



Targeting high needs patients
for sustainable follow-up

Our ambition is to deliver a new generation of data-driven and ROI driven Patient Support Programs



High cost high needs patients centered interventions



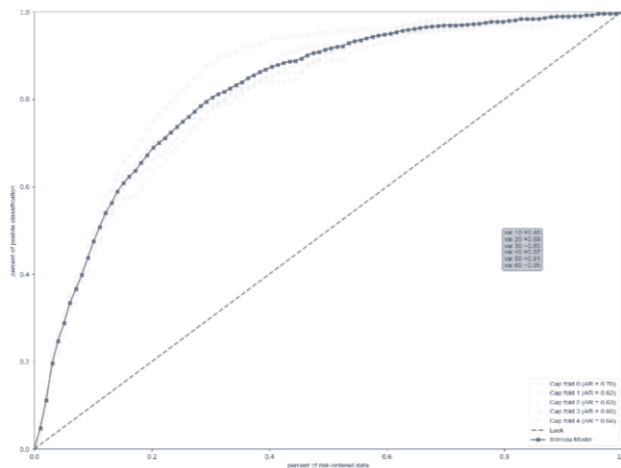
Just-in-Time interventions



Omnichannel and adaptative interventions



Based on the use of predictive models trained on the **claims data of the French Health Insurance (600 TB data)**



For diabetes patients our model targets 70% of illegitimate stops in the first 20% of the surveyed population



Low risk patients



Digital interventions and short human interventions

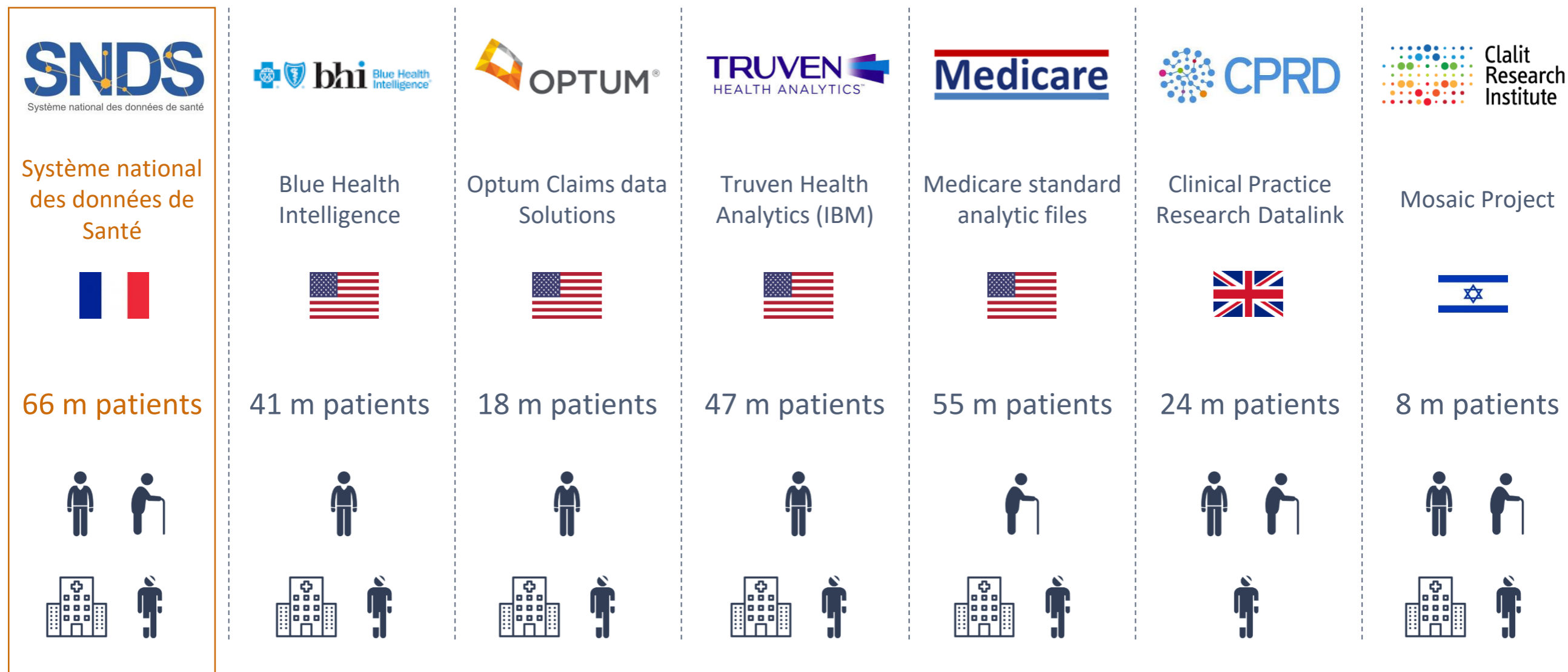


High risk patients



Intensive human interventions

Health insurance claims databases are increasingly frequently and effectively used



