

A Patient Safety (PS) Information Model for Interoperability.

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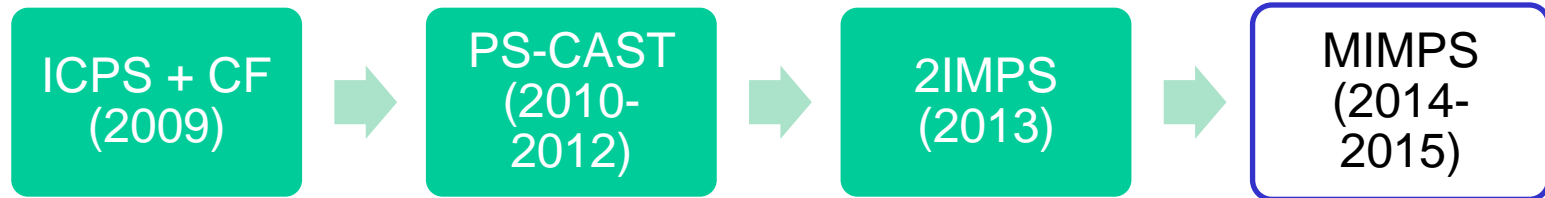


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Patient Safety Standards?

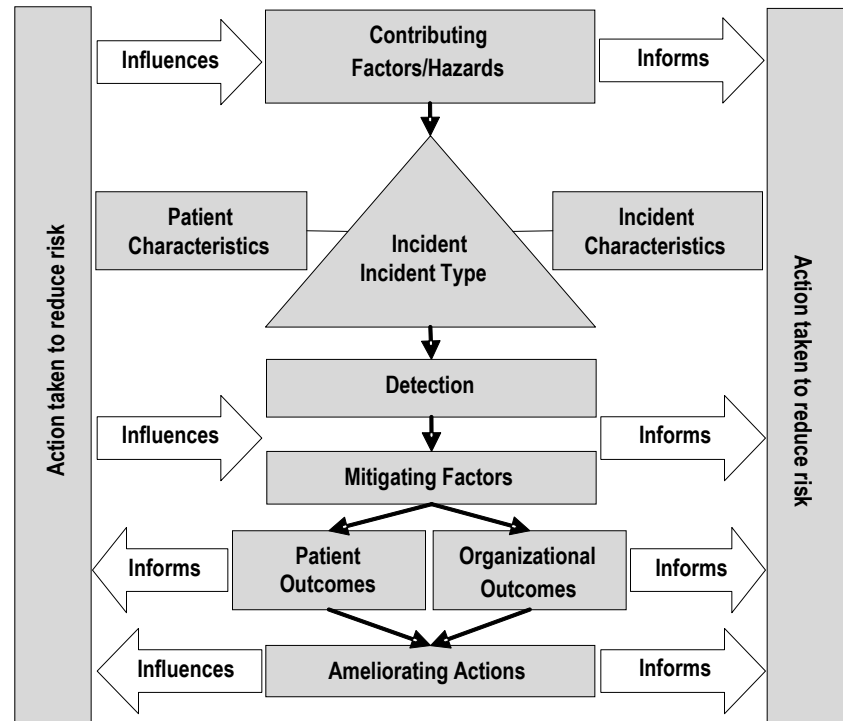


1. Starting point: Knowledge ICPS Conceptual Framework
2. Double refinement approach:
 - Semantic top down (PS-CAST aligned with Biotop and BFO 2)
 - bottom up based on R&L Systems for Patient Safety and international and national vigilance system
3. MIMPS and Incident types Terminology

1 Starting by PS knowledge experts

- In 2009, the WHO published reports for a so called “International Classification for Patient Safety (ICPS)” . Its representation includes:
- a list of terms and ‘key concepts’
 - a conceptual framework

But... this CF is not suitable for computer modelling



ICPS Issues

- Schulz et al. (2009) made an appraisal of ICPS
 - [ICPS] “is neither a classification nor a taxonomy” [but] “presents properties for modelling [...] an ontology”
- Ceusters et al. (2011) wrote:
 - “*some ambiguous definitions*” within ICPS such as “*class*” or “*semantic relationship*”
 - “*additional efforts must be provided, using an ontological methodology*”

