MEDICAL ONTOLOGIES FOR HEALTHCARE

SAP CONNECTED HEALTH PLATFORM

About SAP's Connected Health Platform

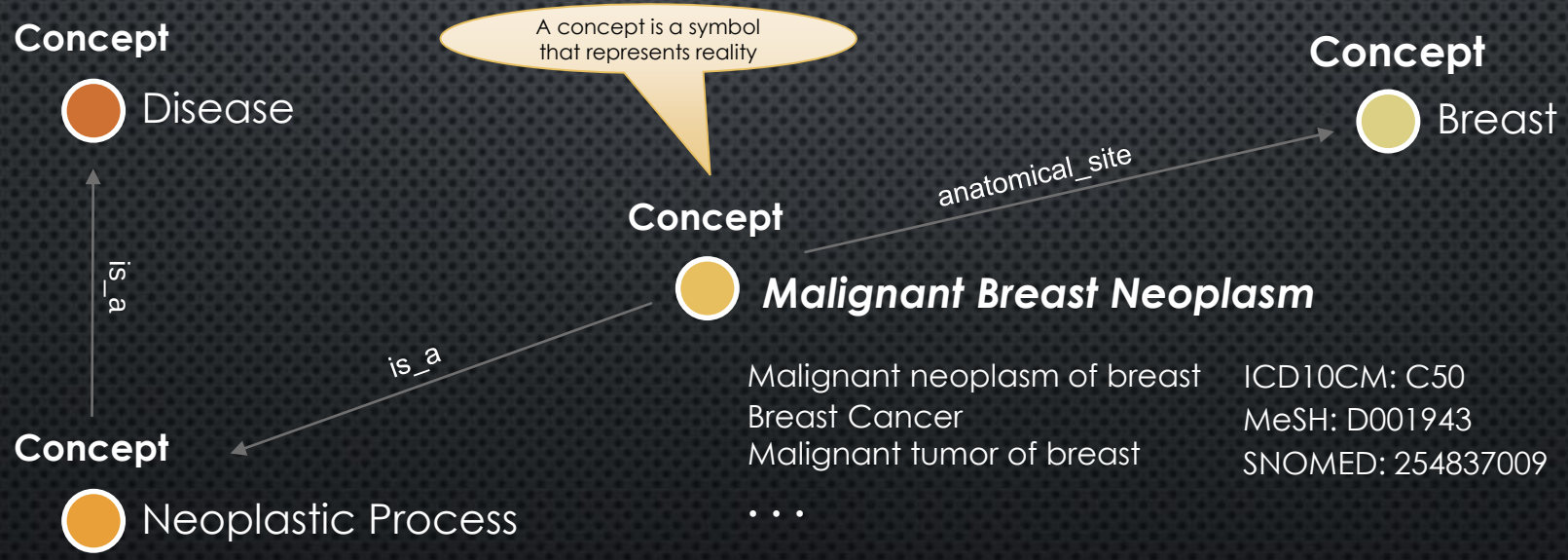
- Platform for personalized-medicine applications
- Analysis of big medical data from various sources
- Optimize patient outcomes through precision medicine and prevention support

