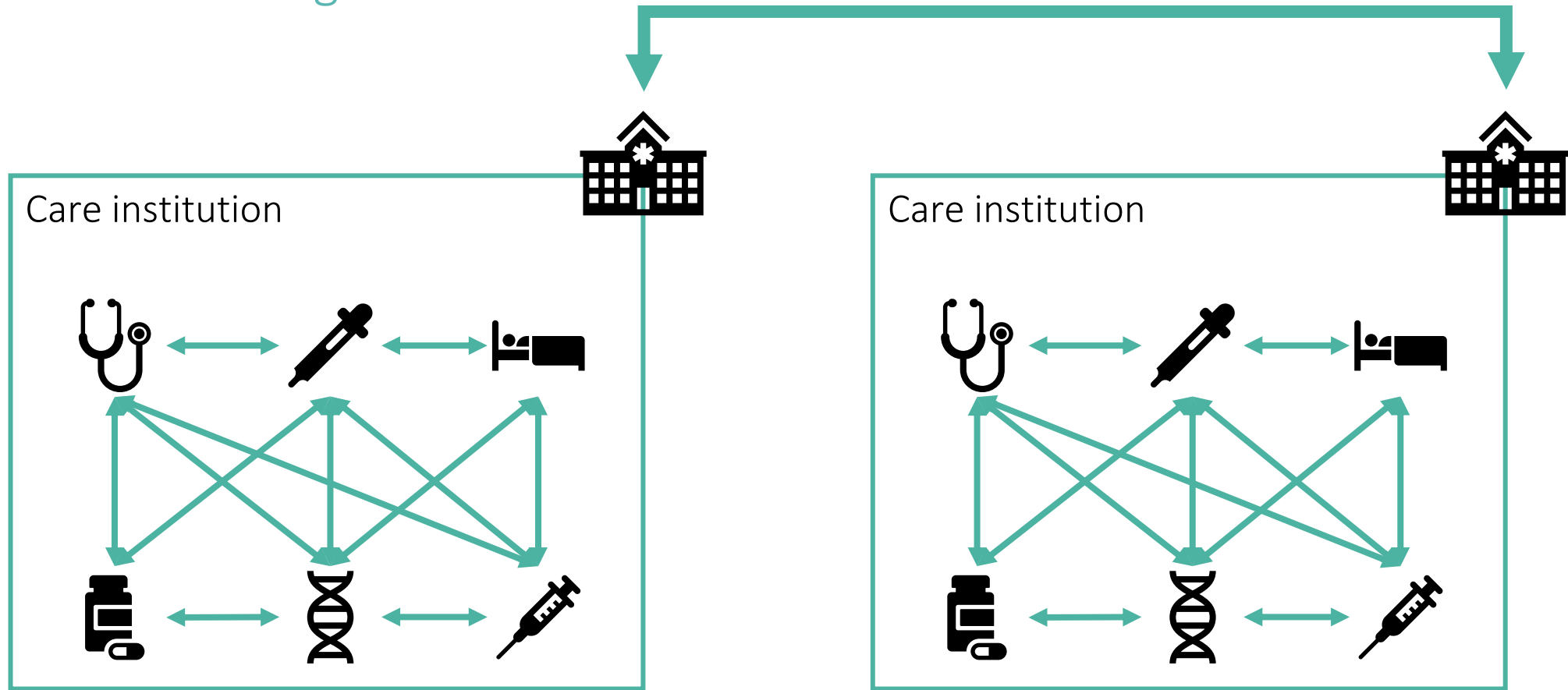


Christophe Gaudet-Blavignac
Julien Ehsam
Cyrille Duret
Christian Lovis

CoviDB

A SNOMED CT enabled database for
COVID-19 related data

Information sharing



Pharmacists



Nurses



Laboratory experts



Clinicians



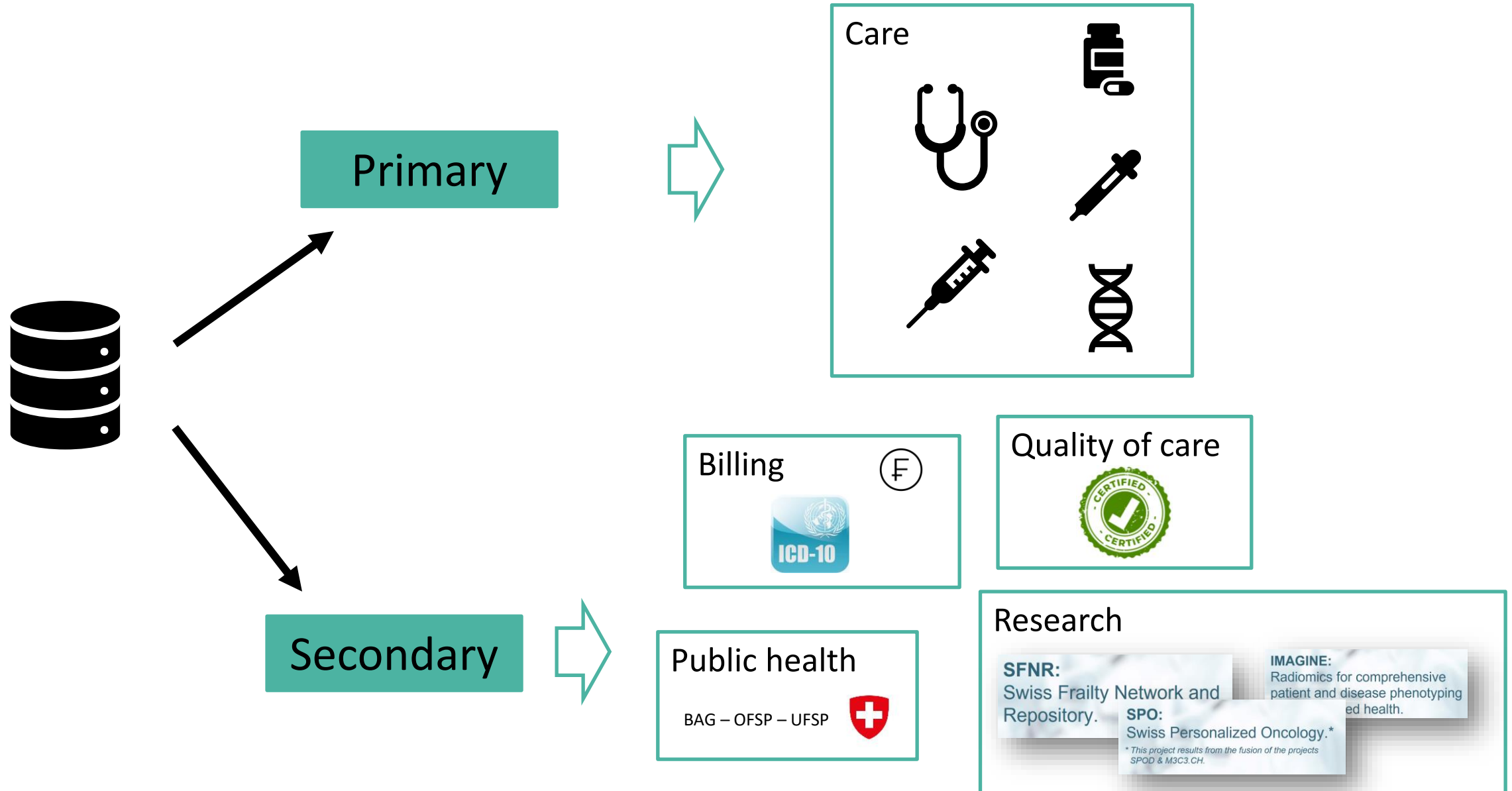
Geneticists



Patients



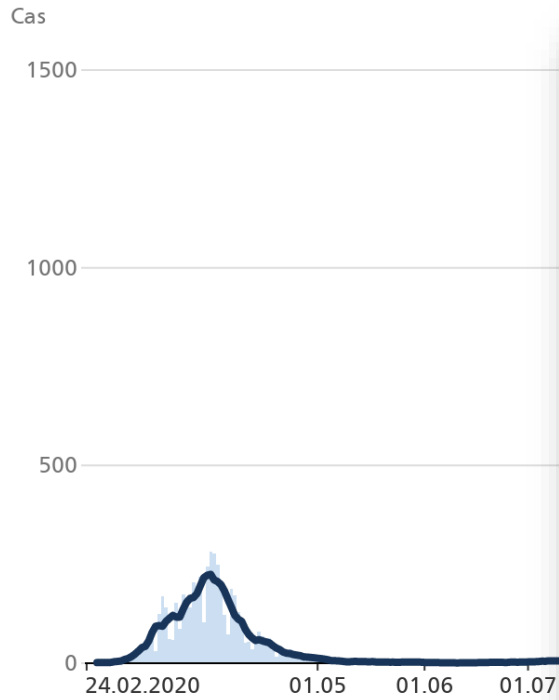
Information sharing



SARS-CoV-2 in Geneva

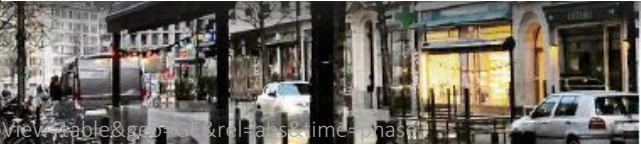
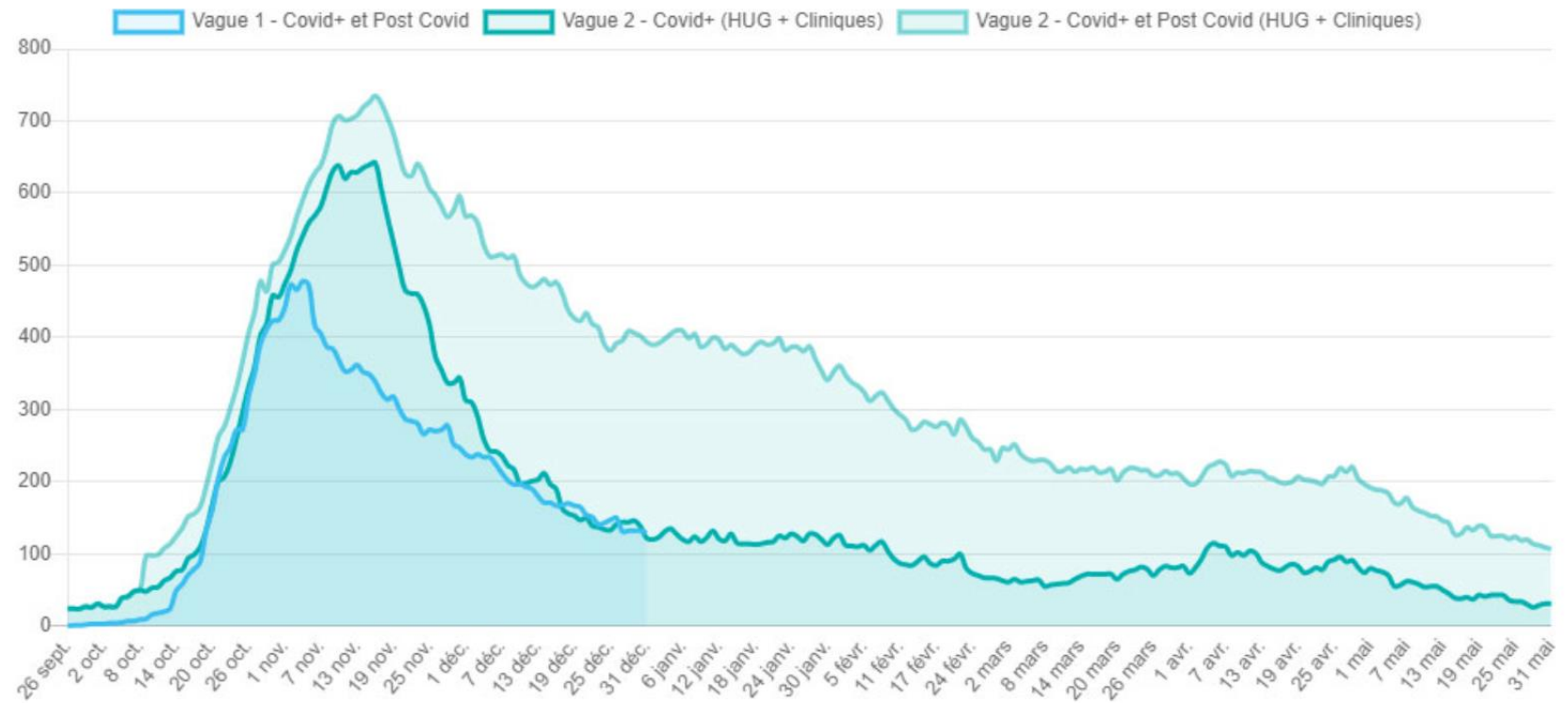
Valeurs journalières ▾

Cas déclarés nouvellement signalé Moyenne sur 7 jours



covid19.admin.ch

Comparatif entre le nombre de malades Covid+ hospitalisés pendant la 1^{ère} et la 2^{ème} vague (HUG et HUG avec Cliniques)



Marc
Bretton
Rubrique Genève

Magasins fermés, réunions de plus de cinq personnes prohibées, manifestations interdites, écoles closes, ferme-

Coronavirus. Une erreur de Santé Publique France à l'origine du bond du nombre de morts

Ce vendredi 18 septembre, Santé Publique a annoncé 123 nouveaux décès dus au coronavirus contre 50 la veille. Un bond inquiétant qui est, en fait, la conséquence d'une erreur statistique. Les chiffres d'un hôpital d'Ile-de-France n'étaient plus pris en compte depuis près de deux mois.



