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IOMED.HEALTH

El uso de IA en el OMOP & Aseguramiento de la Calidad

Gabriel Maeztu M.D. - Cofundador y Director Médico @ IOMED

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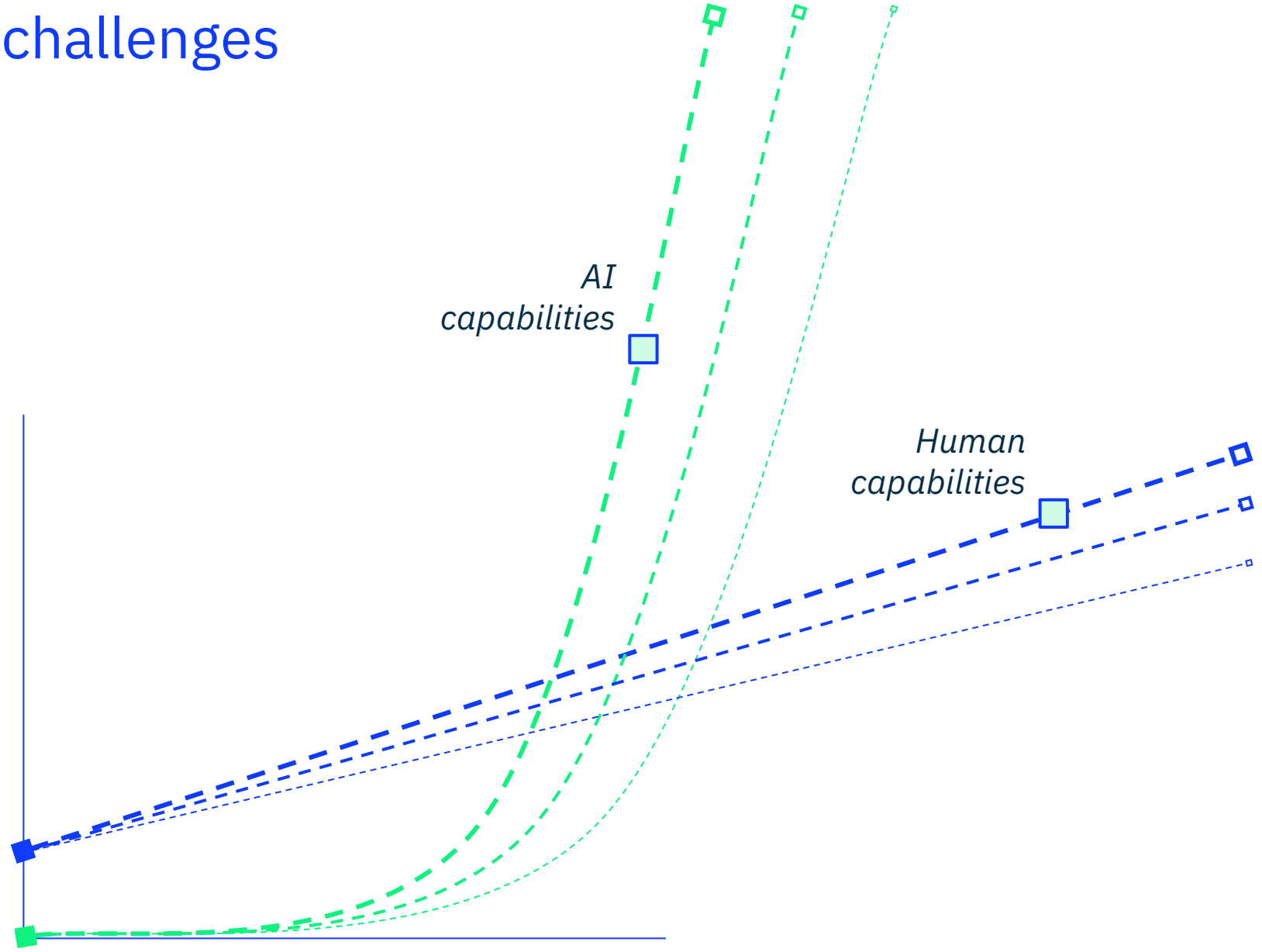
AI to face healthcare challenges

This is not just about replicating human capabilities, but more so about an autonomous response to a specific problem that needs solving.

AI to capture Real World Data



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→ Usos generales

Mapeo y Estandarización

Análisis de los datos

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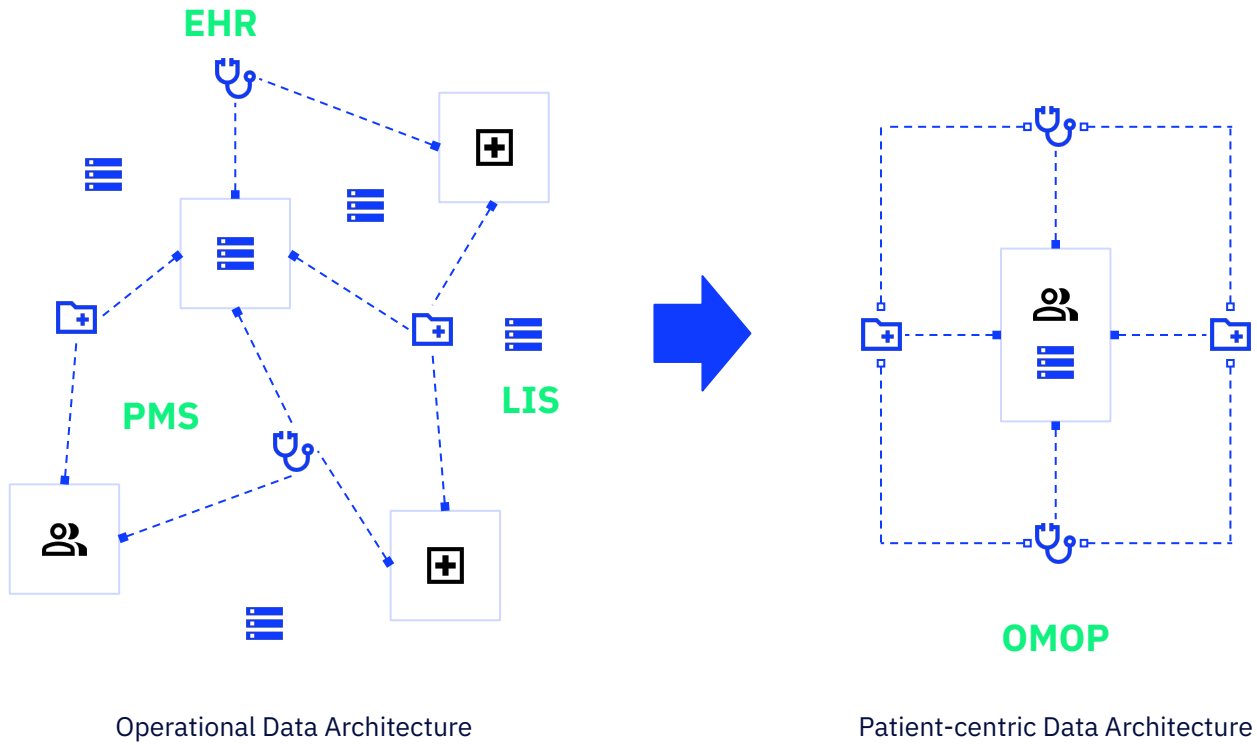
→ Usos de la IA

Mapeo y Estandarización

- El objetivo principal es **estandarizar** los datos del centro a gran escala.
- Esto permite acceder a nuevas fuentes de datos como:
  - Textos clínicos
  - Imagen médica
  - Datos ómicos

Creando datos paciente-céntricos

- La **digitalización** en los hospitales se ha **centrado en los procesos del hospital** y no en representar pacientes.
- En cada centro tiende a haber **varios sistemas de información** que dan soporte a procesos diferentes:
  - Historia Clínica Electrónica
  - Sistemas de gestión de Laboratorio
  - Farmacia y dispensación
  - Sistema de gestión de visitas
  - [...]
- El proceso de mapear los datos al OHDSI OMOP CDM se trata de construir **una versión digital del paciente** sumando los datos de múltiples fuentes, convirtiendo datos proceso-céntricos en datos paciente-céntricos.



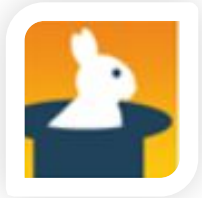
Operational Data Architecture

Patient-centric Data Architecture

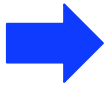
1. Extracción
2. Estandarización
3. Calidad

OHDSI Tools

White Rabbit



Rabbit In a Hat



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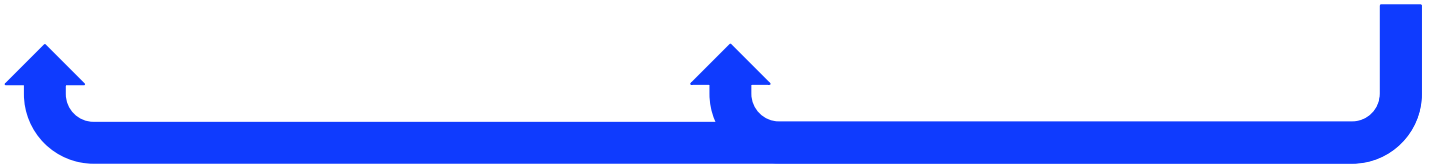
ACHILLES

DQD

Expertos en los datos evalúan las fuentes y definen la transformación de los datos al OMOP CDM

Personas con conocimientos médicos crean las asignaciones de códigos.

