Panel TBI-16 – Resources for Pharmacogenomics

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Drug Information Sources
Beyond Named Entity Recognition

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Outline

- Tasks
  - Beyond named entity recognition
    - Aggregation, reasoning
- Resources
  - RxNorm
  - NDF-RT
- Access to drug information sources
  - Application programming interfaces (APIs)

Tasks

Current paradigm

- Most PGx knowledge is available in unstructured text and need to be extracted
  - Biomedical literature
- Natural language processing tools help manual curation
  - Named entity recognition (NER)
  - Relation extraction
- NLP supported by knowledge resources
  - Dictionaries for NER
  - Ontologies for normalization and aggregation

Drug information sources

- Named entity recognition
  - Dictionaries (built from terminologies)
- Normalization
  - Synonyms (e.g., *acetaminophen* ↔ *paracetamol*)
  - Brand names (e.g., *Tylenol* → *acetaminophen*)
- Aggregation
  - Pharmacologic classes
    (e.g., *amiodarone* → *Class III antiarrhythmic agents*)

Future directions

- Sources of PGx knowledge: Observational studies
  - Drug, genotype and phenotype information in EMRs
- Tasks and enabling resources
  - Normalization across name spaces
    - Require integrated ontology repositories (RxNorm [+ UMLS, NCBO BioPortal])
  - Standardization
    - Point to entities in reference terminologies (RxNorm)
  - Reasoning about functional annotations
    - Mechanism of action, Physiologic effect, …
    - Require knowledge bases (e.g., NDF-RT)

Resources

RxNorm (NLM)

NDF-RT (VHA)

