Representing the Biomedical Science through the Applied Ontology Discipline: the Case of **Neonatal Ontology**

2nd Annual Pediatrics & Neonatology Conference

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AGENDA

Ontology as Science

Obstetric And Neonatal Ontology (OntoNeo)

The Open Biological and Biomedical Ontology (OBO) Foundry

Ontology as Science

"Ontology" is an polysemic term: it can mean a **discipline** or a **software artifact**

As a discipline = it provides principles to properly classify and organize data

As an artifact = it is *software* able to represent large sets of biomedical data

Ontology as Science

Putting together
the discipline and **the artifact** ...

We reach the Applied Ontology

A framework to address challenges
posed by complex biomedical data

What kind of challenges??

"The good news: [...] Hospitals are sharing data electronically [...] which allows clinical information to be shared across multiple providers in a region or state"

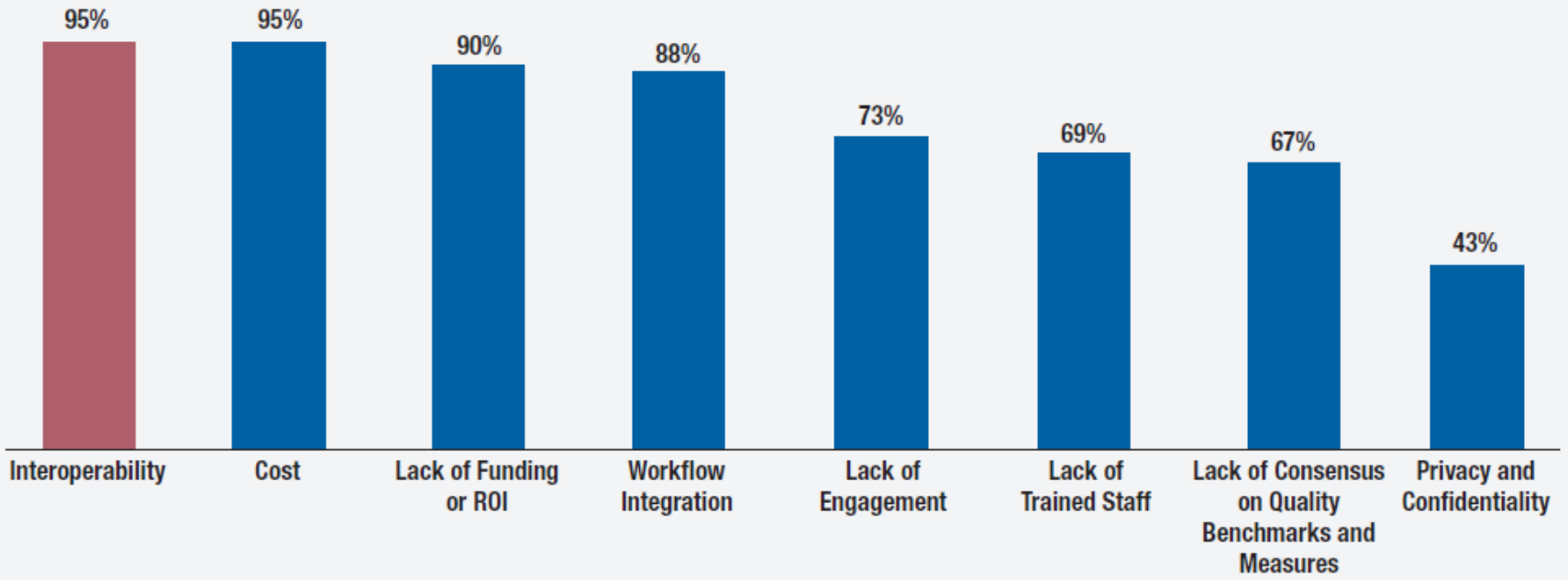
The bad news: Only 40 percent of hospitals can use the information they receive [...] only about a quarter of all hospitals can find, send, receive and use electronic information due to substantial barriers"

American Hospital Association (2015)

What kind "substantial barriers" ?

