



**Department of Veterans Affairs  
Veteran Health Administration  
Knowledge Based Systems  
Informatics Architecture Support Services**

**SNOMED International Drug Model  
& RxNorm Alignment**

**Michael Lawley, Research Group Leader, CSIRO**

Veterans Health Administration, Office of Informatics & Analytics and Health Informatics

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## Goals

- Common generic-level concepts to serve as anchors for national product-specific extensions
- IDMP alignment / compatibility
- International interoperability
- Simplify and enable CDS
- Targets for concepts in other hierarchies

# Fundamental Issues



- Open-world vs closed-world
- Products containing vs Products containing only
- RxNorm is closed-world model, limited hierarchy
- DL limitations
  - Existential vs Universal quantification
- DL work-around pattern
  - Ingredient counting

# RxNorm



## Scope

- generic drugs
- branded drugs
- packs

# RxNorm model



## Many data sources

Anatomical Therapeutic Chemical Classification System
Vaccines Administered
DrugBank
Gold Standard Drug Database
Multum MediSource Lexicon
Micromedex RED BOOK
Medical Subject Headings (MeSH)
CMS Formulary Reference File
FDA Structured Product Labels
FDB MedKnowledge
Veterans Health Administration National Drug File - Reference Terminology
NDFRT FDASPL relationships
NDFRT FMTSME relationships
US Edition of SNOMED CT (drug information)
USP Compendial Nomenclature
Veterans Health Administration National Drug File



# RxNorm model



## Normalised names

- Generic drugs
  - Ingredient Strength DoseForm
- Branded drugs
  - Ingredient Strength DoseForm [Brand Name]
- Generic drug packs
  - {# (Ingredient Strength DoseForm) / # (Ingredient Strength DoseForm)} Pack
- Branded drug packs
  - {# (Ingredient Strength DoseForm) / # (Ingredient Strength DoseForm)} Pack [Brand Name]

# “term” types



TTY	Name	Description	Example
IN	Ingredient	A compound or moiety that gives the drug its distinctive clinical properties. Ingredients generally use the United States Adopted Name (USAN).	Fluoxetine
PIN	Precise Ingredient	A specified form of the ingredient that may or may not be clinically active. Most precise ingredients are salt or isomer forms.	Fluoxetine Hydrochloride
DF	Dose Form		Oral Solution
SCDC	Semantic Clinical Drug Component	Ingredient + Strength	Fluoxetine 4 MG/ML
SCDF	Semantic Clinical Drug Form	Ingredient + Dose Form	Fluoxetine Oral Solution
SCD	Semantic Clinical Drug	Ingredient + Strength + Dose Form	Fluoxetine 4 MG/ML Oral Solution
BN	Brand Name	A proprietary name for a family of products containing a specific active ingredient.	Prozac
SBDC	Semantic Branded Drug Component	Ingredient + Strength + Brand Name	Fluoxetine 4 MG/ML [Prozac]
SBDF	Semantic Branded Drug Form	Ingredient + Dose Form + Brand Name	Fluoxetine Oral Solution [Prozac]
SBD	Semantic Branded Drug	Ingredient + Strength + Dose Form + Brand Name	Fluoxetine 4 MG/ML Oral Solution [Prozac]