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The Guardian
For 200 years

ed by readers

Des mem

Quest-France

Publié le 19/09/2020 à

ion Sport Culture Lifestyle More

Media Society Law Scotland Wales Northern Ireland

Covid: how Excel may have caused loss of 16,000 test results in England

Public Health England data error blamed on limitations of Microsoft spreadsheet

- Coronavirus - latest updates
- See all our coronavirus coverage



Most viewed

- China's noisy 'grannies' silent that disables sp
- If there is a Go he put us on E unlikely return Fears
- Thai restaurant of success as c flock to dine in
- Man who put o disguise to th girlfriend jailed
- US nuclear-pov submarine hits

Trump blames rise in coronavirus cases on increased testing, despite evidence of more spread

PUBLISHED TUE, JUN 23 2020-11:04 AM EDT | UPDATED TUE, JUN 23 2020-4:12 PM EDT



Will Feuer @WILLFOIA

SHARE f t in e

Crise du coronavirus

Les couacs de l'OFSP auront «des conséquences», assure Berset

Le ministre de la Santé a défendu son office dans une interview. Une amélioration de la communication devient cruciale dans la lutte contre la pandémie.

Lucie Monnat
Publié: 04.08.2020, 18h11

51 commentaires



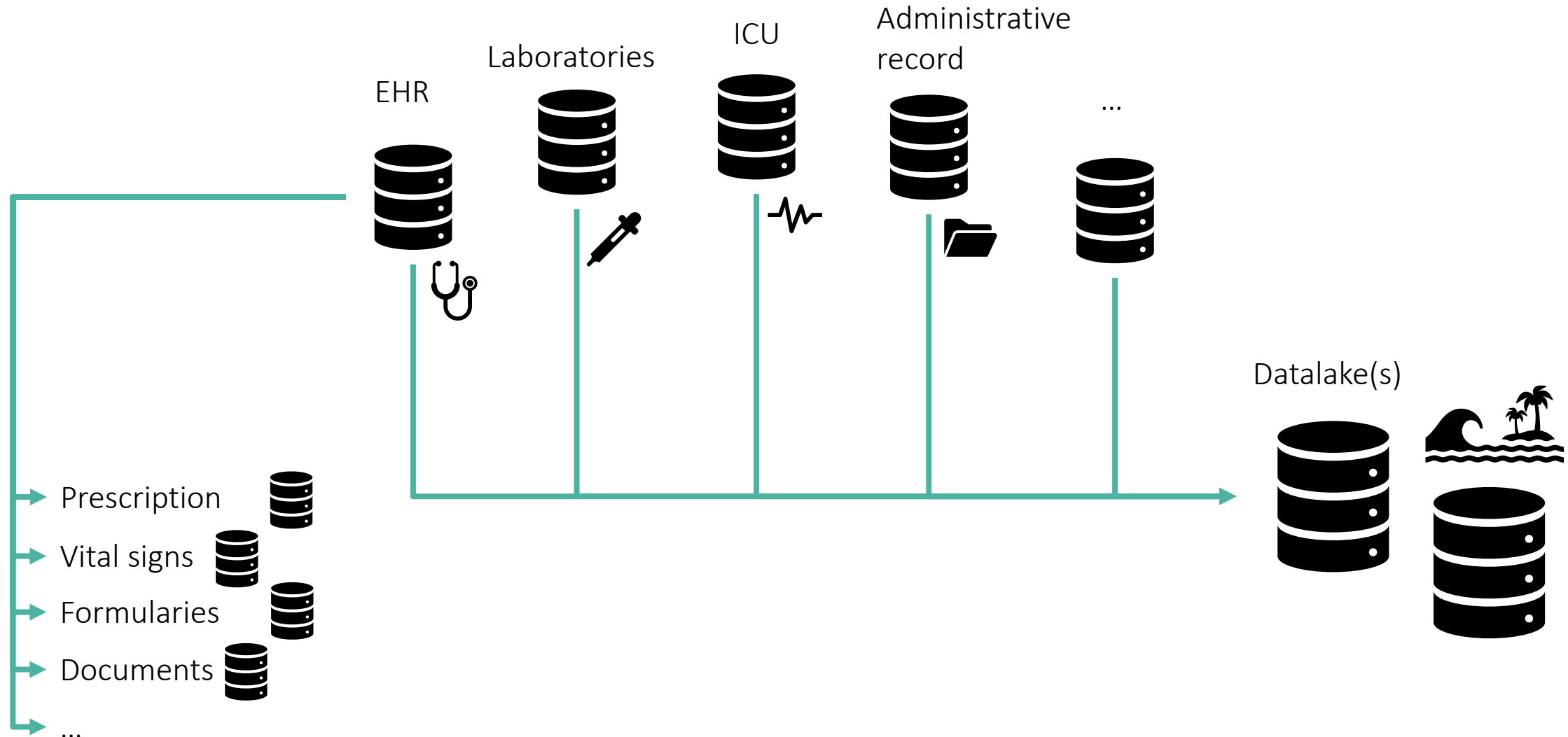
Alain Berset, conseiller fédéral en charge de la Santé.
KEYSTONE

S. because we are testing far more than any other
Trump tweeted Tuesday. "With smaller testing we

lists have repeatedly said the data does not indicate
ts for the recent surge in daily new cases.

ativity rate above 5%, according to John Hopkins
cles Arizona, which reports that 21.15% of all tests are





Multiple type of data

- .doc
- .pdf
- .txt
- .xml
- .xhtml
- .json
- .csv
- .xls
- .rtf
- ...

The screenshot displays a medical software interface for patient management. At the top, patient information is shown: DUMBLEDORE Albus (né le 03.02.1986, 35 ans, M), 97005400, and a general medicine department. A table lists COVID-19 test results with columns for 'code' and 'Libellé'. A cartoon doctor character stands over an ECG diagram with labeled segments (P, PR, Q, R, S, T, QT). A JSON snippet shows patient and analysis details. A yellow sticky note reads 'Covid+!!'. A medical note is partially visible at the bottom right.

code	Libellé
screening-wait	COVID-19 Depist ?
screening-neg	COVID-19 dépist nég
test-wait	COVID-19 PCR ?
test-neg-wait	COVID-19 statut à définir
negative	COVID-19 nég
improbable	COVID-19 imp
probable	COVID-19 probable
positive	COVID-19+
post-covid	Post COVID-19

```
{  "id": "12345678",  "patient_id": "12345678",  "eds_id": "12345678",  "analyse_label": "PSA total",  "sample_date": "2016-08-24T04:00:00.000+0000",  "value": 1.45,  "upper_limit": 3.9,  "lower_limit": 0.04,  "material_label_long": "Sang veineux",  "unit_of_measure": "µg/l",  "dosage_code": "52563",  "analyse_code": "10628",  "validation_date": "2016-08-24T04:00:00.000+0000",  "sample_reception_at_lab_date": "2016-08-24T04:00:00.000+0000"}
```

COVID-19 Test Results Table:

Date	Libellé
16.11.2020	Aigu
02.12.2020	Chimique
08.04.2021	Antécédent
04.02.2021	Antécédent non-pertinent

ECG Diagram Labels: P, PR Segment, Q, R, S, T, QT Interval.

