

About WHO Countries

Health topics **Publications**

Data and statistics

Programmes and projects

Patient safety

Clean Care is Safer

Safe Surgery Saves Lives

Tackling antimicrobial resistance

Patients for patient safety

Taxonomy

Research

Solutions

Reporting and learning

Patient safety

Information centre | Events | Links

WHO > Programmes and projects > Patient safety > Taxonomy

Taxonomy

International Classification for Patient Safety (ICPS)

The key action areas of WHO Patient Safety aim to improve specific aspects of patient safety. A common element of each action area is that it serves as a source of learning within countries and across the world to help make health care safer. In order to accomplish this, a standardized internationally accepted classification for key patient safety concepts must be developed.



Taxonomy for Patient Safety aims to define, harmonize and group patient safety concepts into an internationally agreed classification.

This will help elicit, capture and analyse factors relevant to patient safety in a manner conducive to learning and system improvement. The classification aims to be adaptable vet consistent across the entire spectrum of health care and across cultures and languages.

he International Classification for Patient Safety (ICPS) is not yet a classification. It is a conceptual framework for an international classification

represents a consensus of international experts on a reasonable understanding of the world of patient safety. The Final Technical Report for The Conceptual Framework for the International Classification for Patient Safety 2009 (v1.1) and accompanying Technical Annexes provide a detailed overview of the conceptual framework and the

The ICPS: A taxonomy, a classification, an ontology or an information model?

Stefan SCHULZ

IMBI, University Medical Center, Freiburg, Germany

Ontology

Ontologies

theory of reality



•theories that attempt to give precise mathematical formulations of the properties and relations of certain entities.

(Stanford Encyclopedia of Philosophy)

Epistemology

Information Models

theory of knowledge



 artifacts in which information is recorded

A. Rector, SemanticHealth D6.1

Ontologies

Formal descriptions

- MRSA subtype-of SA
- •SA subtype-of Staphylococcus
- •SA implies bearer-of some MR quality

Textual descriptions

• "MRSA is defined as SA for which methicillin has no toxic effect"



•theories that attempt to give precise mathematical formulations of the properties and relations of certain entities.

(Stanford Encyclopedia of Philosophy)

Information Models

Methicillin resistance

- □Clinically confirmed
- □Confirmed by antibiogram
- ✓Suspected
- □None
- □Unknown



- artifacts in which information is recorded
 - A. Rector, SemanticHealth D6.1

Ontologies

Taxonomies

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Backbone of Ontologies

SubClass or is-a relation:

a class B is a subclass

of a class A

if and only if

all members of B are

also members of A

(ENV 12264:2005, Horrocks 2003)



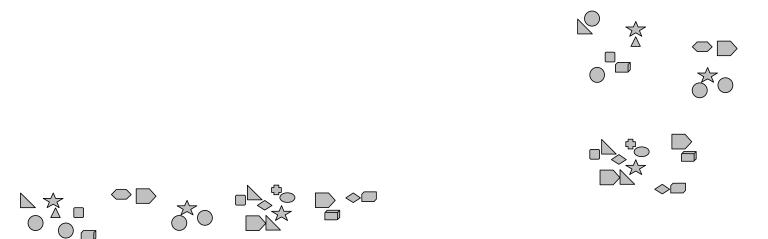
Information Models

Methicillin resistance

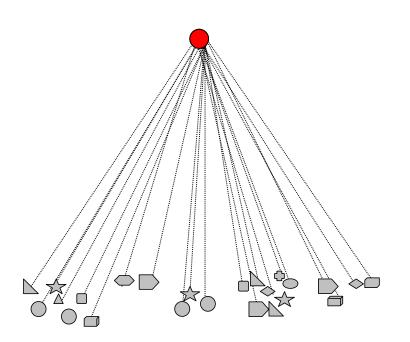
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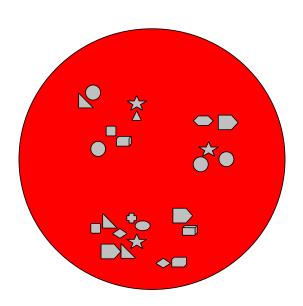


