XXIV Jornadas Científicas de Análises Clínicas e de Genética Humana

Leveraging Digital Health & AI to improve healthcare sustainability

XXIV Jornadas Científicas de Análises Clínicas e de Genética Humana

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ERO

Globally, healthcare providers are at capacity and cannot keep up with people's needs.

50% of EU population says waiting times are too long

Source: OCDE, Medscape

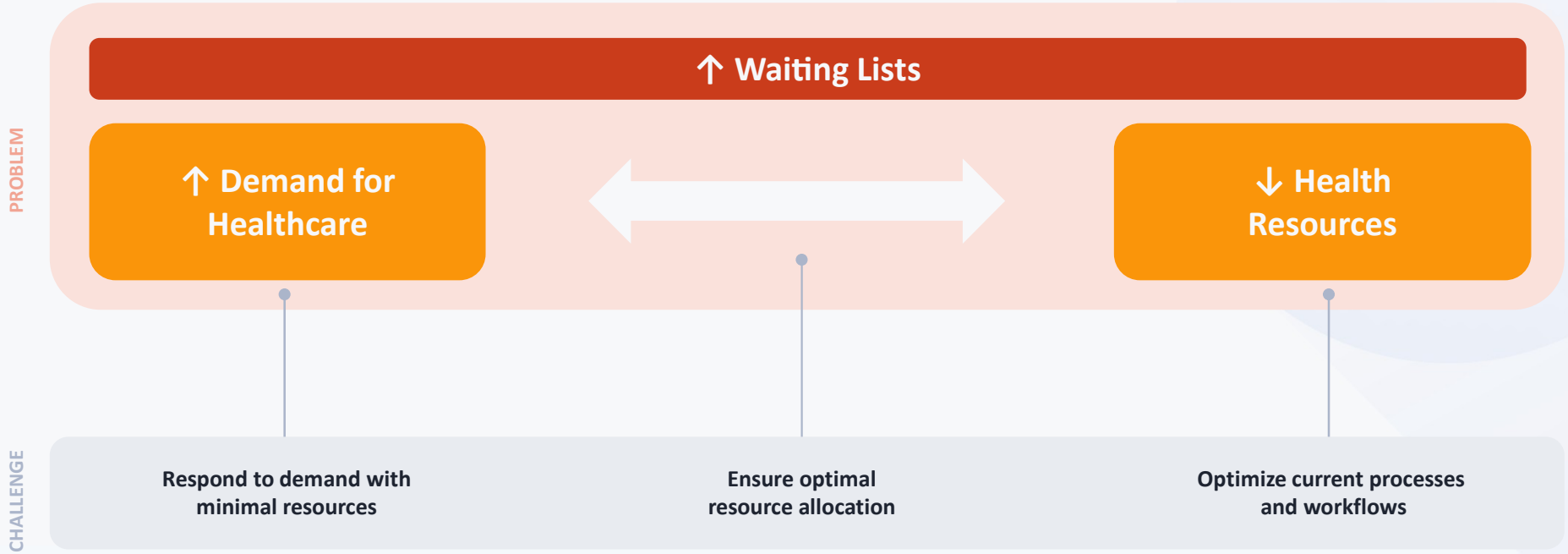
Diapositivo 2

ER0 Números

Eduardo Rodrigues; 2023-05-22T13:07:12.854

Challenges

Providers and healthcare systems are challenged to increase access with minimal resources, due to increased demand and medical shortages