Ontology

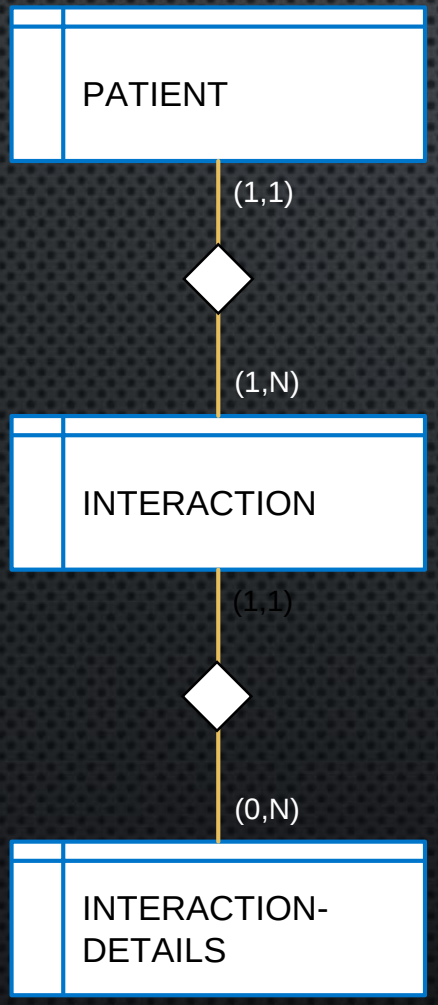
- Ontology is a discipline in philosophy. It's a meta description of beings and things that exists.
- In computer science an ontology is as well a meta description. It describes the meaning of data. It can be under stood as a knowledge framework.