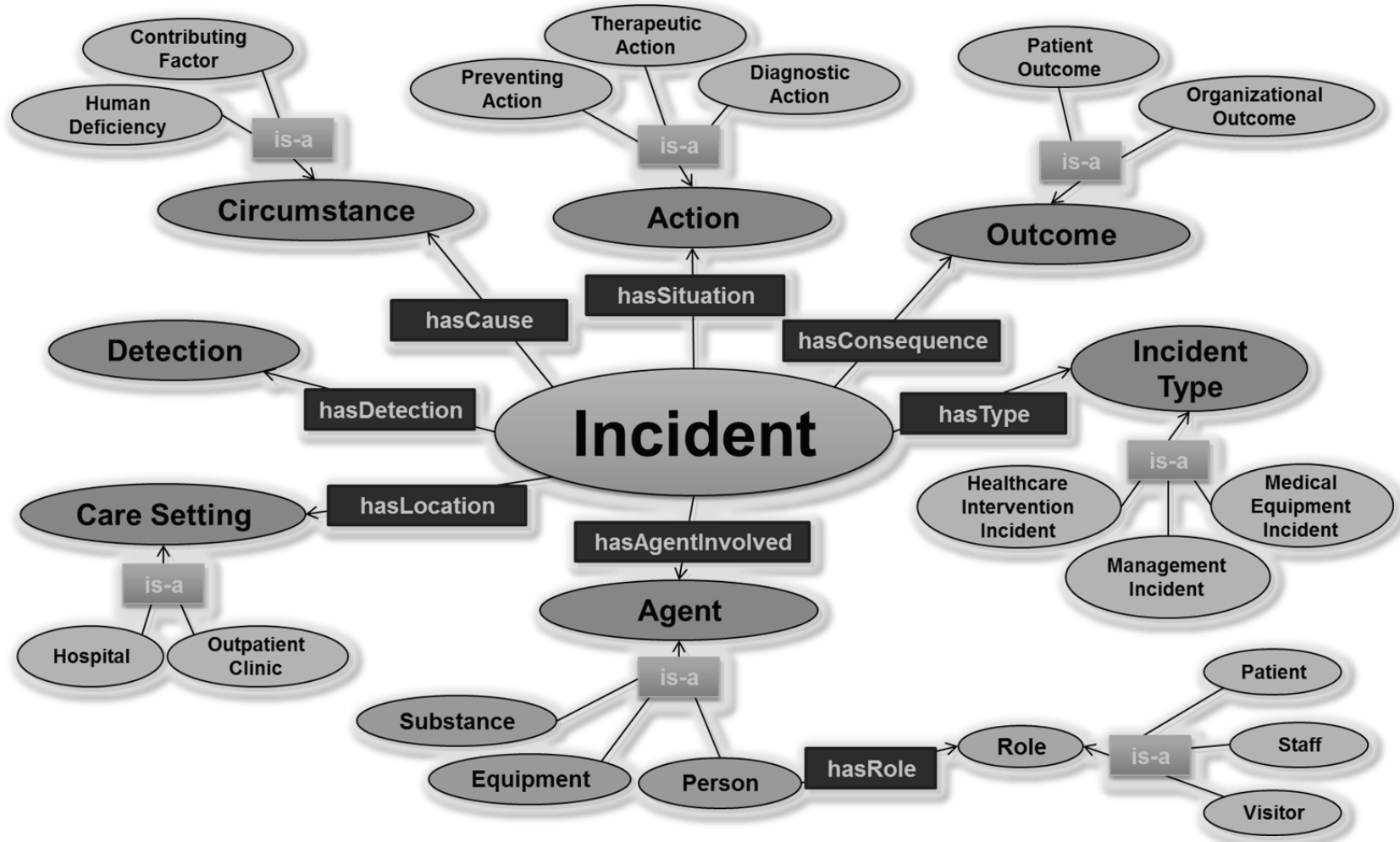
2 PS Semantic modelling and bottom up testing

- 21 PS CAST and ULO
- 22 Bottom up
 - Reporting and learning systems
 - Vigilance systems