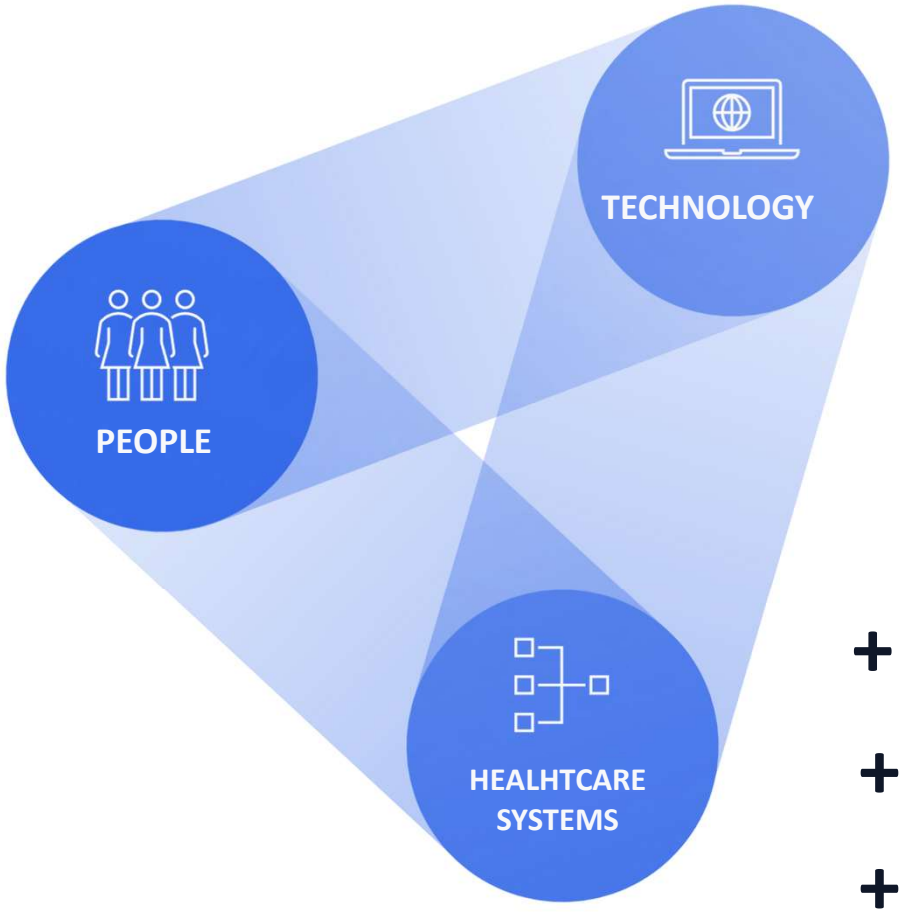


Sources for problem identification: OECD (2017), Tackling Wasteful Spending on Health, OECD Publishing, Paris | Uscher-Pines, L., Pines, J., Kellermann, A., Gillen, E., & Mehrotra, A. (2013). Emergency department visits for nonurgent conditions: systematic literature review. The American journal of managed care, 19(1), 47–59.

Two interventions

Time-to-Market	**Months**	Short due to Agile methodologies and iterative development processes.	**Decades**	Typically longer due to extensive research, development, and regulatory approval processes.

The perfect storm for digital health



+ Digital literacy
+ Connected
+ Unmet needs

+ Agile
+ Capital
+ Data

+ Undersized
+ Expensive
+ Overloaded

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Examples

Digital health solutions can be broadly categorized into two types, often perceived as Software-as-a-Medical-Device (SaMD)

Healthcare SaaS

Software implemented in health units

Tech-enabled Health Services

Software integrated with a care component

The constant pressure to deliver high-value care is overwhelming healthcare professionals across all sectors

There has been an increase demand for care
driven by an aging population, the rise in chronic diseases and the improved access to healthcare

… which results in

Workload and burnout

Due to longer working hours, increased patient volumes, and complex decision-making

Challenges reaching personalized care

Due to dealing with complex conditions and shortage of resources

Innovation and affordability constraints

Due to the pressure to develop drugs that are not only effective but also affordable

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The world is moving forward to overcome this challenge by improving the availability of healthcare data and advancing healthcare technology

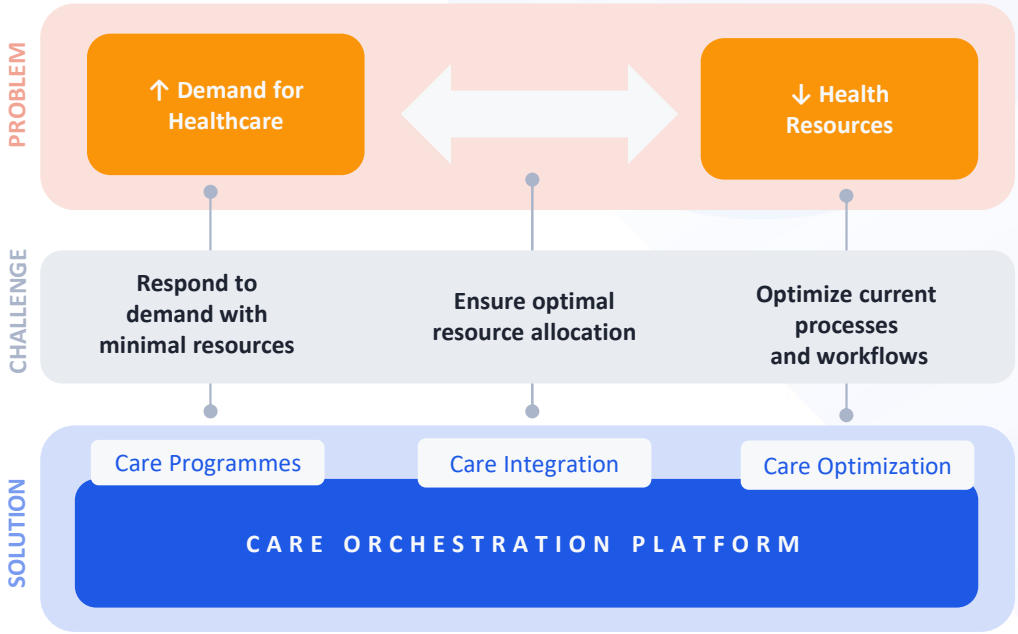
Improving the availability of healthcare data

Through advancements in digital health technologies, increased adoption of electronic health records, better data interoperability, and the growing use of real-world evidence

Advancing healthcare technology

By developing AI-powered technologies that enhance tools for diagnostics, treatment, patient monitoring, and personalized medicine

... but how can we leverage these tools to better support healthcare professionals and enhance patient outcomes?