EXAMPLE

- AN ONTOLOGY IS ORGANIZED BY CONCEPTS



CLINICAL DATA MODEL



Patient ID

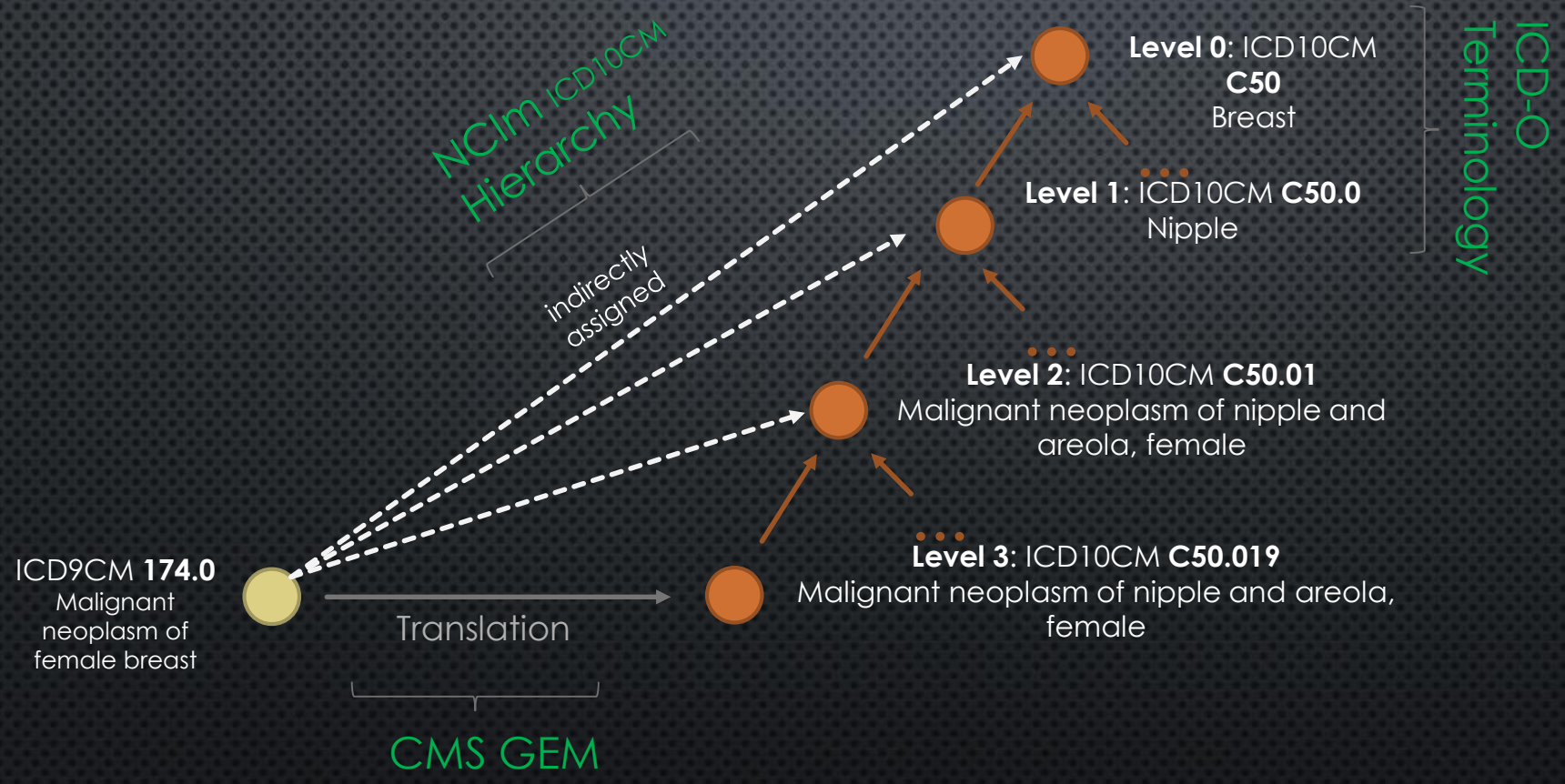
Interaction Type

Diagnosis, Active

Attribute Vocab	Attribute Value	Value Vocab	Value
SNOMED	8319008	ICD10CM	C50.312

Populated by
- Structured or
- Unstructured data

DISEASE CLASSIFICATION

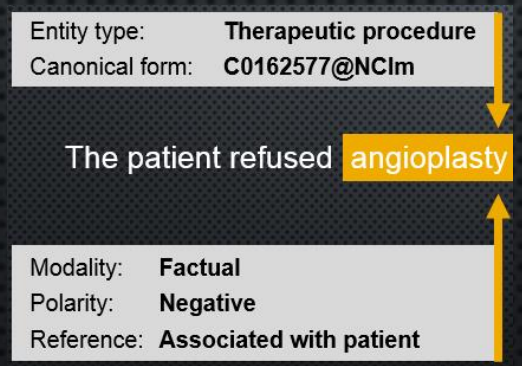


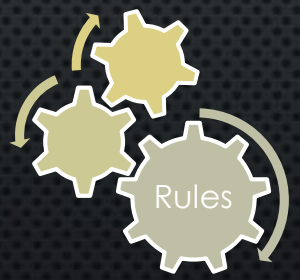
DEMO: DATA INGESTION WITH NLP PIPELINE

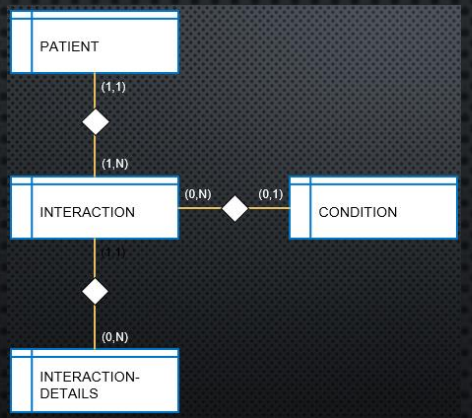
Ontology Services

Terminology | Advanced Matching | Disambiguation | Target Codification

Core Text Analysis → Post processing → Transformation Rules → Clinical Data Warehouse

