	1	1	⋮

Additional interface elements include a sidebar with navigation options (Notificações, Leitos, Gestão de Usuários, Sair com segurança), a top navigation bar with the user's name (Marcus Fellipe de ... Federal) and a 'Criar notificação' button, and a table with 10 rows per page and 68 total rows. The footer contains logos for SVS, DATASUS, and the Brazilian Ministry of Health (Ministério da Saúde).

# Test Strategy

50K Labs + 42M tests(Phase one)

# ConecteSUS

## COVID'S EXAM RESULT + TIMELINE

The screenshot displays the ConecteSUS web application interface. At the top, there is a navigation bar with the G.O.V. BR logo on the left and links for 'ACESSO À INFORMAÇÃO', 'PARTICIPE', 'SERVIÇOS', 'LEGISLAÇÃO', and 'ÓRGÃOS DO GOV' on the right. Below this, the main header features the ConecteSUS logo and a search bar for patient records. The left sidebar contains a menu with options: 'Ajuda', 'Configurações', and 'Sair com segurança'. The main content area shows the profile of 'Maria Aparecida de Sousa', an 87-year-old patient from Sorocaba, SP. Below the profile, there are four tabs: 'Atendimentos e Internações', 'Retiradas de Medicamentos', 'Vacinas', and 'Exames realizados'. The 'Atendimentos e Internações' tab is active, displaying a list of medical records for the last 12 months. The records include two clinical consultations and two hospitalizations, all dated 28 Nov 2019, with a diagnosis of 'A90 - Dengue/ Z33 - Cefaléia' and a duration of 3 days.

GOV BR

ACESSO À INFORMAÇÃO | PARTICIPE | SERVIÇOS | LEGISLAÇÃO | ÓRGÃOS DO GOV

ConecteSUS

PROFISSIONAL  
**João da Silva de Sousa**  
000.000.000-00

ESTABELECIMENTO  
**Hospital de Base**

MENU

- Ajuda
- Configurações
- Sair com segurança

Pesquisar paciente

Busque por CPF do paciente

Buscar

**Maria Aparecida de Sousa**  
87 anos · Sorocaba, SP  
000.000.000-00

Alertas encontrados  
Campanha contr HPV, Vacina contra...

Atendimentos e Internações

Retiradas de Medicamentos

Vacinas

Exames realizados

Filtre um registro por palavras-chave...

Últimos 12 meses

**ATENDIMENTO CLÍNICO**  
28 Nov 2019  
CBO: 223228 - Cirurgião Dentista - Odontogeriatra  
Diagnóstico/Problema: A90 - Dengue/ Z33 - Cefaléia