La calidad de los datos es evaluado, y se replantean los procesos de carga de datos y mapeos.



4. Ajustar

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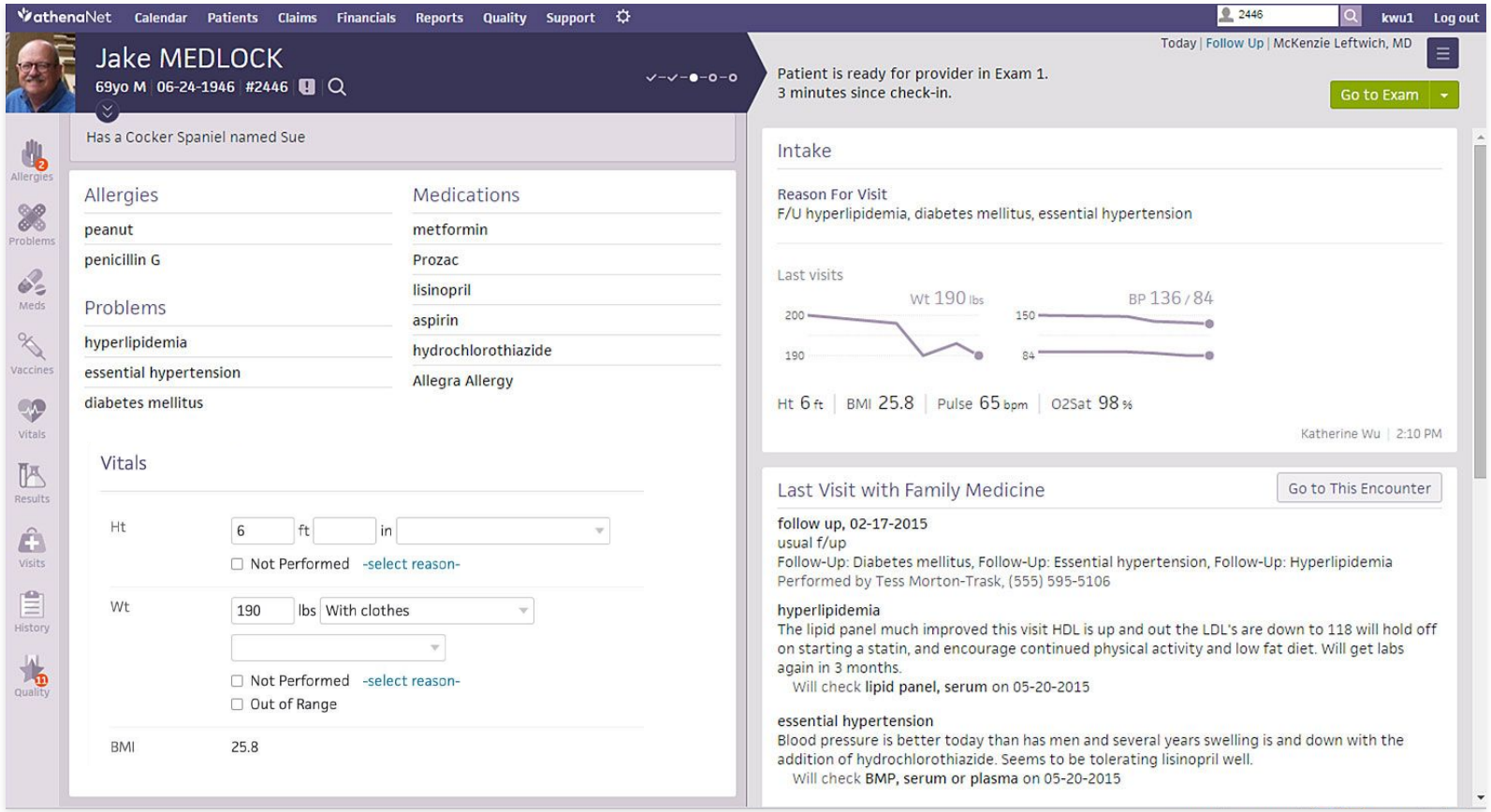
→ Bringing order to RWD thanks to AI



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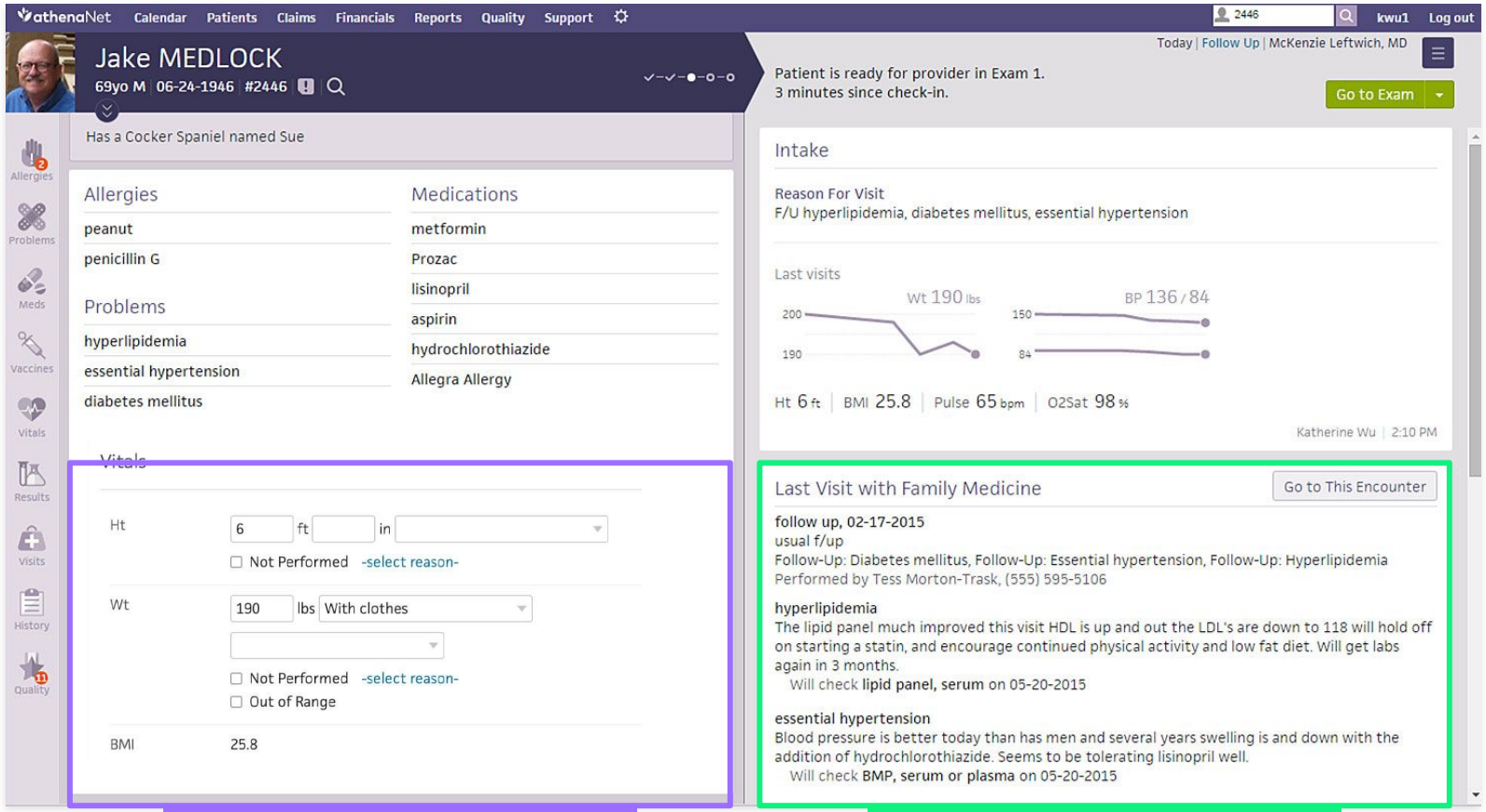