Medical Note: Note de suite V1 - Enregistrée par **Christophe Gaudet-Blavignac** - Médecine interne générale. Revue en soirée pour RAM avec CA en CP selon douleur, technique revue. Hello cardio garde pour SCA : voire pour coro/transfert pour surveillance rythmique.

• Technical



- HL7 FHIR
- HL7 CDA
- ISO 13606
- OMOP CDM
- DICOM
- CDISC
- ...



ICS > 35 > 35.240 > 35.240.40
ISO 13606-1:2019
Health informatics — Electronic health record
communication — Part 1: Reference model



• Semantic

ICD-10

- Diseases

CHOP

- CH – Surgical procedures

LOINC

- Observations and laboratory exams

ICNP

- Nursing procedures

ICPC

- Primary care

ICF

- Function and handicap

ATC

- Drugs

GTIN

- Commercial units

RxNorm

- Drugs

Orphanet

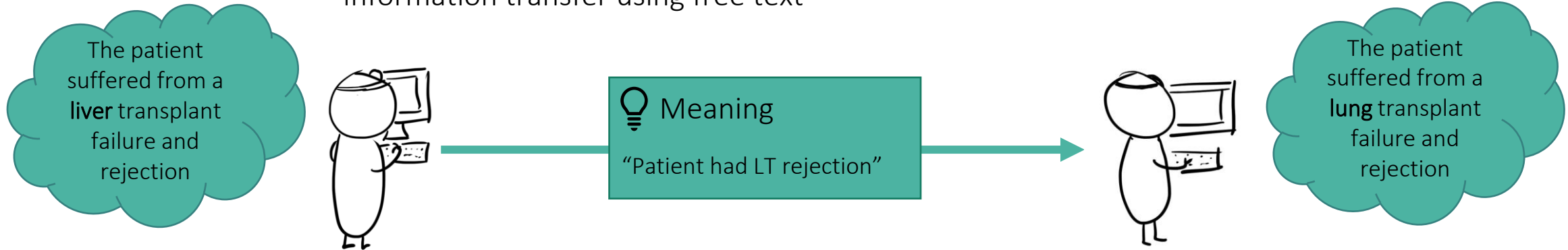
- Orphan diseases

MedDRA

- Medical products

.....

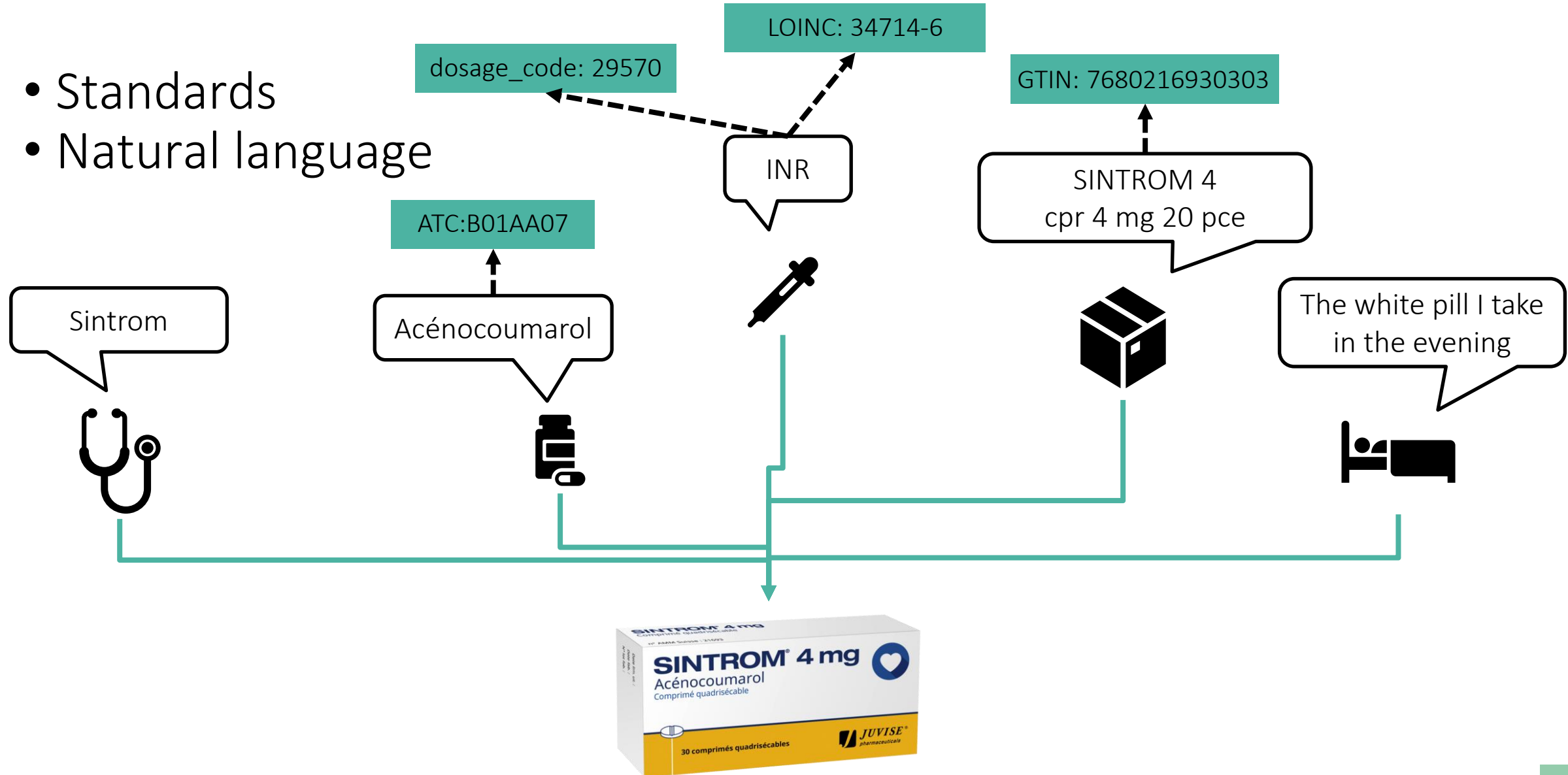
Information transfer using free text



Information transfer using a classification



- Standards
- Natural language



Real world



Narrative
representation

Snow white asleep, surrounded
by the mourning dwarves.