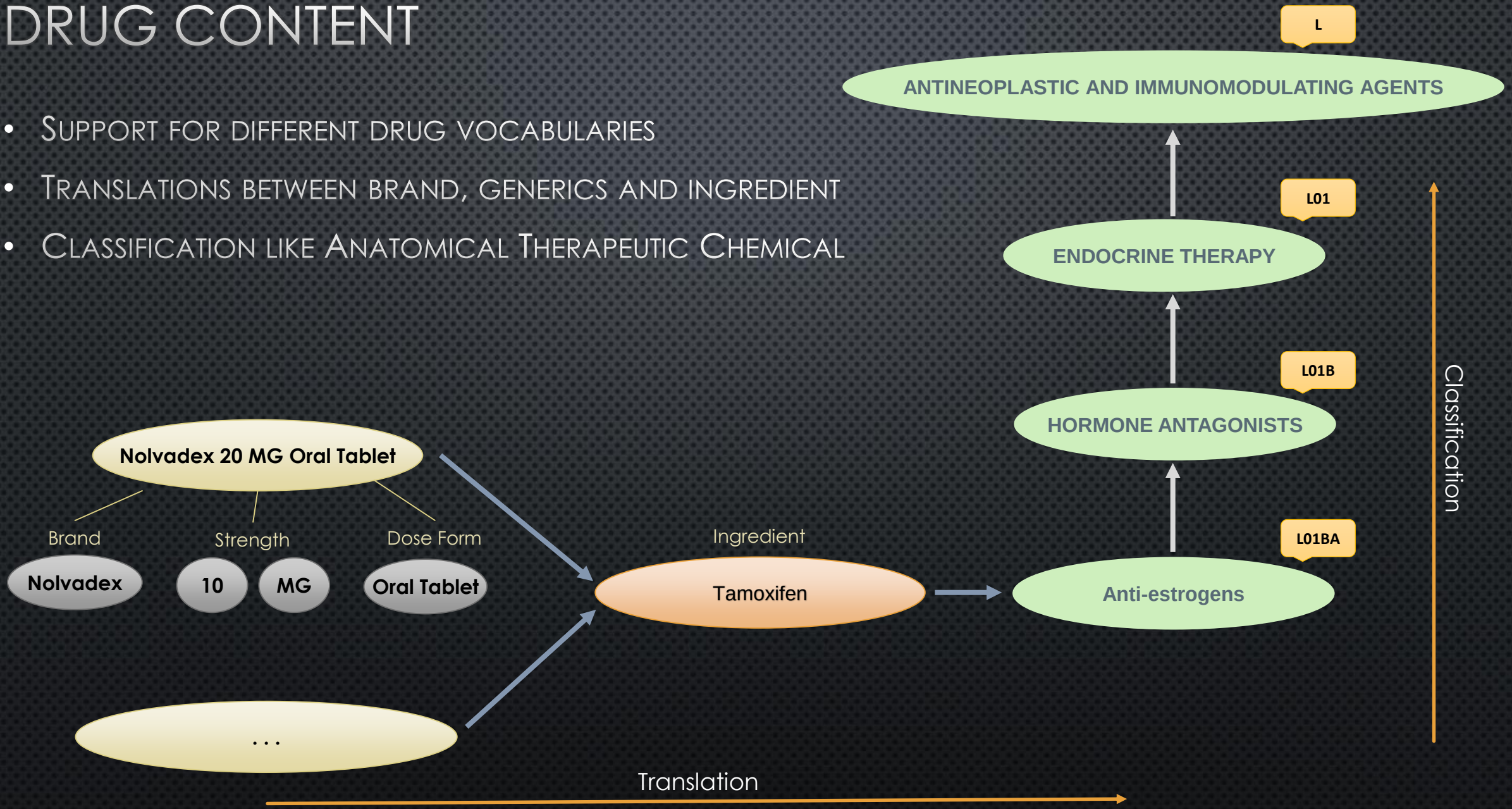






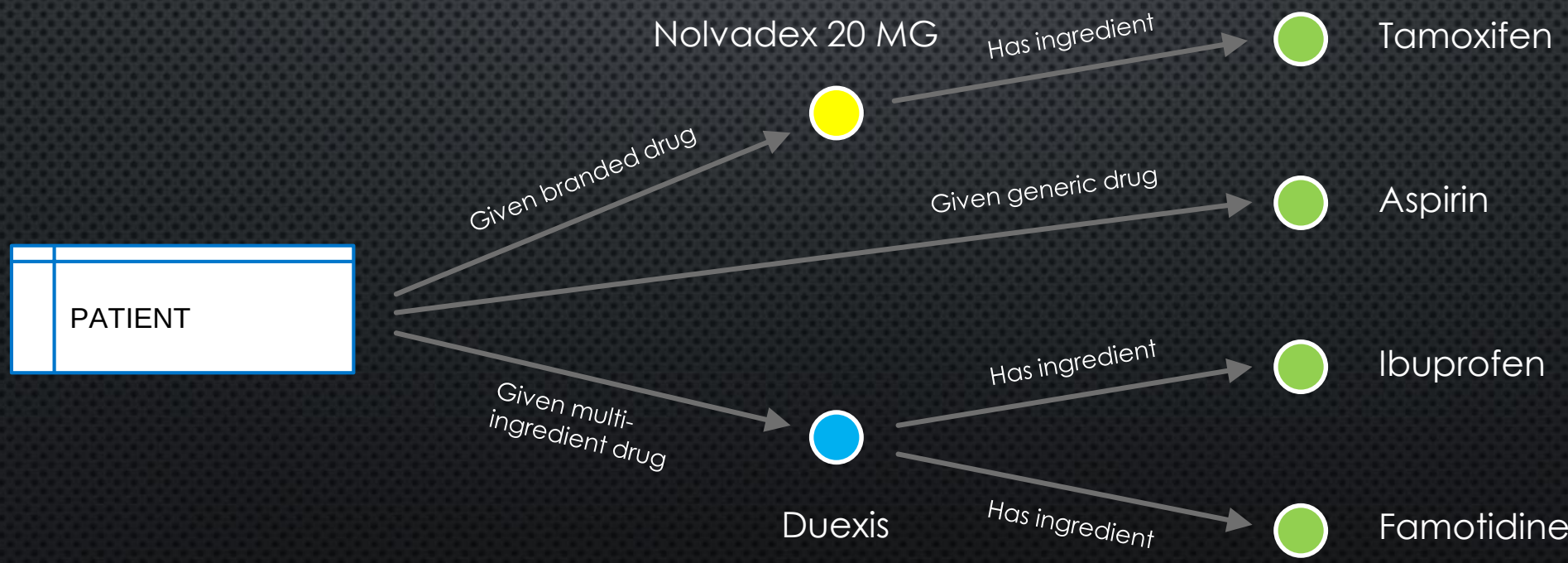
DRUG CONTENT

- SUPPORT FOR DIFFERENT DRUG VOCABULARIES
- TRANSLATIONS BETWEEN BRAND, GENERICS AND INGREDIENT
- CLASSIFICATION LIKE ANATOMICAL THERAPEUTIC CHEMICAL