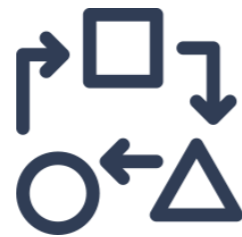
French SNDS is currently the best-in-class anonymized claim database because of its size (600 TB) and its unbiased recruitment (99% of the French population)

SNDS data allow deep dive analyses of care pathways



Prerequisites to access the SNDS data

- Health data accessed must not be used to promote health products or to calculate insurance premiums
- Data must be accessed only for research study or evaluation purposes
- Private actors can access to SNDS only through certified research offices
- Use of the data is subject to confidentiality and integrity obligations
- Results of the research must be published



Process for requesting access to the data

- Drafting of the research protocol with the support of an ad hoc scientific board
- Assessment by an the Independent Scientific Advisory Committee
- Evaluation of the public interest of the research
- Authorization from the Data Protection Authority
- Data release either on the NHS secure cloud (only descriptive statistics) or on a certified private secure cloud (machine learning)



Available Patients data

- Age month and year of birth
- Gender
- Medical diagnoses (ICD-10 codes) for severe and costly chronic diseases
- Hospital discharge diagnoses (ICD-10 codes)
- Comorbidities (among 52 major chronic conditions)
- date of death



Available Inpatient/Outpatient care data

- All detailed reimbursements with dates of prescription and dispensing
- Primary care and specialists consultations
- Reimbursed medicines
- Medical procedures
- Biological tests
- Medical devices
- Procedures from other HCPs (nurses,...)
- Date of hospital discharge and length of stay
- Diagnosis-related groups
- Ambulatory visits in hospital



No information on

- over-the-counter drugs
- results of clinical exams blood pressure BMI
- results of laboratory tests histology
- smoking alcohol use exercise diet family history
- drug use during hospital stay except for most costly drugs (specific list)

Once accessed through a complex process for which Sêmeia is fully accredited, SNDS data constitute a unique way to analyze real-world care pathways

Further analyses could be achieved by linking claims databases with clinical databases



Claims databases and clinical databases matching is already legally and technically feasible

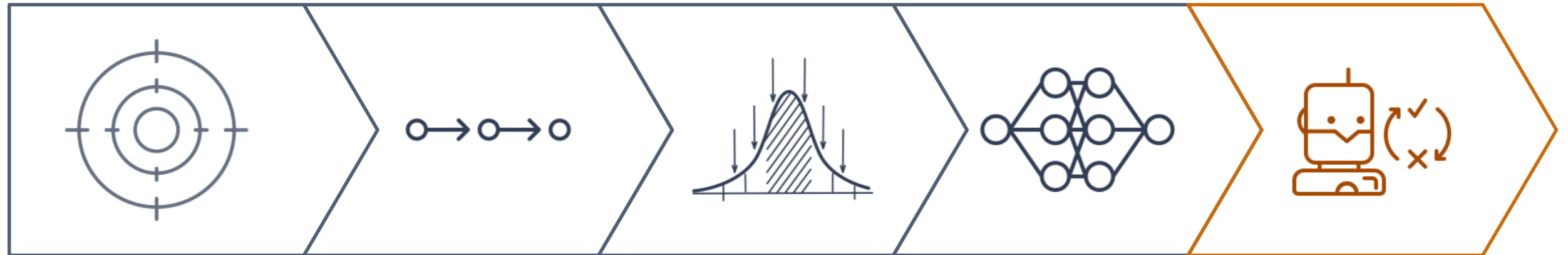
- By using probabilistic matching instead of deterministic matching
- By using the same process of approval used to access claims data



The Health data hub, a 125 million euros initiative, will ease healthcare databases matching in France

- By financing a unique IT infrastructure aimed at linking claims databases, healthcare databases, registers and EHRs
- By enabling patient and HCPs informed consent for anonymized data use through blockchain and smart contracts

Our aim is to mobilize AI/ML to build predictive models based on these data



Identification of relevant pain points

- Non-adherence to treatment
- Illegitimate treatment stops
- Flares/exacerbations
- Relapse/complications
- Avoidable hospitalizations
- Premature death
- ...

Phase analysis

- Reworking of the raw claims data with KOLs to identify the different phases of the care pathway
- Identification of treatment phases (intake of a molecule, surgery, hospitalization in an ICU,...)
- Identification of legitimate end of phases (death, switch of treatment, serious comorbidities, palliative care,...)