ICD-10
representation

- R40.2 Coma
- T57.0 Toxic effect of Arsenic and its compounds
- Z63 Other problems related to primary support group, including family circumstances
- E34.3 Short stature, not elsewhere classified

Quantity of information

SNOMED CT

- Born in 2001 (CT – SNOMED RT)
- Owned by its 40 member countries
- Free to use for members
- Non-profit organization: SNOMED International
- The most comprehensive, multilingual clinical healthcare terminology in the world

The global language of healthcare

Member

Affiliate Licensee

AMERICAS

Argentina
Canada
Chile
United States
Uruguay

EUROPE, MIDDLE EAST & AFRICA

Austria	Estonia	Israel	Netherlands	Slovak Republic
Belgium	Finland	Jordan	Norway	Spain
Cyprus	Germany	Lithuania	Portugal	Sweden
Czech Republic	Iceland	Luxembourg	Republic of Slovenia	Switzerland
Denmark	Ireland	Malta	Saudi Arabia	United Kingdom

ASIA PACIFIC

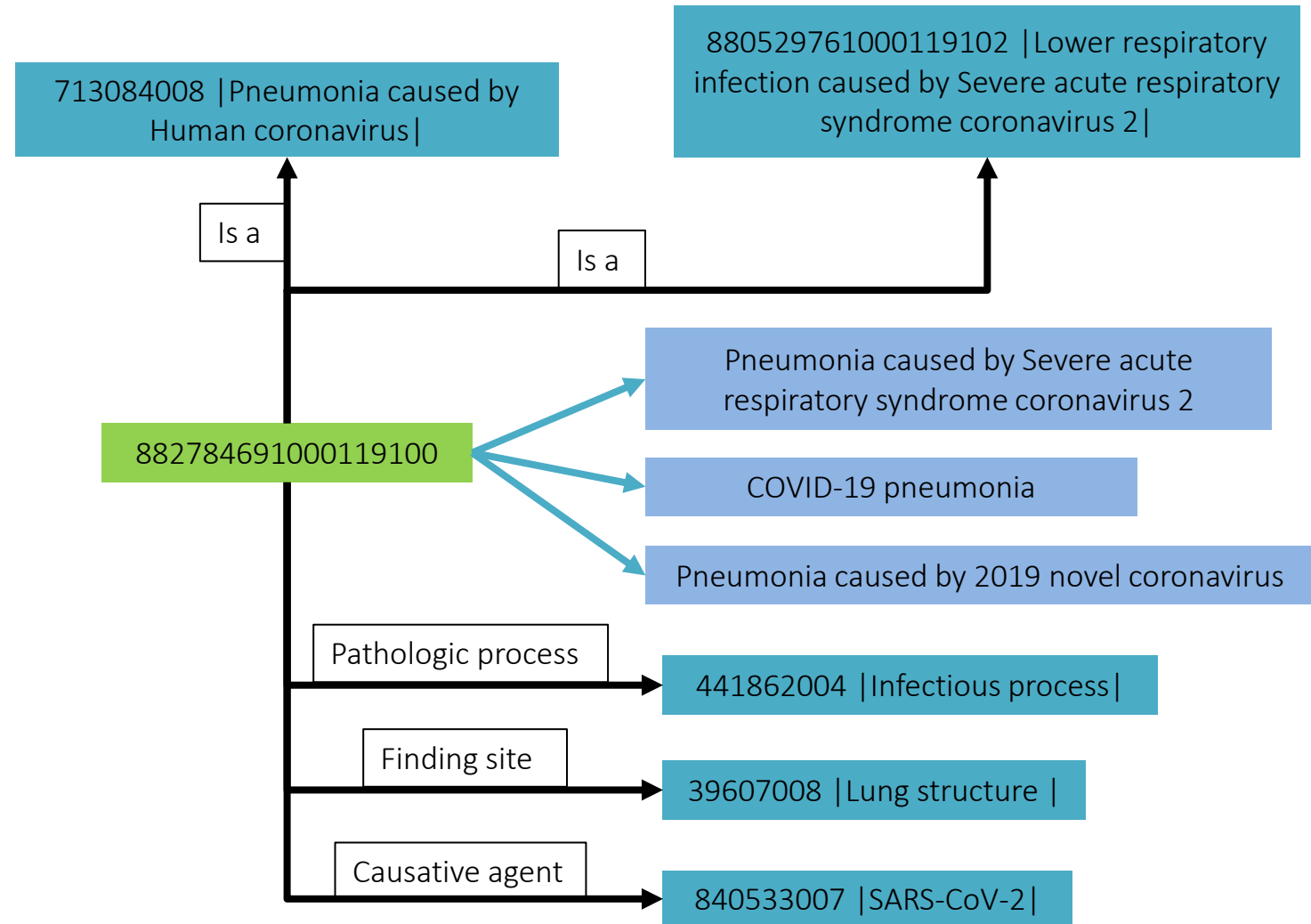
Australia	Malaysia
Brunei	New Zealand
Hong Kong, China	Republic of Armenia
India	Republic of Korea
Kazakhstan	Singapore