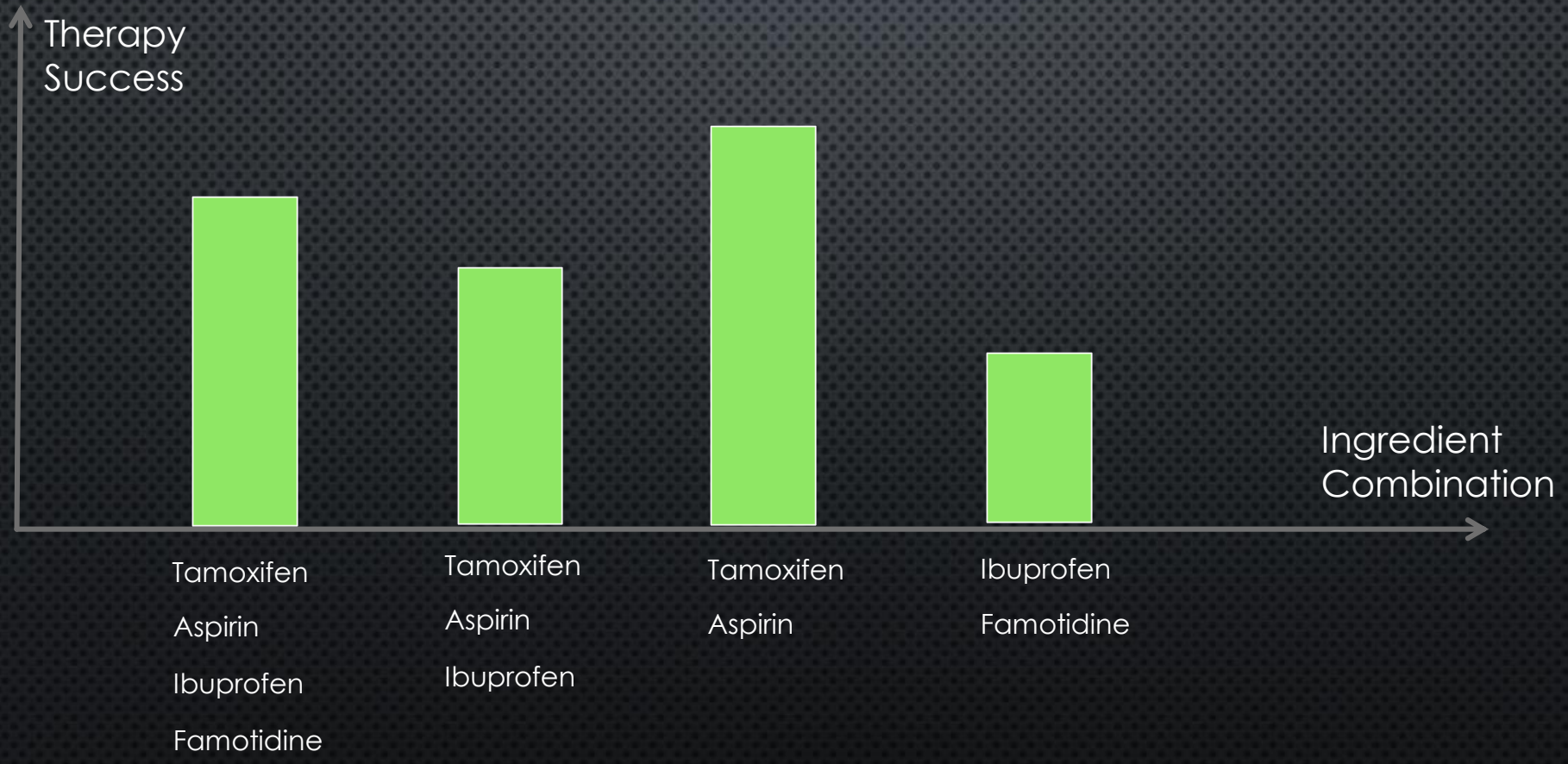
PATIENTS WITH SAME MEDICATION

- Problem Description: To analyze the success of a medication – including drug interactions, a certain cohort of patients shall be divided into groups whose members got the exact same combination of ingredients
- Medication data will be inhomogeneous: They may be given by brand name, by ingredient directly, or as multi-ingredient drugs