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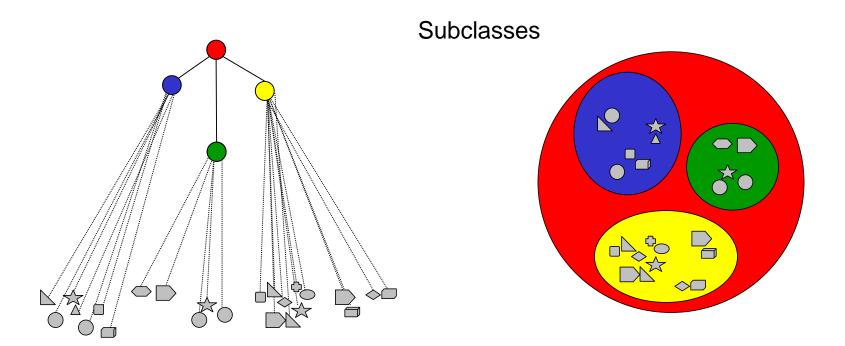


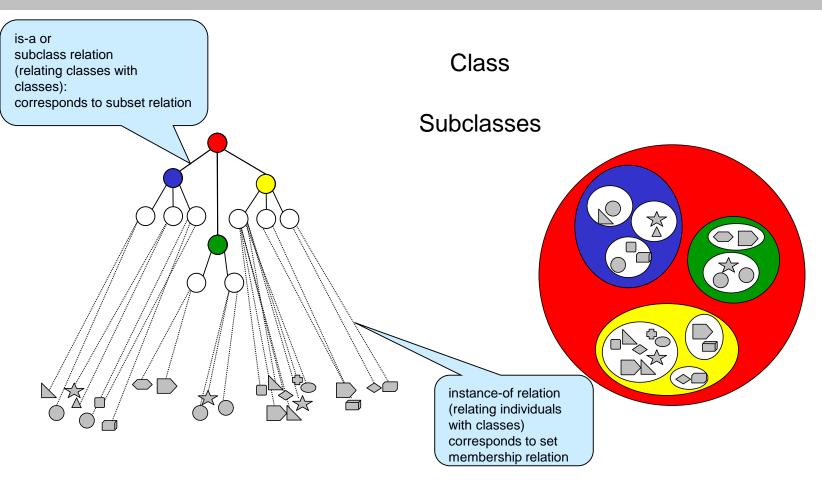
Class





Class





Ontologies

Taxonomies

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- •SA *subtype-of* Staphylococcus
- •SA implies bearer-of some MR quality

Textual descriptions

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Classifications

Taxonomies with additional

building principles:

- exhaustiveness
- disjointness

Packpone of Ontologies

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B is a subclass

ss A

nly if

bers of *B* are

mbers of A

2264:2005, Horrocks 2003)

Information Models

Methicillin resistance

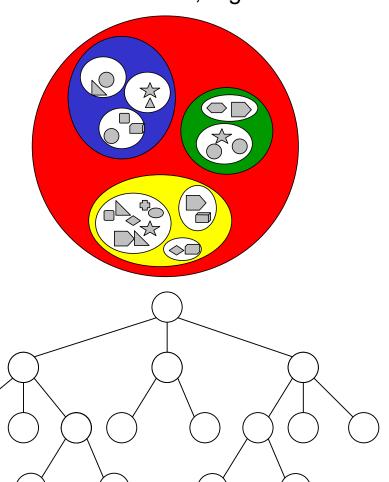
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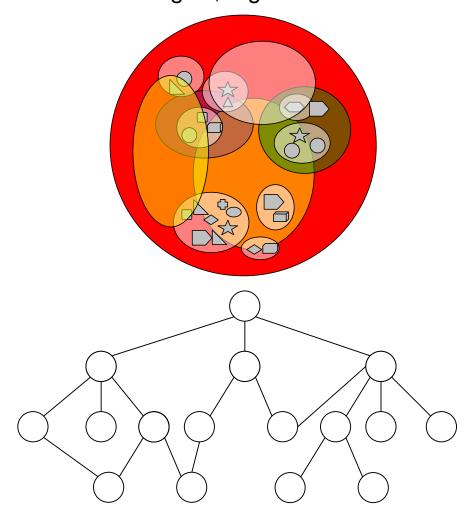
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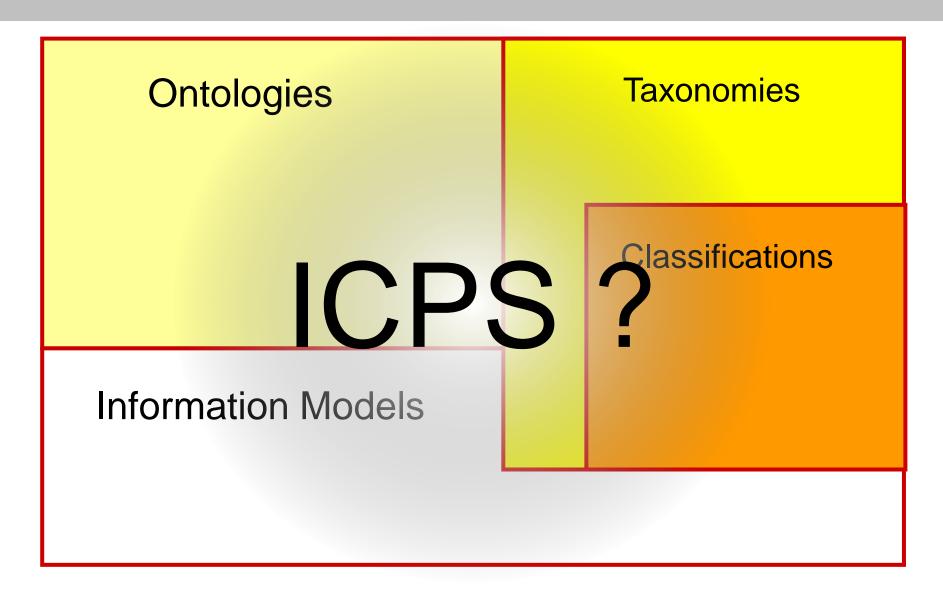
Classifications: Disjointness principle