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Redefining care provision with artificial intelligence

AI models bounded by clinical pathways

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AI Models

Widescale adoption and application of artificial intelligence in healthcare

Timeline	Connected/ augmented care	Precision diagnostics	Precision therapeutics	Precision Medicine	Summary
Short term: 0–5 years	Internet of things in healthcare Virtual assistants Augmented telehealth Personalised mental health support	Precision imaging (eg diabetic retinopathy and radiotherapy planning)	CRISPR (increasing use)	Digital and AI enabled research hospitals[30]	AI automates time consuming, high-volume repetitive tasks, especially within precision imaging
Medium-term: 5–10 years	Ambient intelligence in healthcare	Large-scale adoption and scale-up of precision imaging	Synthetic biology Immunomics	Customisation of healthcare Robotic assisted therapies	AI uses multi-modal datasets to drive precision therapeutics
Long term: >10 years	Autonomous virtual health assistants, delivering predictive and anticipatory care Networked and connected care organisations (single digital infrastructure)	Holographic and hybrid imaging Holomics (integrated genomic/radiomic/ proteomic/clinical/ immunohistochemical data)	Genomics medicine AI driven drug discovery	New curative treatments AI empowered healthcare professionals (eg digital twins)	AI enables healthcare systems to achieve a state of precision medicine through AI-augmented healthcare and connected care

Bajwa J, Munir U, Nori A, Williams B. Artificial intelligence in healthcare: transforming the practice of medicine. Future Healthc J. 2021 Jul;8(2):e188-e194. doi: 10.7861/fhj.2021-0095. PMID: 34286183; PMCID: PMC8285156.

AI Models

Medical AI models are largely still developed with a task-specific approach to model development

	Clinical models	Operational models
Natural Language Processing	• Unstructured data analysis • Chatbots and virtual assistants • Literature and publications	• Augmented telehealth
Voice Recognition	• Patient voice analysis	• Speech-to-Text
Recommendation Systems	• Decision support systems (bounded by pathways) • Clinical data summaries	
Predictive Analytics	• Risk stratification • Disease progression models	• Disease outbreak prediction (public health)
Computer Vision and Precision Imaging	• Medical imaging analysis • Surgical navigation • Precision imaging	
Robotics	• Surgical robots • Rehabilitation robots	• Disinfection robots
Generative Models	• Drug discovery	• Synthetic data generation

Moor, M., Banerjee, O., Abad, Z.S.H. et al. Foundation models for generalist medical artificial intelligence. Nature 616, 259–265 (2023). https://doi.org/10.1038/s41586-023-05881-4

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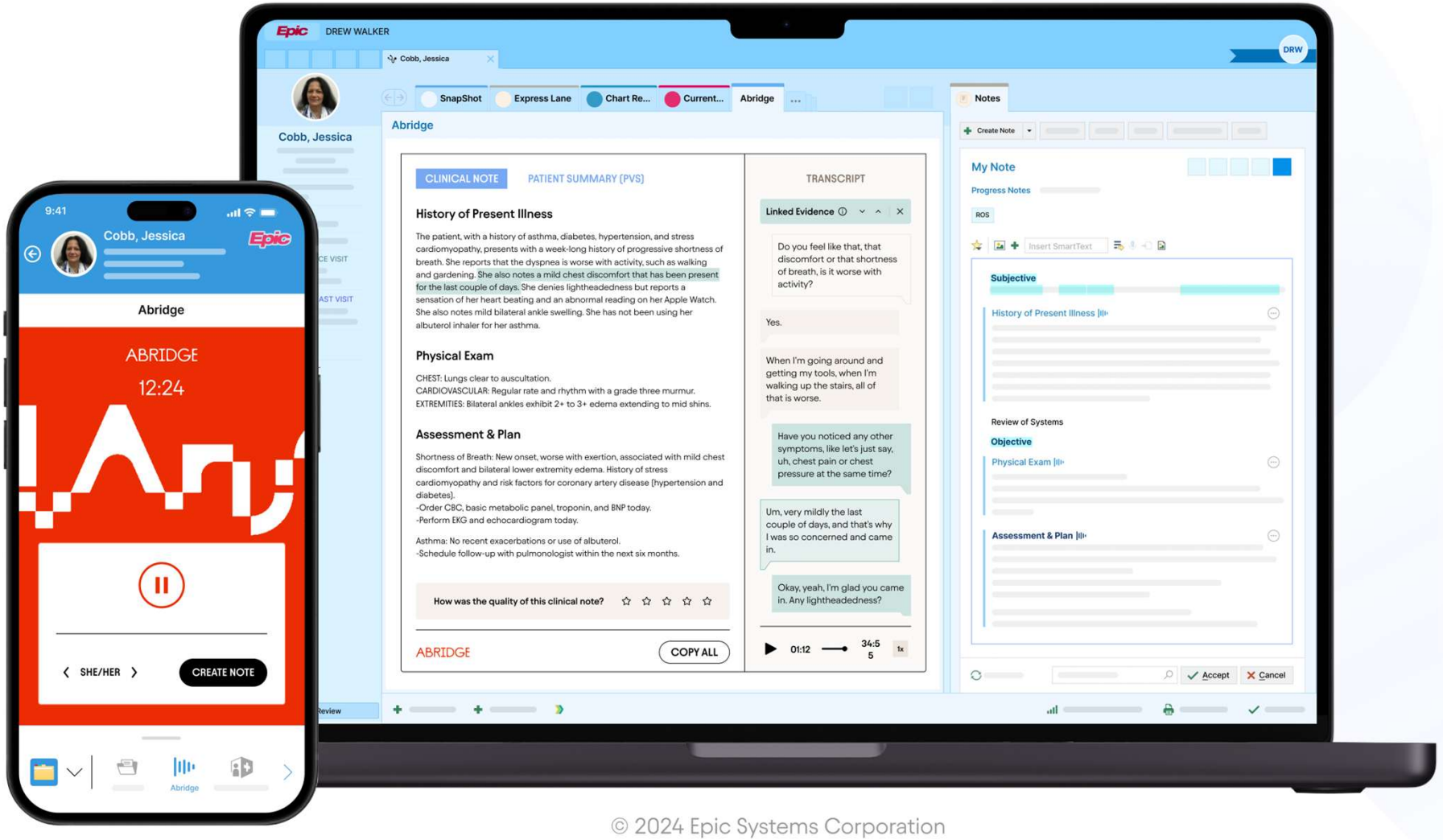
AI in Healthcare