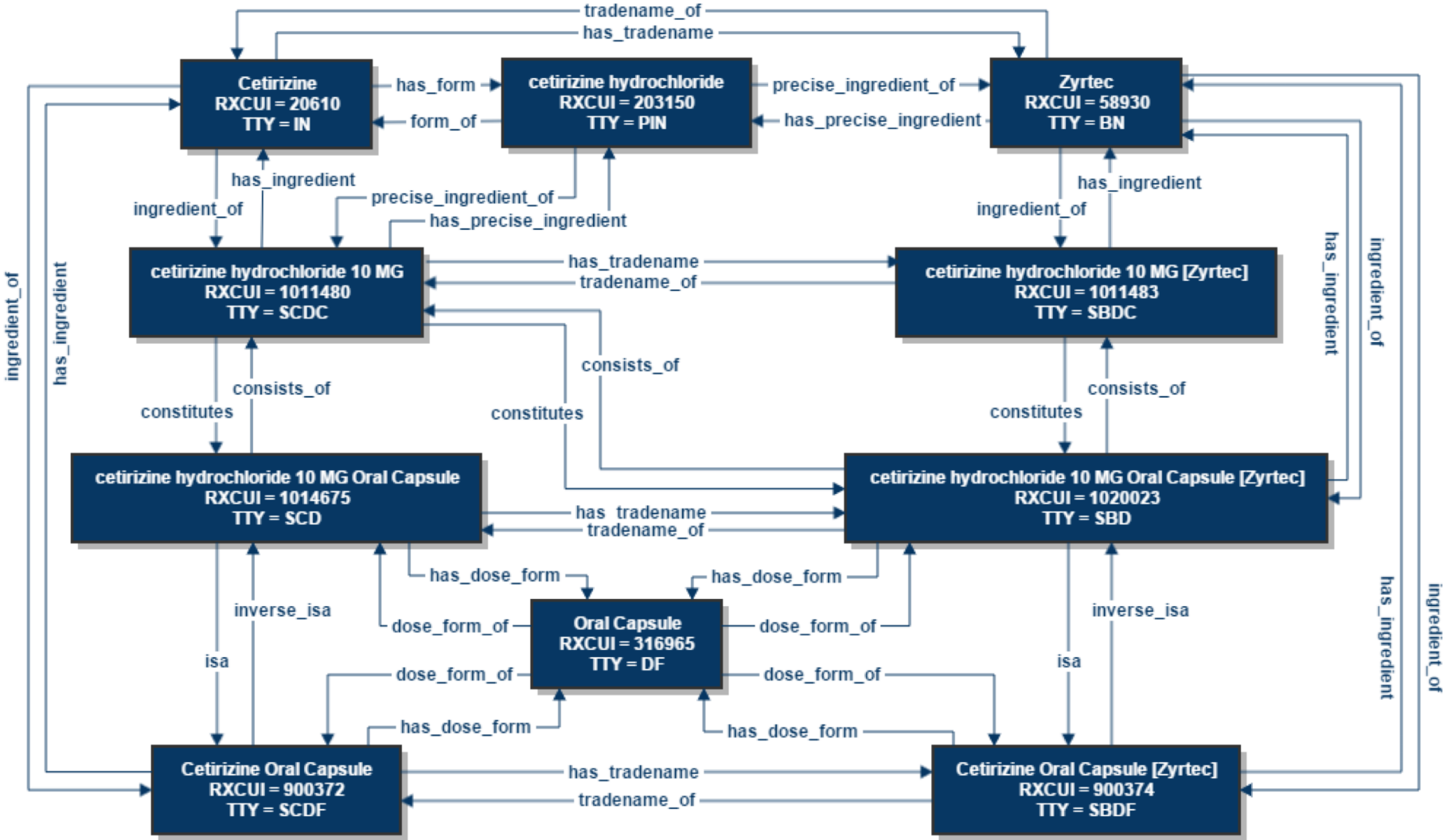
# “term” types



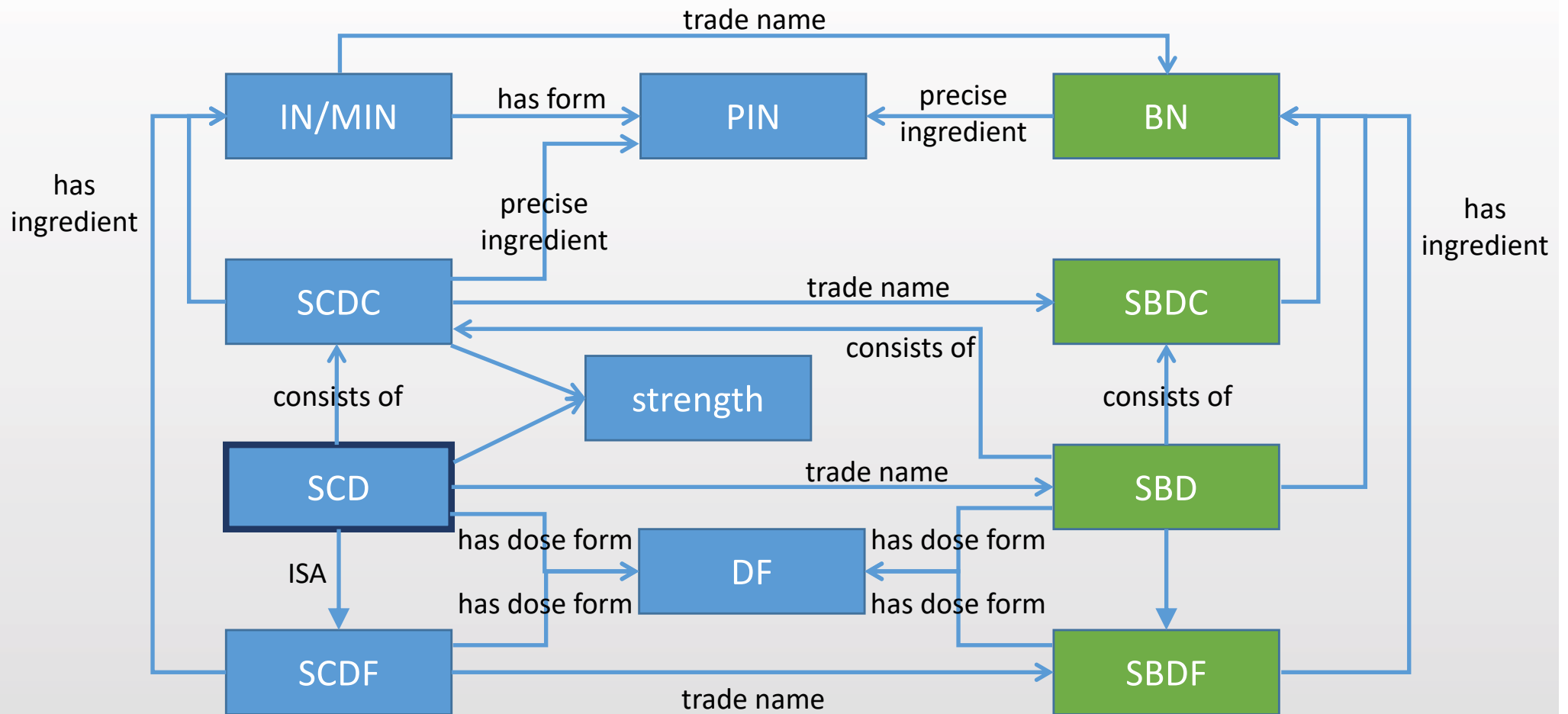
TTY	Name	Description	Example
MIN	Multiple Ingredients	Two or more ingredients appearing together in a single drug preparation, created from SCDF. In rare cases when IN/PIN or PIN/PIN combinations of the same base ingredient exist, created from SCD.	Fluoxetine / Olanzapine
DFG	Dose Form Group		Oral Liquid
SCDG	Semantic Clinical Dose Form Group	Ingredient + Dose Form Group	Fluoxetine Oral Product
SBDG	Semantic Branded Dose Form Group	Brand Name + Dose Form Group	Prozac Pill
PSN	Prescribable Name	Synonym of another TTY, given for clarity and for display purposes in electronic prescribing applications. Only one PSN per concept.	Leena 28 Day Pack
SY	Synonym	Synonym of another TTY, given for clarity.	Prozac 4 MG/ML Oral Solution
TMSY	Tall Man Lettering Synonym	Tall Man Lettering synonym of another TTY, given to distinguish between commonly confused drugs.	FLUoxetine 10 MG Oral Capsule [PROzac]
BPCK	Brand Name Pack	{# (Ingredient Strength Dose Form) / # (Ingredient Strength Dose Form)} Pack [Brand Name]	{12 (Ethinyl Estradiol 0.035 MG / Norethindrone 0.5 MG Oral Tablet) / 9 (Ethinyl Estradiol 0.035 MG / Norethindrone 1 MG Oral Tablet) / 7 (Inert Ingredients 1 MG Oral Tablet) } Pack [Leena 28 Day]
GPCK	Generic Pack	{# (Ingredient + Strength + Dose Form) / # (Ingredient + Strength + Dose Form)} Pack	{11 (varenicline 0.5 MG Oral Tablet) / 42 (varenicline 1 MG Oral Tablet) } Pack