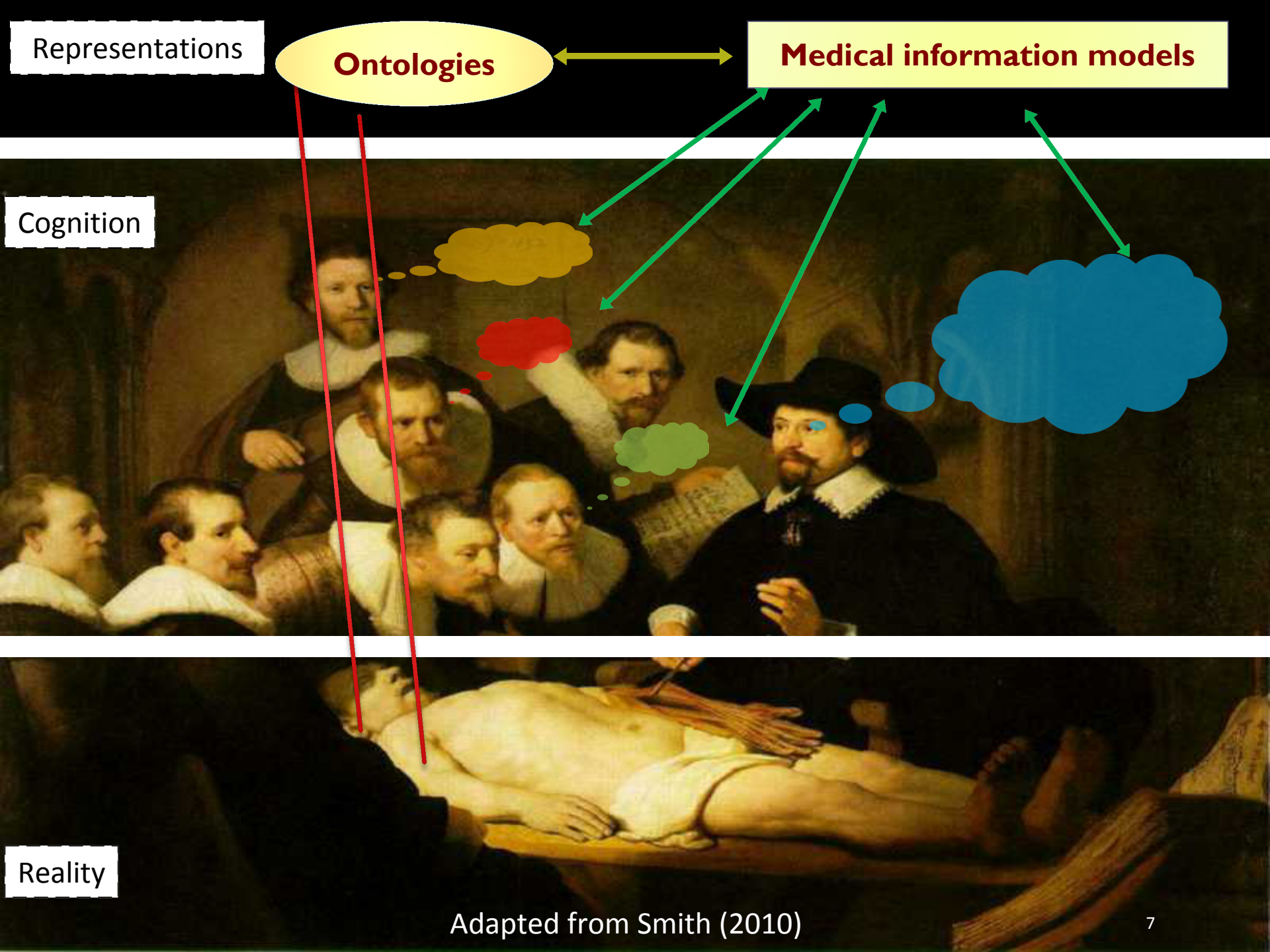
Interoperability is almost universally seen as a major obstacle to effectively using and meeting the potential of health IT.

Chart 4: Percent of ACOs Reporting Largest Barriers to Using Health IT Effectively, 2014



Source: Premier, Inc. and eHealth Initiative survey of accountable care organizations fielded July – August 2014. 62 organizations responded to the survey.

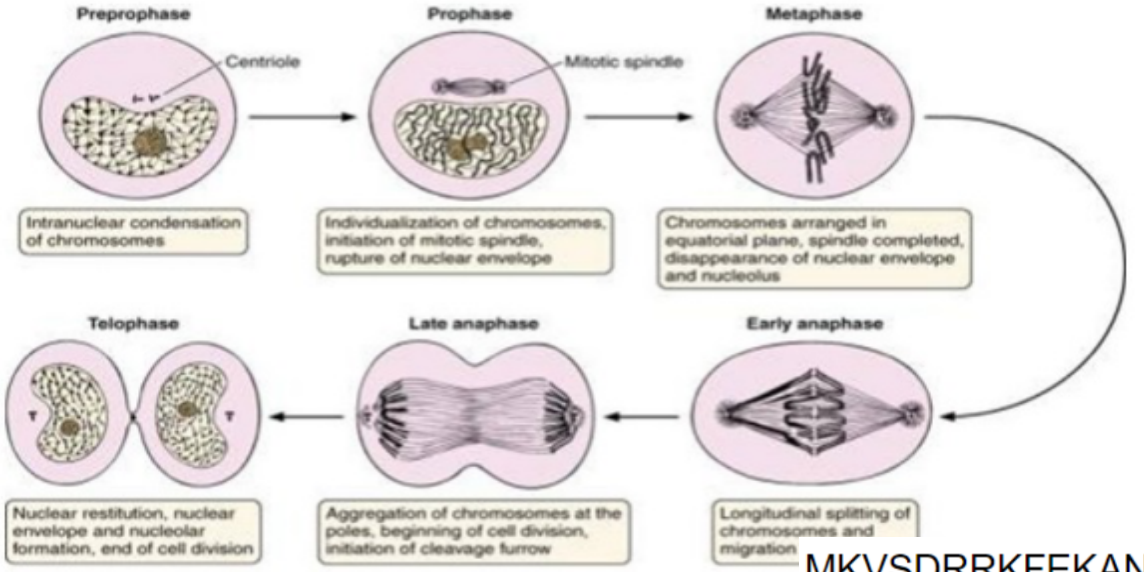
American Hospital Association (2015)



Adapted from Smith (2010)