STRUCTURED DATA
20% of the patient information

CLINICAL NOTES
80% of the patient information

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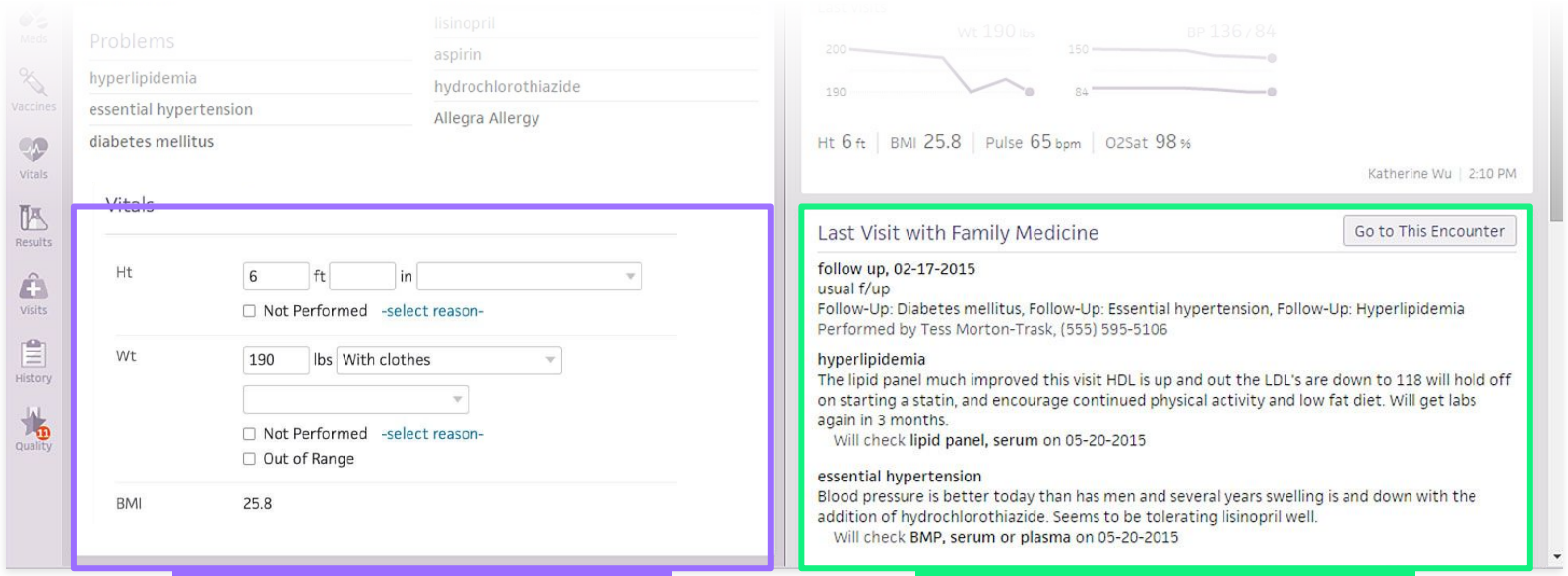
Bringing order to RWD thanks to AI



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CLINICAL NOTES
80% of the patient information

ID	patient_id	data_id	date	value	unit	visit
643	243	weight	2021-10-12	190	lbs	367
2891	243	weight	2021-11-21	170	lbs	458

noteID	person_id	date	value	visit
1	243	2021-10-12	follow up, 02-17-2015 usual f/up Follow-Up: Consultation on pian left arm since yesterday. Thi smorning pain persists. Had similar pain whn had AMI. Has taken nitrostat without improvement. Request of ECG	367

Non-standard codification

Data stored in free-text format

Bringing order to RWD thanks to AI

- We cover all therapeutic areas and provide weekly and monthly data updates.

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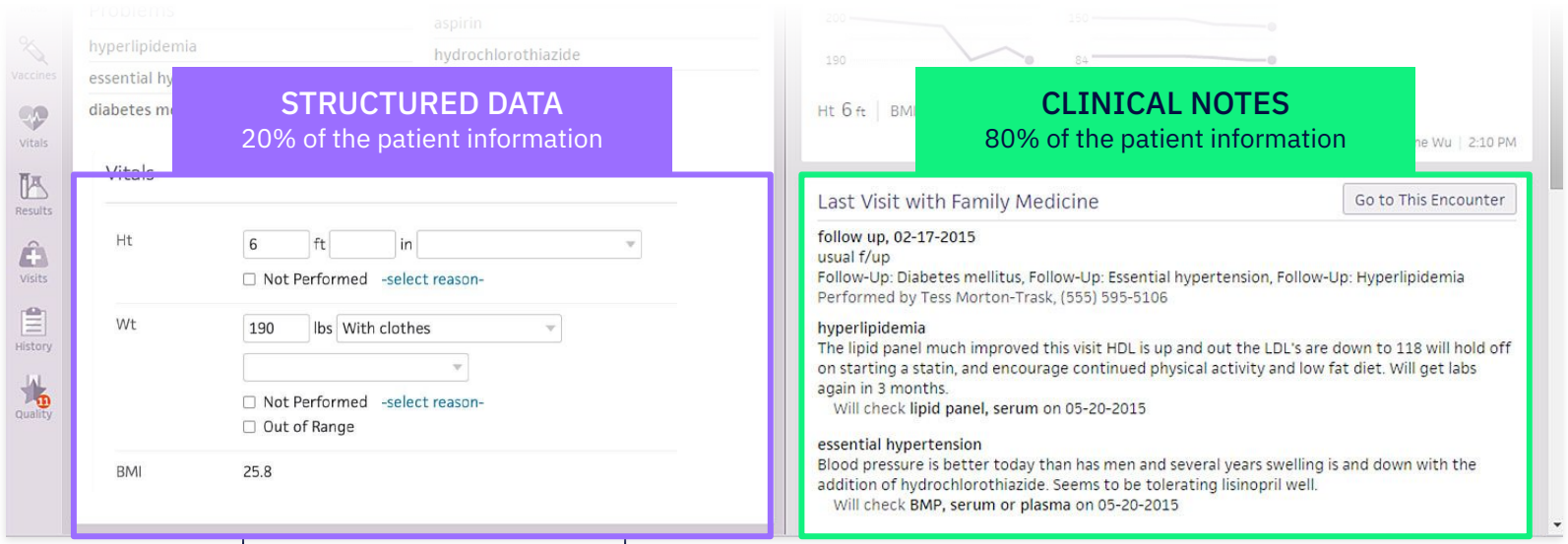
Bringing order to RWD thanks to AI



...	person_id	measurement_concept_id	measurement_date	value_as_number	...
...	243	3025315	2021-10-12	86.18	...

Weight → OMOP CDM Measurement

...	person_id	condition_concept_id	condition_date	visit_occurrence_id	...
	243	4115169	2021-10-12	896	

Pain in the left arm → OMOP CDM Condition Occurrence

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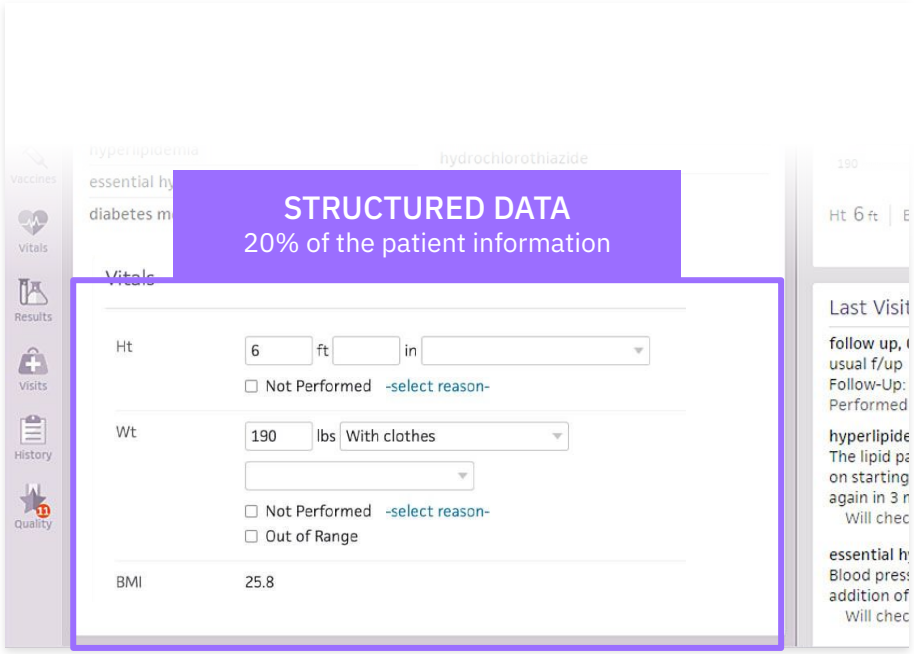
[01] Automated Terminology Mapping



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Automapping model

...	person_id	measurement_concept_id	measurement_date	value_as_number	...
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OMOP CDM Measurement