# RxNorm model



# RxNorm Model (clean)



# Medicinal Product (MP)



- MP containing :  
[1..\*]{ Has active ingredient = < Substance }
- MP only :  
[1..\*]{ Has active ingredient = < Substance }  
[1..1]Count of base active ingredient = < Number
- MP precisely : Extensions only  
[1..\*]{ Has precise active ingredient = < Substance }  
[1..1]Count of base active ingredient = < Number  
[0..1]Count of base and modification pair = < Number  
[0..1]Count of active ingredient = < Number

# Medicinal Product Form (MPF)

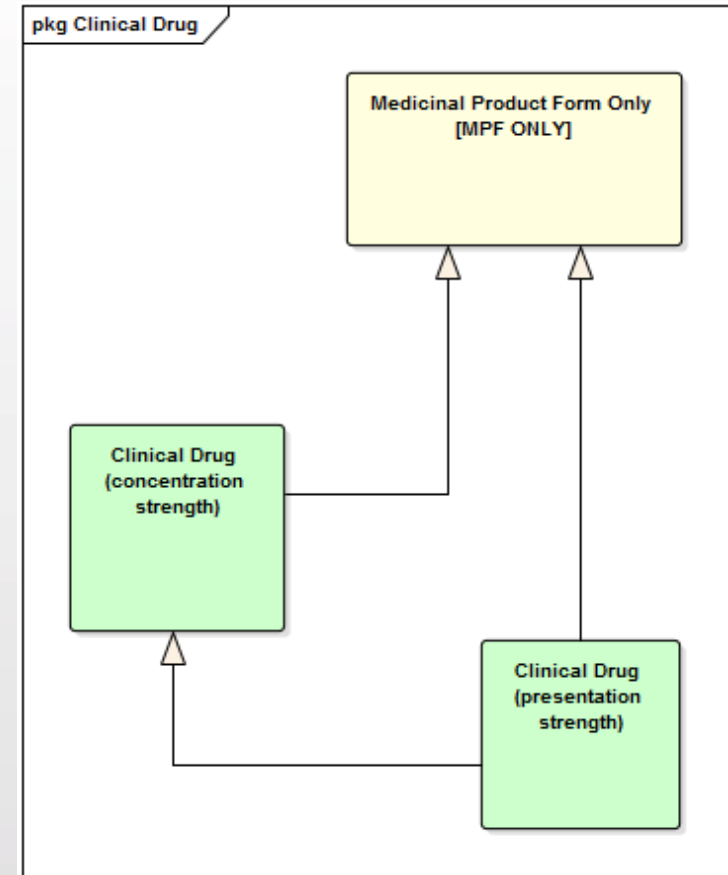


- MPF containing :  
[1..1]Has manufactured dose form = <Pharm. dose form  
[1..\*]{ Has active ingredient = < Substance }
- MPF only :  
[1..1]Has manufactured dose form = <Pharm. dose form  
[1..\*]{ Has active ingredient = < Substance }  
[1..1]Count of base active ingredient = < Number
- MPF precisely Extensions only
  - Same pattern as MP precisely