Election of the new pope 2005

Election of the new pope 2013



Biological data
30 years ago

Biological data
nowadays

MKVSDRRKFEKANFDEFESALNNKNDLVHCPSI
YEDEKSGLIKVVKFRTGAMDRKRSFEKVVISVMV
EDEPDFQGGPISKYLIPKKINLMVYTLFQVHTLKF
YLNRGYYNELSFRVLERCHEIASARPNDSSTMR
RSLQKSTIRKYGYNLAPYMFLLLHVDELSIFSAYC
ERLKRDLCPRKPIEIKYFSQICNDMMNKKDRLGD
GAGPRGGAGDEEDRSITNEEPIIPSVDEHGLKVC
RKTLDAVKALLVSSCACTARDLDIFDDNNGVAMV
QETTLKDSYRITLVPSSDGISLLAFAGPQRNVYVD
YNKNGSSEPRLKTLDGLTSDYVFYFVTVLRQMQ
HDPWMDVVGFEDPNQVTNRDISRIVLYSYMFLN
FRQYMRELPKNAPQKLNFREMRQGLIALGRHCV
ATSELMANHSVQTGRNIYGVDFSLTSVSGTTATL

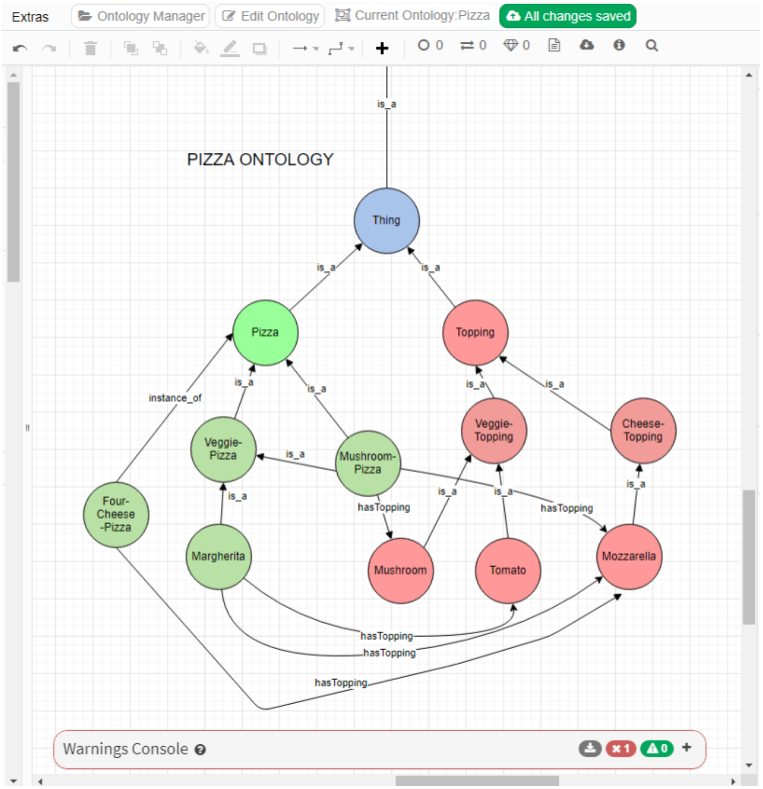
Adapted from Smith (2010)

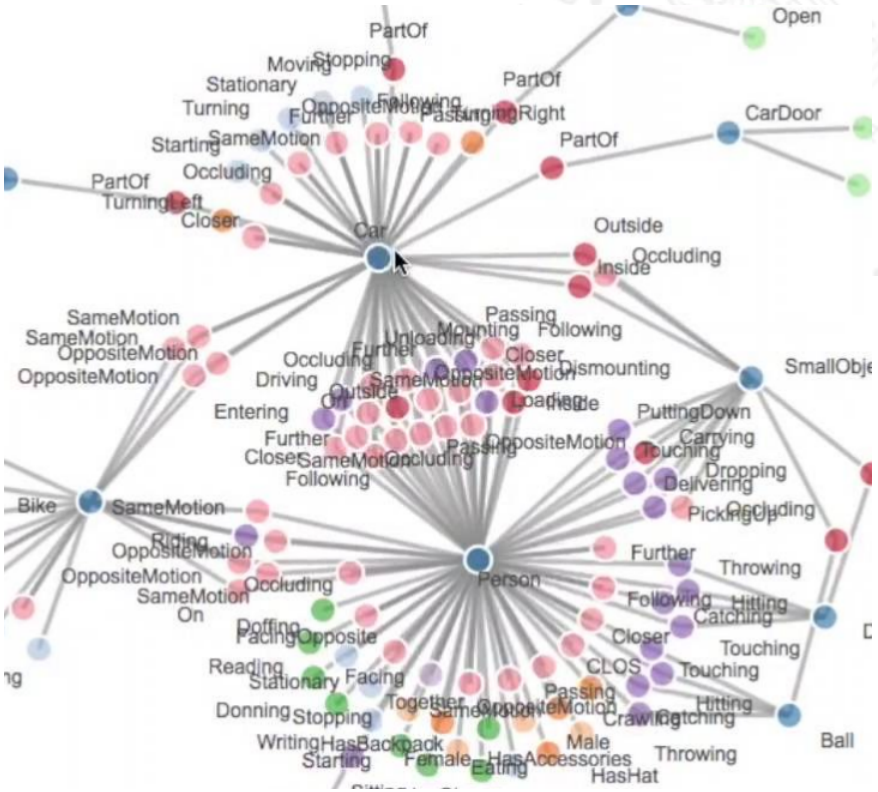
Ontology as Science

*"Accessing and integrating massive amounts of information from multiple data sources in the absence of **ontologies** is like trying to find information in library books using only old catalog cards as a guide, when the cards themselves have been dumped on the floor."*