Standard statistical modeling

- Generalized Linear Models
- Cox models
- Aimed at identifying major determinants of the predictable pain points

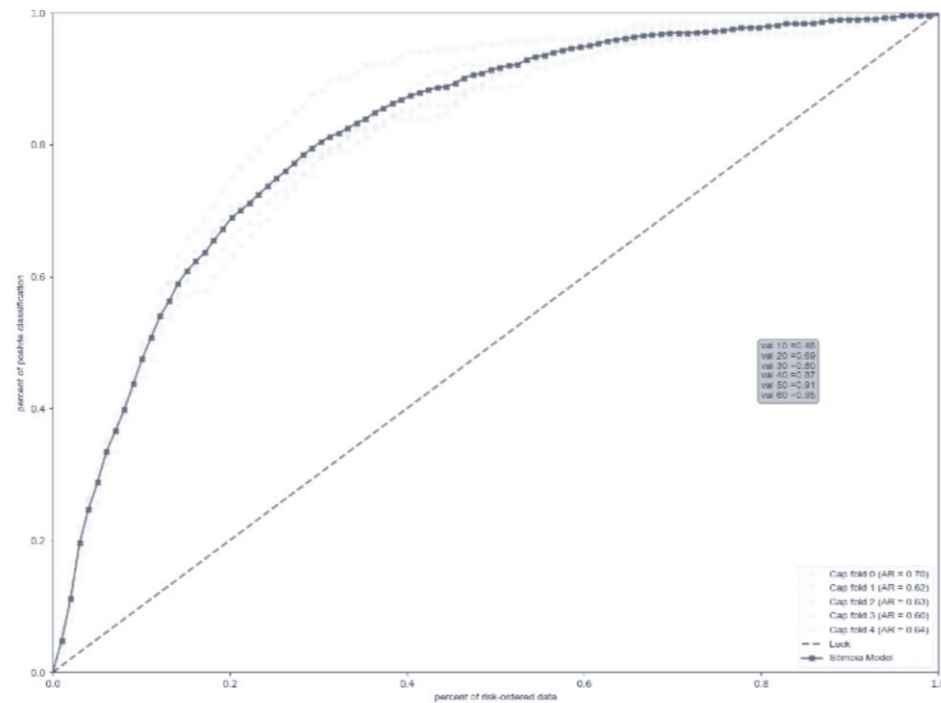
ML/AI modeling

- Gradient boosting models
- Multilayer perceptron
- Recurrent Neural Networks
- Aimed at improving the accuracy of our predictive models

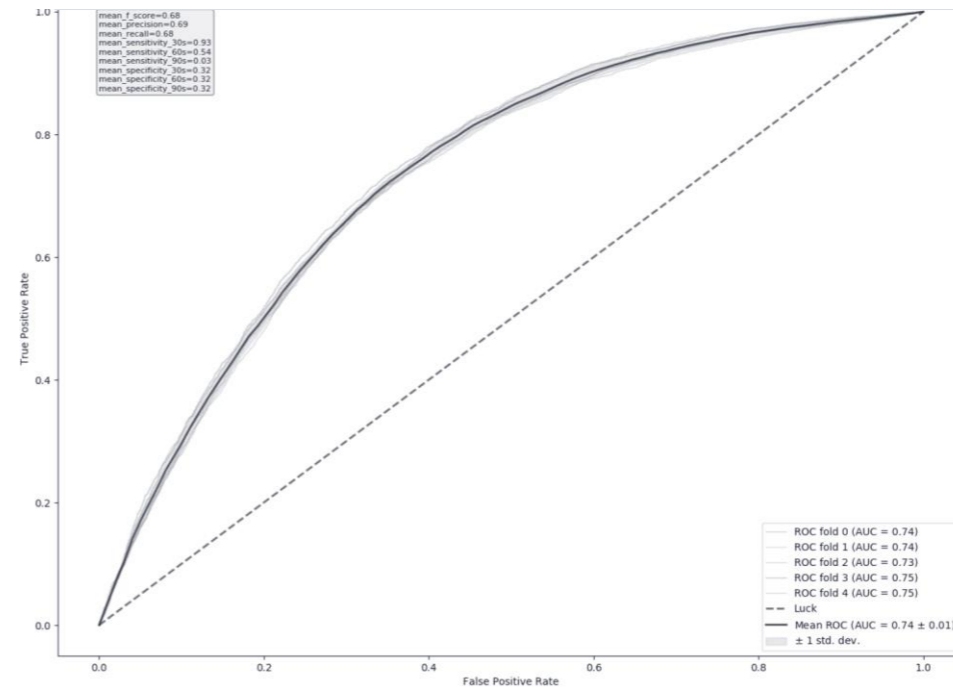
Reinforcement learning

- Identification of key clinical data with KOLs that have to be gathered in real life to improve the accuracy of our models
- Structuration of a data warehouse architecture that allow to adjust our models in real-time to every data that is gathered through our patient support programs