Classifications, e.g. ICD



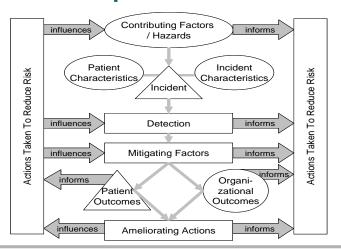
Other Terminologies, e.g. SNOMED CT



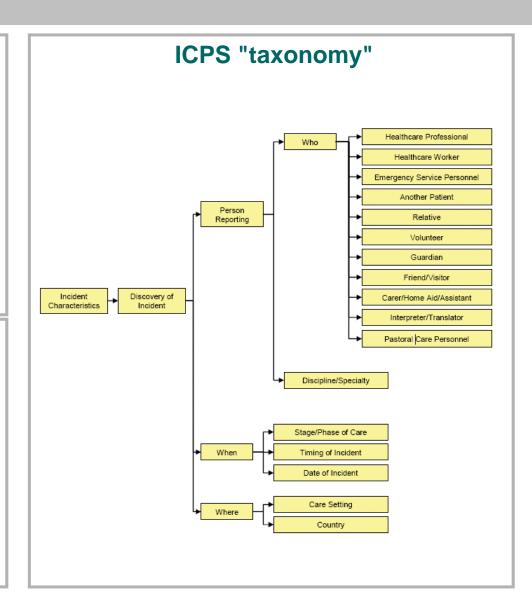


Three components of ICPS

"Conceptual Framework"

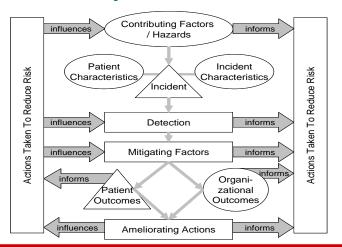


- Hazard: a circumstance, agent or action with the potential to cause harm.
- 10. Circumstance: a situation or factor that may influence an event, agent or person(s).
- 11. Event: something that happens to or involves a patient.
- 12. Agent: a substance, object or system which acts to produce change.
- 13. Patient Safety: the reduction of risk of unnecessary harm associated with healthcare to an acceptable minimum.
- 14. Healthcare-associated harm: harm arising from or associated with plans or actions taken during the provision of healthcare, rather than an underlying disease or injury.
- 15. Patient safety incident: an event or circumstance which could have resulted, or did result, in unnecessary harm to a patient.