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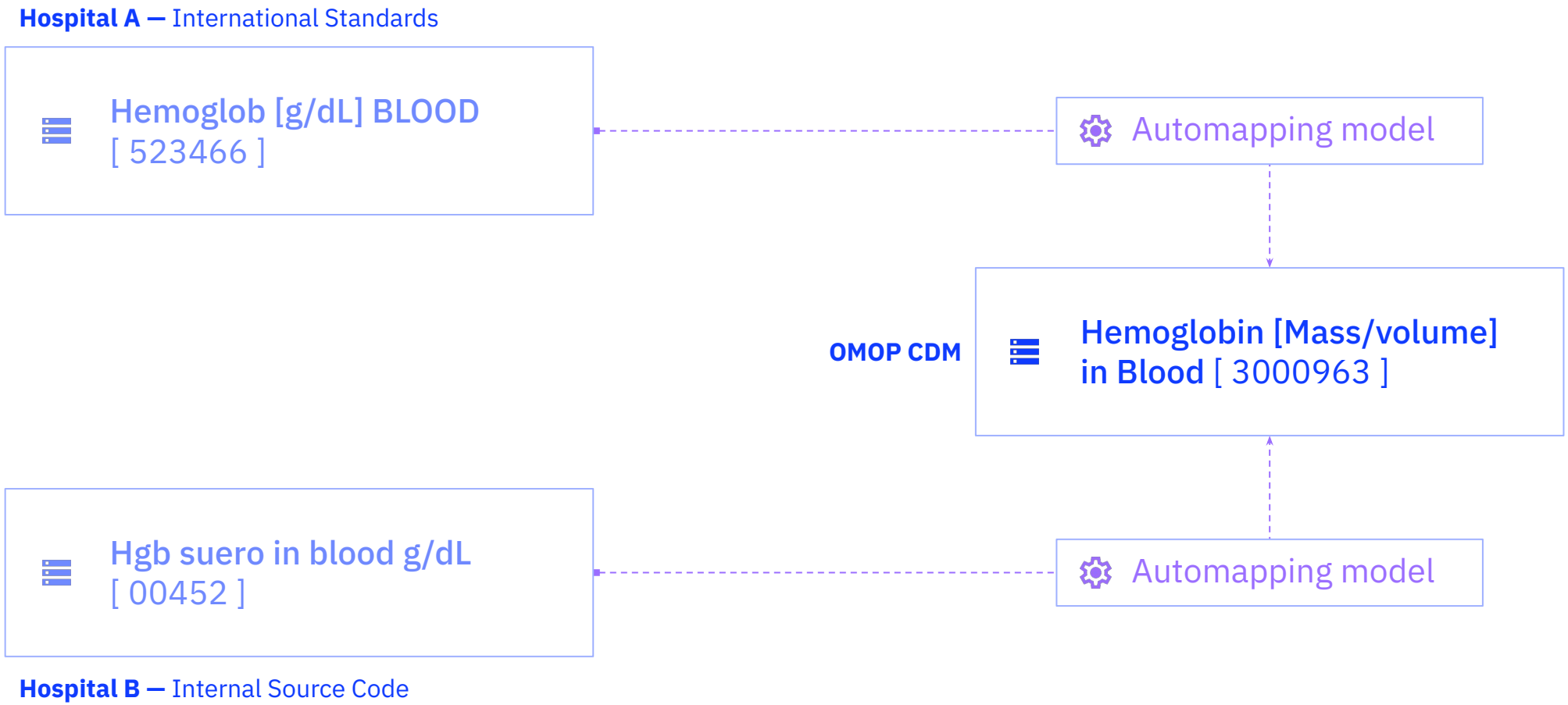

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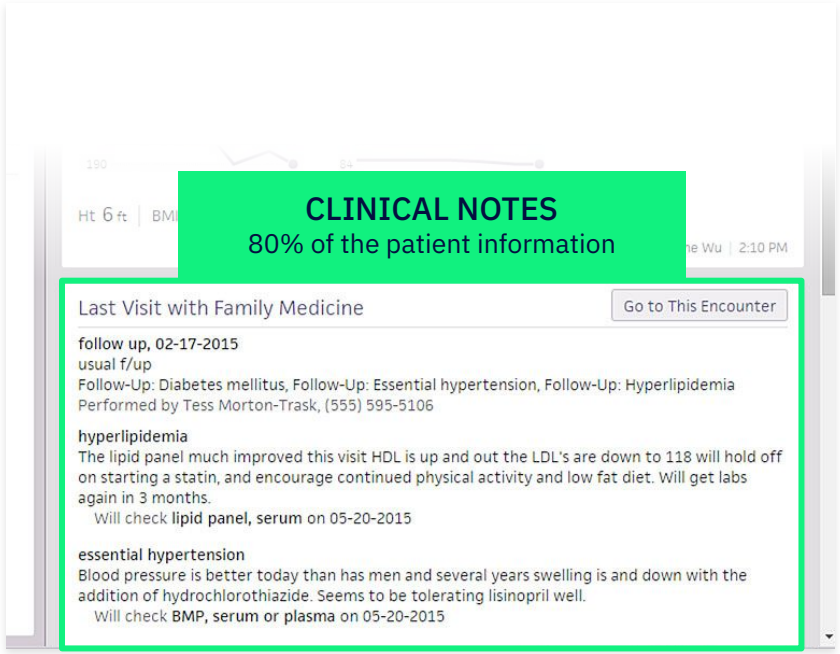
[02]Natural Language Processing



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Natural Language Processing

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...	243	4115169	2021-10-12	896	...

OMOP CDM Condition Occurrence

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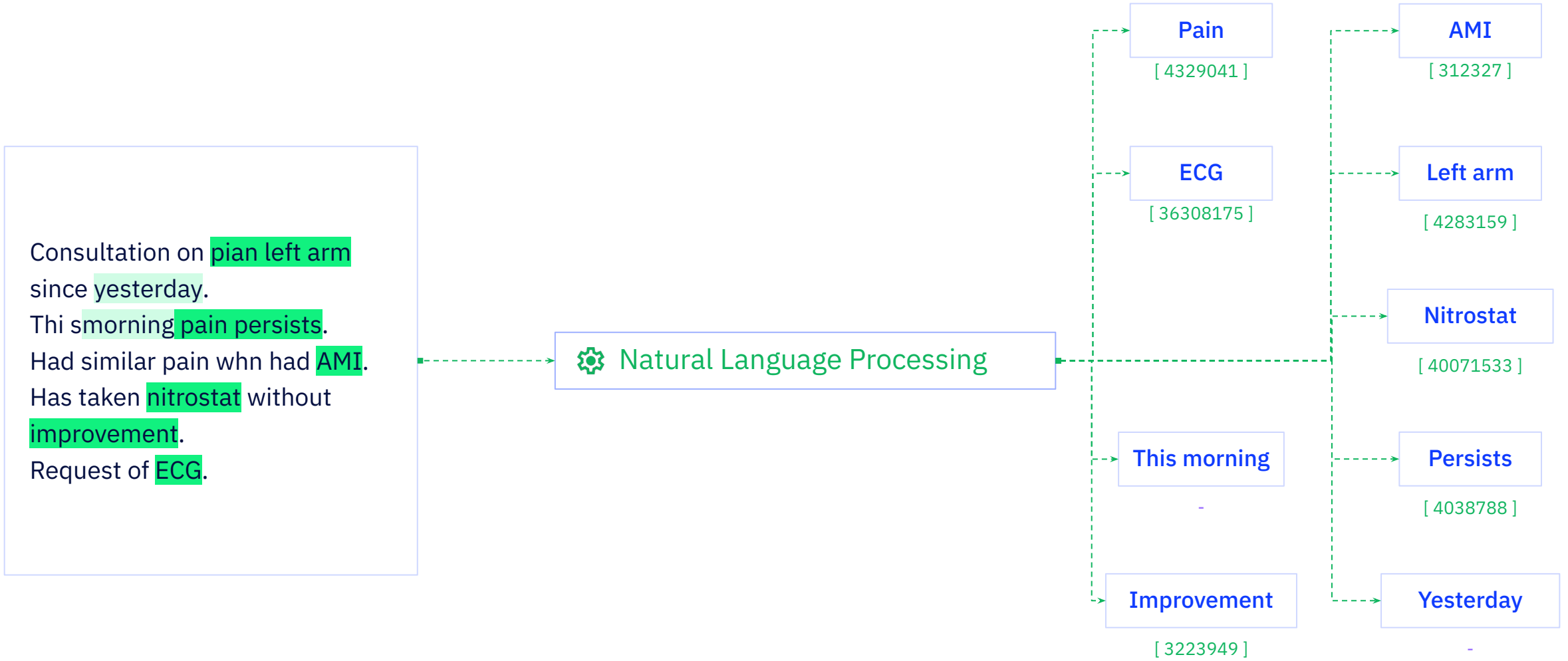

IOMED

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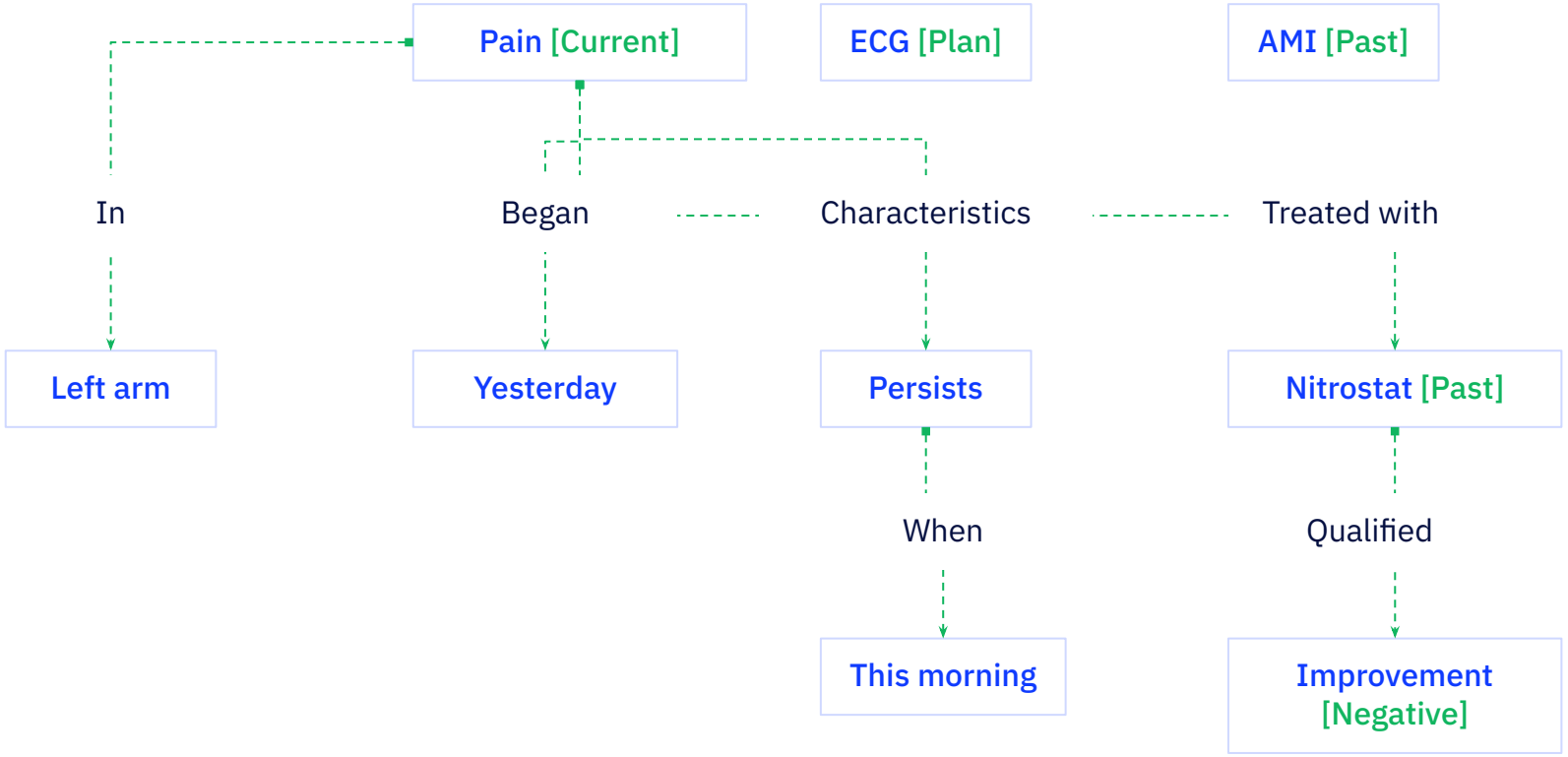