Normalized form

Strength **Ingredient** **Dose form**

4mg/ml Fluoxetine Oral Solution

Strength **Ingredient**

Clinical drug component

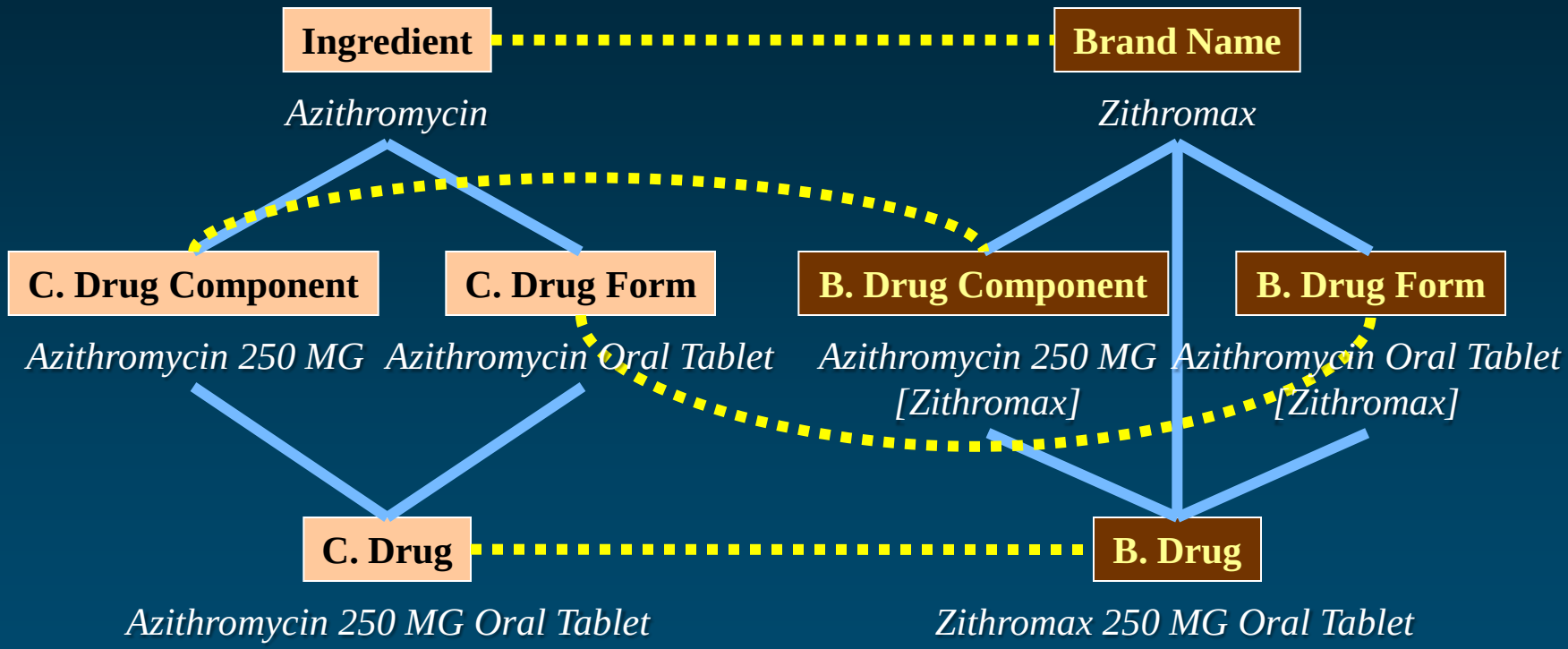
Ingredient **Dose form**

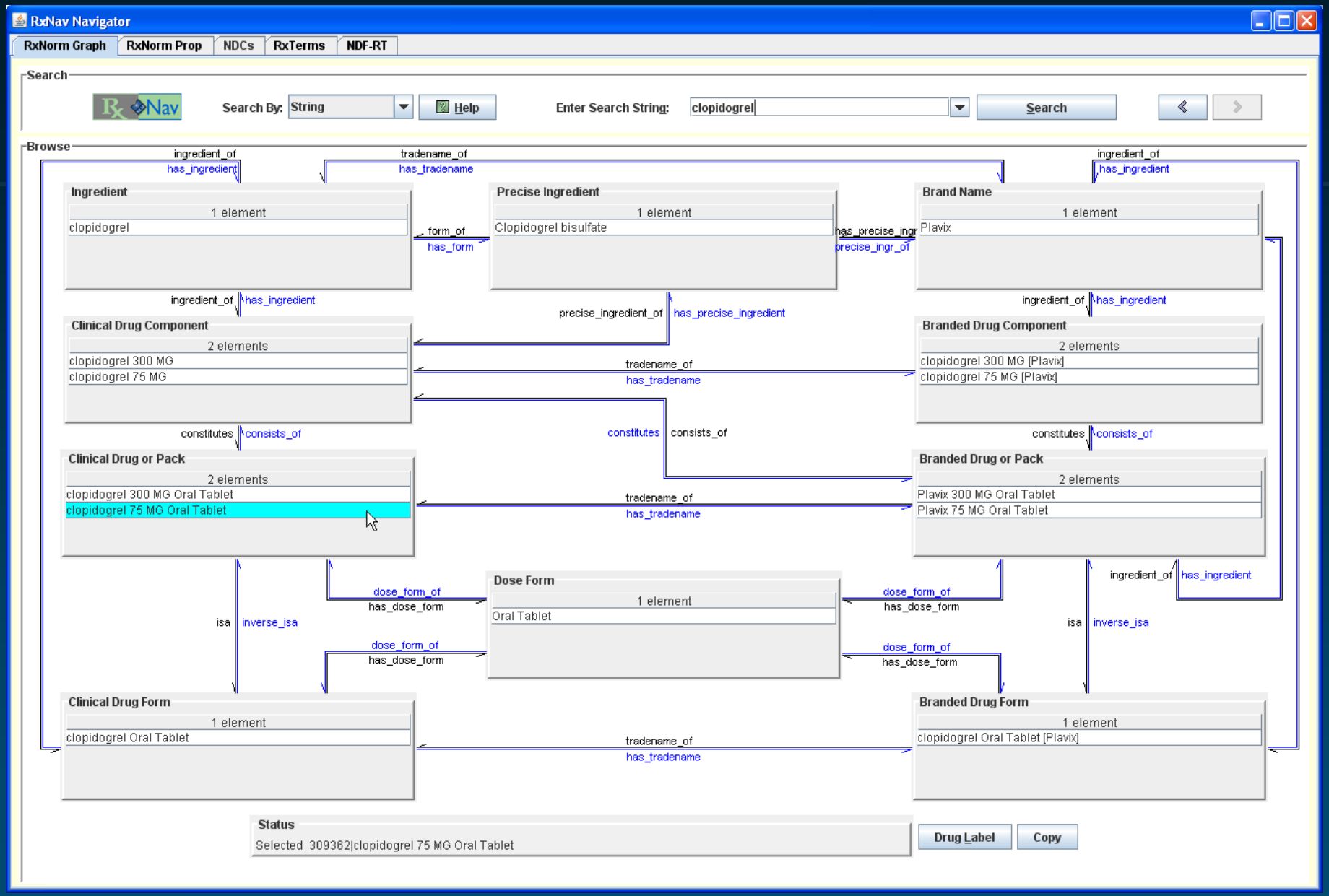
Clinical drug form

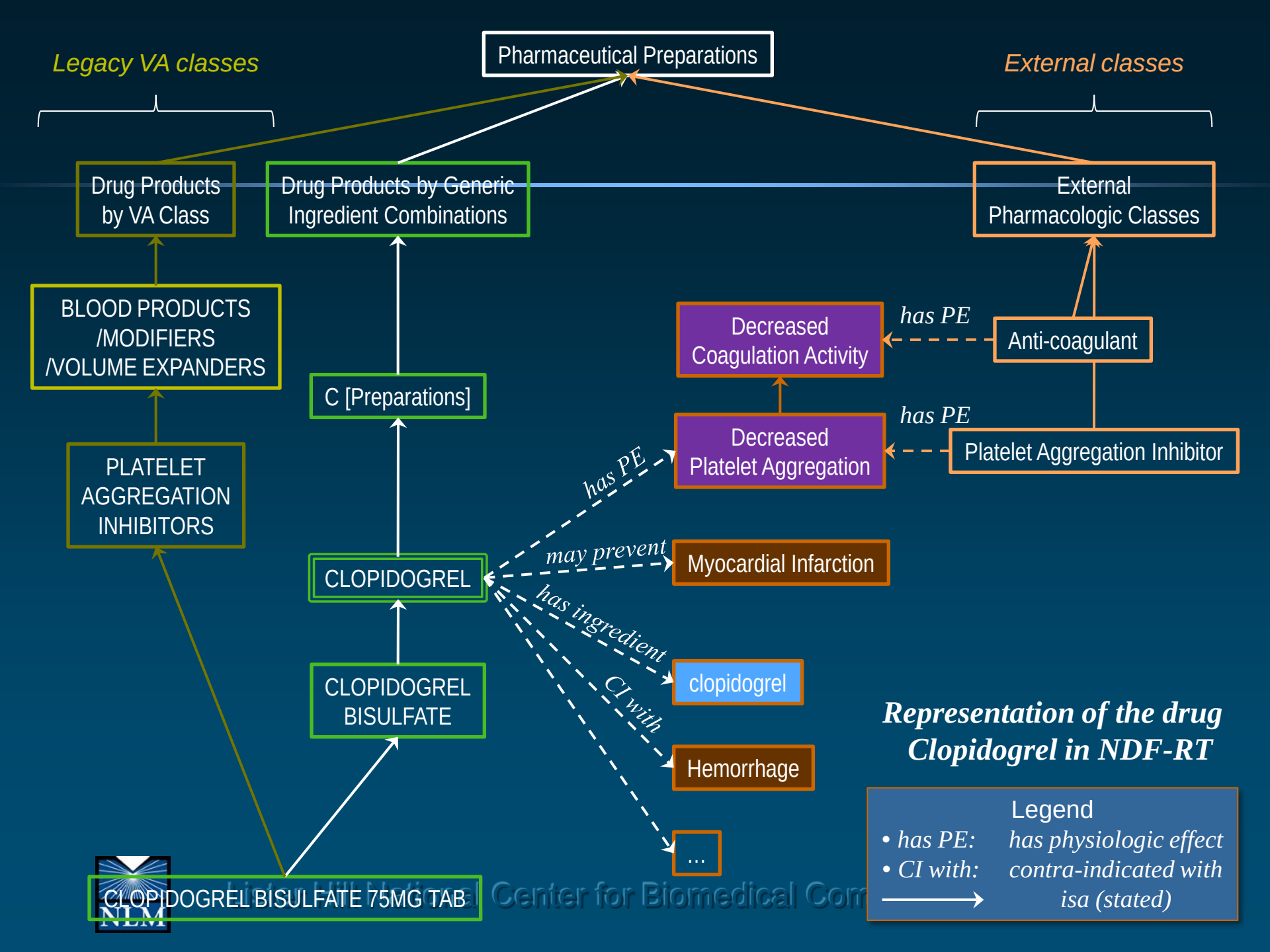
Strength **Ingredient** **Dose form**

Clinical drug

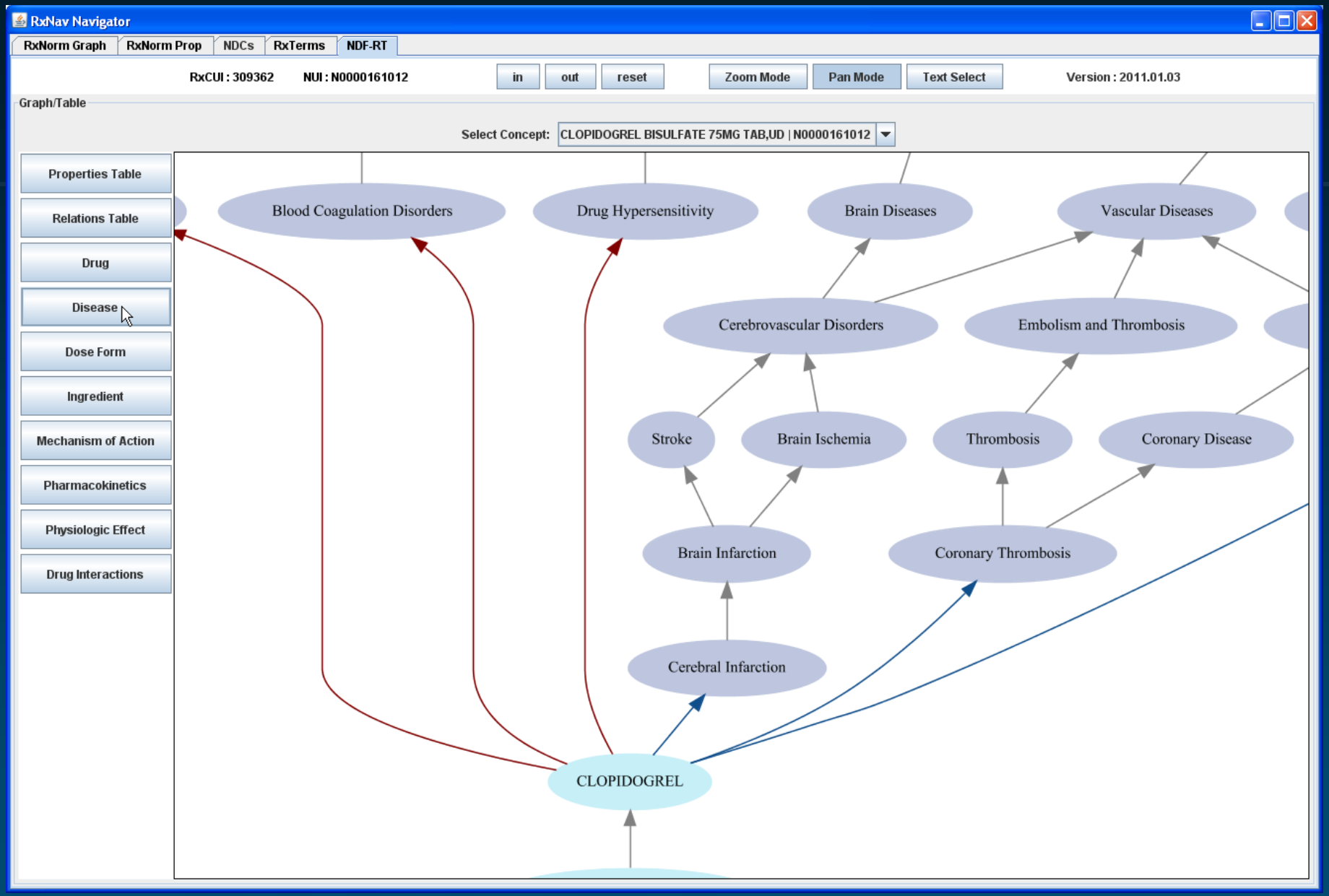
Relations among drug entities




RxNav Navigator
RxNorm Graph
RxNorm Prop
NDCs
RxTerms
NDF-RT
Search
RxNav
Search By: String
Help
Enter Search String: clopidogrel
Search
Browse
ingredient_of
has_ingredient
tradename_of
has_tradename
Ingredient
1 element
clopidogrel
form_of
has_form
Precise Ingredient
Clopidogrel bisulfate
has_precise_ingr
precise_ingr_of
Brand Name
Plavix
precise_ingredient_of
has_precise_ingredient
Clinical Drug Component
2 elements
clopidogrel 300 MG
