HOSPITAL ITALIANO
de Buenos Aires

Implementation of a drug composition service based on UK's dm+d model

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Objectives

- to share our experience in the development, implementation and support of a local drug information model, its mapping to SNOMED CT and its adaptation based on the dm+d model, which supports several institutions in the countries of Argentina and Uruguay

Overview

- Background
- History
- Local information model
- SNOMED CT as reference
- UK's dm+d
- HIBA's drug composition service

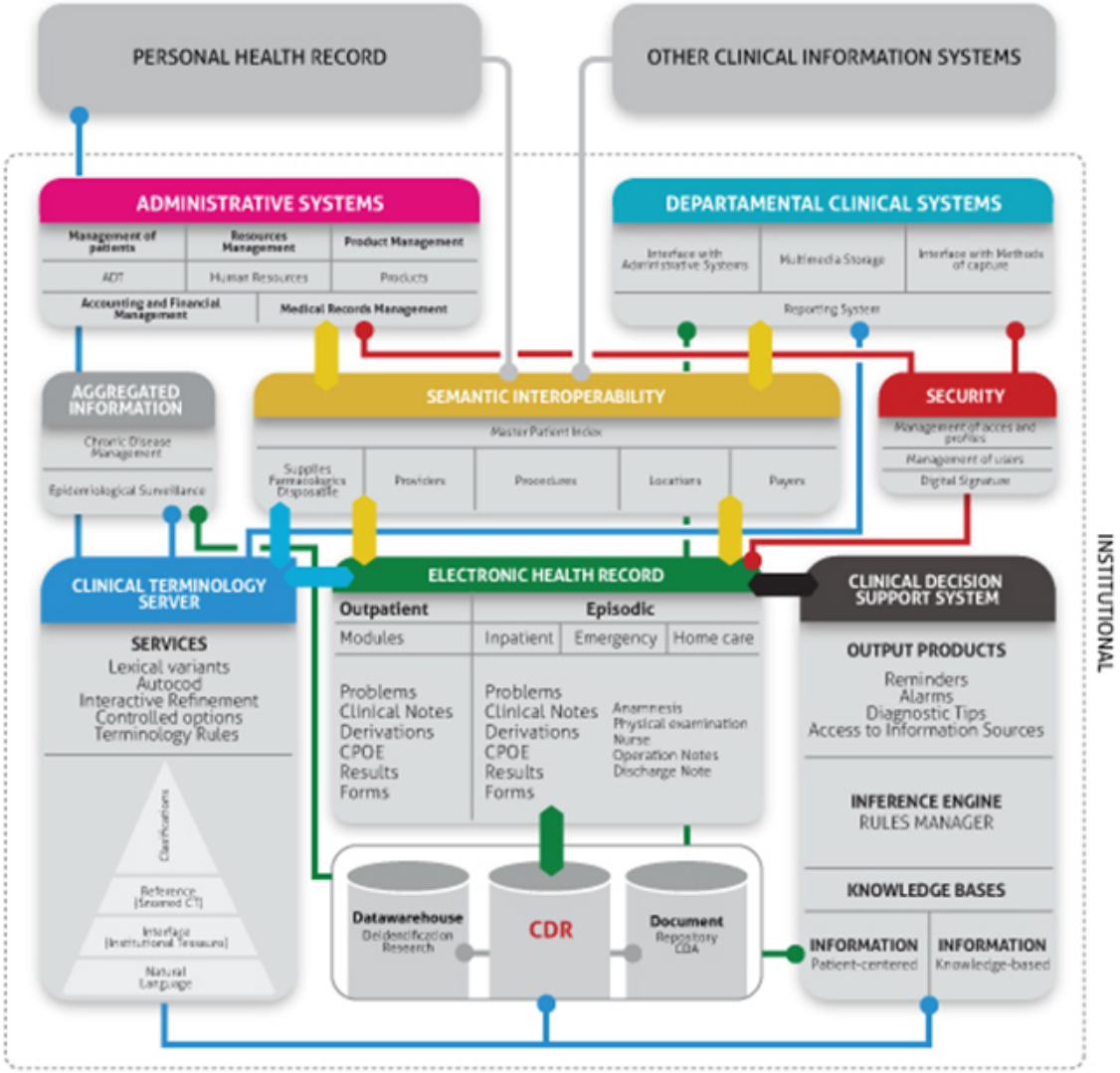
Background

Non-profit academic medical center
Network of two hospitals with **800 beds**
800 home care patients
24 ambulatory clinics
>2,200,000 **outpatient visits** (annually)

Since 1998 HIS (Italica)
EHR:
Fully-implemented (paperless)
Web-based
Problem-oriented
Patient-centered

ITALICA
HISTORIA CLÍNICA ELECTRÓNICA ÚNICA

Background


PERSONAL HEALTH RECORD
OTHER CLINICAL INFORMATION SYSTEMS
ADMINISTRATIVE SYSTEMS
Management of patients
Resources Management
Product Management
ADT
Human Resources
Products
Accounting and Financial Management
Medical Records Management
DEPARTAMENTAL CLINICAL SYSTEMS
Interface with Administrative Systems
Multimedia Storage
Interface with Methods of capture
Reporting System
AGGREGATED INFORMATION
Chronic Disease Management
Epidemiological Surveillance
SEMANTIC INTEROPERABILITY
Master Patient Index
Supplies Farmacologics Disposable
Providers
Procedures
Locations
Payers
SECURITY
Management of acces and profiles
Management of users
Digital Signature
CLINICAL TERMINOLOGY SERVER
SERVICES
Lexical variants
Autocod
Interactive Refinement
Controlled options
Terminology Rules
Classifications
Reference (Snomed CT)
Interface (Institutional Tesaurus)
Natural Language
ELECTRONIC HEALTH RECORD
Outpatient
Episodic
Modules
Inpatient
Emergency
Home care
Problems
Clinical Notes
Derivations
CPOE
Results
Forms
Problems
Clinical Notes
Derivations
CPOE
Results
Forms
Anamnesis
Physical examination
Nurse
Operation Notes
Discharge Note
Datawarehouse
Deidentification
Research
CDR
Document
Repository
CDA
CLINICAL DECISION SUPPORT SYSTEM
OUTPUT PRODUCTS
Reminders
Alarms
Diagnostic Tips
Access to Information Sources
INFERENCE ENGINE
RULES MANAGER
KNOWLEDGE BASES
INFORMATION
Patient-centered
INFORMATION
Knowledge-based
INSTITUTIONAL

A bit of History

•1998: HIS development started. Ambulatory record implemented. Free text entry with centralized secondary codification
•2001: thesaurus started, secondary coding with ICPC-2 and ICD-10. CPOE using local drugs information model created
•2002/3: SNOMED CT evaluation, SNOMED CT added to thesaurus
•2004: institutional extension, interactive coding (with non valid terms). Cross maps to ICD-9 for DRG

A bit of History

- 2005: terminology server implementation across HIBA
- 2007: terminology services offered to other institutions.

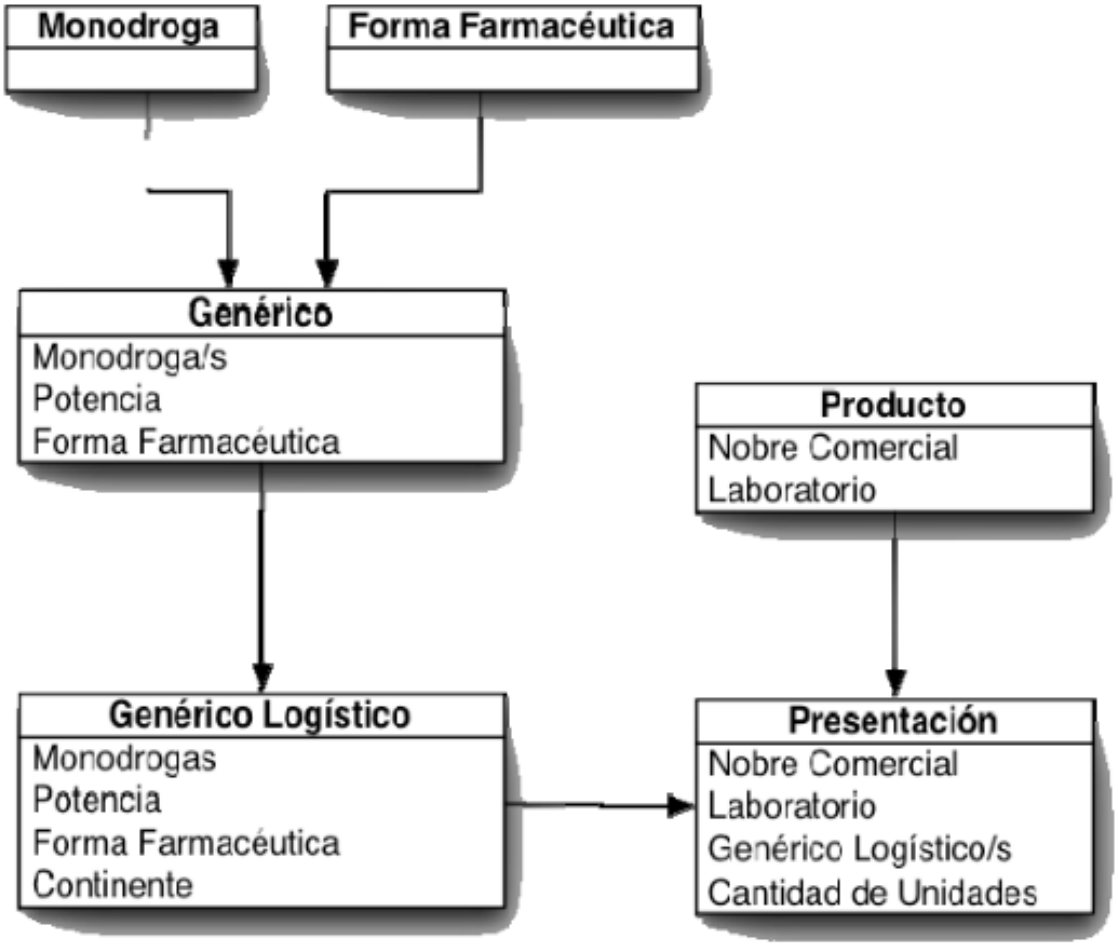
Local drugs information model mapped to SNOMED CT