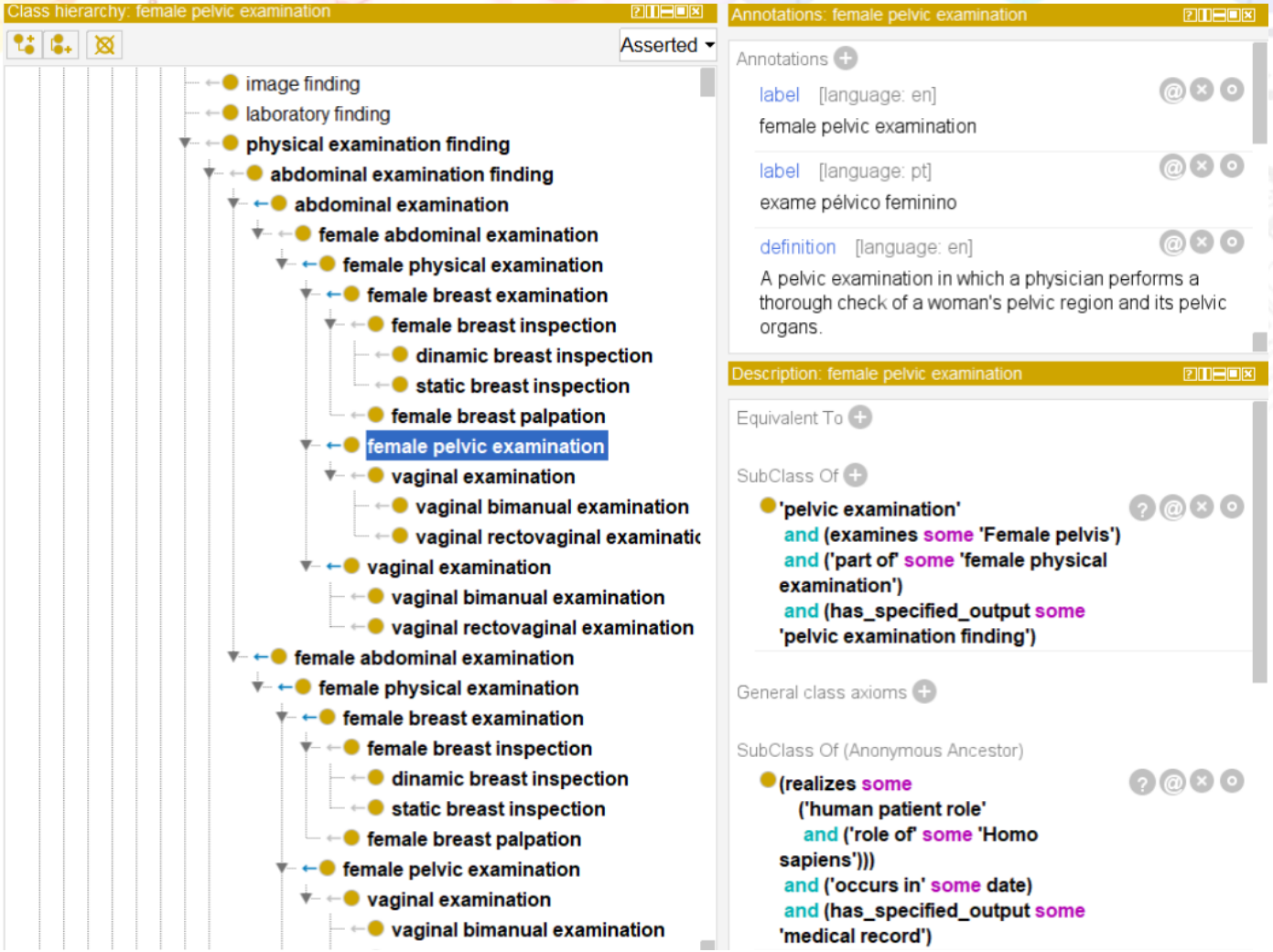
Smith, B. (2021)