**INTERNAÇÃO**  
28 Nov 2019 - 31 Nov 2019  
Diagnóstico: A90 - Dengue/ Z33 - Cefaléia  
Tempo de permanência: 3 dias

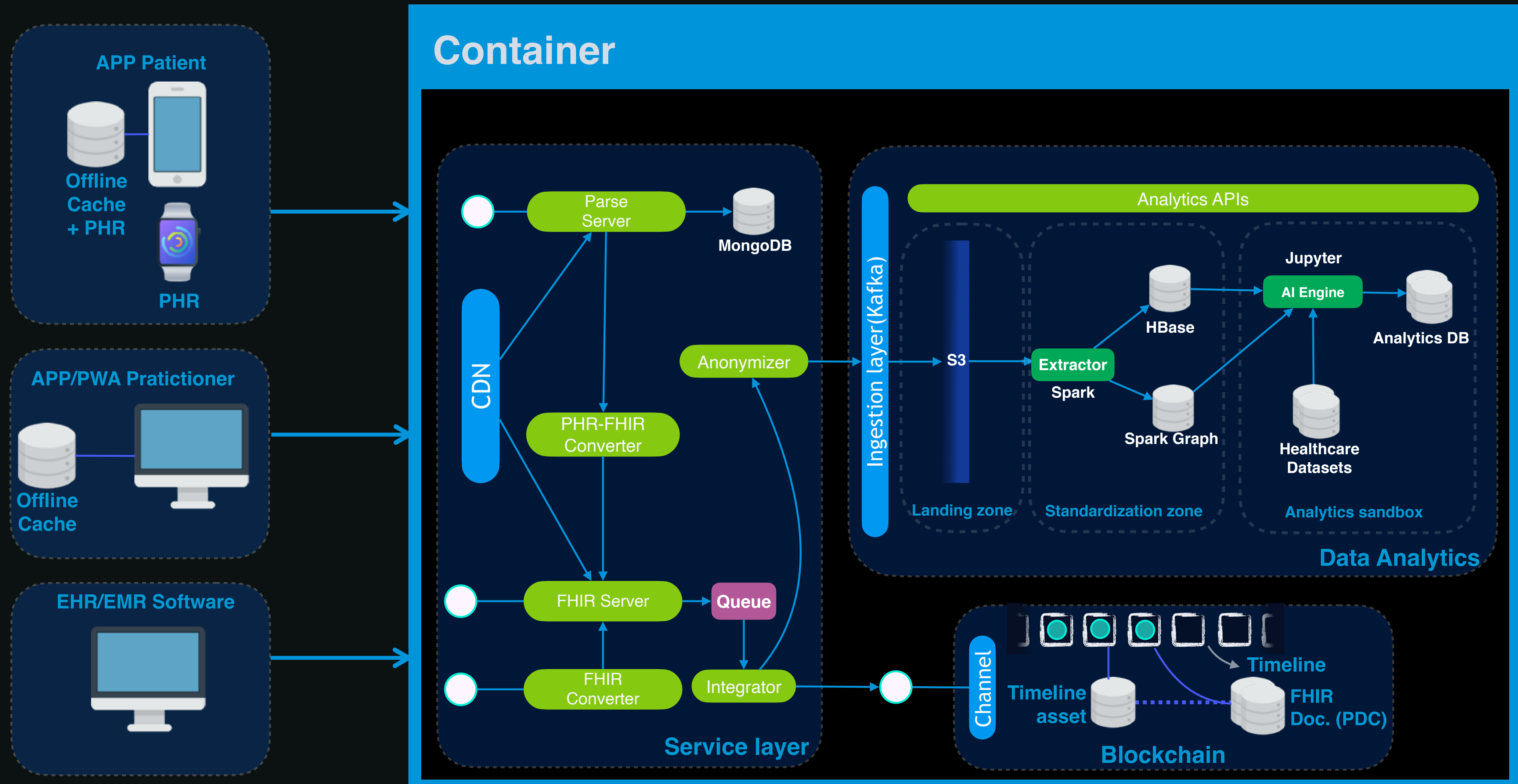
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# Blockchain

Shared Timeline

# Healthcare Architecture



# Private Data Collection and GDPR\*

Patient consent access to his data  
in Smart Contract

# Performance

2000 TPS(read and write) on AWS Cloud

RAFT Consensus(5 nodes)

Timeline channel and Log channel

3 private data collections

CouchDB





# **FHIR Standard**

Services ready for packaging messages in  
Brazilian standard

**CLINICAL  
DOCUMENT**

**PERSONAL  
HEALTH DATA**

**EXAMS**

**OBSERVATIONS**

**EHR  
EMR**

**Apple Watch  
Galaxy Watch  
FitBit**

**Diagnosis  
Images  
Equipments**

**App Patient  
App Doctor**

**RNDS**



**Condition**



**Encounter**



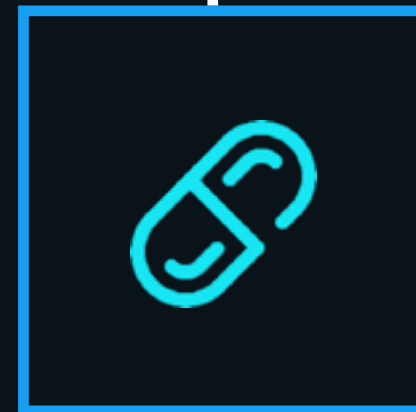
**Procedure**



**Observation**



**Immunization**



**Medication  
Dispense**



**Composition**

**BRAZIL'S FHIR PROFILE**

# Integration

FHIR APIs and HL7, OpenEHR and CDA converters



# After the Pandemic

‘NEW NORMAL’: ARE WE PREPARED?



# Blockchain + AI

Intelligent patient summary, Prognosis, Drug  
recommendation,...