Updated: 01.01.2021



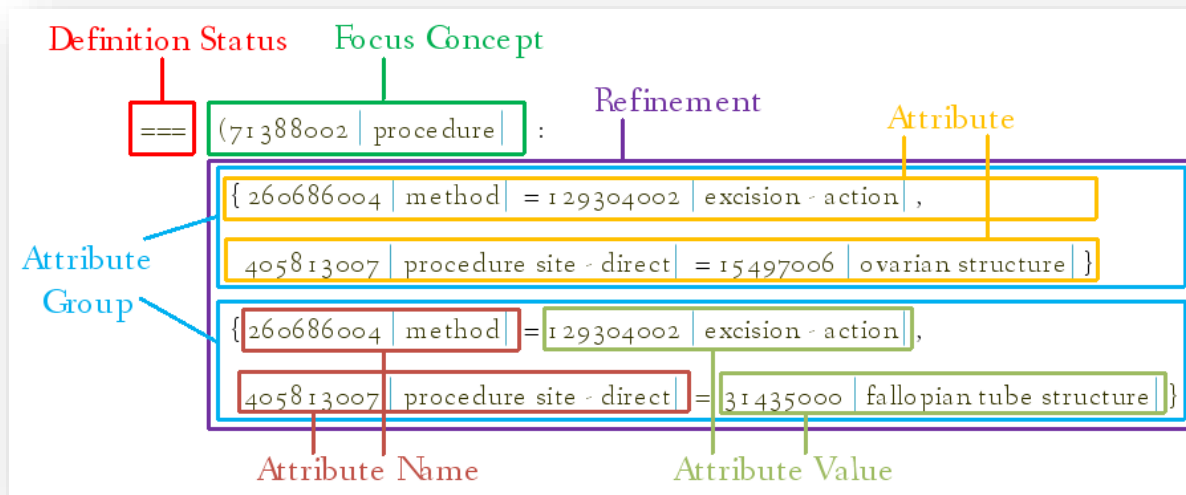
Composition of SNOMED CT

- Concepts
 - 354,448
- Descriptions
 - 1,506,185
- Relationships
 - 3,043,425



Compositional possibilities

- Compositional grammar
- Postcoordinated concept



```
expression = ws [definitionStatus ws] subExpression ws
subExpression = focusConcept [ws "." ws refinement]
definitionStatus = equivalentTo / subtypeOf
equivalentTo = "==="
subtypeOf = "<<<"
focusConcept = conceptReference *( *ws "+" ws conceptReference)
conceptReference = conceptId [ws "]" ws term ws "]"
conceptId = sctId
term = nonwsNonPipe *( *SP nonwsNonPipe)
refinement = (attributeSet / attributeGroup) *( ws ["," ws] attributeGroup)
attributeGroup = "(" ws attributeSet ws ")"
attributeSet = attribute *(ws "," ws attribute)
attribute = attributeName ws "=" ws attributeValue
attributeName = conceptReference
attributeValue = expressionValue / QM stringValue QM / "#" numericValue
expressionValue = conceptReference / "(" ws subExpression ws ")"
stringValue = 1*(anyNonEscapedChar / escapedChar)
numericValue = ["-"/"+"] (decimalValue / integerValue)
integerValue = digitNonZero *digit / zero
decimalValue = integerValue "." 1*digit
sctId = digitNonZero 5*17( digit)
ws = *( SP / HTAB / CR / LF ); optional white space
SP = %x20 ; space
HTAB = %x09 ; tab
CR = %x0D ; carriage return
LF = %x0A ; line feed
QM = %x22 ; quotation mark
BS = %x5C ; back slash
digit = %x30-39
zero = %x30
digitNonZero = %x31-39
nonwsNonPipe = %x21-7B / %x7D-7E / UTF8-2 / UTF8-3 / UTF8-4
anyNonEscapedChar = HTAB / CR / LF / %x20-21 / %x23-5B / %x5D-7E / UTF8-2 / UTF8-3 / UTF8-4
escapedChar = BS QM / BS BS
UTF8-2 = %xC2-DF UTF8-tail
UTF8-3 = %xE0 %xA0-BF UTF8-tail / %xE1-EC 2( UTF8-tail) / %xED %x80-9F UTF8-tail / %xEE-EF 2( UTF8-tail)
UTF8-4 = %xF0 %x90-BF 2( UTF8-tail) / %xF1-F3 3( UTF8-tail) / %xF4 %x80-8F 2( UTF8-tail)
UTF8-tail = %x80-BF
```


Create a database of SARS-CoV-2 patients in HUG

Allow the governance of HUG to support decision processes required by the pandemic

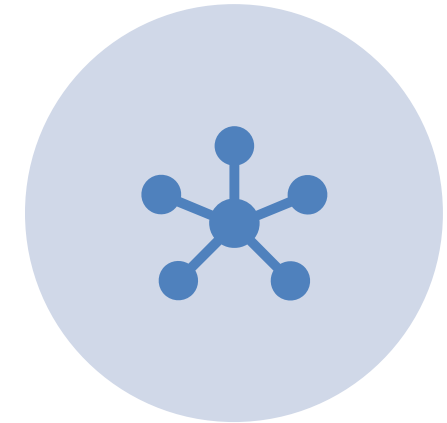
Allow reuse of the data for research



FOCUS ON EXISTING
DATA



HUMAN READABLE
LABEL



CLEAR SEMANTICS

SNOMEDCT
The global
language of
healthcare

All patients

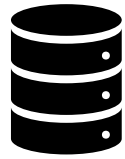
- Tested for SARS-CoV-2
- Diagnosed with SARS-CoV-2
- Suspect of SARS-CoV-2 infection

All structured data

- Laboratories, observations, diagnoses, administrative data, etc.