Ontology take several forms





Ontology take several forms



Obstetric And Neonatal Ontology

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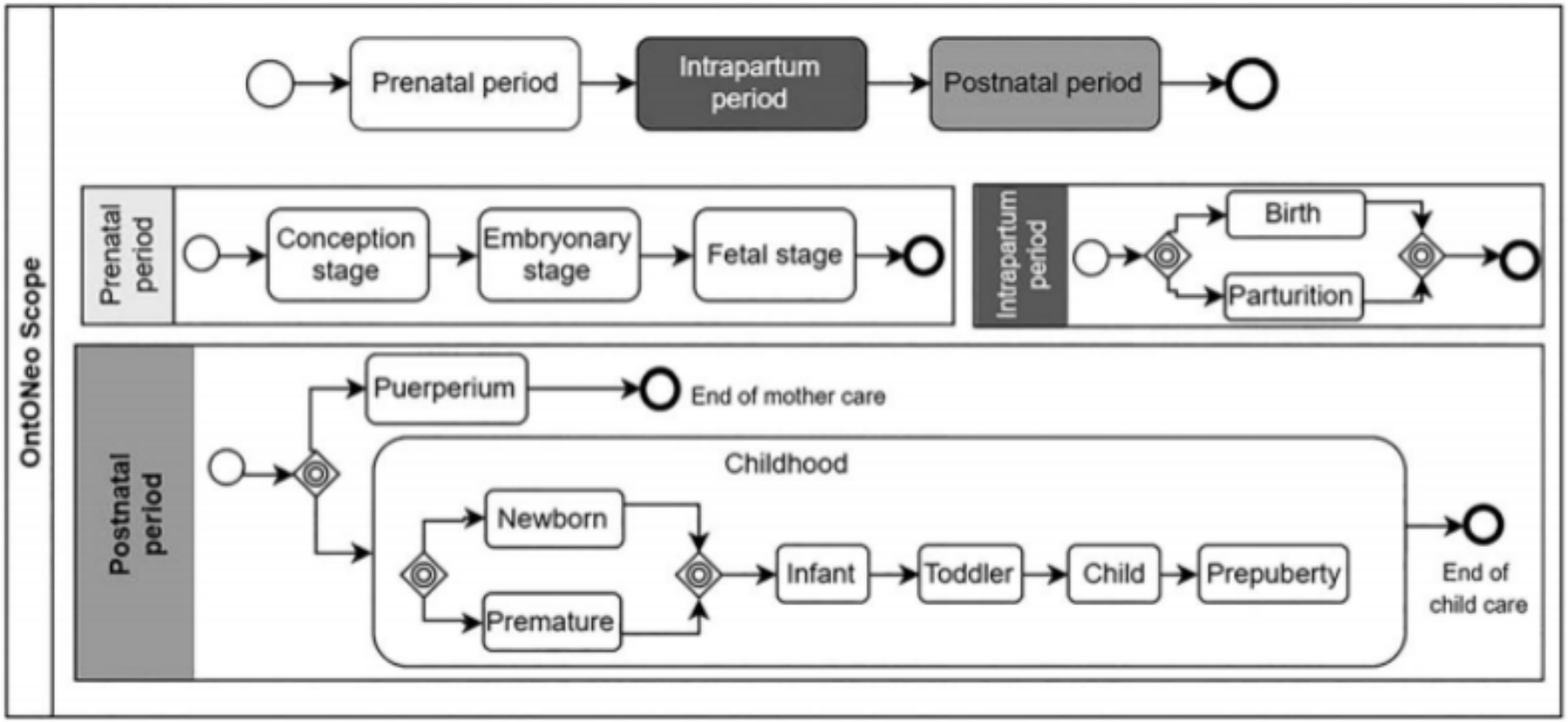
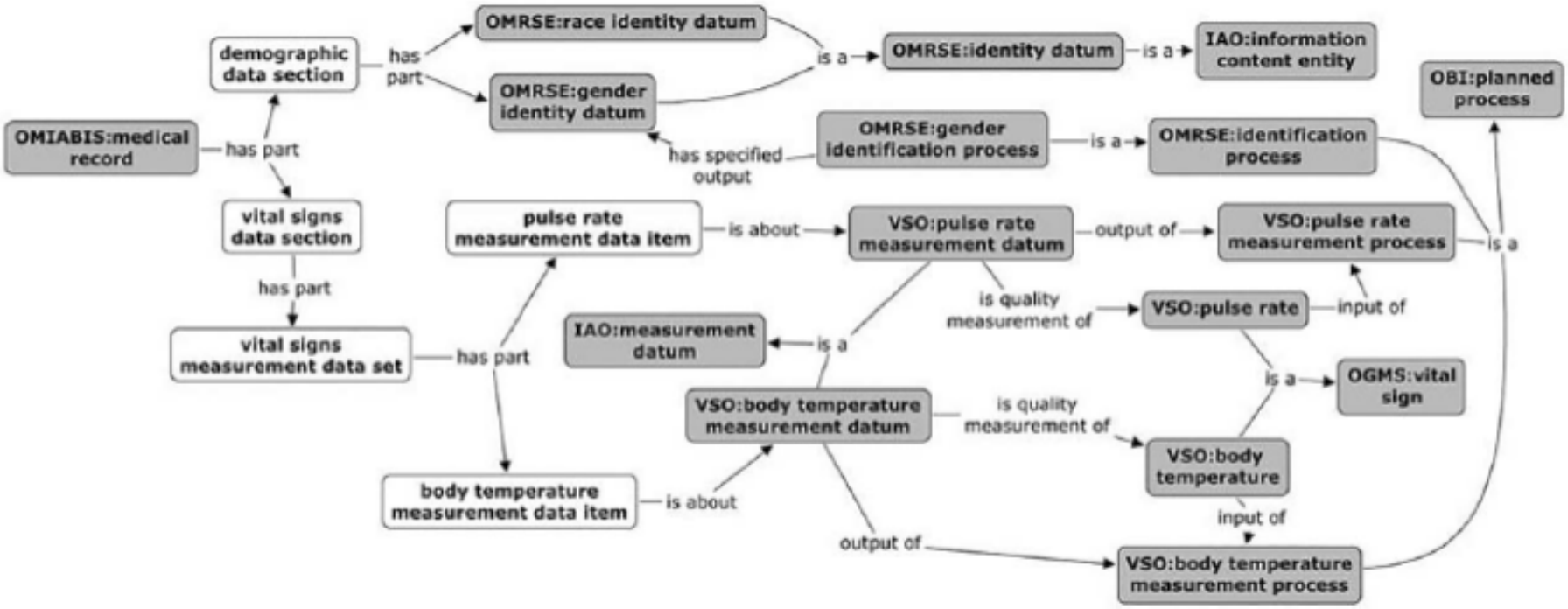
https://ontoneo.com/