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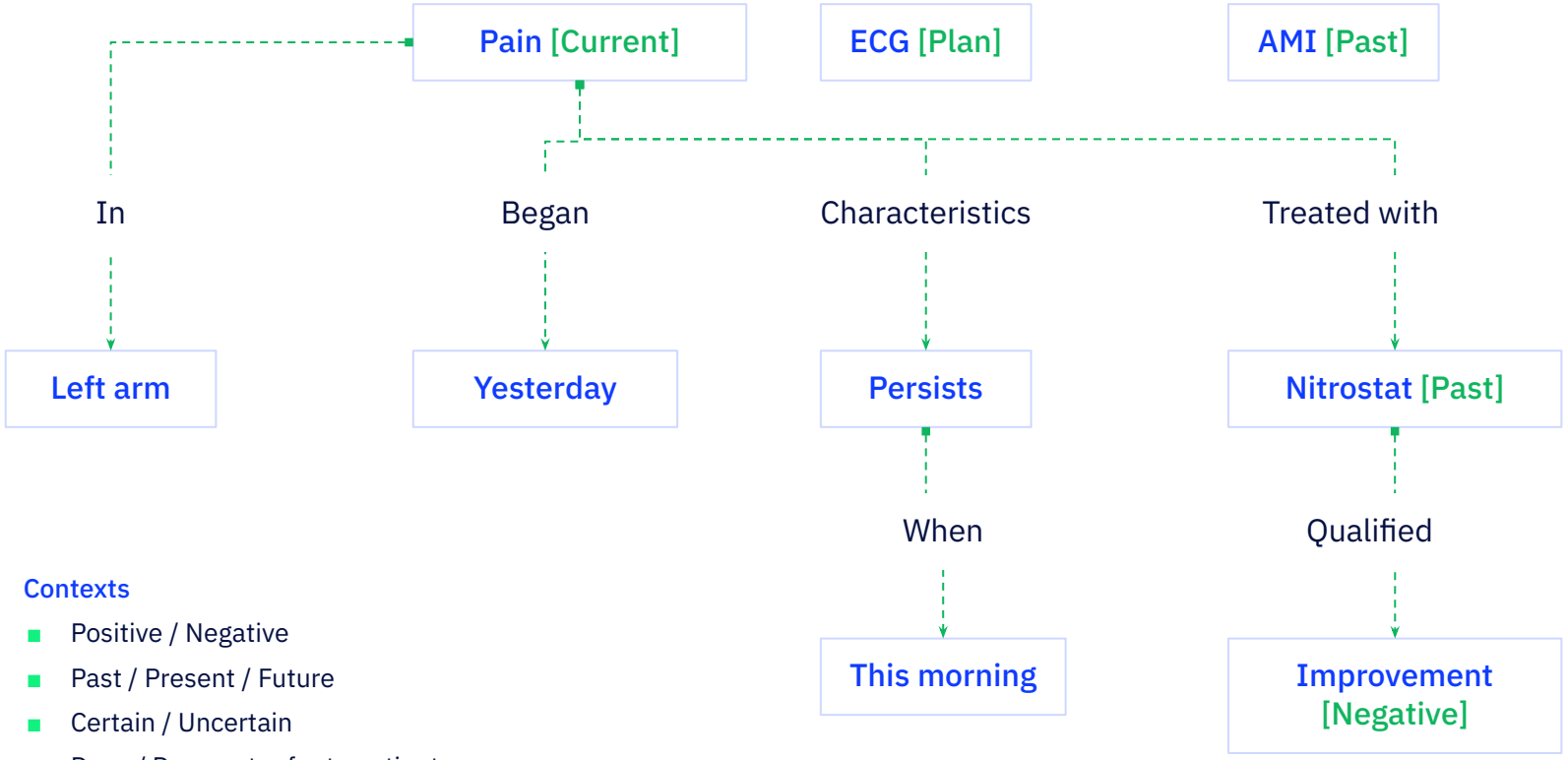

Contexts

- Positive / Negative
- Past / Present / Future
- Certain / Uncertain
- Does / Does not refer to patient
- ...

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[02]Natural Language Processing

Consultation on pian left arm since yesterday.
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Had similar pain whn had AMI.
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Request of ECG.

Pain [Current, Certain, Patient...]

In

Left arm [Current, Certain, Patient...]

4329041

4283159

PAIN IN LEFT ARM

Domain ID	Condition
Concept Class ID	Clinical Finding
Vocabulary ID	SNOMED
Concept ID	4115169
Concept code	287045000
Validity	Valid
Concept	Standard
Synonyms	Pain in left arm (finding) Pain in left upper limb
Valid start	31-Jan-2002
Valid end	31-Dec-2099

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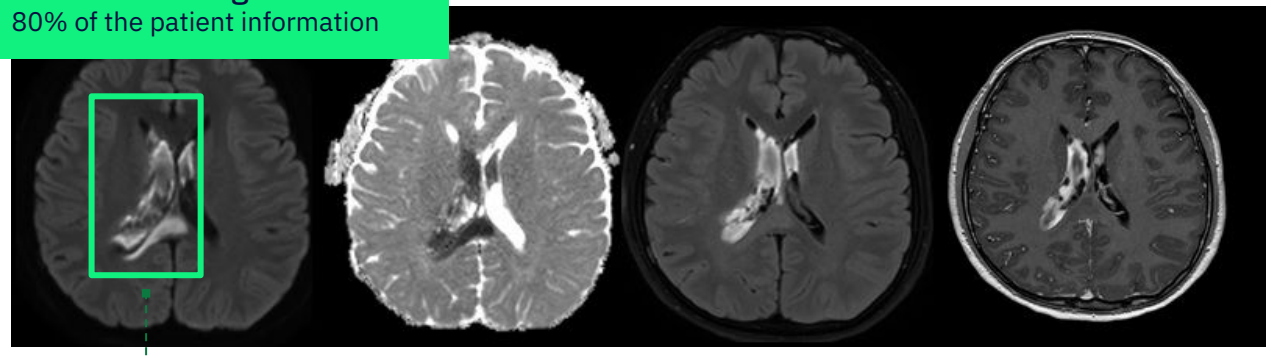
[03] Computer Vision

MRI images
80% of the patient information



...	person_id	condition_concept_id	condition_date	visit_occurrence_id	...
	243	36684840	2021-10-12	896	