- 2013: drug composition service based on dm+d
- 2015: CDSS based on drugs and allergies knowledge database and SNOMED CT

Local information model (2001)

- in order to implement an electronic prescription system in the EHR an information model was created
- this model was designed to represent the complexity of drugs in Argentina

Local information model (2001)



Local information model (2001)

- "Generic Drug" - related to the active components (ingredients), the pharmaceutical form (dosage form) and the amount of each ingredient (strength)
- many pharmaceutical products have different containers for the same "Generic Drug", and the interchangeability calculations were difficult
- "Logistic Generic" - includes the container of fluids or creams and allows for a better administration of the hospital's stock

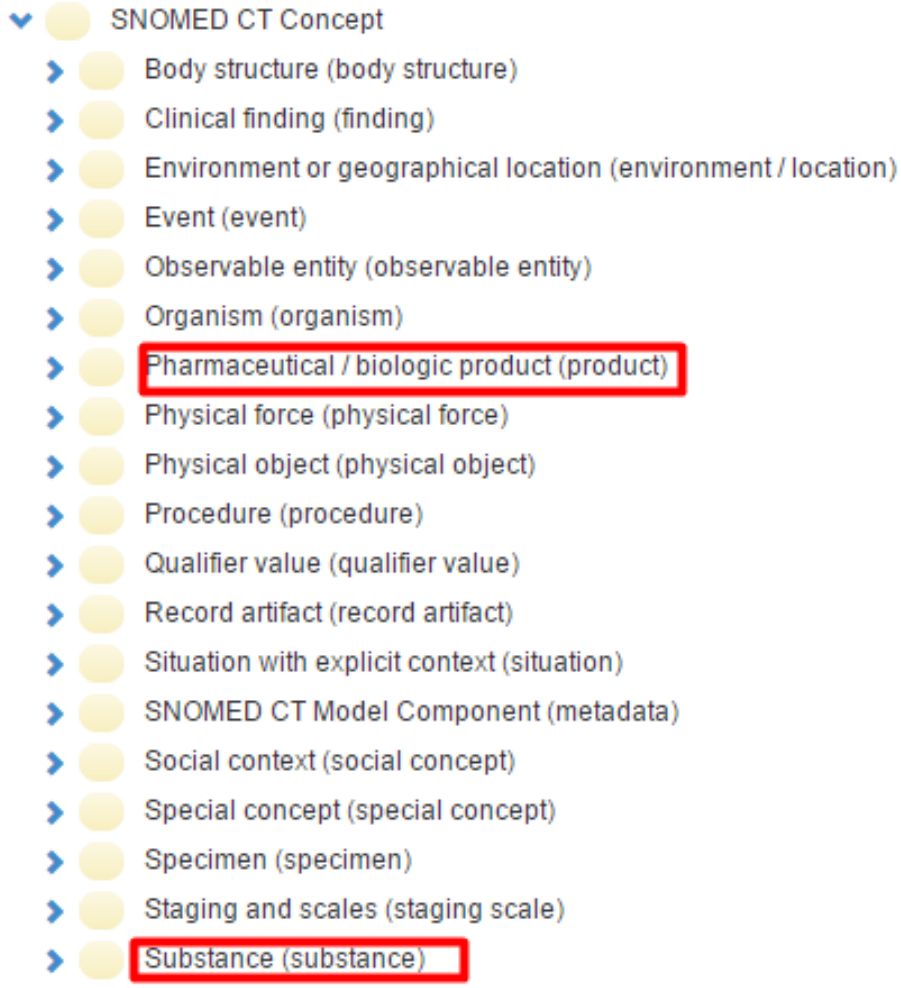
Local information model (2001)

- 2280 drugs
- 477 pharmaceutical laboratories
- 7892 generic drugs
- 12790 products
- 26594 individual presentations

Next steps

- we needed to interoperate between different systems and desired to adopt a standard
- created a terminology server with an interface terminology
- SNOMED CT was adopted as reference terminology