Operational AI



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AI in Healthcare

Clinical AI

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AI in Healthcare

Hybrid AI

Jasmine

Pre-Op: Colonoscopy

Gastroenterology | Pre-Op

Satisfaction Score: **83.9%**

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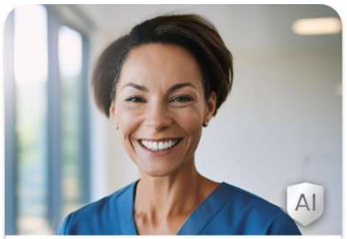

Felicia

Monthly Medication Reconcilliation

General | Check-in

Satisfaction Score: **83.4%**

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Emma

Discharge: Congestive Heart Failure

Cardiology | Check-in

Satisfaction Score: **83.2%**

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Rachel

Ongoing: Chronic Kidney Disease

Urology | Check-in

Satisfaction Score: **83.1%**

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Caroline

Wellness Program

General | Check-in

Satisfaction Score: **82.4%**

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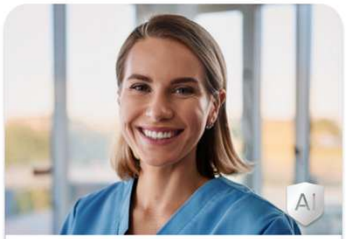

Ivy

Discharge: Total Knee Replacement

Orthopedics | Post-Op

Satisfaction Score: **80.1%**

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Molly

Post-Discharge Follow-up: Asthma/COPD

Allergy | Post-Discharge

Satisfaction Score: In Progress

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Cora

Care Plan Review With Care Pro

General | Care Plan

Satisfaction Score: In Progress

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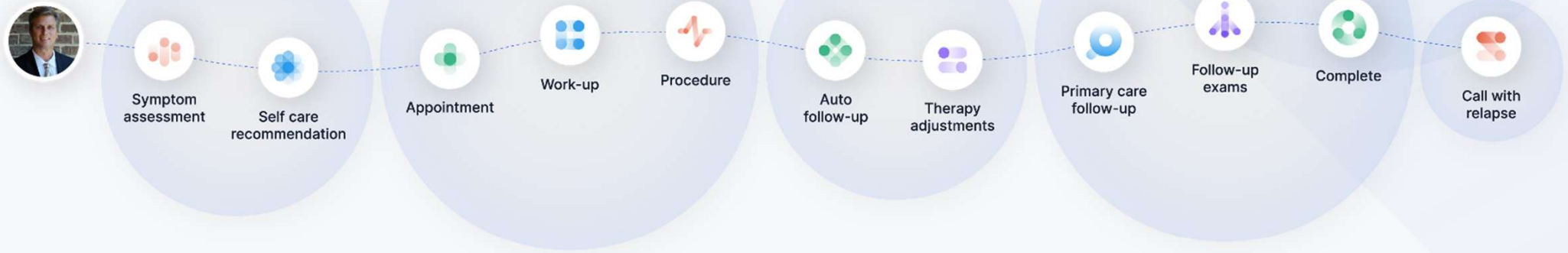
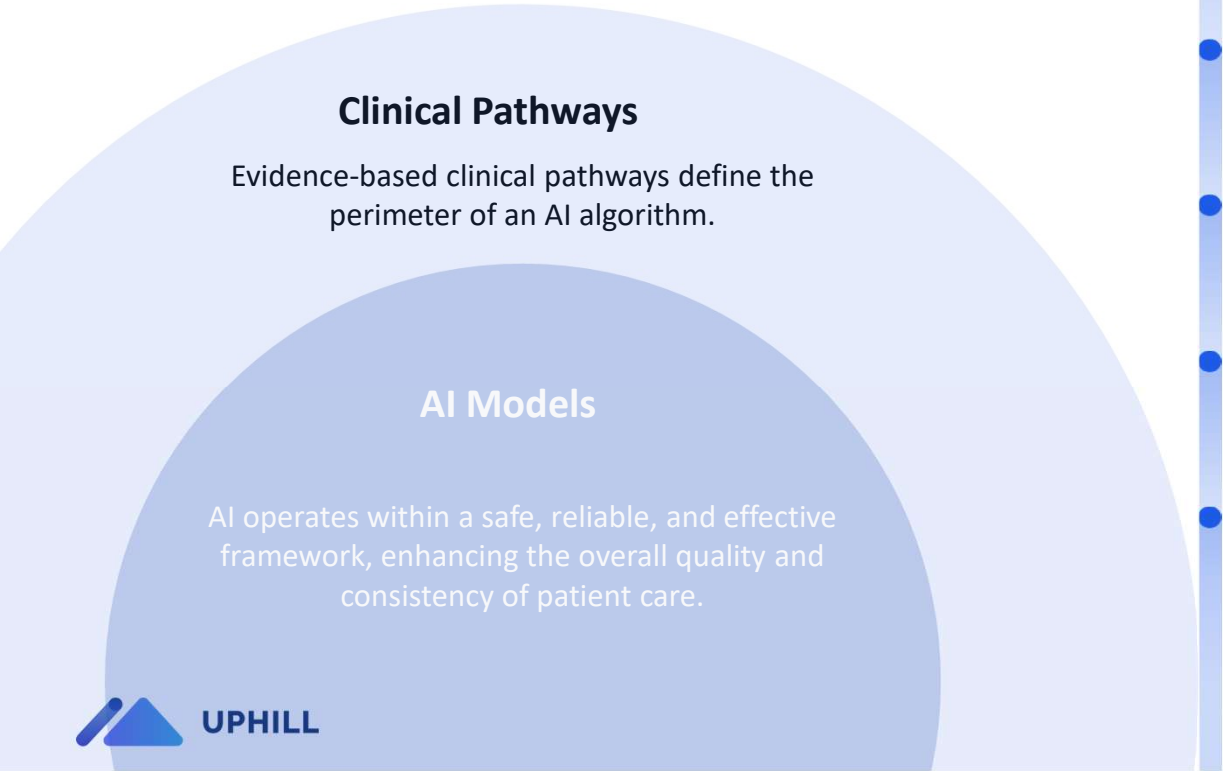
Journey-based care is a clinical approach based on integrated and multilevel care processes that addresses the lack of capacity and coordination



AI Models

Integrating evidence-based clinical pathways and AI models leverages the strengths of structured clinical guidelines and advanced data analytics