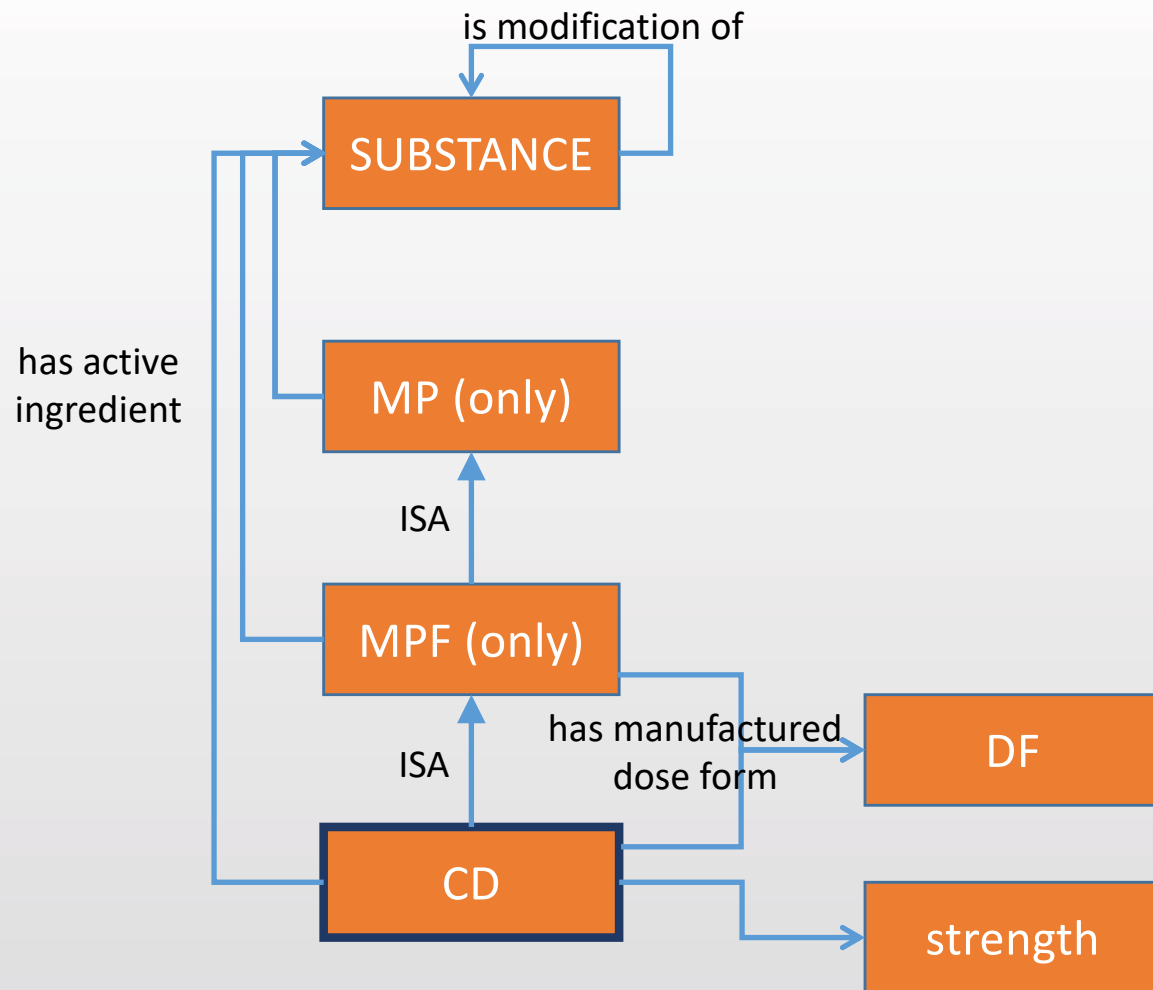
# Clinical Drug (CD precisely)