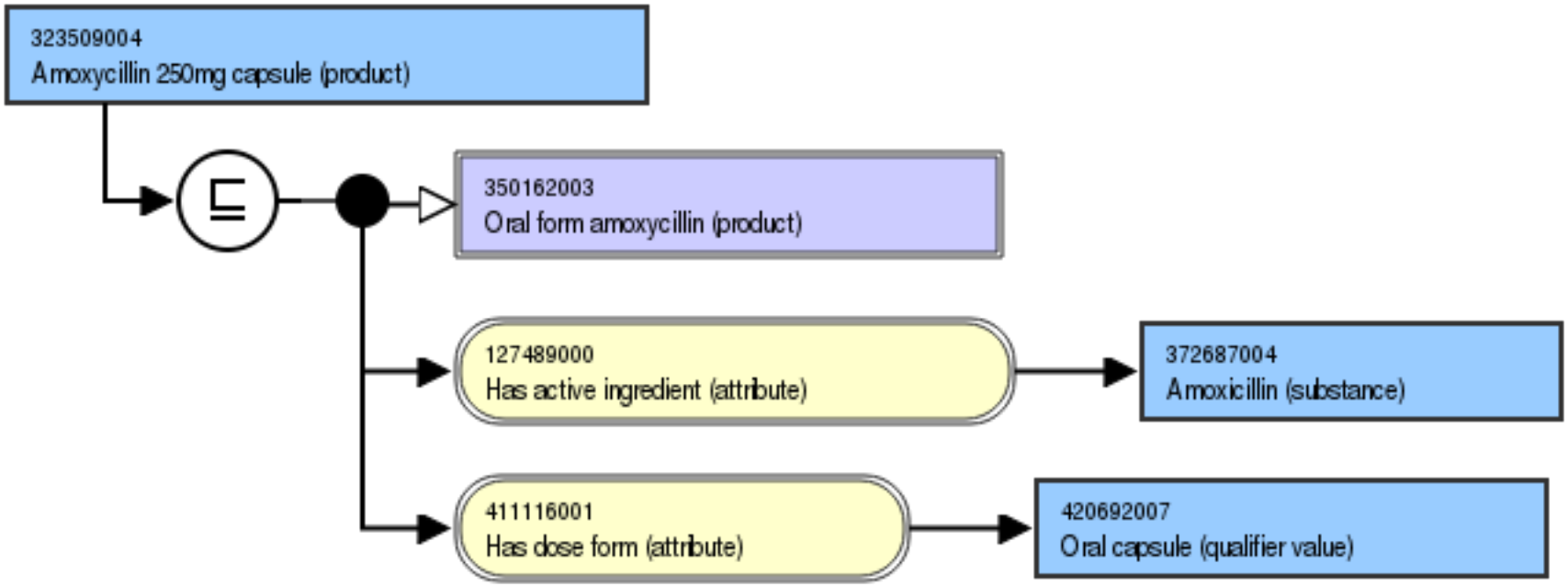
SNOMED CT



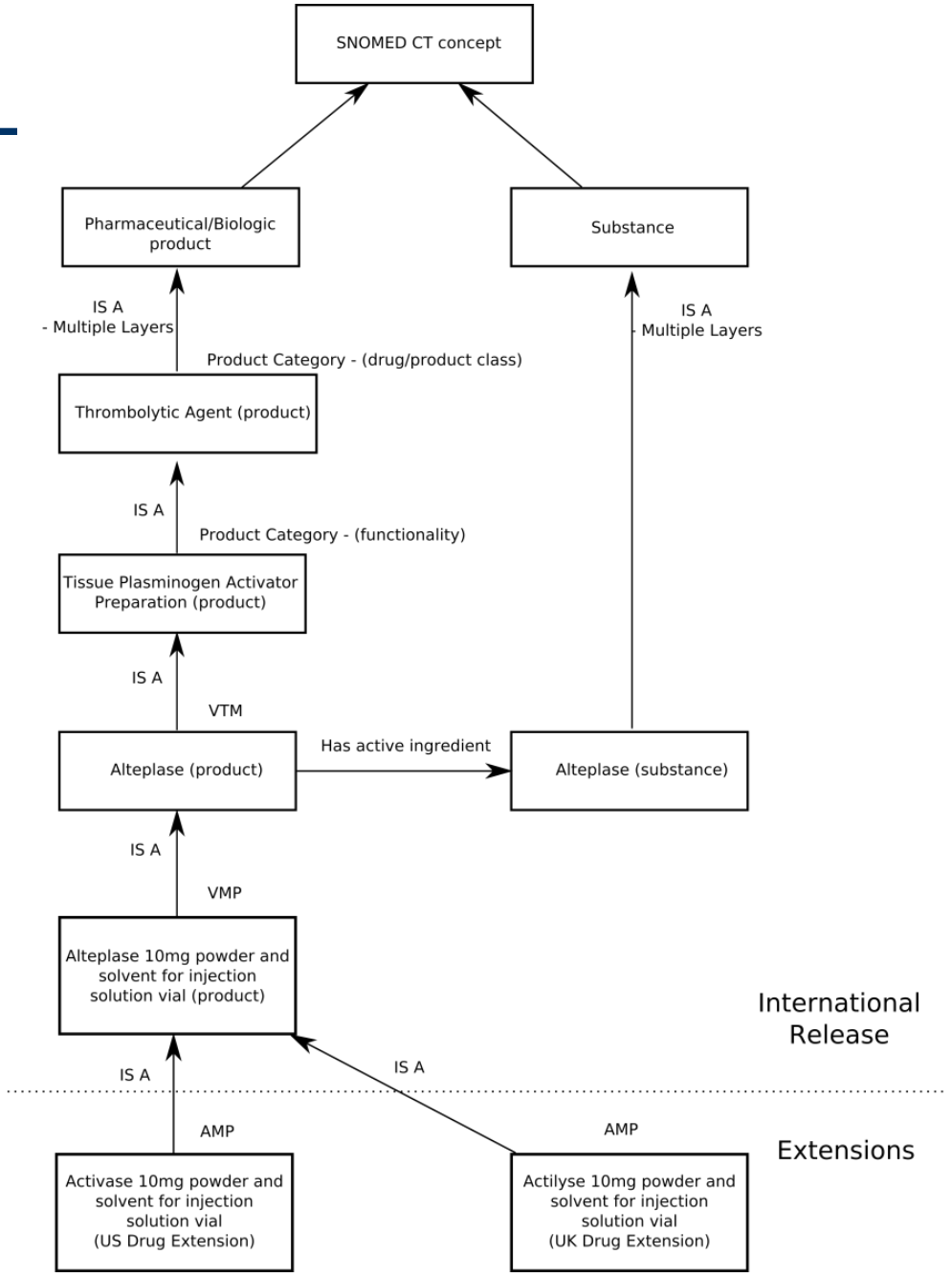
Pharmaceutical / biologic product
Introduced as a top-level *hierarchy* in order to clearly distinguish drug products (products) from their chemical constituents (substances).
The levels of drug products represented in the *International Release* include VTM and VMP.

Substance
Contains *concepts* that can be used for recording *active* chemical constituents of drug products, food and chemical allergens, adverse reactions, toxicity or poisoning information, and physicians and nursing *orders*.

SNOMED CT

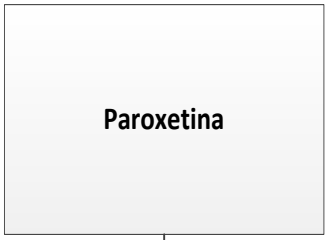

323509004
Amoxycillin 250mg capsule (product)
350162003
Oral form amoxycillin (product)
127489000
Has active ingredient (attribute)
372687004
Amoxicillin (substance)
411116001
Has dose form (attribute)
420692007
Oral capsule (qualifier value)

SNOMED CT


SNOMED CT concept
Pharmaceutical/Biologic product
Substance
IS A
- Multiple Layers
Product Category - (drug/product class)
Thrombolytic Agent (product)
IS A
Product Category - (functionality)
Tissue Plasminogen Activator Preparation (product)
IS A
VTM
Alteplase (product)
Has active ingredient
Alteplase (substance)
IS A
VMP
Alteplase 10mg powder and solvent for injection solution vial (product)
International Release
IS A
IS A
AMP
AMP
Extensions
Activase 10mg powder and solvent for injection solution vial (US Drug Extension)
Actilyse 10mg powder and solvent for injection solution vial (UK Drug Extension)

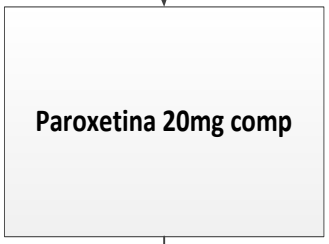
SNOMED CT

Core Snomed CT



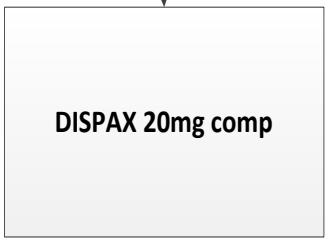
Virtual Therapeutic Moiety
(**VTM**)
Compuesto Terapéutico Virtual

Core Snomed CT



Virtual Medicinal Product
(**VMP**)
Presentación Clínica

Extension



Actual Medicinal Product
(**AMP**)
Producto Comercial

Benefits of using SNOMED CT as reference

- using a standard terminology opens the doors to interoperability between different actors
- it allows for the exchange of information between systems, healthcare institutions, providers, governmental organs
- integration with knowledge bases for CDSS
- management
- research

Local information model mapped to SNOMED CT

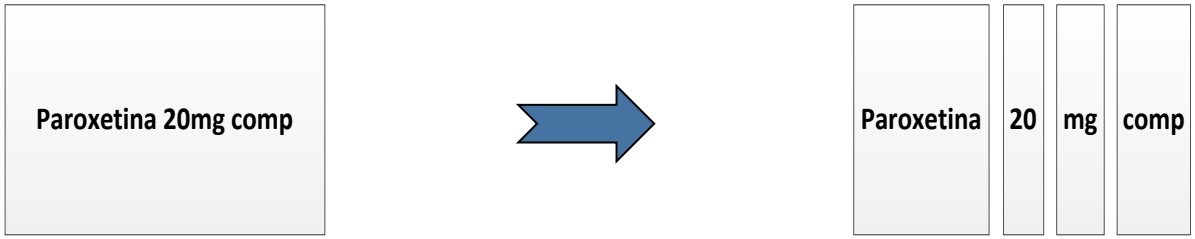
- taking into account the components of both models (local model and SNOMED CT), we proceeded to mapping them
- 437 drugs, 20% of the total of 2280 were not represented in SNOMED CT
- these drugs were modeled on a local extension of SNOMED CT

Local information model mapped to SNOMED CT

Local drug model	SNOMED CT drug model
Ingredients	Substances
Dosage forms	Dosage forms
Generic Drug	VTM Subtype
Logistic Generic	VMP