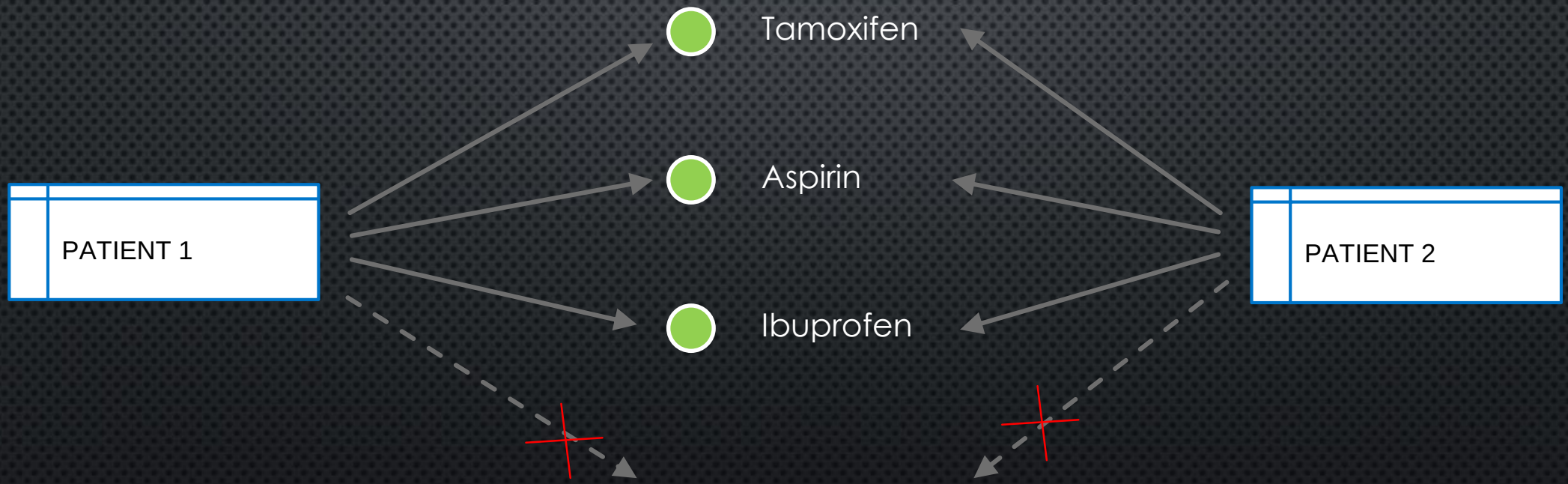
PATIENTS WITH SAME MEDICATION

- POSSIBLE USE CASE: SHOW DIAGRAM WITH THERAPY SUCCESS DEPENDING ON THE COMBINATION OF INGREDIENTS



PATIENTS WITH SAME MEDICATION

- ***SIMPLIFYING*** ASSUMPTION: INGREDIENTS ARE ASSIGNED DIRECTLY
- HOW TO FIND PATIENTS WITH EXACTLY THE SAME COMBINATION OF INGREDIENTS



PATIENTS WITH SAME MEDICATION

- CYPHER SNIPPET FOR FINDING PATIENTS WITH THE SAME ADMINISTERED INGREDIENTS

```
MATCH (patient1:Patient) -[:GOT_INGREDIENT]-> (ingredient) <-[:GOT_INGREDIENT]- (patient2:Patient)
WITH patient1, collect(ingredient.Code) as commonIngredients, patient2
WHERE size((patient1) -[:GOT_INGREDIENT]-> ()) = size(commonIngredients)
      and
      size((patient2) -[:GOT_INGREDIENT]-> ()) = size(commonIngredients)
RETURN patient1.Name,  commonIngredients, patient2.Name
```

PATIENTS WITH SAME MEDICATION

- IDEA FOR LANGUAGE SUPPORT OF SET AGGREGATION

```
MATCH (patient1:Patient) -[:GOT_INGREDIENT]-> (ingredient) <-[:GOT_INGREDIENT]- (patient2:Patient)
WHERE UNORDERED_SET{ (patient1) -[:GOT_INGREDIENT]-> (ingred) | ingred.Code } =
      UNORDERED_SET{ (patient2) -[:GOT_INGREDIENT]-> (ingred) | ingred.Code }
RETURN patient1.Name, collect(ingredient.Code), patient2.Name
```

- SIMILAR TO PATTERN COMPREHENSION:

```
[ (patient1) -[:GOT_INGREDIENT]-> (ingred) | ingred.Code) ]
```

Summary

- Ontology Services: **Tool to understand the meaning of clinical data**
- Use Cases
  - Translations & interoperability between vocabularies
  - Categorization / Classification of clinical data
  - Integration with NLP
  - Integration with Data Ingestion
  - Content assessment & evaluation

Q & A

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