Acute Stroke → OMOP CDM Condition Occurrence

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[03] Computer Vision

MRI images
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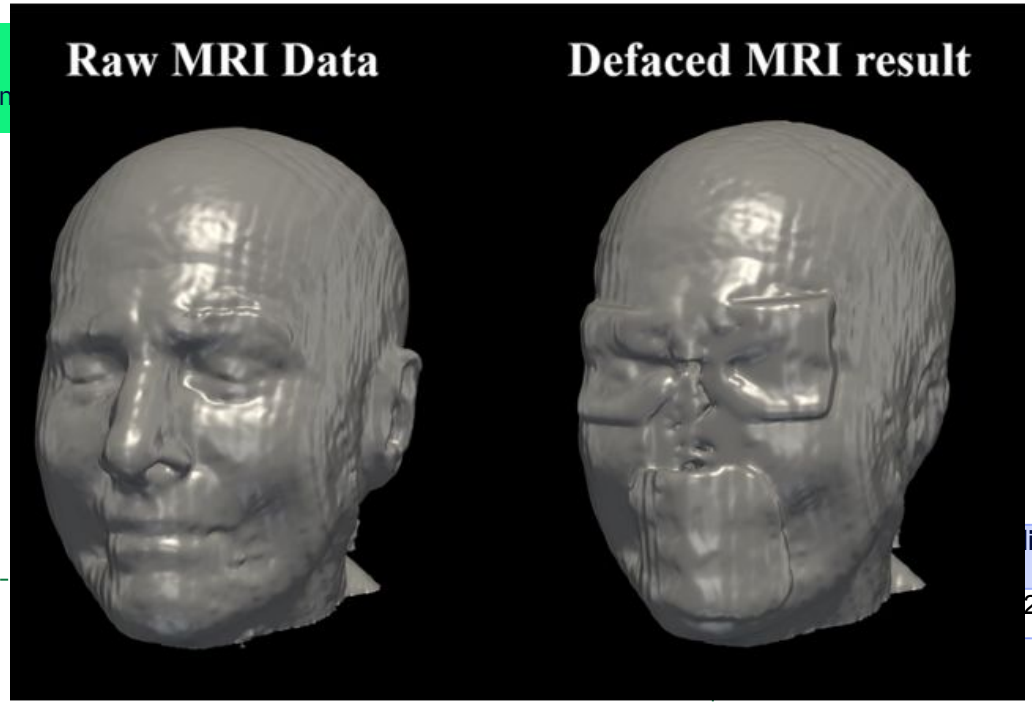

ition_date	visit_occurrence_id	...
21-10-12	896	

Acute Stroke → OMOP CDM Condition Occurrence

[03]Quality Assurance

Quality Assurance is a key factor in ensuring the accuracy, reliability, and performance of our technology. The quality of this technology is directly related to the quality of the data we deliver through the Data Solutions in our offering.

Data Verification
Expert annotators

We have expert physicians who compared the results extracted by our technology against the original source of data to obtain quality metrics.

Data Validation
Clinical Tests

We test the consistency and coherence of extracted data with statistical methods. Clinical and statistical evaluation of data is also performed by experts.

[03]Quality Assurance

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True Positives (TP)
Patients identified by our algorithms and corroborated by a human annotator.

False Positives (FP)
Patients identified by our algorithms but discarded by a human annotator.

False Negatives (FN)
Patients discarded by our algorithms but identified by a human annotator.

True Negatives (FN)
Patients discarded by our algorithms and discarded as well by a human annotator.

Paciente varón de 56 años originario de Málaga. Diagnosticado de adenocarcinoma de próstata oligometastásica con M1 ilíaca derecha irradiada en curso de bloqueo hormonal. Anatomía patológica gleason 8 con afectacón perineural. En radioterapia paliativa antiálgica en columna lumbar iniciada el 03.21. Acude para valoración y seguimiento. Inicio Eligard mensual marzo 2021, se pasó a semestral el 29/08/2021 + Bicalutamida continuo. Actualmente solo con eligard por intolerancia a la bicalutamida.

Actualmente, FUD 3-4h, FUN 2 veces, urgencia miccional +, incontinencia (actualmente no, refiere que en su país llegó a padecer incontinencia), chorro medio y entrecortado, goteo terminal +, sensación de vaciado incompleto. No ITUs de repetición, no hematuria.

EF: BEG, abdomen blando y depresible no doloroso a la palpación, no se palpa globo vesical. PPL negativa. Pene sin lesiones, prepucio retráctil. Testes en bolsa escrotal anodulares no dolorosos. TR: no doloroso, próstata G I, simétrica de consistencia fibroelástica de bordes bien delimitados sin palparse nódulos.

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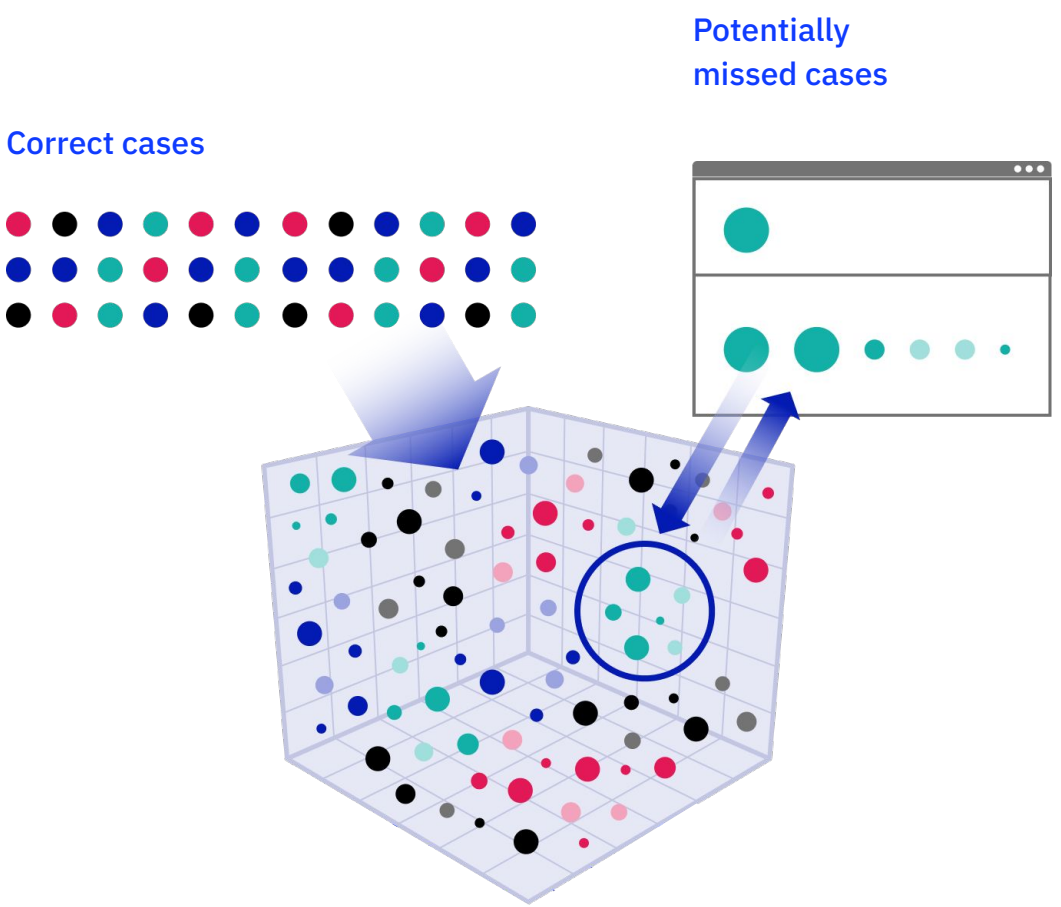

[1]: Quijada, M., Vivó, M., Abella-Bascarán, Á., Chocrón, P., Maeztu, G.d. (2022). A Framework for False Negative Detection in NER/NEL. Natural Language Processing and Information Systems. NLDB 2022 https://doi.org/10.1007/978-3-031-08473-7_30

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Clinical tests

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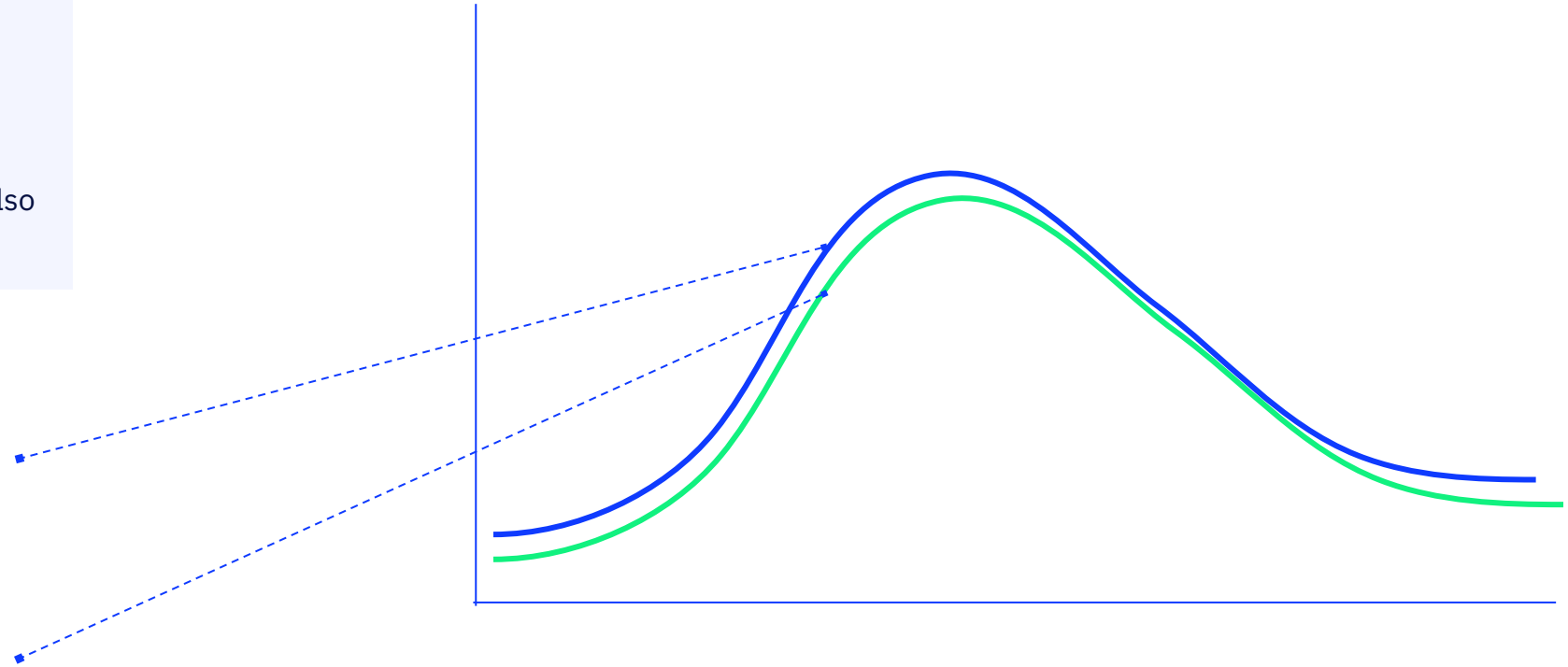

Observed descriptive data for the main outcomes.