The problem with SNOMED CT

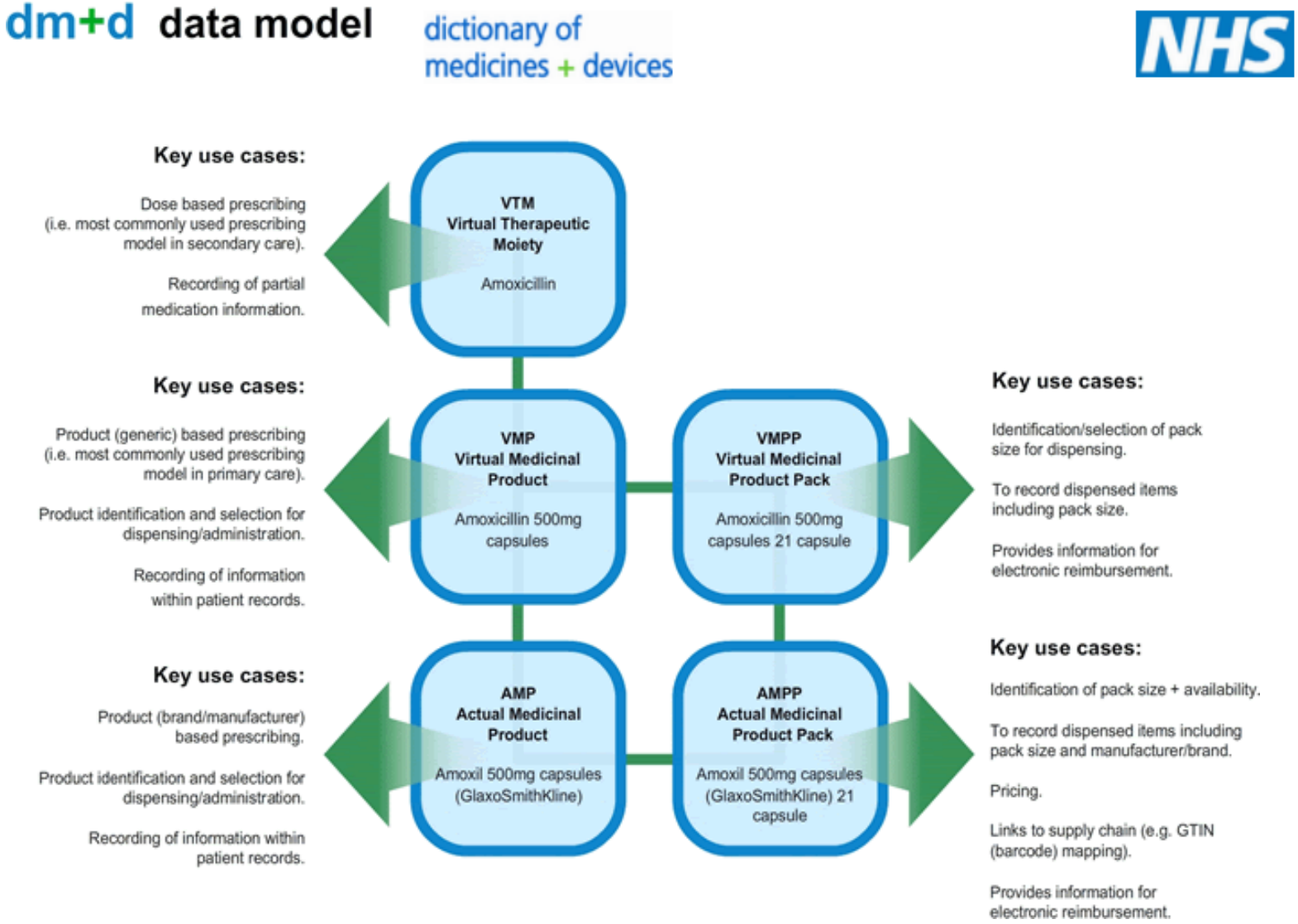
- doesn't represent strength and unit of measure in a disaggregated (computable) form
- means problems for logistics and e-prescribing



Next steps

- we needed to offer drug terminology services to other institutions in our country and potentially other countries
- we needed a (relatively) easy way to construct drug dictionaries for other countries without creating them from the ground up
- we wanted to keep SNOMED CT as the reference standard
- we didn’t want to use our local model metadata to complement SNOMED CT

UK's dm+d model



UK’s dm+d model

Virtual Medicinal Product Attributes	
ID	321964006
Name	Paroxetine 20mg tablets
Date name is applicable from	
Short Name	
Basis of Name	rINN - Recommended International Non-proprietary
Previous ID	
Previous Name	
Basis of Previous Name	
Name Change Reason	
Virtual Therapeutic Moiety Name	Paroxetine
Invalid	No
Date ID is applicable from	
Combination Product Indicator	N/A
Sugar-free	No
Gluten-free	No
Preservative-free	No
CFC-free	No
Prescribing Status	Valid as a prescribable product
Non-Availability	Actual products are now available
Non-Availability Status Change Date	
Unit Dose Form Indicator	Discrete
Unit Dose Form Size	1
Unit Dose Form Units	tablet
Unit of Measure	tablet

Dose Form Information	
Dose Form Identifier	385055001
Dose Form	Tablet

Drug Route Information	
Drug Route Identifier	26643006
Drug Route	Oral

UK's dm+d model

Ingredients	
Ingredient Substance Identifier	96214003
Ingredient Substance Name	Paroxetine hydrochloride
Basis of Strength Substance Identifier	Paroxetine
Basis of Pharmaceutical Strength	Based on Base Substance
Strength Value Numerator	20
Strength Value Numerator Unit of Measure	mg
Strength Value Denominator	
Strength Value Denominator Unit of Measure	

Controlled Drug Prescribing Information	
Controlled Drug Category	No Controlled Drug Status
Category change date	
Category prior to change date	

Ontology Dose Form and Route Information	
Ontology Dose Form and Route	tablet.oral

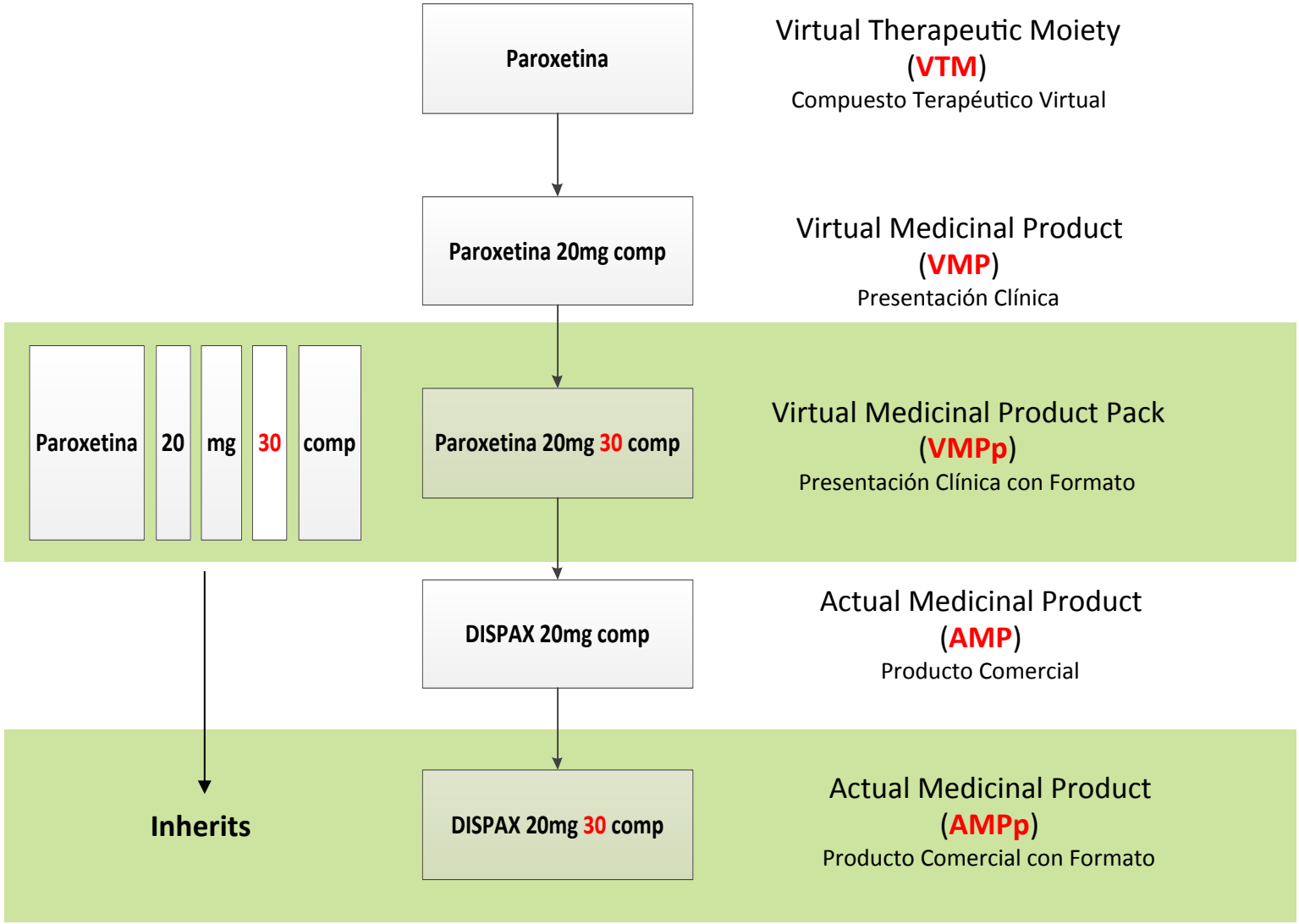
Actual Medicinal Products	
Name	Paroxetine 20mg tablets (Mylan Ltd)
Name	Paroxetine 20mg tablets (IVAX Pharmaceuticals UK Ltd)
Name	Paroxetine 20mg tablets (Alliance Healthcare (Distribution) Ltd)
Name	Paroxetine 20mg tablets (Kent Pharmaceuticals Ltd)
Name	Paroxetine 20mg tablets (A A H Pharmaceuticals Ltd)
Name	Paroxetine 20mg tablets (Actavis UK Ltd)
Name	Paroxetine 20mg tablets (Sandoz Ltd)
Name	Paroxetine 20mg tablets (Sterwin Medicines)
Name	Paroxetine 20mg tablets (Teva UK Ltd)
Name	Paroxetine 20mg tablets (Genus Pharmaceuticals Ltd)