First results of our models allow us to categorize patients into risk classes leading to appropriate utilization of HCPs resources



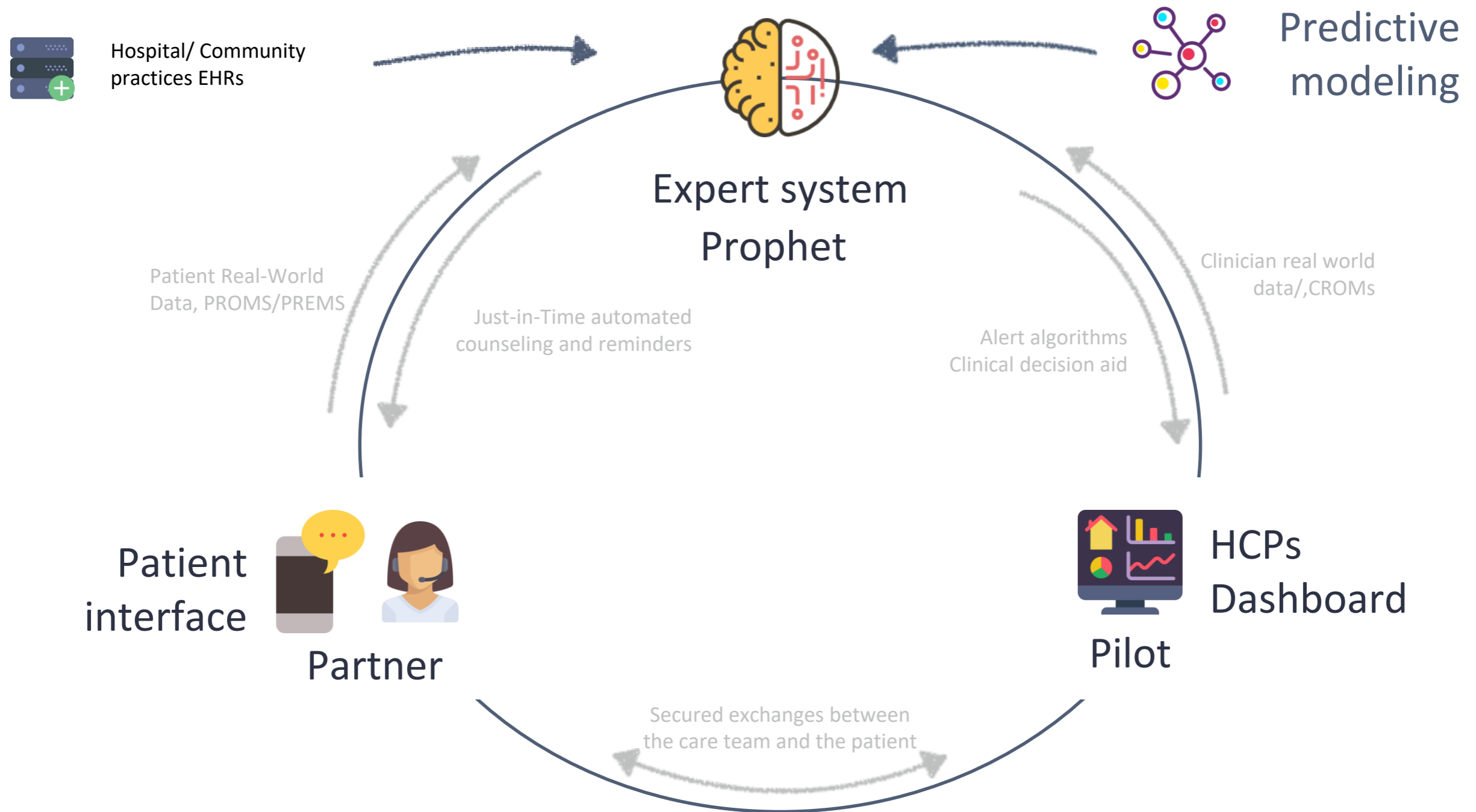
For diabetes patients our model targets 70% of illegitimate stops in the first 20% of the surveyed population



For breast cancer patients on hormone therapy our model targets 90% of illegitimate stops in the first half of the surveyed population