Expected descriptive according to the scientific literature.

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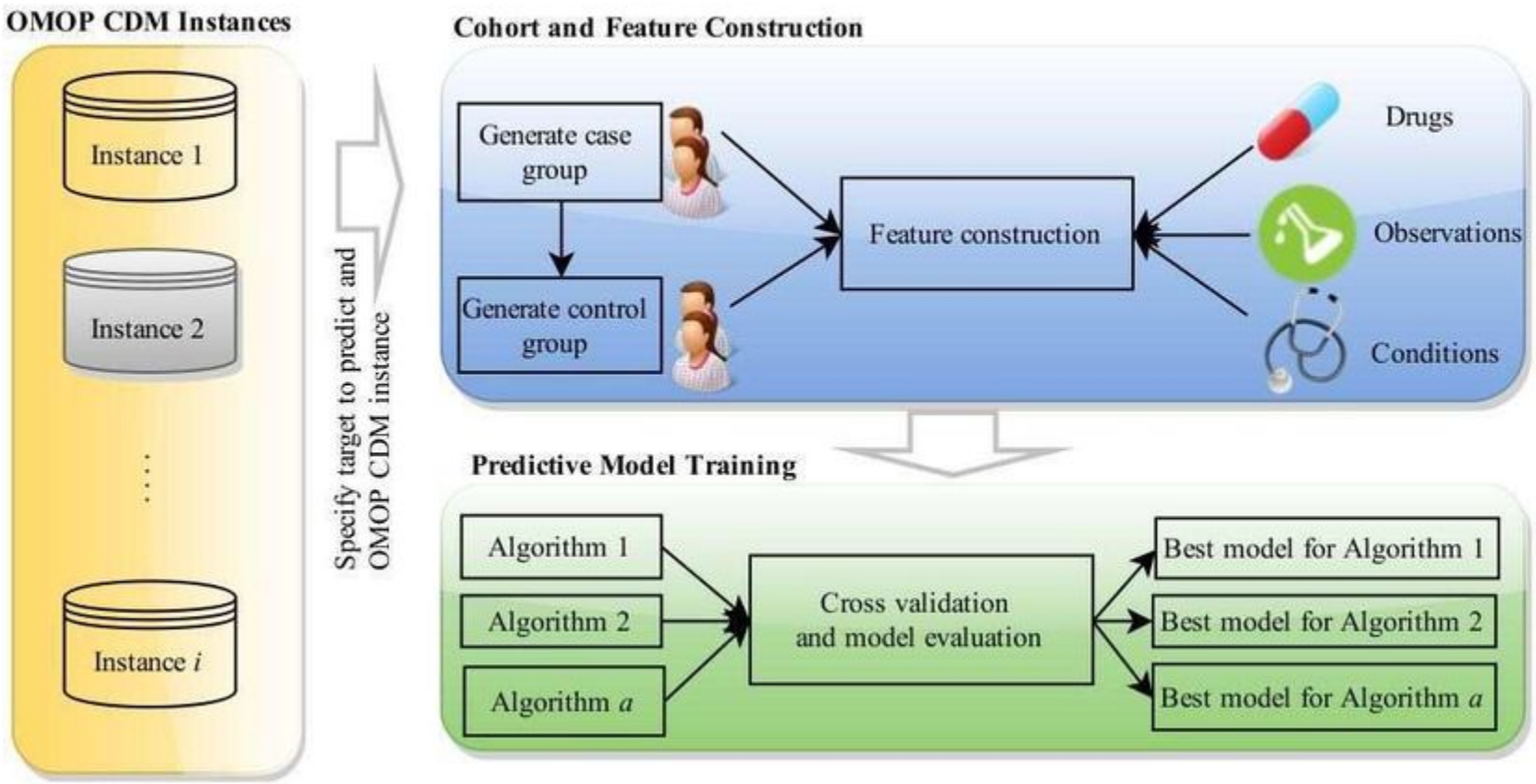
→ Usos de la IA

Análisis de los datos

- El objetivo principal es **aterrizar un caso de uso** sobre los datos del centro a gran escala.
- Esto permite mejorar:
  - Conclusiones sobre las cohortes
  - Integrar análisis avanzados de forma sistemática
  - Una mejor gestión de procesos en el centro

Entrenamiento de modelos



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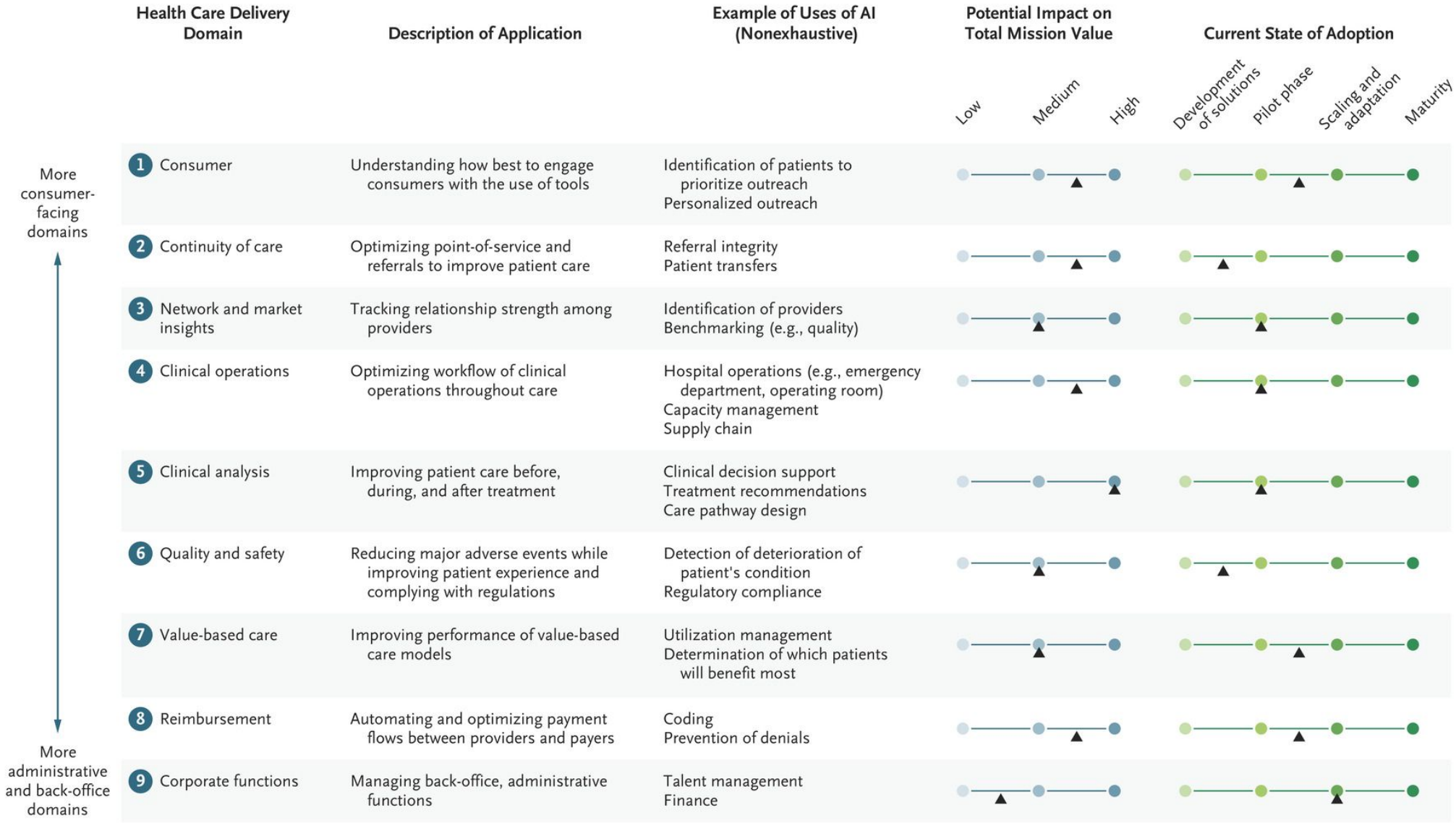
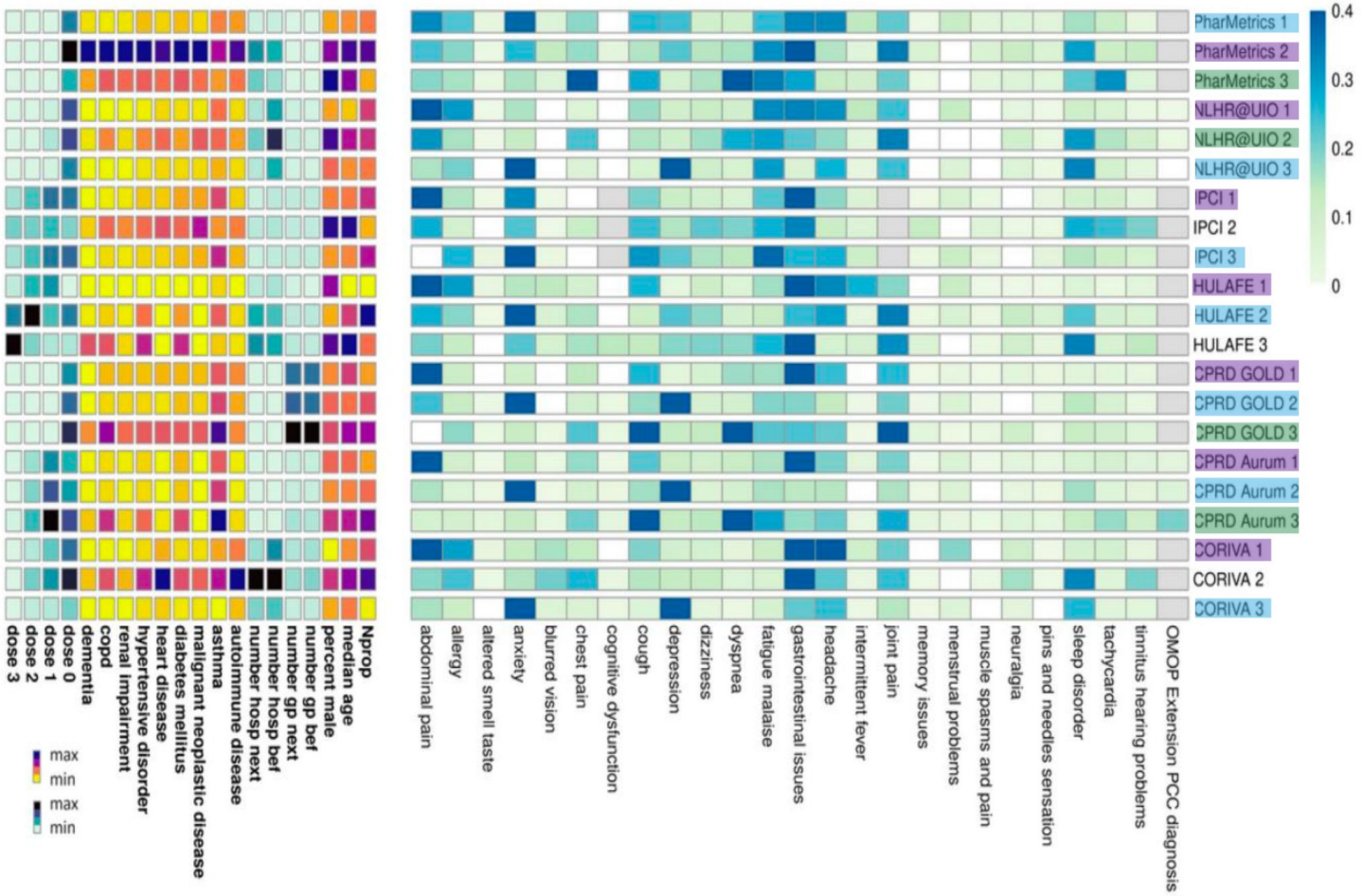