Virtual Medicinal Product Packs	
ID	5533611000001109
Name	Paroxetine 20mg tablets 14 tablet
ID	5408911000001109
Name	Paroxetine 20mg tablets 28 tablet
ID	1083911000001105
Name	Paroxetine 20mg tablets 30 tablet

UK's dm+d model

- allows the complete representation of comercial products without the need to use local metadata to complement SNOMED CT's standard representation
- this model was adapted by other countries outside UK, like Spain and Chile

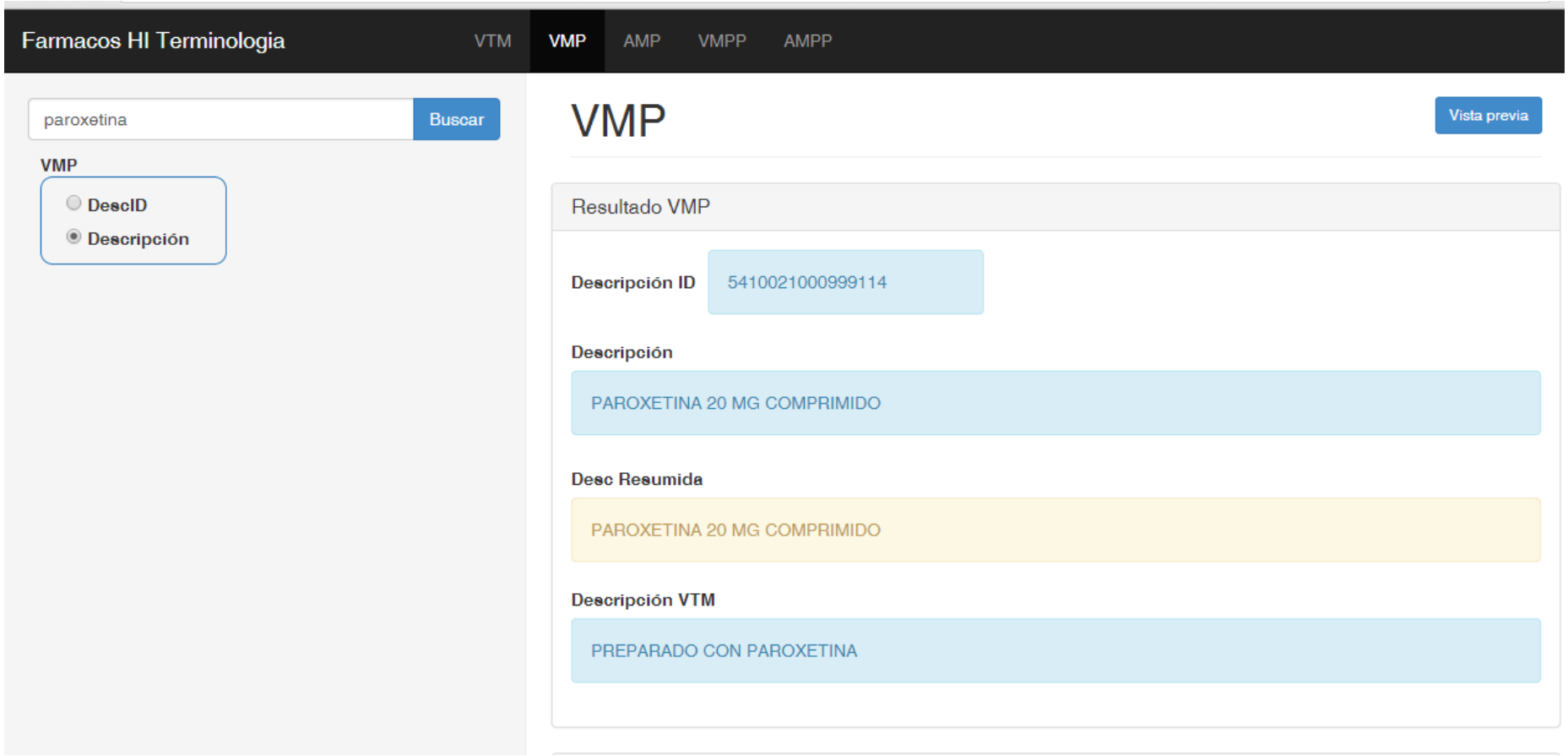
HIBA's drug composition service



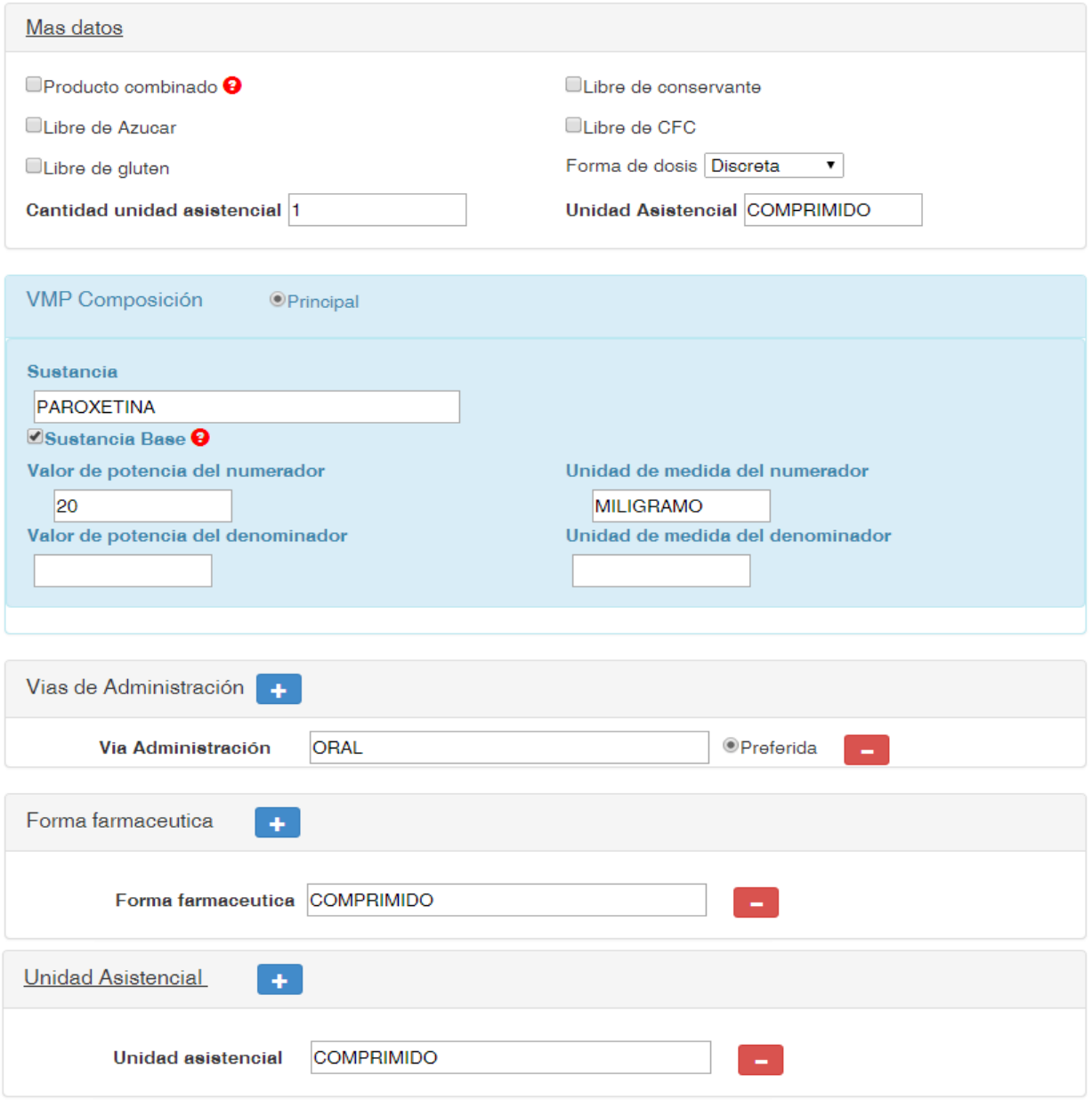
HIBA's drug composition service

- the drug composition service requires an ad-hoc data model, but strictly linked to SNOMED CT as the reference terminology used by the rest of our HIS
- based on UK's dm+d data model to incorporate new metadata to the reference model