Patient Safety CAST (PS-CAST) following ENISO 1828

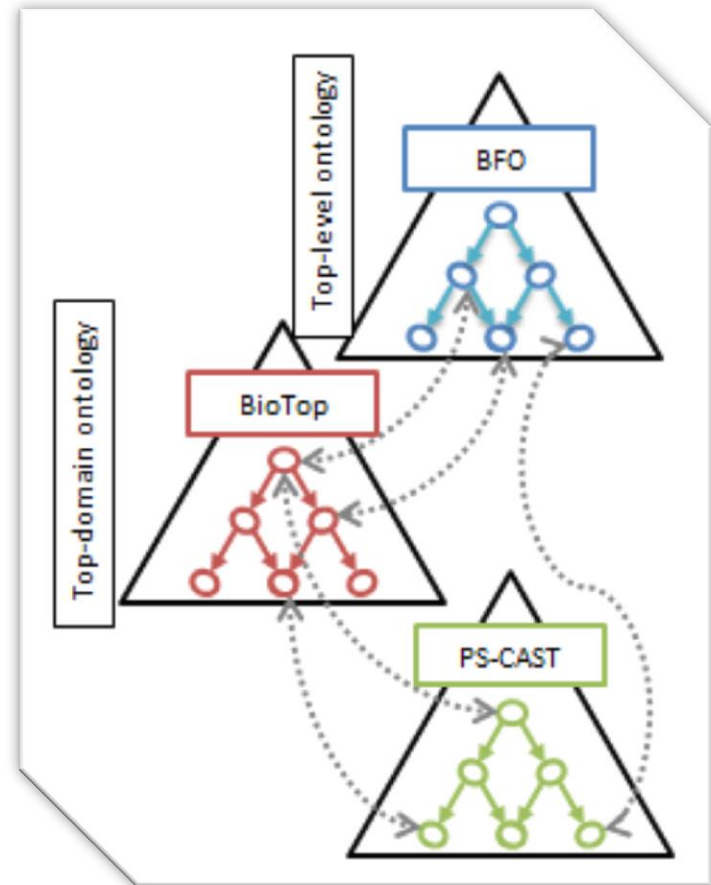
Item	Categorial Structure Definition Model
Place of occurrence	Incident <i>hasLocation</i> some Care_Setting
Patient	Incident <i>hasPeopleInvolved</i> some Person Person <i>hasRole</i> some Patient
Sex of patients	Person <i>hasGender</i> some Gender
Who found this incident?	Incident <i>hasDetection</i> some Detection Detection <i>hasPeopleInvolved</i> some Person
Years of experience	Staff <i>hasWorkExperience</i> some DurationDescription
Level of damage	Incident <i>hasConsequence</i> some Outcome Outcome <i>hasSeverity</i> some Severity
Clinical examination	Incident <i>hasSituation</i> some Action Diagnostic_Action <i>is a</i> Action
Cause of incident > system	Incident <i>HasCause</i> some Circumstance System_Deficiency <i>is a</i> Circumstance
...	...

PS-CAST incident Model



Upper level ontologies

- Top level ontology:
 - BFO (Basic Formal Ontology)
- Top-domain ontology
 - BioTop (a biomedical top-domain ontology)



Alignment with BFO2

PS-CAST Concepts	(link) BFO2.0
Incident	(subClassOf) Process
Incident_Type	(subClassOf) Dependant Continuant
Outcome	(subClassOf) Disposition
Action	(subClassOf) Process
Circumstance	(subClassOf) Disposition
Detection	(subClassOf) Process
Care_Setting	(subClassOf) Site
Agent	(subClassOf) Material Entity
Role	(subClassOf) Role
hasType	(subRelationOf) hasContinuantPartAtAllTime
hasConsequence	-
hasSituation	(subRelationOf) hasOccurentPart
hasCause	-
hasDetection	(subRelationOf) hasOccurentPart
hasLocation	(equivalentTo) HasLocationAtSomeTime
hasAgentInvolved	(equivalentTo) HasContinuantPartAtSomeTime
hasRole	(equivalentTo) HasRoleAtSomeTime

Remark expressivity(PS-CAST) versus formal logic (BFO 2)

- “hasCause” and “hasConsequence” relationships involve causality. This refers to a trigger-and-realization process pair.
- we use the relation of temporal relatedness **PrecededBy**, which does not express causation. The reason is that although much of those events are of causal nature, the proof of this is often impossible.

