

NUVA – What it is

AND WHY IT MATTERS

Where it come from

SYADEM builds and operates decision support systems for vaccination

We needed a description of administered vaccines that was precise, comprehensive and inclusive of all existing vaccination trails.

While working for the EC on recommendations for an EU citizen's vaccination card we realized that we had created a unique asset.



A seasoned solution

2010-2018	Initial	Mostly digitization of paper records Written entry - brand name, explicit or abbreviated - or functional description (TDaP) Binding to French pharmaceutical codes for CDA documents.
2019-2022	Structuration	Study on recommendations for the European Vaccination Card (EVC) Identification of the need for a pivot terminology Formalization as FHIR resources, then as RDF graph Publication on the national terminology server Alignment of some external codes Presentation at the LOINC 2022 Conference
Since 2023	Generalization	Alignments of further external codes Use as the pivot terminology within the EUVABECO EVC pilots Agreement with SNOMED Intl to create a community content Promotion within the HL7 Immunization Focus Group Launch of the IVCI workgroup



Different codes have different purposes

Purpose	Code	Applies to	Typical lifetime
Fraud prevention	Serialization	Unique packaging	3 years
Pharmacovigilance	Presentation code + Batch number	Packages from same batch	3 years
Logistics	GTIN	Identical products	5 years
Marketing authorization	Presentation code Authorization number	Product and presentation	10 years
Vaccination history	NUVA	Products and classes of products	100 years
Vaccines characterization	SNOMED-CT ICD-11 ATC	Classes of products	100 years



Capturing any vaccination record

Support	Variant	Record	NUVA Code	
Written	Fully explicit	Infanrix Hexa		
	Abbreviated, mistyped		VAC0014	
Digital	CIS (FR)	62966063		
	CNK (BE)	1665363		
Written	Valences FR	dTca		
	Valences EN	Tdap	VAC0610	
Digital	CVX	115		
Written	Target disease FR	Vaccin grippe	VAC0110	
Digital	CVX	88		
	SNOMED-CT 1181000221105			



Interpreting vaccine records

- No one knows all vaccines administered, all around the world, over the lifetime of all patients.
- The vaccine code must be complemented with information about its function.
- This information is expressed by valences.
- A vaccine can be monovalent or multivalent.



Determining the valences

A valence is not a single ingredient, but a shorthand notation used by vaccinologists for a combination and a dose of antigens against a same disease.

Examples:

- aP Acellular pertussis vaccine, standard dose
- ap Acellular pertussis vaccine, low dose
- IPV Whole inactivated trivalent polio vaccine
- mOPV1 Live attenuated monovalent oral polio vaccine type 1

Protection is determined by the history of administered valences.



Hierarchical representation of valences

Allows to describe vaccines that are not fully identified. Illustrated here with the case of pertussis valences



What valences bring ?

- They solve the usual issue of classification of multivalent vaccines (in ATC, J07AE = Cholera, J07AP = Typhoid, but J07AE51 = Cholera + Typhoid)
- They structure the reasoning for the decision support system
- They allow to navigate between different levels of abstraction:
 - Finding all vaccines that can be represented by J07CA01
 - Finding possible SNOMED-CT representations for REPEVAX
 - A demonstrator is available at https://nuva.syadem.com/mapping



Representation of valences

notation	VAL008	VAL117	VAL003
label	"Acellular pertussis vaccine, standard dose"@en	"Acellular pertussis vaccine, dose unspecified"@en	"Pertussis vaccine, unspecified"@en
altLabel	"aP"@en	"Acel"@en	"Per"@en
subClassOf	VAL117 (Acel)	VAL003 (Per)	Valence
prevents	D10 (Pertussis)	D10 (Pertussis)	D10 (Pertussis)
containedInVaccine	VAC0014	VAC0795	VAC0138



Representation of vaccines

notation	VAC0520	VAC0133
isAbstract	False	True
label	IMVANEX	"Smallpox vaccine, unspecified"@en
hiddenLabel	I <mark>N</mark> VANEX	Variolic
comment	"Smallpox vaccine, third generation, modified vaccinia virus Ankara, non- replicative"@en	"Live attenuated smallpox vaccine"@en
containsValence	VAL296 (Pox-3G-MVA)	VAL022 (Smallpox-L)
exactMatch	AIC-042944013	ATC-J07BX01, CVX-105, SNOMED-CT-836389008



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Capturing from other code systems

Most countries :

- Start with pharmaceutical code
- Once in production, realize that it is not enough and complement with custom codes
- Some anticipated and created fully dedicated code systems.
- The most mature ones (i.e., Denmark, Canada) have built complete ontologies to bind vaccines codes, pharmaceutical codes, batch numbers, target diseases, etc. Yet they still address only domestic use.



Vaccine code systems are fragmented

From 2020 study Custom or pharmaceutical codes (blue and green) are not compatible across countries.

EMA SPOR will unify pharmaceutical codes across the EU, but only for today's products.

International mobility will not slow down.



- Pharma
- Pharma+Custom
- No IIS identified
- No online documentation
- Custom
- ATC only
- Pharma+SNOMED-INT
- Out of scope

NUVA as a pivot terminology

Instead of binding any code system with any other:

- For each entry in a code system, create or bind the exact NUVA equivalent.
- Describe it in terms of valences to allow to navigate across functionally similar vaccine concepts.



Wrap up – The NUVA model





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