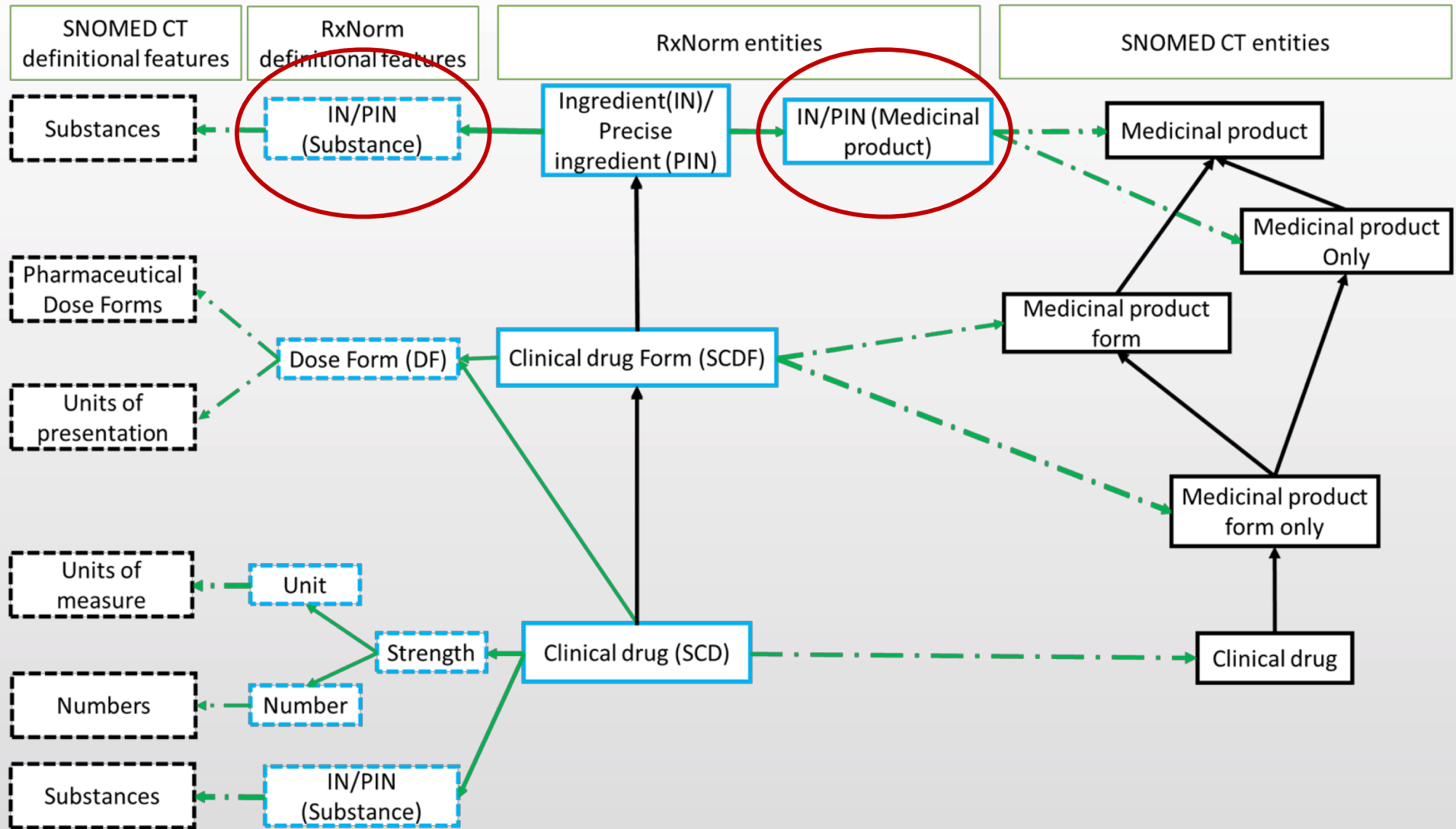
- Presentation strength only
- Concentration strength only
- Presentation and concentration strength
  
- closest international representation of products authorized by national regulatory agencies