"The **Obstetric and Neonatal Ontology** is a controlled vocabulary to provide a representation of the data from EHRs involved in the care of the pregnant woman, and of her baby"



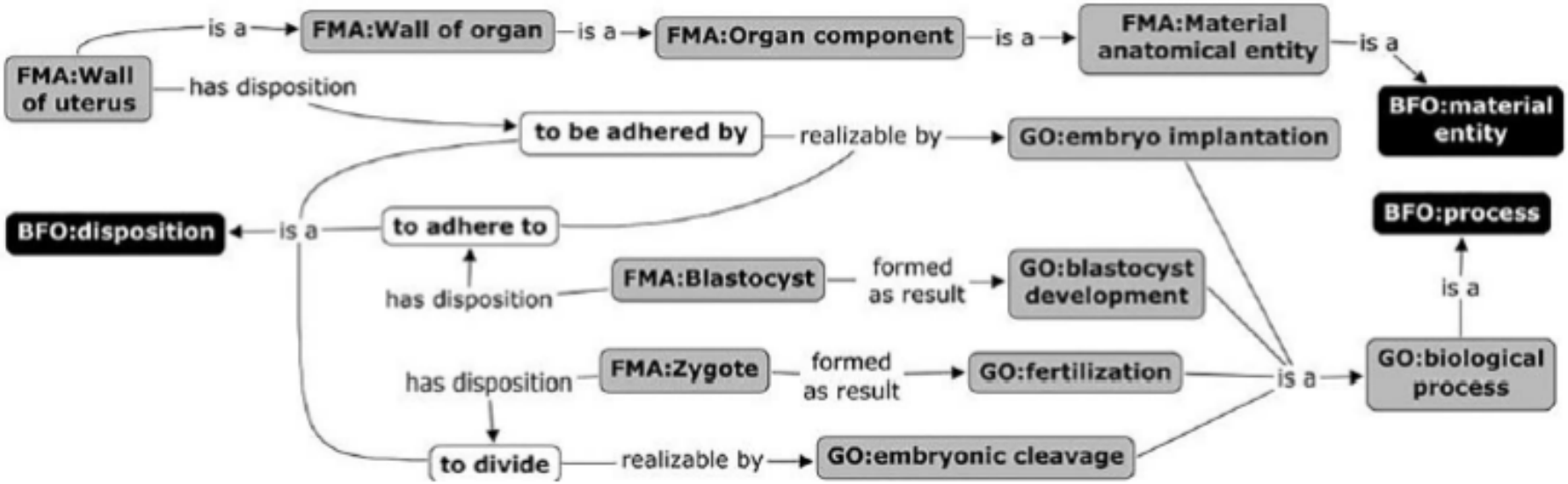
Scope of Ontoneo
Source: Almeida & Farinelli (2017)