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Scope and focus

Avoid non-compliant models, deviant from guidelines

Decision Support

Data-driven and evidence-based recommendations

Guiding Principles

Recommendations prioritization with reduced bias

Safety and Reliability

Safe eligibility criteria

Operational Boundaries

Assist within pre-defined tasks and pathway steps

Using clinical pathways to redefine care

From theory to practice

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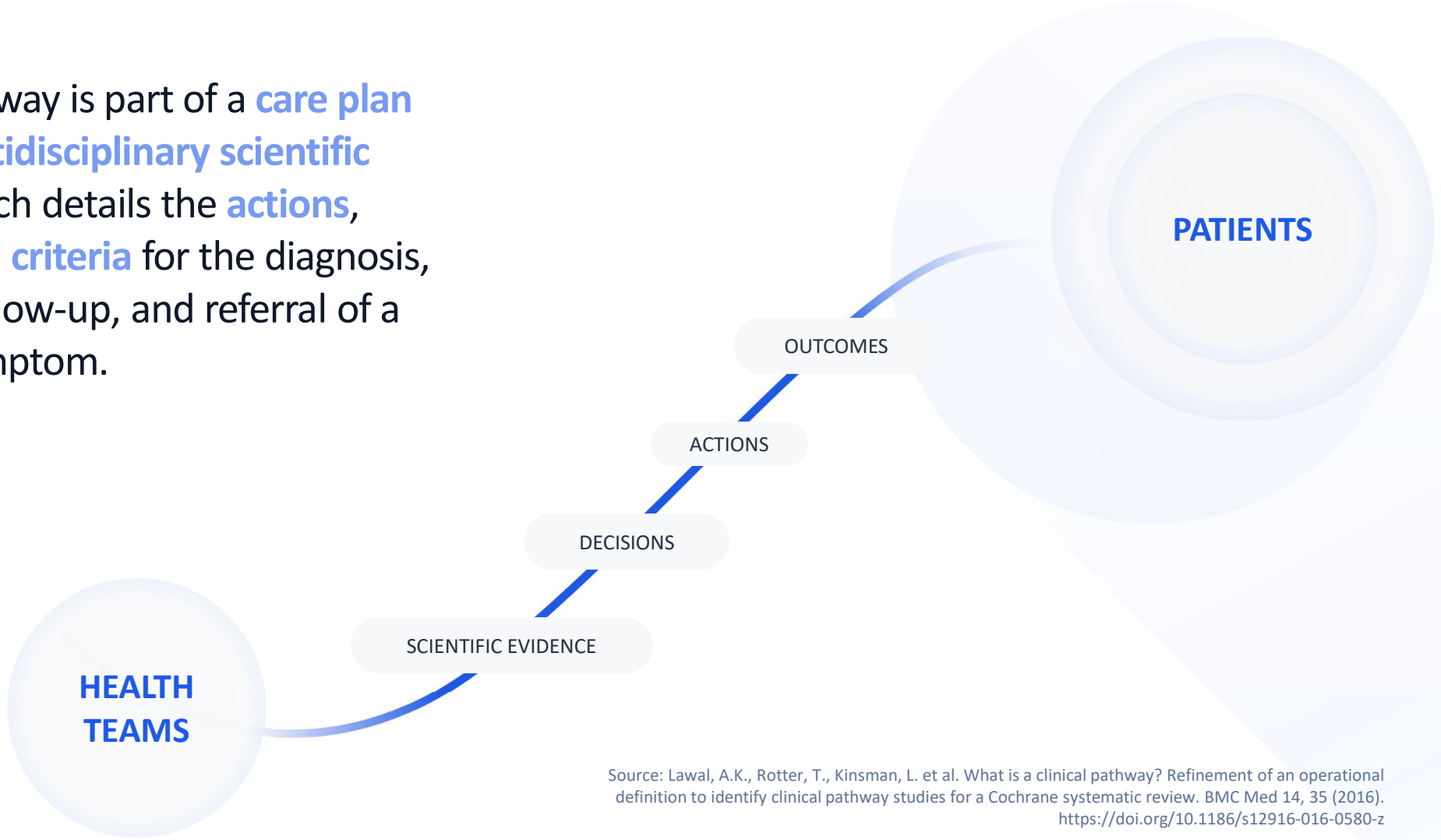
Concepts

A clinical pathway is part of a **care plan** based on **multidisciplinary scientific** evidence, which details the **actions**, **decisions**, and **criteria** for the diagnosis, treatment, follow-up, and referral of a disease or symptom.