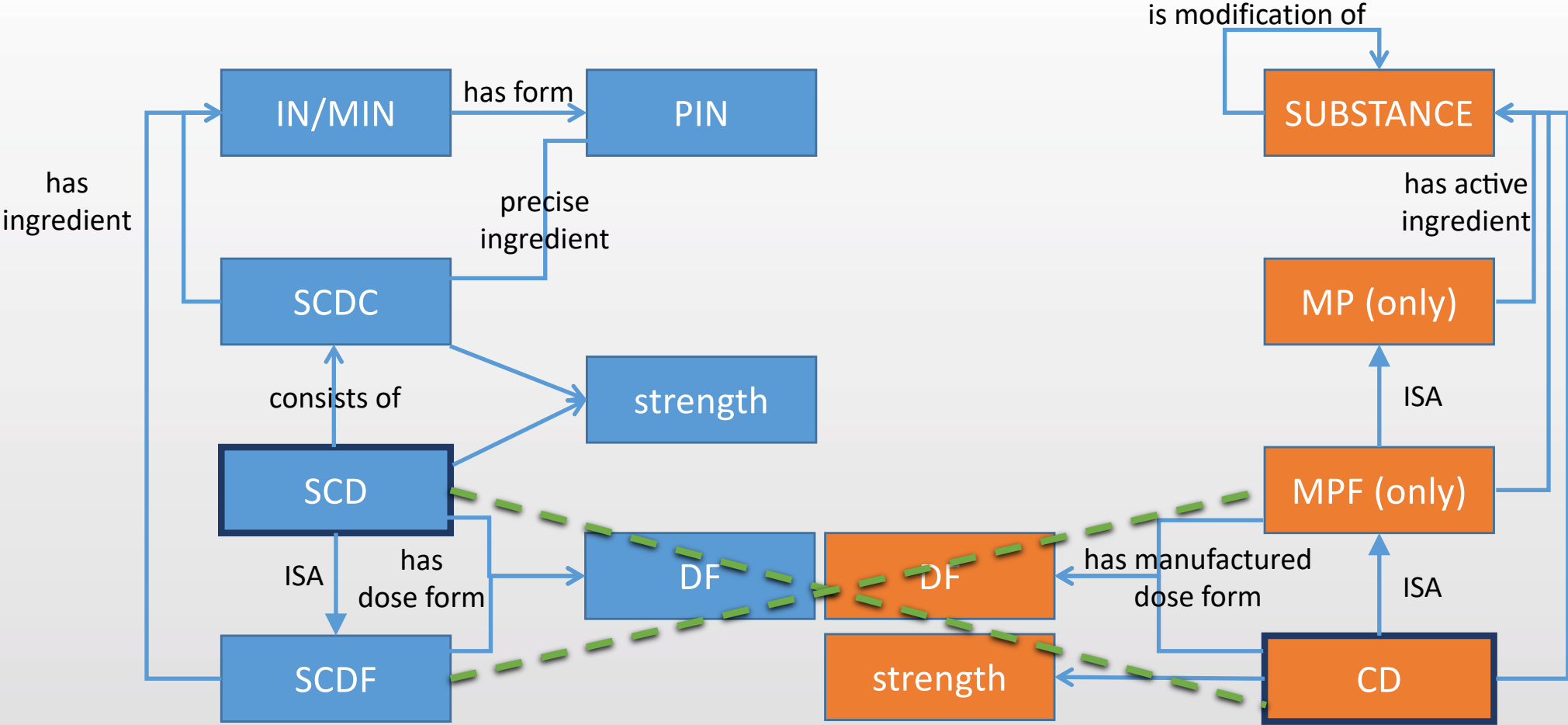
# SNOMED Model (simple)



# Integrating RxNorm with medicinal products in SNOMED CT- Jean Noël NIKIEMA



# RxNorm Model (clean)





# Content mapping



- Preliminary results, needs further analysis; doesn't account for in-use in SNOMED CT

*Table 1 : Mappings for the definitional features*

<b>Mappings</b>	<b>RxNorm</b>	<b>Mapped</b>	<b>SNOMED CT</b>
(IN/PIN)-Substances	<b>4,038</b>	<b>3,020</b>	<b>26,743</b>
Numbers-Numbers	<b>1,924</b>	<b>535</b>	<b>725</b>
Units-Units of measure	<b>18</b>	<b>10</b>	<b>1236</b>
Dose Forms-Pharmaceutical dose forms	<b>113</b>	<b>83</b>	<b>307</b>
Dose Forms- Units of presentation	<b>113</b>	<b>*43</b>	<b>50</b>

\*All mappings are 1-1, with the exception of the mappings between dose forms and units of presentation.

# Observations



1. IN acts like both Substance and MP
2. MIN has no Substance equivalent
3. SDC -> SDCD relationship is not an ISA
4. SCDC has no direct counterpart, but can be modelled
5. PINs are treated separately to INs
6. Additional specific description types:
  1. Prescribable name
  2. Tall Man Lettering Synonym



# Questions?