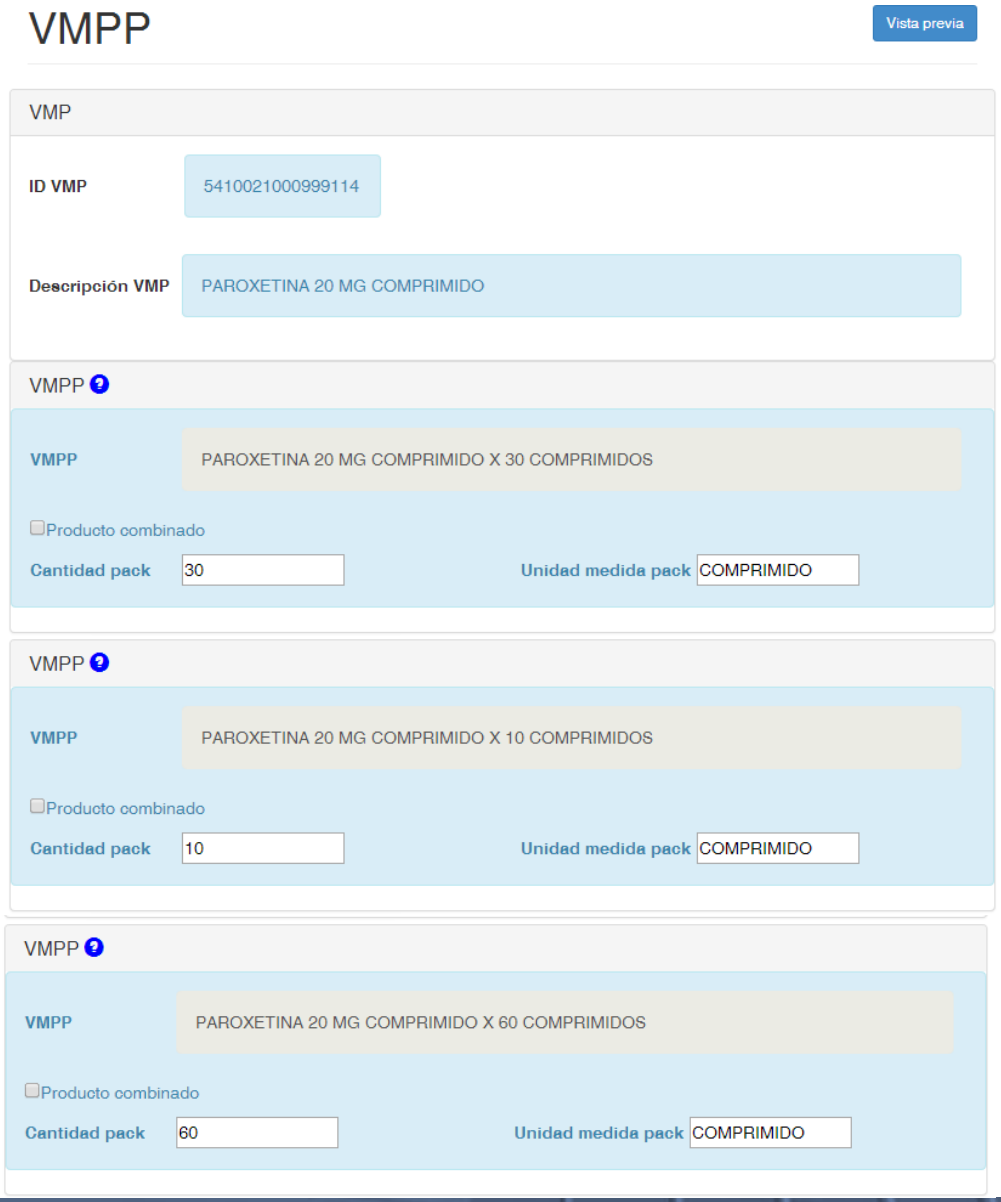
HIBA's drug composition model (VMP)



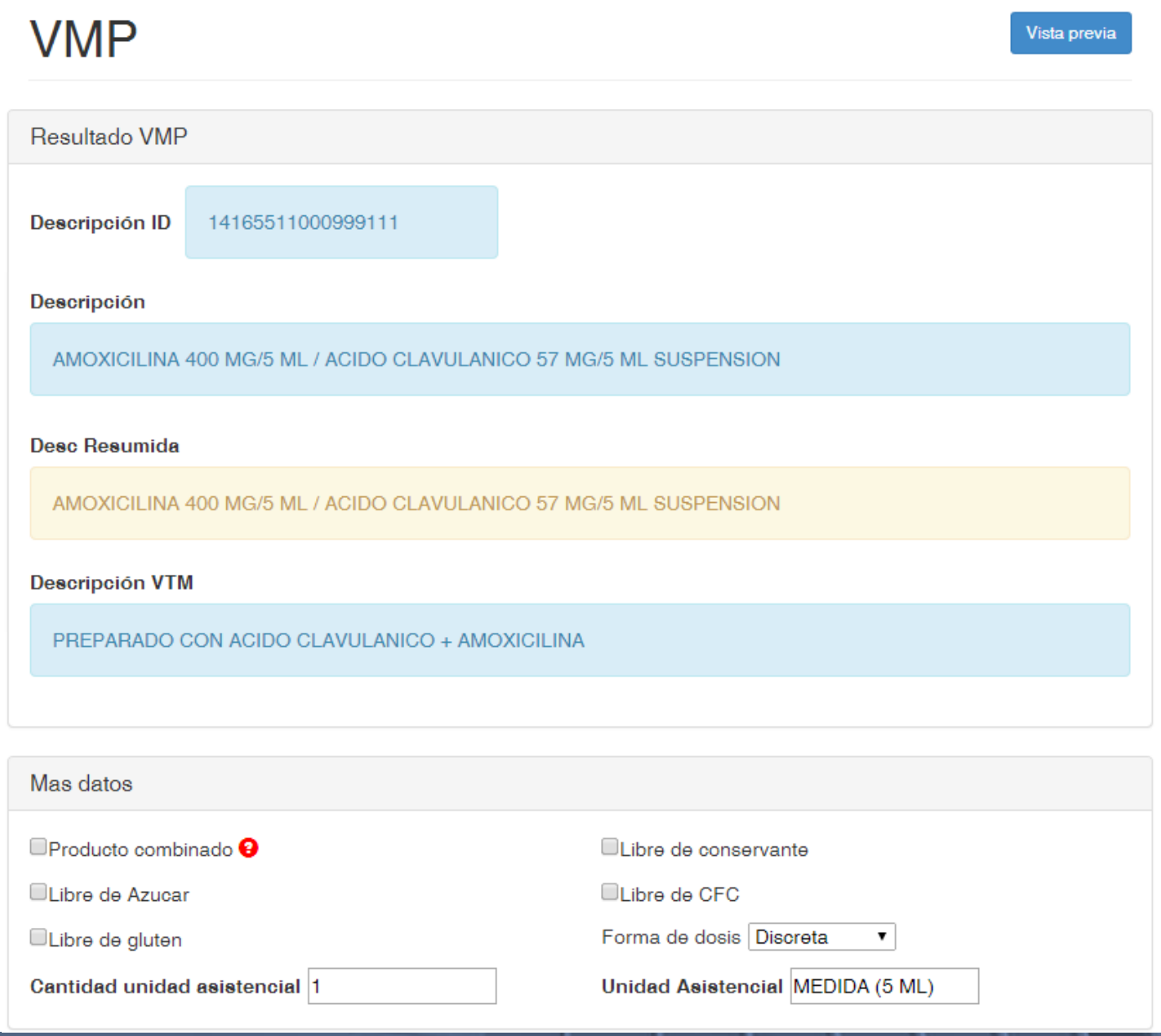
VMP


Mas datos
Producto combinado
Libre de conservante
Libre de Azucar
Libre de CFC
Libre de gluten
Forma de dosis Discreta
Cantidad unidad asistencial 1
Unidad Asistencial COMPRIMIDO
VMP Composición
Principal
Sustancia
PAROXETINA
Sustancia Base
Valor de potencia del numerador
20
Unidad de medida del numerador
MILIGRAMO
Valor de potencia del denominador
Unidad de medida del denominador
Vias de Administración
Via Administración
ORAL
Preferida
Forma farmaceutica
Forma farmaceutica
COMPRIMIDO
Unidad Asistencial
Unidad asistencial
COMPRIMIDO