Obstetric And Neonatal Ontology

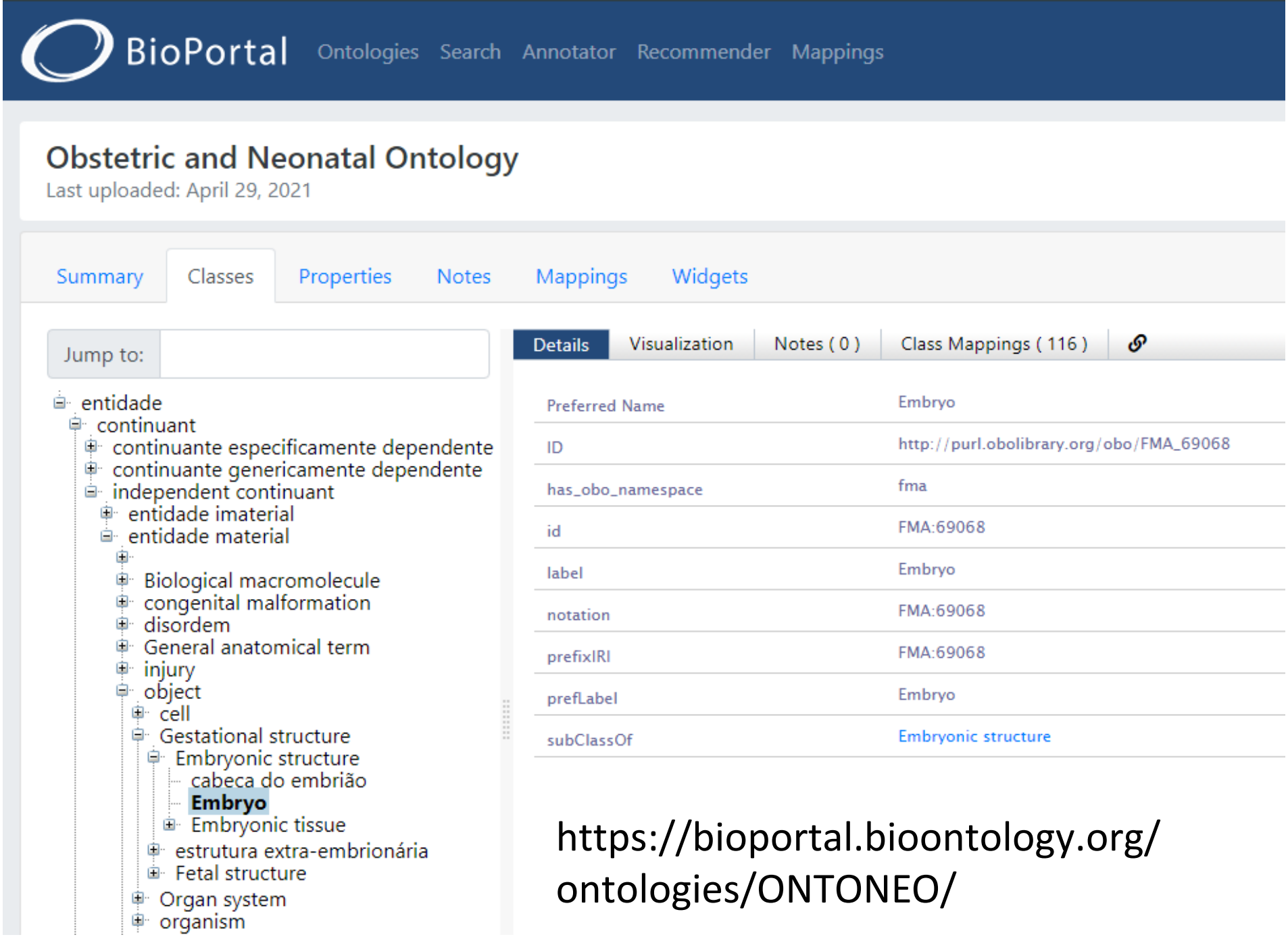


Sketch of a structure of medical records in OntoNeo
Source: Almeida & Farinelli (2017)

Obstetric And Neonatal Ontology

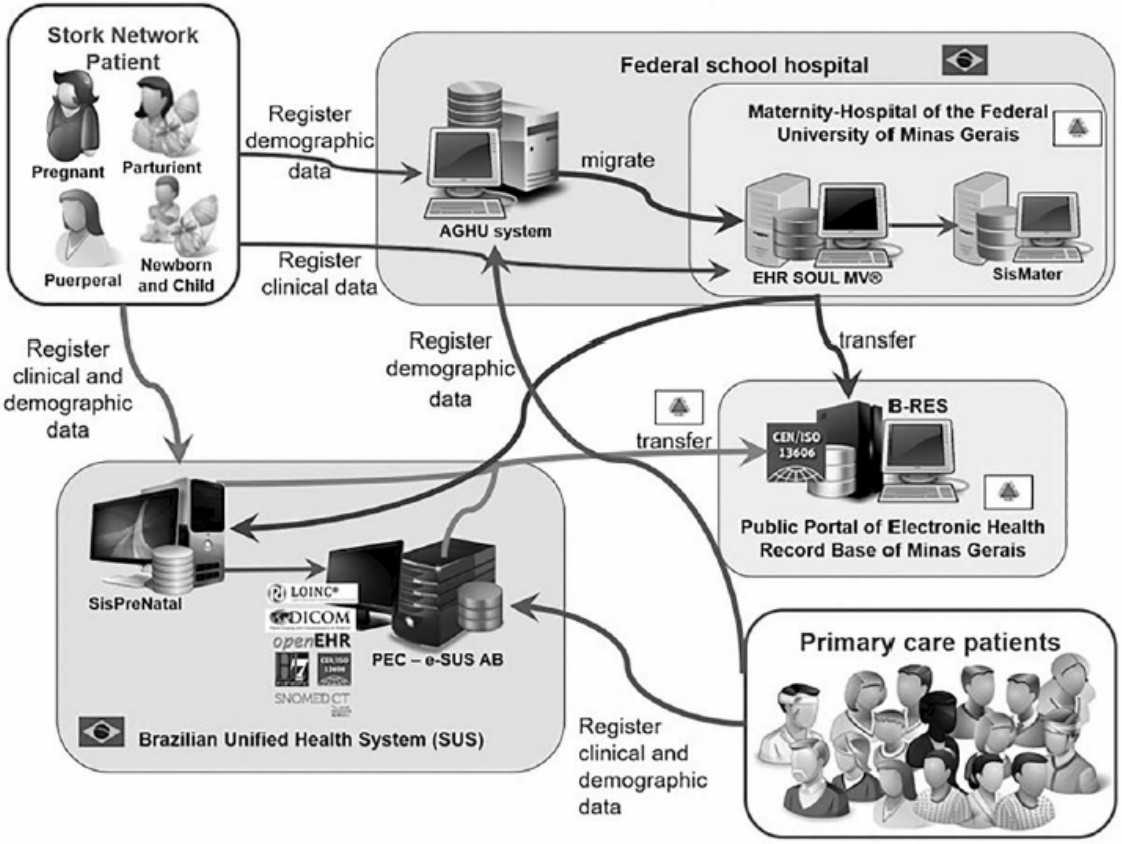


Sketch of embryo and pre-embryo stages
Source: adapted from Rosse & Mejino (2003).



https://bioportal.bioontology.org/ontologies/ONTONEO/

Obstetric And Neonatal Ontology



Brazilian medical information systems to be connected through OntoNeo
Source: Almeida & Farinelli (2017)

The Open Biological and Biomedical Ontology (OBO) Foundry

Dr. Barry Smith
State University of New York at Buffalo

http://www.obofoundry.org/

"Community [for the] development of interoperable ontologies for the biomedical sciences"