A woman with blonde hair, wearing a light blue hospital gown, is shown in profile, looking towards a computer monitor. The monitor displays a patient summary interface with various data fields and a sidebar. The background is a blurred hospital room with other people and equipment. The overall image has a blue tint.

# Patient's summary

USING AI WITH BLOCKCHAIN'S TIMELINE



# Graphs + AI

EXPOSURE NOTIFICATION API AND FHIR'S TIMELINE GRAPH



# Rethinking Healthcare

Telemedicine, rapid tests, new approach on  
hospitals,...



A man with a beard, wearing a light-colored t-shirt and a jacket, is looking down at a smartphone in his hands. The background is a blurred indoor setting, possibly a hallway or office. The entire image is overlaid with a dark, semi-transparent filter.

# E-Patient

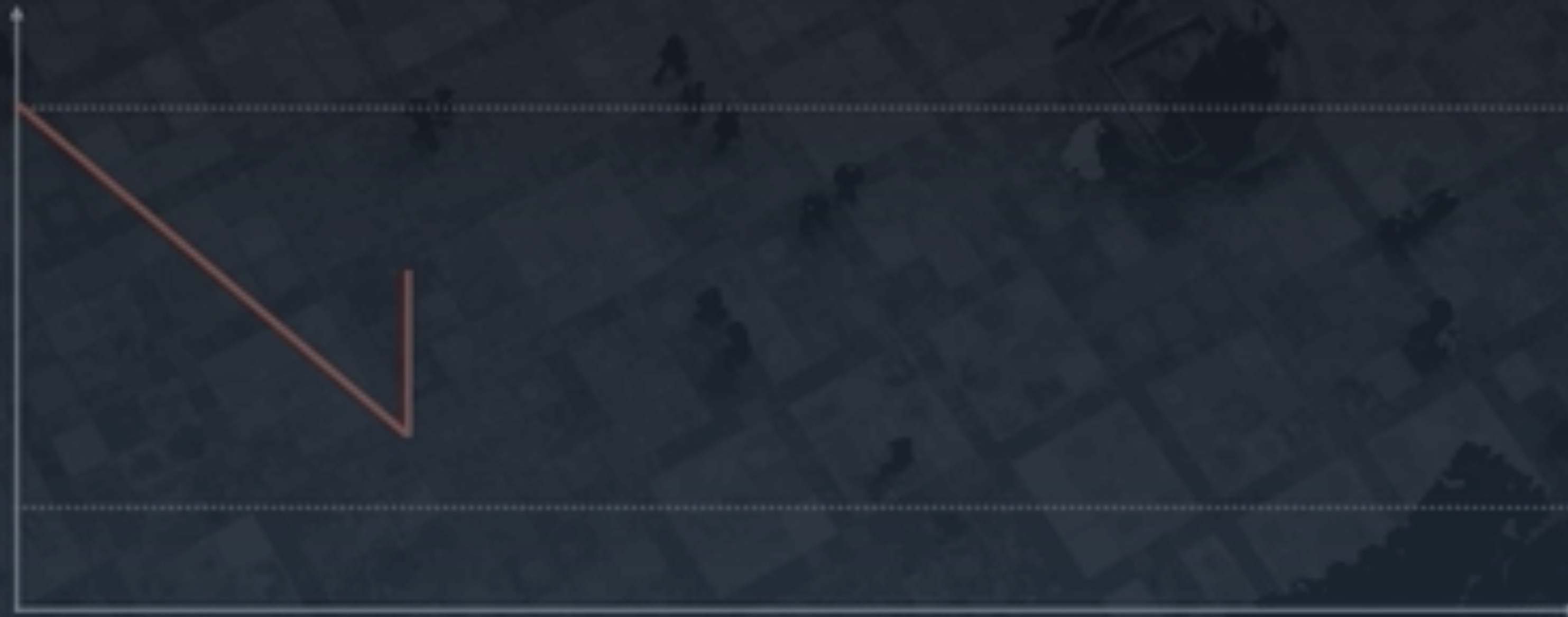
The patient as CEO of his own health



# Preventive medicine

Health risk analysis through AI  
Enhanced timeline data(Wearables, IoT...)