2 years of history

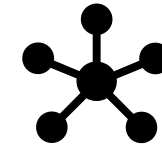
- If already known in the hospital



Raw data

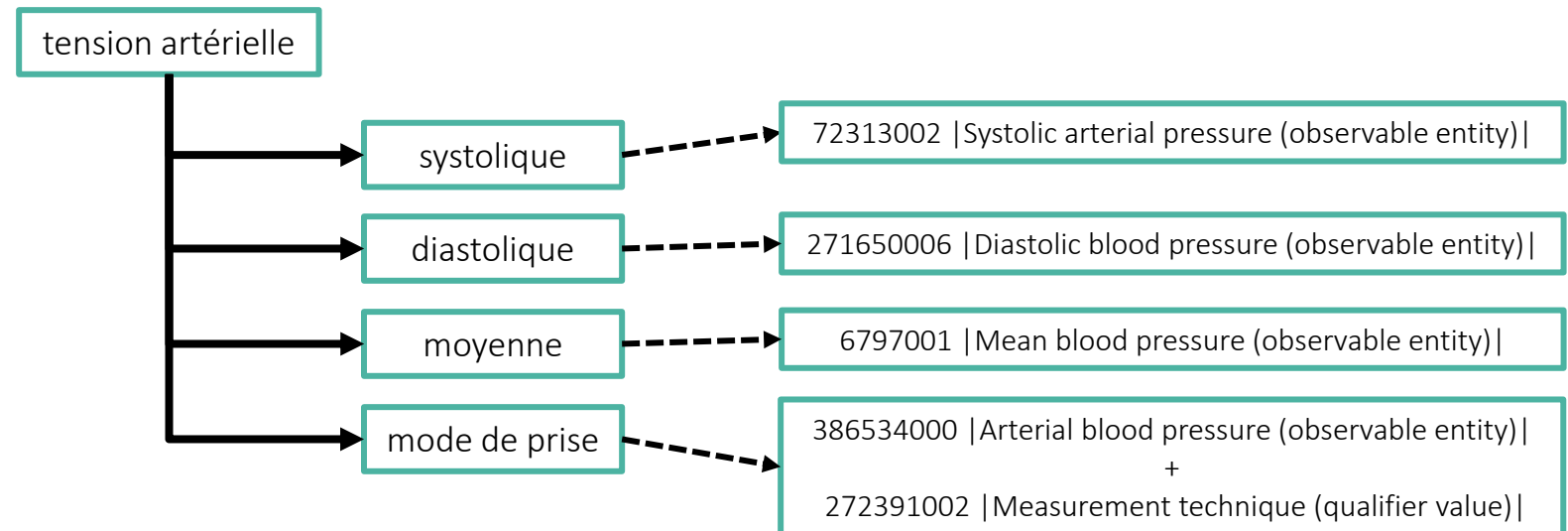


Readable label



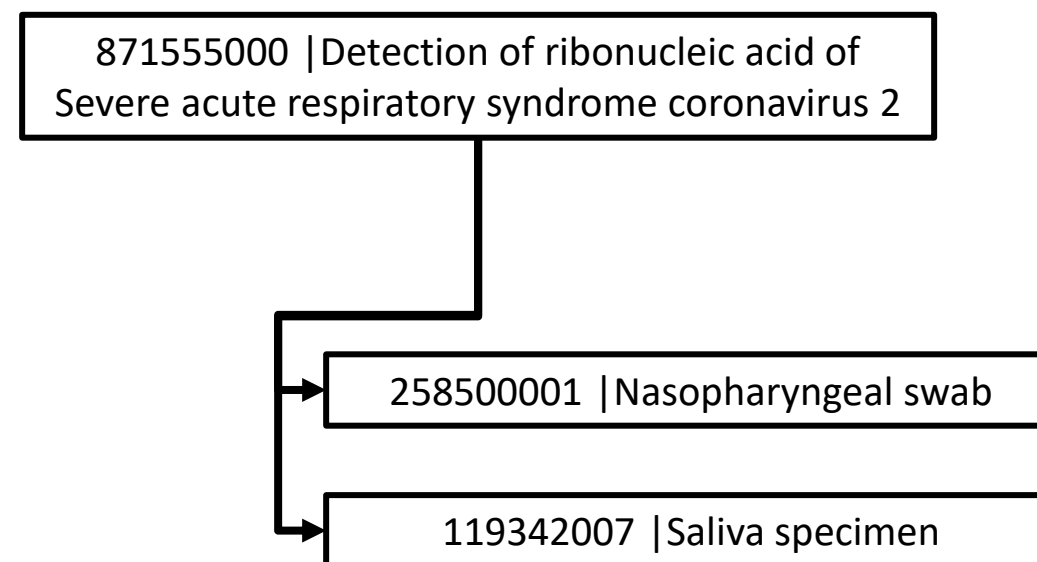
Semantic encoding

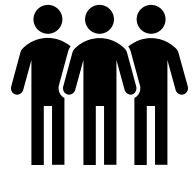
```
"datas": [
  {
    "subkey": "sys",
    "value_str": "90",
    "value": 90.0,
    "unit": "mmHg"
  },
  {
    "subkey": "dia",
    "value_str": "47",
    "value": 47.0,
    "unit": "mmHg"
  },
  {
    "subkey": "mean",
    "value_str": "62",
    "value": 62.0,
    "unit": "mmHg"
  },
  {
    "subkey": "mode",
    "value_str": "invasive"
  }
]
```



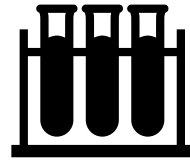
- 4085 lab analysis,
 - 1200 simplified labels
 - 1204 SNOMED CT encodings
- 365 observations
 - 340 simplified labels
 - 331 SNOMED CT encodings
- 128 formularies encoded in SNOMED CT
 - 4172 droplists
 - 478 SNOMED CT encodings

MATERIEL	ANALYSE	RESULTAT	RESULTAT_LIBEL
autre	2019-nCoV, PCR	SARS2, Nimb, interp	SARS-CoV-2, ARN, PCR, qI (Nimbus)
autre	2019-nCoV, PCR	2019-nCoV, interp.	SARS-CoV-2, ARN, PCR, qI (COBAS 6800)
autre	2019-nCoV, PCR	CoV2, GXpert, interp	SARS-CoV-2, ARN, PCR, qI (GeneXpert)
frot.	2019-nCoV, PCR	SARS2, Nimb, interp	SARS-CoV-2, ARN, PCR, qI (Nimbus)
frot.	2019-nCoV, PCR	2019-nCoV, interp.	SARS-CoV-2, ARN, PCR, qI (COBAS 6800)
frot.	2019-nCoV, PCR	CoV2, GXpert, interp	SARS-CoV-2, ARN, PCR, qI (GeneXpert)
salive	2019-nCoV, PCR	CoV2, GXpert, interp	SARS-CoV-2, ARN, PCR, qI (GeneXpert)
salive	2019-nCoV, PCR	SARS2, Nimb, interp	SARS-CoV-2, ARN, PCR, qI (Nimbus)
salive	2019-nCoV, PCR	2019-nCoV, interp.	SARS-CoV-2, ARN, PCR, qI (COBAS 6800)