Our models are integrated in a full service SaaS suite designed to better follow-up and support patients



Pilot, our dashboard allows HCPs to accurately follow-up and support patients

< Retour aux patients Dossier patient Dr. André Loesener

Risques & alertes

- FORT** Observance
- MOYEN** Persistance
- MOYEN** Rejet
- FAIBLE** Re-hospitalisation hors rejet

Depuis le 10 octobre 2018 (dernière consultation)

- Créatinine = 100
- Tension : 8/8

Traiter l'alerte

Résumé des événements

A venir

- 12/09/18 Consultation néphrologue
- 10/09/18 Examen biologique
- 04/09/18 Séance d'éducation thérapeutique

Démarrer une séance

Passé

- 10/06/18 Consultation néphrologue
- 05/06/18 Séance d'éducation thérapeutique
- 05/06/18 Examen biologique
- 23/05/16 Greffe de rein

Consulter le CR de visite

Consulter le CR éducatif

Consulter les résultats

Consulter le CR d'opération

Chat patients

- Dernier commentaire en date du JJ/MM à HH:MM

Coordonnées

- Email
- Téléphone
- Adresse postale

Entourage (aidant ou PS)

- Gérard Lami : aidant Voir

Plan de soins

- Ordonnance médicaments Édité le 10/08/2018 Voir
- Ordonnance biologique récurrente Édité le 10/10/2018 Voir
- Ajouter un contrôle biologique
- Ordonnance télésurveillance 10/10/2018 Voir

Suivi de la tension

Dernières valeurs prises le 10/09

Pression systolique (en mmHg)

Pression diastolique (en mmHg)

Ajouter une mesure

Date	Pression systolique (mmHg)	Pression diastolique (mmHg)
Sept 10	100	70
Sept 15	130	100
Sept 20	145	110
Sept 25	140	105
Sept 30	130	100
Oct 5	140	110
Oct 10	140	110
Oct 15	170	140
Oct 20	160	130
Oct 25	150	120
Oct 30	140	110

Suivi de la créatinine

Dernières valeurs prises le 10/09


Créatinine (en µmol/L)


Ajouter une mesure


Date	Créatinine (µmol/L)
Sept 10	1.3
Sept 15	2.3
Sept 20	2.5
Sept 25	1.9
Sept 30	2.2
Oct 5	2.3
Oct 10	3.0
Oct 15	2.6
Oct 20	2.2
Oct 25	1.8

Partner, our patient support tool allow us to gather PROs and to offer a unique digital health education experience

Déclarer mon état de santé & ma qualité de vie

Douleur Pas de douleur  Douleur maximale

Fatigue Pas de fatigue  Fatigue maximale

Sommeil Pas de sommeil  Sommeil parfait

Enregistrer

Questionnaire à remplir

Compléter le questionnaire d'observance

Prendre sa tension

Pression systolique (en mmHg) :

Pression diastolique (en mmHg) :

Enregistrer

Signaler un effet indésirable

Maux de tête

Œdème

Fièvre

vomissement

Diarrhée

Signaler

Coordonnées de mon pharmacien

Julie Martin
Pharmacie de la Mairie
Téléphone : 06 66 66 66 66

Communiquer avec mon pharmacien

Le 12/05/2018 : Mes maux de têtes sont continues depuis 2 jours

Le 12/05/2018 : Je vous invite à consulter votre médecin traitant

Saisir un message



Mieux comprendre ma maladie et mon parcours de soins



 **Ma pathologie**

 **Mon traitement**

 **Mon RDV pharmacien**

Mon plan de prise

Médicament 1    **Déclarer une prise**

Médicament 2    **Déclarer une prise**

Our product development pipeline continues to be upgraded with new therapeutic areas and new care pathways

		Research protocol	Access to Data filing	Predictive modeling	IT development	Feasibility/usability study	CE marking
Chronic kidney disease	adherence/persistence to immunosuppressive drugs graft failure avoidable hospitalizations						
Breast Cancer, Prostate cancer, CLL, CML	adherence/persistence to oral anticancer drugs						
Cardiovascular risk factors (diabetes, hypertension, dyslipidemia)	adherence/persistence to medicines avoidable hospitalizations						
Orthopedic Surgery	avoidable rehospitalizations						
Inflammatory Bowel Disease	adherence/persistence to medicines Flares						
Multiple sclerosis	adherence/persistence to medicines Relapse Level of physical functioning						
Sickle cell disease	Vaso-occlusive crisis						
COPD	adherence/persistence to medicines persistence to LTOT and NIV exacerbations avoidable hospitalizations						
Sleep apnea	persistence to CPAP						