SAÚDE



IDADE

# Longevity escape velocity

HEALTH MAINTENANCE: PROGNOSIS + PREVENTION + HEALTH MANAGER



**ARTIFICIAL  
INTELLIGENCE**



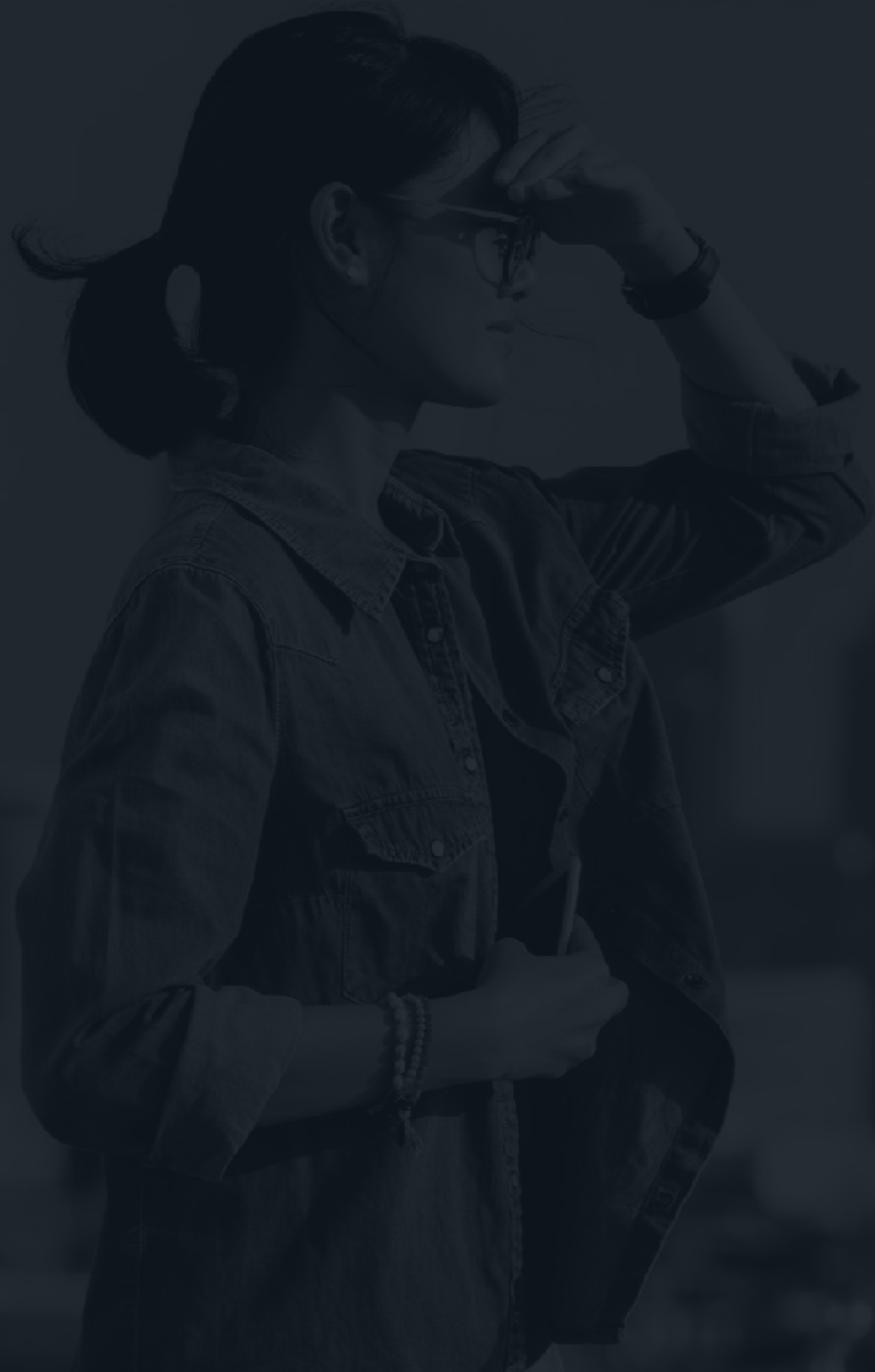
**IOT/WEARABLES**



**BIOTECH**



**GENOMICS**



# Thank you!



Diógenes Firmiano  
diogenesjf@gmail.com  
+55 61 99426-4048