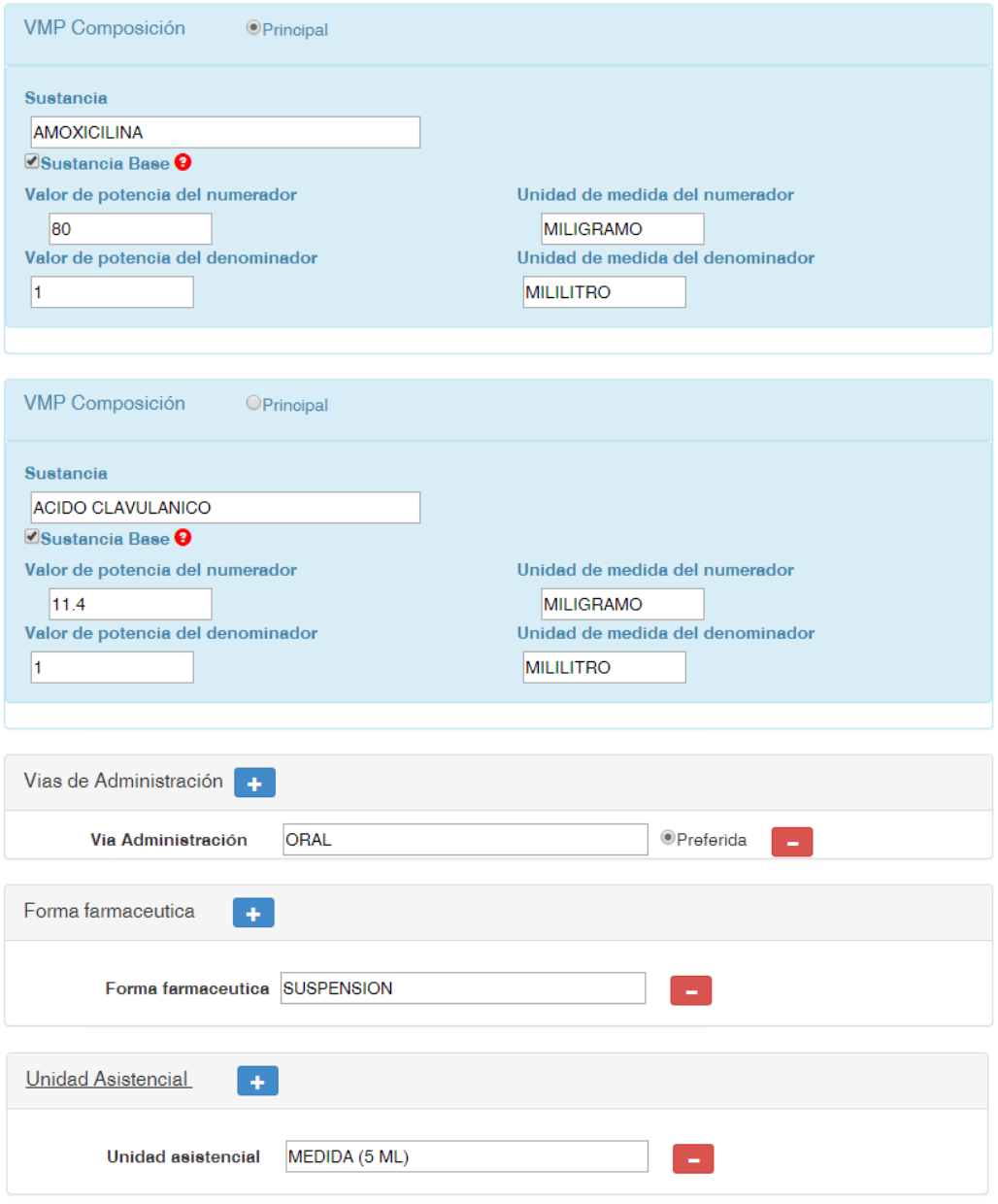
VMPP


VMPP
Vista previa
VMP
ID VMP
5410021000999114
Descripción VMP
PAROXETINA 20 MG COMPRIMIDO
VMPP
VMPP
PAROXETINA 20 MG COMPRIMIDO X 30 COMPRIMIDOS
Producto combinado
Cantidad pack
30
Unidad medida pack
COMPRIMIDO
VMPP
VMPP
PAROXETINA 20 MG COMPRIMIDO X 10 COMPRIMIDOS
Producto combinado
Cantidad pack
10
Unidad medida pack
COMPRIMIDO
VMPP
VMPP
PAROXETINA 20 MG COMPRIMIDO X 60 COMPRIMIDOS
Producto combinado
Cantidad pack
60
Unidad medida pack
COMPRIMIDO

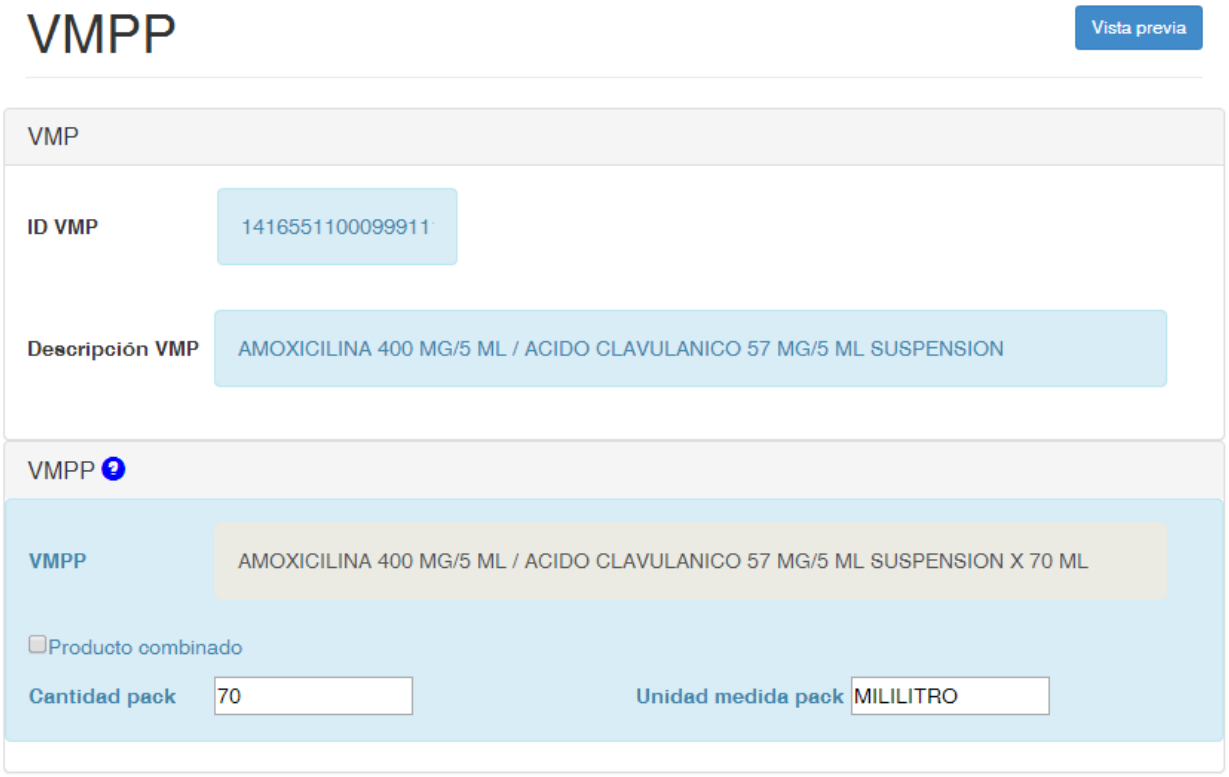
VMP


VMP
Vista previa
Resultado VMP
Descripción ID
14165511000999111
Descripción
AMOXICILINA 400 MG/5 ML / ACIDO CLAVULANICO 57 MG/5 ML SUSPENSION
Desc Resumida
AMOXICILINA 400 MG/5 ML / ACIDO CLAVULANICO 57 MG/5 ML SUSPENSION
Descripción VTM
PREPARADO CON ACIDO CLAVULANICO + AMOXICILINA
Mas datos
Producto combinado
Libre de conservante
Libre de Azucar
Libre de CFC
Libre de gluten
Forma de dosis
Discreta
Cantidad unidad asistencial
1
Unidad Asistencial
MEDIDA (5 ML)