Source: Lawal, A.K., Rotter, T., Kinsman, L. et al. What is a clinical pathway? Refinement of an operational definition to identify clinical pathway studies for a Cochrane systematic review. BMC Med 14, 35 (2016). https://doi.org/10.1186/s12916-016-0580-z

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Clinical pathways

Why are clinical pathways an essential component of care integration?

Clinical pathways support care integration in the provision of **coordinated healthcare services** across **different levels and settings of care**.

- **Standardization of Care**
- **Improved Communication**
- **Patient-Centred Care**
- **Streamlined Care Transitions**
- **Enhanced Patient Outcomes**
- **Efficiency and Cost-Effectiveness**

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An integrated care approach powered by RWE can shape individual patient care provision while streamlining delivery on a population-wide scale

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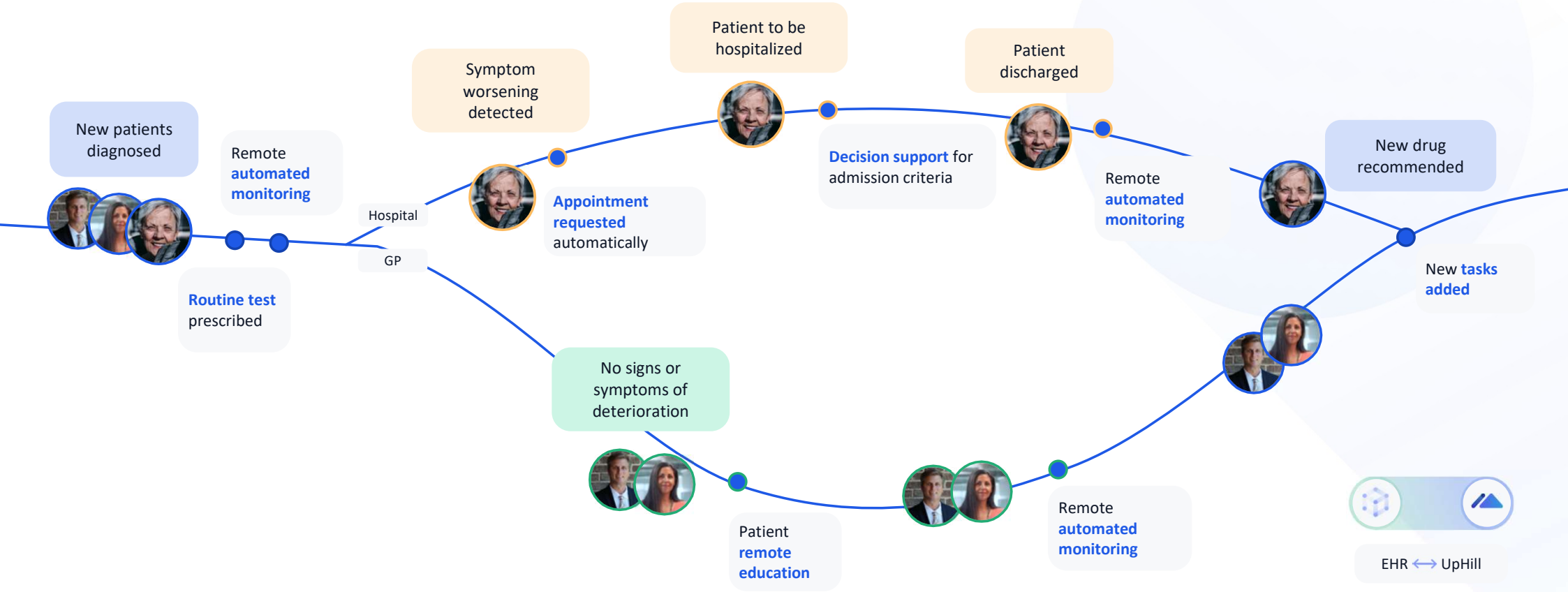
Patient Journeys