22 Bottom up validation

- R and L national systems
 - Australia, Japan, Belgium, Denmark, British Columbia (Canada), U.S. AHRQ
- Vigilance systems
- EU

3 Results

31 MIMPS 10 items definitions

- 1 The **PATIENT** is the person who is a recipient of healthcare and involved (NO IDENTIFICATION only age and gender).
- 2 **TIME** refers to date and time of day when the incident occurred.
- 3 **LOCATION** refers to the physical environment in which a patient safety incident occurs.
- 4 **CAUSE WITH FREE TEXT**
- 5 **CONTRIBUTING FACTORS WITH FREE TEXT**
- 6 **MITIGATING FACTORS WITH FREE TEXT**
- 7 **INCIDENT TYPE** is a descriptive term for a category made up of incidents of a common nature, grouped because of shared, agreed features.
- 8 **INCIDENT OUTCOMES** refer to all impacts upon a patient or an organization wholly or partially attributable to an incident.
- 9 **RESULTING ACTIONS** refers to all actions resulting of an incident.
- 10 **REPORTER'S ROLE** refers to the person who collects and writes information about the incident.(NO IDENTIFICATION)

Vigilance systems high Compliance score with MIMPS

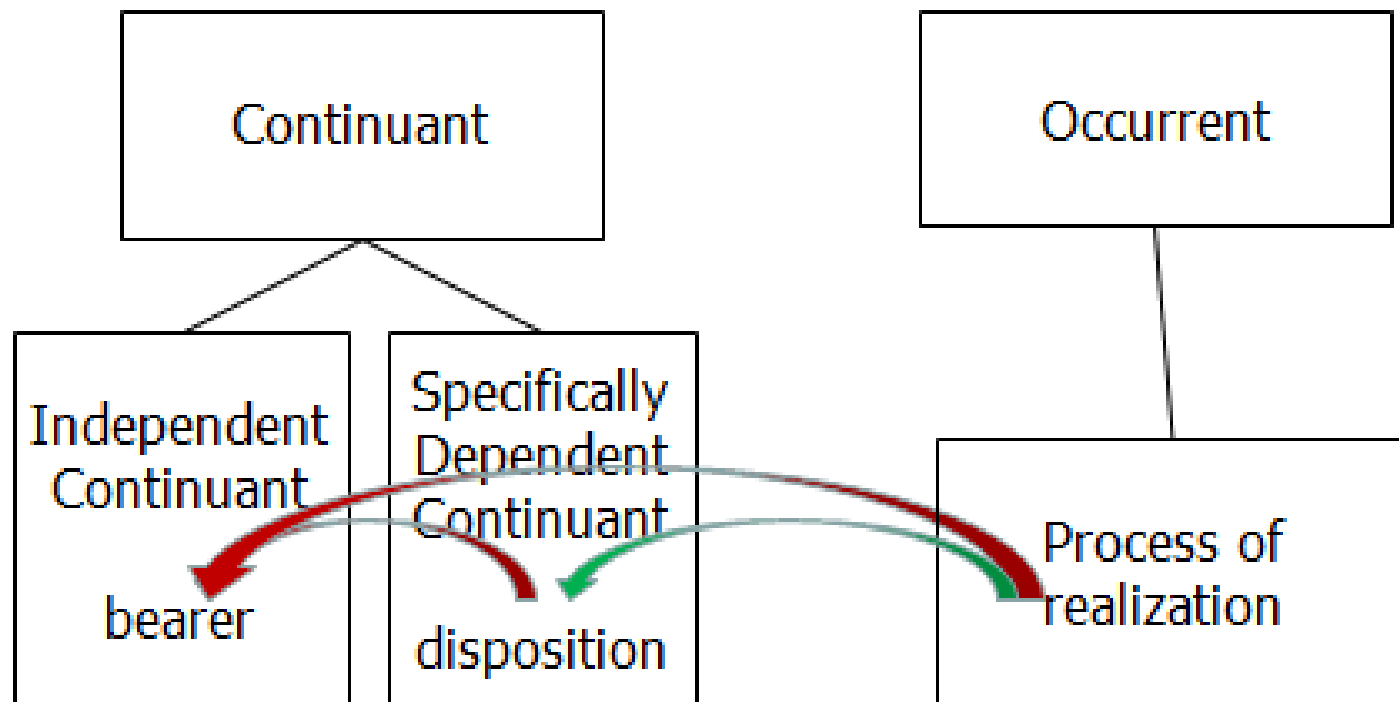
Reporting System	Patient	Date of incident	Location	Agent(s) involved	Incident type	Incident outcomes	Resulting actions	Reporter's role	items present/8
(1) ADR CIOMS	YES	YES	NO	YES	YES	YES	YES	NO	6
(2) GENERIC ADR UPPSALA	YES	YES	NO	YES	YES	YES	YES	YES	7
(3) SAFRON RADIATION ONCOLOGY IAEA	NO	YES	NO	YES	YES	YES	YES	NO	5
(4) AEFI POST IMMUNIZATION	YES	YES	YES	YES	YES	YES	YES	YES	8
(5) SOUTH AFRICA HAEMOVIGILANCE	YES	YES	YES	YES	YES	YES	NO	YES	7
(6) NEEDLE STICK INJURY CDC	YES	YES	YES	YES	YES	YES	NO	YES	7
(7) BODY FLUID EXPOSURE CDC	YES	YES	YES	YES	YES	NO	NO	YES	6
(8) MEDICAL DEVICES NCAR	NO	NO	NO	NO	YES	YES	YES	YES	4
(9) MEDICAL DEVICES DG SANCO annex3	YES	YES	YES	YES	YES	YES	YES	YES	8
TOTAL /9	7	8	5	8	9	8	6	7	