clopidogrel 75 MG
Branded Drug Component
clopidogrel 300 MG [Plavix]
clopidogrel 75 MG [Plavix]
constitutes
consists_of
Clinical Drug or Pack
clopidogrel 300 MG Oral Tablet
clopidogrel 75 MG Oral Tablet
Branded Drug or Pack
Plavix 300 MG Oral Tablet
Plavix 75 MG Oral Tablet
dose_form_of
has_dose_form
Dose Form
Oral Tablet
isa
inverse_isa
Clinical Drug Form
clopidogrel Oral Tablet
Branded Drug Form
clopidogrel Oral Tablet [Plavix]
Status
Selected 309362|clopidogrel 75 MG Oral Tablet
Drug Label
Copy



U.S. National Library of Medicine, National Center for Biomedical Computing


RxNav Navigator
RxNorm Graph
RxNorm Prop
NDCs
RxTerms
NDF-RT
RxCUI : 309362
NUI : N0000161012
in
out
reset
Zoom Mode
Pan Mode
Text Select
Version : 2011.01.03
Graph/Table
Select Concept:
CLOPIDOGREL BISULFATE 75MG TAB,UD | N0000161012
Properties Table
Relations Table
Drug
Disease
Dose Form
Ingredient
Mechanism of Action
Pharmacokinetics
Physiologic Effect
Drug Interactions
Blood Coagulation Disorders
Drug Hypersensitivity
Brain Diseases
Vascular Diseases
Cerebrovascular Disorders
Embolism and Thrombosis
Stroke
Brain Ischemia
Thrombosis
Coronary Disease
Brain Infarction
Coronary Thrombosis
Cerebral Infarction
CLOPIDOGREL

Access to drug information sources

APIs

APIs vs. static resources

- Frequent updates
  - Monthly releases of RxNorm and NDF-RT
- Complex tasks
  - Traversal of the RxNorm graph
  - Drug-drug interactions inferred among clinical drugs

RESTful resource	SOAP-based function
/	(none)
/version	getRxNormVersion
/displaynames	getDisplayNames
/idtypes	getIdTypes
/relatypes	getRelaTypes
/termtypes	getTermTypes
/rxcui?name=*value*&srclst=*value*&allsrc=*value*&search=*value*	findRxcuiByString
/rxcui?idtype=*value*&id=*value*&allsrc=value	findRxcuiById