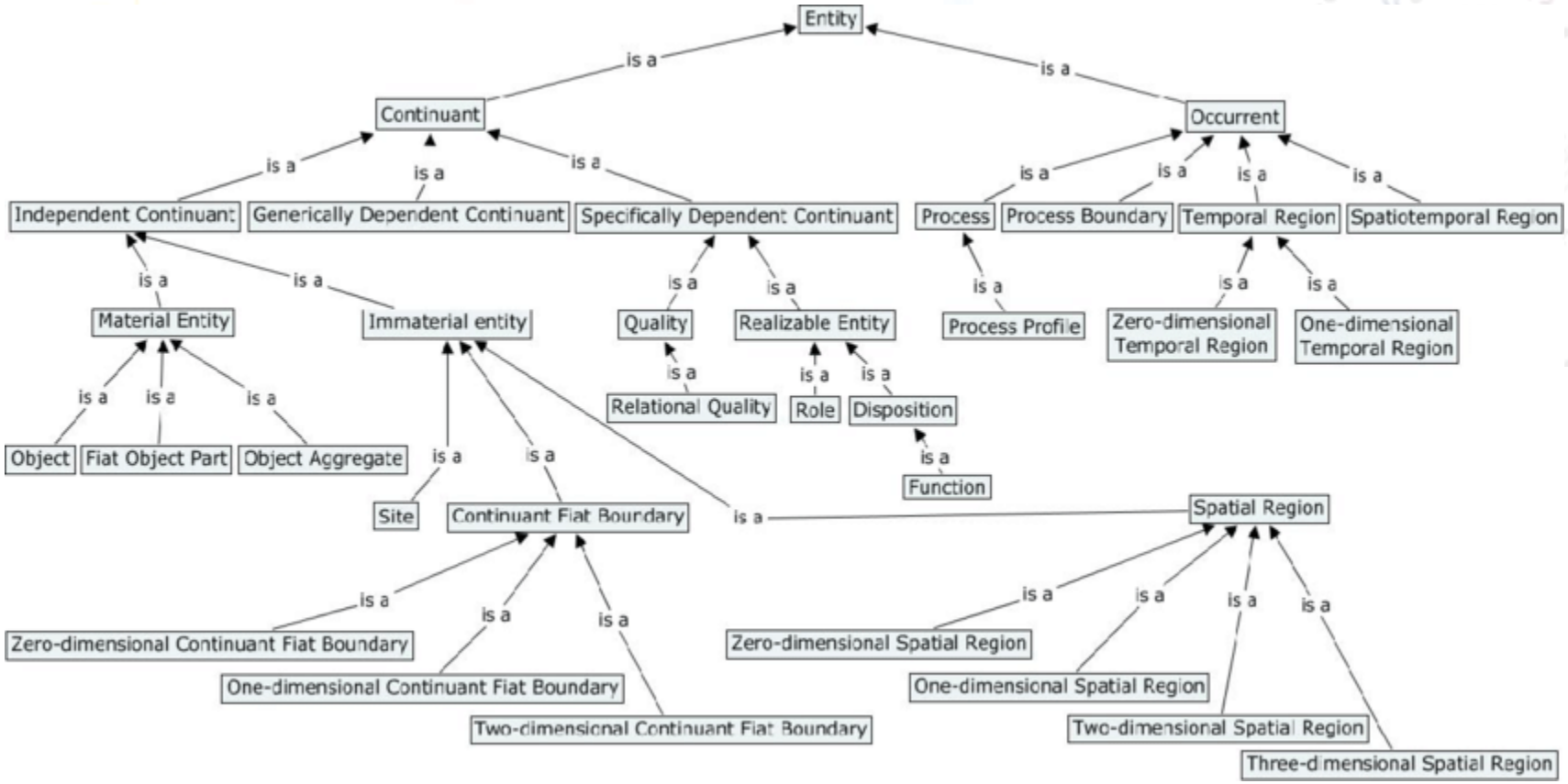
The Open Biological and Biomedical Ontology (OBO) Foundry

Principles:

- Logically well-formed and scientifically accurate
- The development is collaborative
- Non-overlapping and strictly-scoped content
- Common syntax and relations
- Based on ontology models that work well

What are models that work well?

Basic Formal Ontology (BFO)



Source: https://basic-formal-ontology.org/

The Open Biological and Biomedical Ontology (OBO) Foundry

bfo	Basic Formal Ontology CC BY	The upper level ontology upon which OBO Foundry ontologies are built. Detail	
chebi	Chemical Entities of Biological Interest CC BY	A structured classification of molecular entities of biological interest focusing on 'small' chemical compounds. Detail	
doid	Human Disease Ontology PUBLICDOMAIN	An ontology for describing the classification of human diseases organized by etiology. Detail	
go	Gene Ontology CC BY	An ontology for describing the function of genes and gene products Detail	
obi	Ontology for Biomedical Investigations CC BY	An integrated ontology for the description of life-science and clinical investigations Detail	
pato	Phenotype And Trait Ontology CC BY	An ontology of phenotypic qualities (properties, attributes or characteristics) Detail	
po	Plant Ontology CC BY	The Plant Ontology is a structured vocabulary and database resource that links plant anatomy, morphology and growth and development to plant genomics data. Detail	
pr	PRotein Ontology (PRO) CC BY	An ontological representation of protein-related entities Detail	

Source: http://www.obofoundry.org/

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Thanks!!