3 Results

32 Terminology of Incident types

BFO 2 top level entities

realizable



Incident types :complex entities

- *an incident occurred to a patient during the past, is documented in a database and there is an expectation of some future happening that can be prevented*
- *it is a complex entity which corresponds to a occurrent event or process as well as to an independent continuant as physical object or to dependent continuant as a wrong drug prescription by a physician*
- *inherent polysemy arises only when there are dependence relations involved, such as between components, and that such complex objects are mereological sums of their aspect components*

BF0 based Incident types Terminology 1

- *bfo: Occurrent* (incident unrelated to any healthcare intervention)
 - ICPS Patient accidents; Behaviour.
 - CHADx: Accidental injuries.
 - ICD11 beta Chapter 23: "External causes of morbidity and mortality: Unintentional causes"
- *bfo: Occurrent and PrecededBy* some *HealthCareIntervention* (incident happening in relation with an health care intervention)
 - ICPS Health care associated infection, Problems in the management of Clinical process, Medication, Blood/Blood products, Nutrition, Medical fluids, Medical devices.
 - CHADx: Post-procedural complications; Adverse Drug Event and codes Not Present On Admission (NPOA)
 - ICD11 beta Chapter 23 External causes of morbidity and mortality: causes of healthcare related harm or injury

BF0 based Incident types

Terminology 2

- *bfo:IndependentContinuant*: incident related to a permanent entity as a structure or organization)
 - ICPS Infrastructure/building /Fixtures;
 - CHADx: none
 - ICD 11 beta none
- *bfo:GenericallyDependentContinuant*: Information entities:
 - ICPS Documentation; Human resource management (plan)
 - CHADx: none
 - ICD 11 beta none

Conclusion and outlook

- Top down semantic approaches CAST and ULO and bottom up validations across countries can be associated for semantic interoperability
- MIMPS is presently tested in four countries (Morocco, Afghanistan, Sri Lanka and India) having no national PS or specific vigilance reporting systems.
- 2 main issues are pending
 - Structured(mimps) vs free text analysis
 - Cause vs precededby ontology

Vielen Dank für Ihre Aufmerksamkeit

! Any Questions ?

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Questions?

Muito obrigado

Terima Kashi

Thank you

Grazie

Gracias

ευχαριστώ

Multumesc

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Vielen Dank für Ihre Aufmerksamkeit

Merci

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