	Health Care Delivery Domain	Description of Application	Example of Uses of AI (Nonexhaustive)	Potential Impact on Total Mission Value	Current State of Adoption
				Low · Medium · High	Development of solutions · Pilot phase · Scaling and adaptation · Maturity
More consumer-facing domains	1 Consumer	Understanding how best to engage consumers with the use of tools	Identification of patients to prioritize outreach Personalized outreach		
	2 Continuity of care	Optimizing point-of-service and referrals to improve patient care	Referral integrity Patient transfers		
	3 Network and market insights	Tracking relationship strength among providers	Identification of providers Benchmarking (e.g., quality)		
	4 Clinical operations	Optimizing workflow of clinical operations throughout care	Hospital operations (e.g., emergency department, operating room) Capacity management Supply chain		
	5 Clinical analysis	Improving patient care before, during, and after treatment	Clinical decision support Treatment recommendations Care pathway design		
	6 Quality and safety	Reducing major adverse events while improving patient experience and complying with regulations	Detection of deterioration of patient's condition Regulatory compliance		
	7 Value-based care	Improving performance of value-based care models	Utilization management Determination of which patients will benefit most		
	8 Reimbursement	Automating and optimizing payment flows between providers and payers	Coding Prevention of denials		
More administrative and back-office domains	9 Corporate functions	Managing back-office, administrative functions	Talent management Finance		

→ Clusterización de sintomatología

- Aprovechar los datos ya disponibles en el OMOP para poder hacer análisis más avanzados



Alport Syndrome

Many patients with Chronic Kidney Disease (CKD) do not have a confirmed diagnosis of Hereditary Kidney Disease (HKD) such as Alport Syndrome. **We assist physicians in identifying patients with a not filiated HKD** and supports the diagnostic confirmation process.

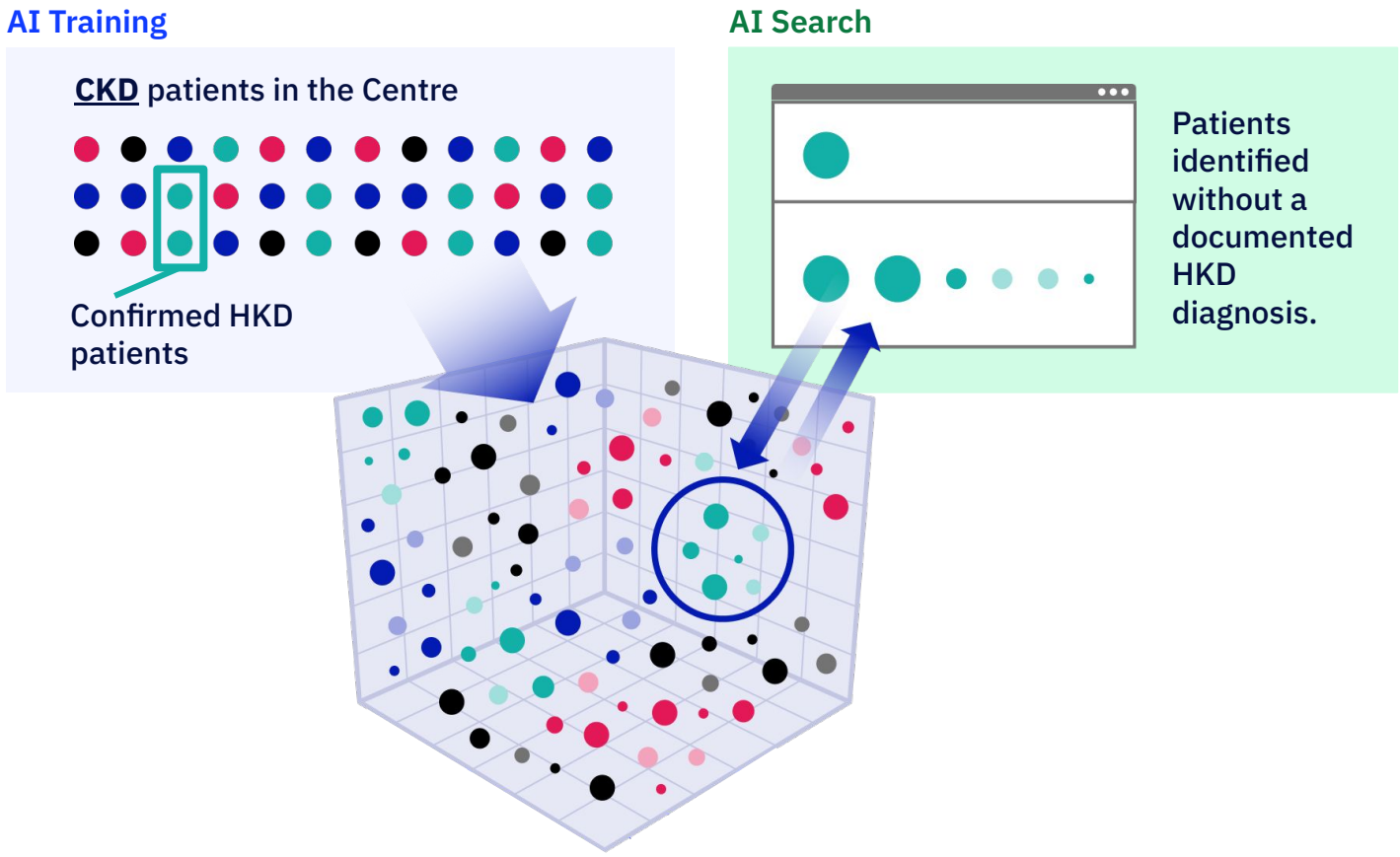
Confirmed HKD
292

New HKD
+53

CKD Patients
45.382

Patients with Chronic Kidney Disease (CKD) and a Hereditary Kidney Disease (HKD)

Hospital Fundació Puigvert (total patients=920K)



C/ de St. Antoni Maria Claret, 167,
Pabellón de La Mercè,
08025 — Barcelona

info@iomed.health

https://iomed.health