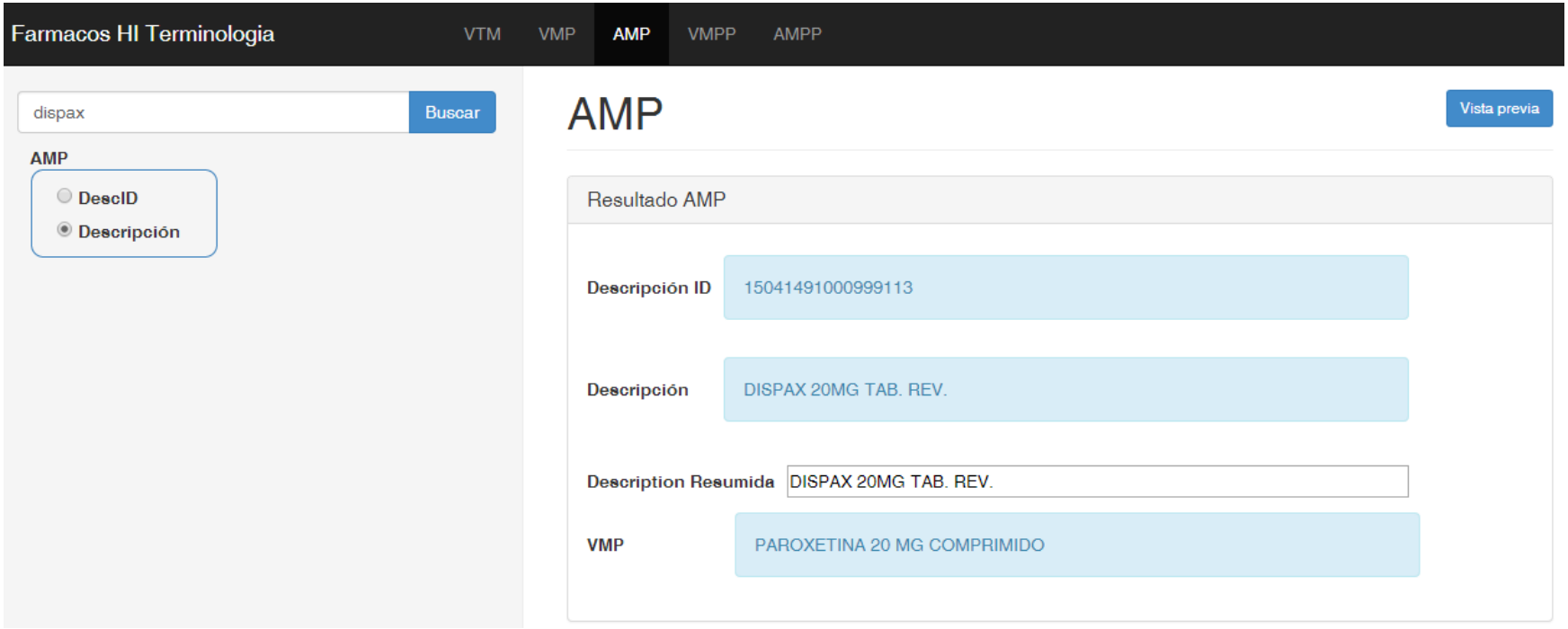
VMP


VMP Composición
Principal
Sustancia
AMOXICILINA
Sustancia Base
Valor de potencia del numerador
80
Unidad de medida del numerador
MILIGRAMO
Valor de potencia del denominador
1
Unidad de medida del denominador
MILILITRO
VMP Composición
Principal
Sustancia
ACIDO CLAVULANICO
Sustancia Base
Valor de potencia del numerador
11.4
Unidad de medida del numerador
MILIGRAMO
Valor de potencia del denominador
1
Unidad de medida del denominador
MILILITRO
Vias de Administración
Via Administración
ORAL
Preferida
Forma farmaceutica
Forma farmaceutica
SUSPENSION
Unidad Asistencial
Unidad asistencial
MEDIDA (5 ML)

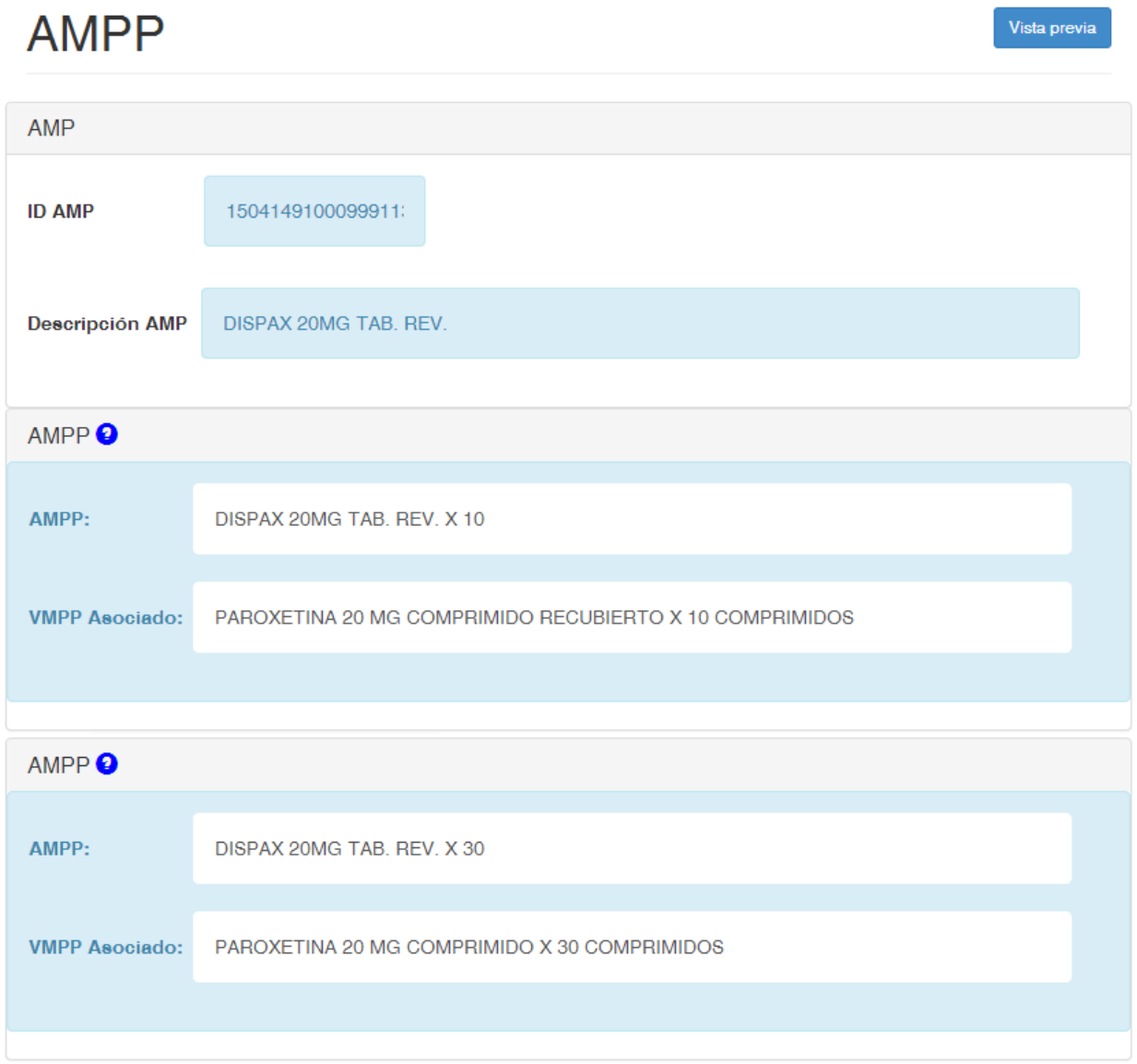
VMPP


VMPP
Vista previa
VMP
ID VMP
1416551100099911
Descripción VMP
AMOXICILINA 400 MG/5 ML / ACIDO CLAVULANICO 57 MG/5 ML SUSPENSION
VMPP
VMPP
AMOXICILINA 400 MG/5 ML / ACIDO CLAVULANICO 57 MG/5 ML SUSPENSION X 70 ML
Producto combinado
Cantidad pack
70
Unidad medida pack
MILILITRO

AMP


Farmacos HI Terminologia
VTM
VMP
AMP
VMPP
AMPP
dispax
Buscar
AMP
DescID
Descripción
AMP
Vista previa
Resultado AMP
Descripción ID
15041491000999113
Descripción
DISPAX 20MG TAB. REV.
Description Resumida
DISPAX 20MG TAB. REV.
VMP
PAROXETINA 20 MG COMPRIMIDO

AMPP


AMPP
Vista previa
AMP
ID AMP
1504149100099911
Descripción AMP
DISPAX 20MG TAB. REV.
AMPP
AMPP:
DISPAX 20MG TAB. REV. X 10
VMPP Asociado:
PAROXETINA 20 MG COMPRIMIDO RECUBIERTO X 10 COMPRIMIDOS
AMPP
AMPP:
DISPAX 20MG TAB. REV. X 30
VMPP Asociado:
PAROXETINA 20 MG COMPRIMIDO X 30 COMPRIMIDOS

Finishing remarks

- allowed us to create and maintain a drug dictionary for Argentina and Uruguay to support other institutions
- in the process of creating a drug dictionary for a brazilian institution
- implemented CDSS for drug-allergy and drug-drug interactions based on SNOMED CT and an in-house Drugs Knowledge Base
- in the process of adaptation for its use in other institutions

Thank you very much!

http://www.hospitalitaliano.org.ar/infomed/index.php?contenido=term.php

twitter
#InfomedHIBA
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Hacete fan

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