With personalized patient journeys, supported by evidence-based clinical pathways, health teams can optimize their workflow activities



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Chronic Package Case Study

Amadora-Sintra Local Health Unit

Enhancing PCP capacity through automatic care programmes for Diabetes

-80%
avoidable task

-40%
outsourcing cost reduction

+32%
access to PCP

30,000
diabetic patients

UNIDADE LOCAL DE SAÚDE
AMADORA / SINTRA

Problem

High volume of patients without assigned family physicians and primary care centers unable to prioritize appointments for unstable patients.

Solution

Characterize the diabetic population, prioritize in-person appointments for unstable patients, and ensure proper monitoring.

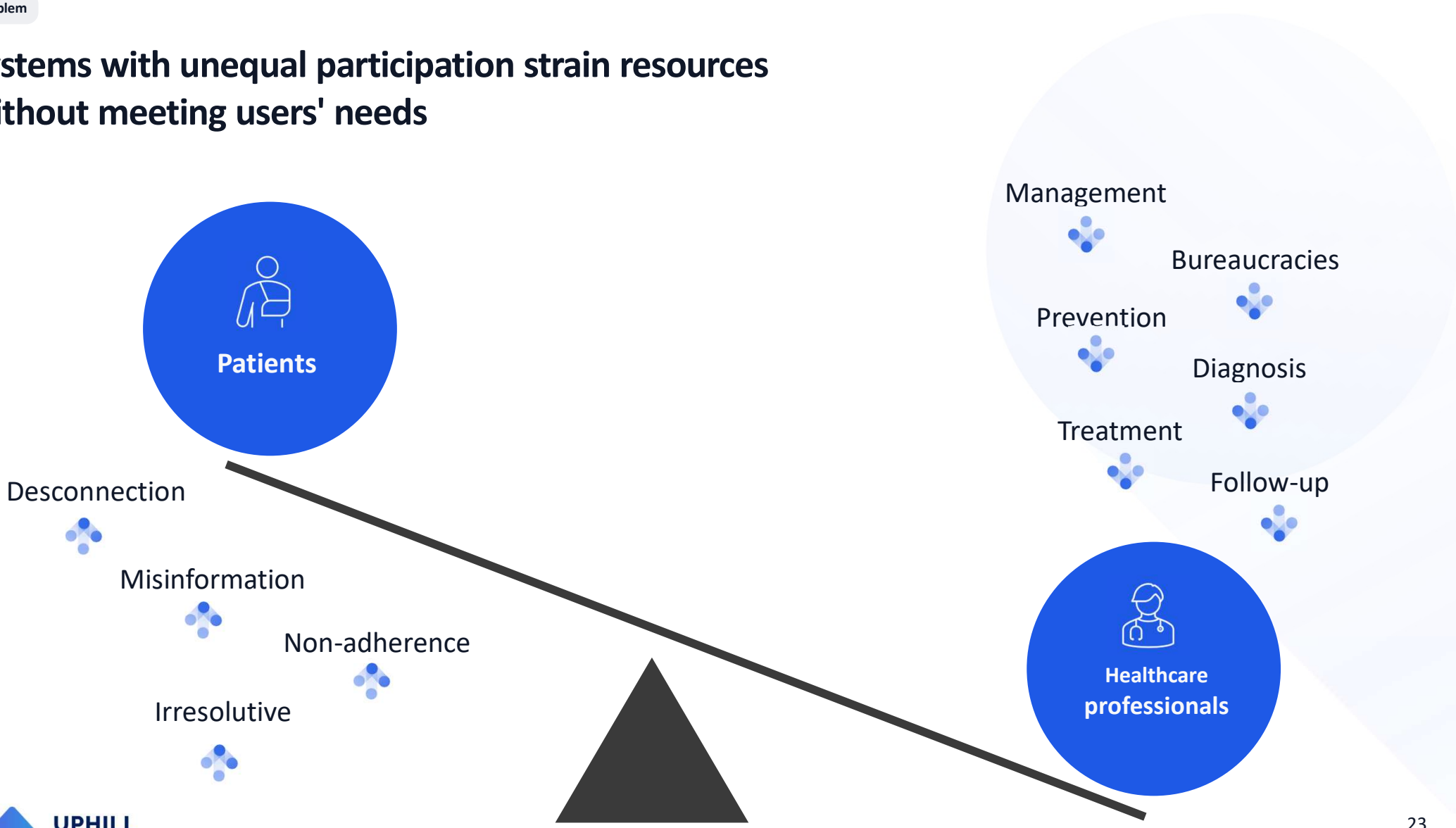
Benefits

Increased capacity and allocative efficiency