191'000
patients



30'000'000
lab analysis



4'700'000
diagnoses



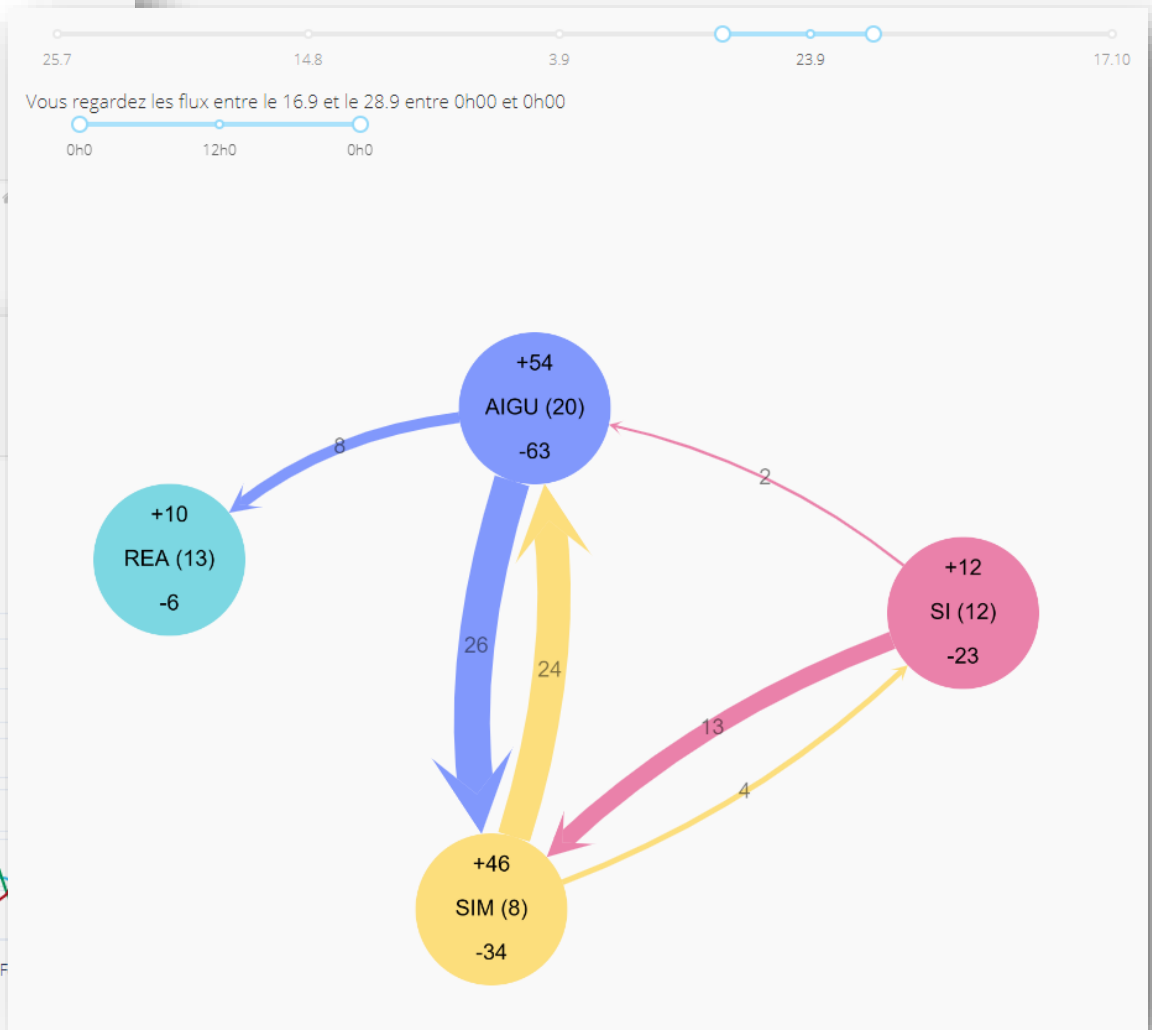
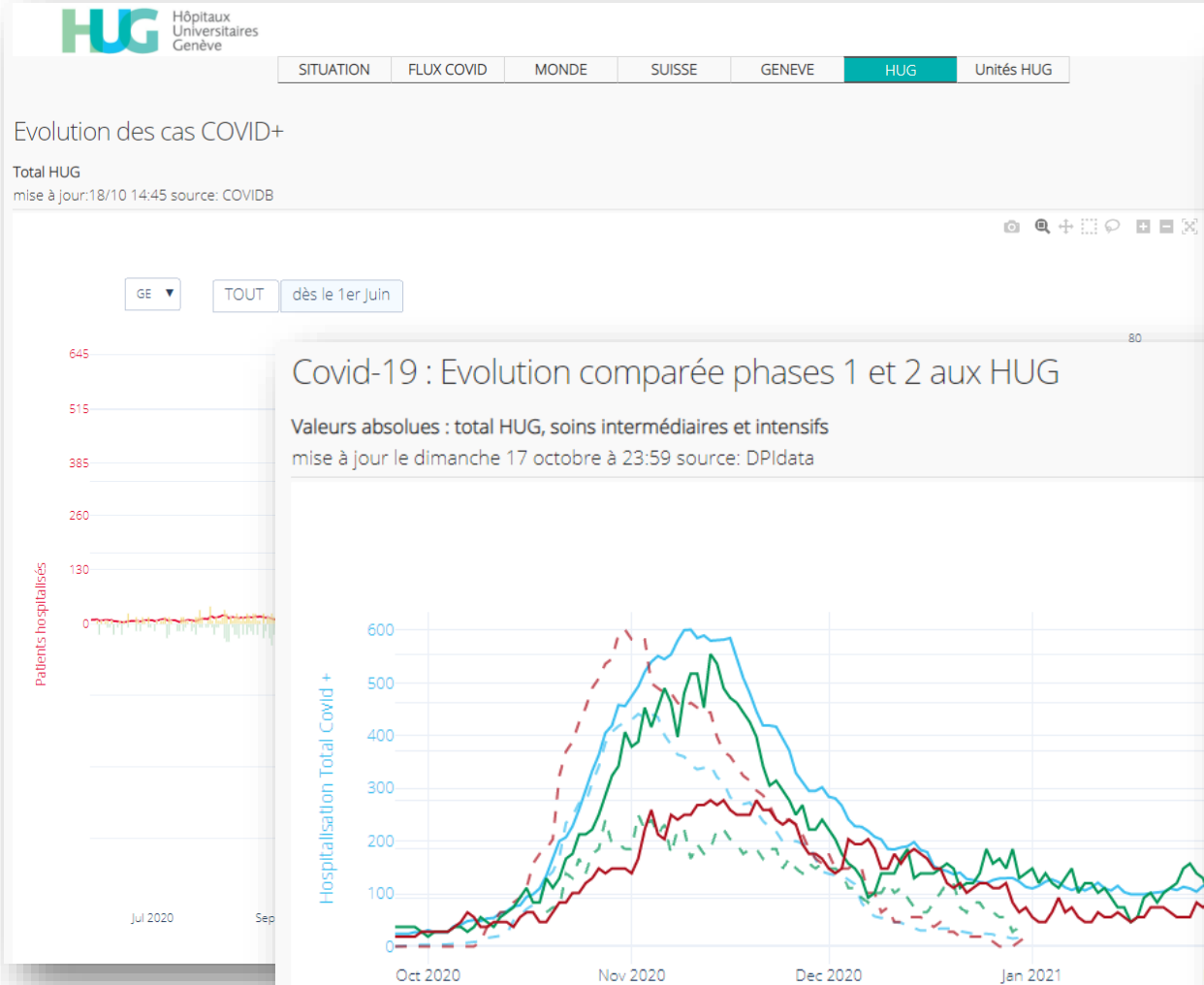
890'000
stays



227'000'000
observations



2'800'000
prescriptions





Autoser Cov

Faisabilité de l'utilisation d'un dispositif d'auto-prélèvement de sang capillaire pour des sérologies anti-SARS-CoV-2 et performances des tests sérologiques chez des patients vulnérables



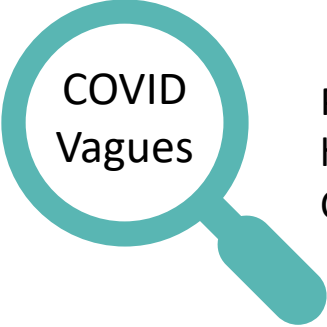
COVID HBP

Etude rétrospective examinant l'interaction entre le système hépatopancréato-biliaire et le COVID-19



HGT COVID

Impact de la glycémie pré-hospitalière sur le pronostic des patients avec COVID pris en charge en pré-hospitalier



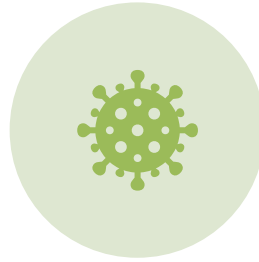
COVID Vagues

Patient characteristics and outcomes among patients hospitalised at Geneva University Hospital with COVID-19: Comparison between first and second waves



StratCov

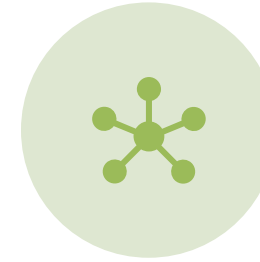
Evaluation de stratégies thérapeutiques dans le contexte du COVID-19



ALL COVID RELATED
DATA



ONE PLACE



CLEAR SEMANTICS



HUMAN READABLE
LABELS



ONLY BROWSE
RELEVANT ITEMS



BENEFIT FROM
SNOMED CT FEATURES



“The Hatter’s remark seemed to have no sort of meaning in it, and yet it was certainly English.”

Lewis Carroll, Alice in Wonderland