/rxcui/*{rxcui}*	(none)
/rxcui/*{rxcui}*/properties	getRxConceptProperties
/rxcui/*{rxcui}*/ndcs	getNDCs
/rxcui/*{rxcui}*/allrelated	getAllRelatedInfo
/rxcui/*{rxcui}*/related?tty=*values*	getRelatedByType
/rxcui/*{rxcui}*/related?rela=*values*	getRelatedByRelationship
/rxcui/*{rxcui}*/unii	getUNII
/rxcui/*{rxcui}*/quantity	getQuantity
/rxcui/*{rxcui}*/strength	getStrength
/rxcui/*{rxcui}*/proprietary?srclist=*values*&ticket=*value*	getProprietaryInformation
/spellingsuggestions?name=*value*	getSpellingSuggestions
/brands?ingredientids=*value*	getMultiIngredBrand
/drugs?name=*value*	getDrugs

References

- and RxNorm APIs
  - http://rxnav.nlm.nih.gov/
- RxNorm
  - http://www.nlm.nih.gov/research/umls/rxnorm/index.html
- NDF-RT
  - http://evs.nci.nih.gov/ftp1/NDF-RT/

Contact: RXNAVINFO@LIST.NIH.GOV

Web: http://rxnav.nlm.nih.gov/

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