- Automatic assessment of patient clinical status
- Appointments prioritization according to risk stratification
- Less hospitalizations or admissions in the emergency department
- Reduced high-cost healthcare interventions

Problem

Systems with unequal participation strain resources without meeting users' needs



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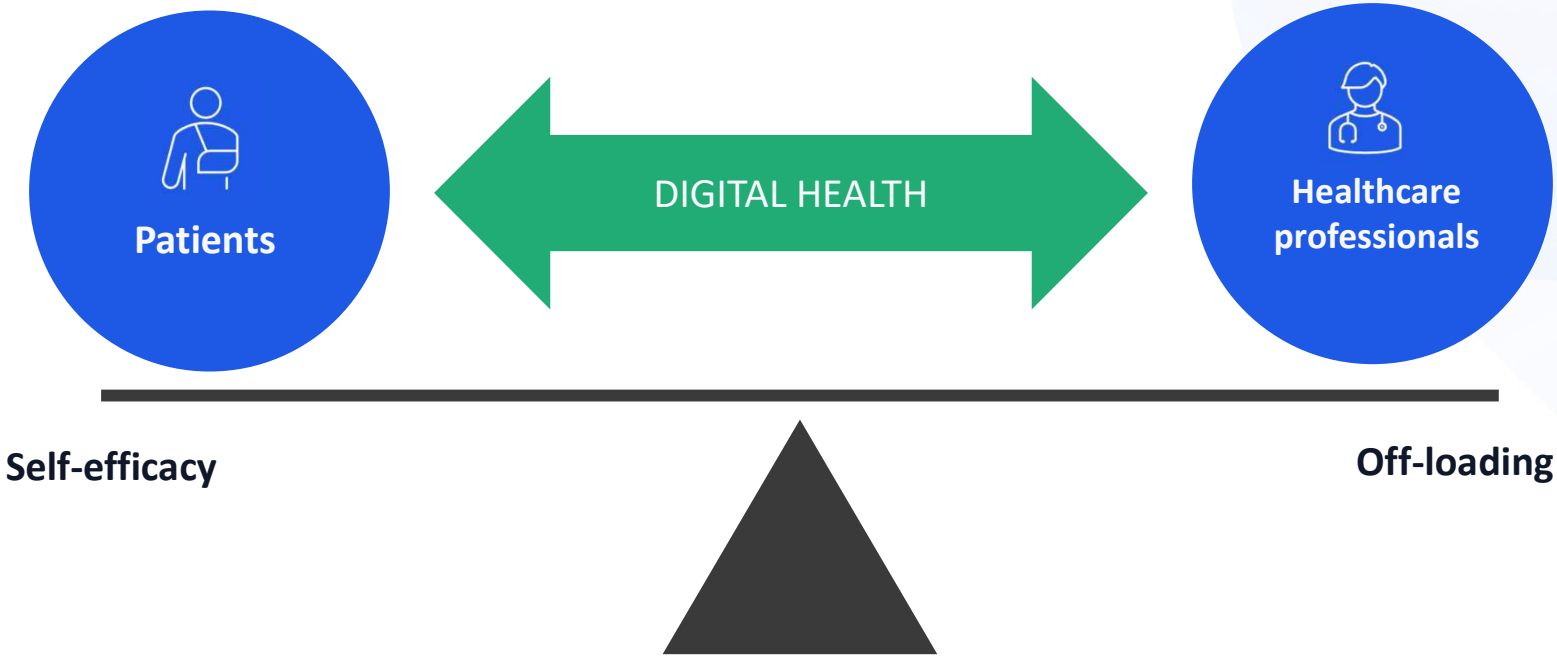
End - game

Digital health helps balance healthcare systems by providing users with more solutions while optimizing resource utilization



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The future is now.

And we desperately need it.

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Thank you.

Eduardo Freire Rodrigues

Co-founder & CEO

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