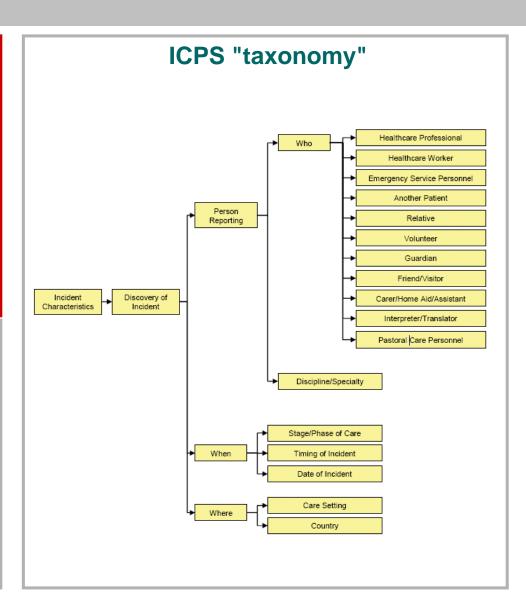


Three components of ICPS

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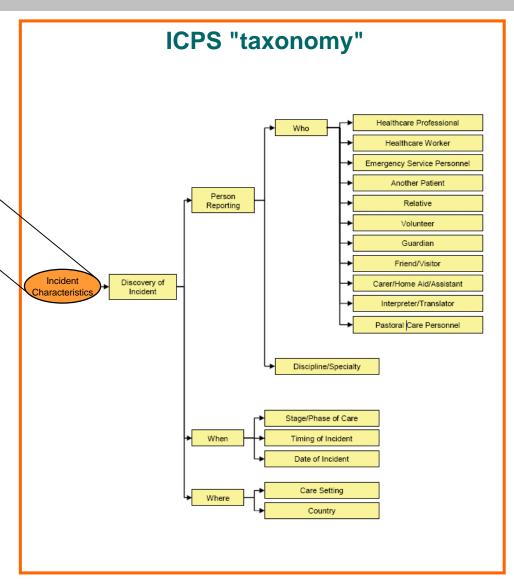
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ICPS Components

"Conceptual Framework" Contributing Factors influences informs / Hazards Patient Risk Characteristics haracteristic Incident Actions Taken To Reduce Reddoe Actions Taken To influences Detection informs Mitigating Factors influences informs informs Organi-Patient zational Outcomes Outcomes informs **Ameliorating Actions**

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ICPS Conceptual Framework

informs

Organi-

zational

Outcomes

Actions Taken

"Conceptual Framework" Contributing Factors informs influences / Hazards Patient Incident Risk Risk Characteristics. Characteristics Incident Actions Taken To Reduce To Reduce

Detection

Mitigating Factors

"Key Concepts"

Ameliorating Actions

- Hazard: a circumstance, agent or action with the potential to cause harm.
- Circumstance: a situation or factor that may influence an event, 10. agent or person(s).....
- Event: something that happens to or involves a patient. 11.

influences

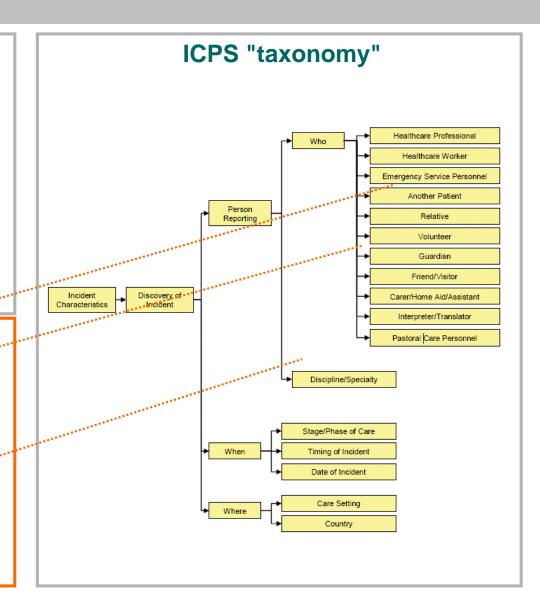
influences

informs

∕Patient

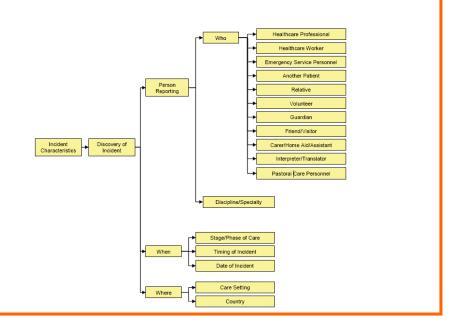
Outcomes

- Agent: a substance, object or system which acts to produce 12. change.
- Patient Safety: the reduction of risk of unnecessary harm 13. associated with healthcare to an acceptable minimum.
- Healthcare-associated harm: harm arising from or associated with plans or actions taken during the provision of healthcare, rather than an underlying disease or injury.
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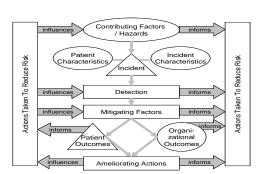


Analyzing ICPS

- target of analysis: the ICPS tree...
 - graph structure:
 resemblance with WHO-FIC
 classifications
 (4 5 levels, single
 parents)
 - artifact meant to be used by coders
- key concepts and conceptual framework: meta information from user's point of view



- 9. Hazard: a circumstance, agent or action with the potential to cause harm.
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ICI

A member of the class *Person Reporting* is not a member of the class *Discovery of Incident*: No taxonomic link!
But

For every member of the class *Discovery of Incident*' there is some member of the class *Person Reporting* as a participant: non-taxonomic, ontological relation

Characteristics

 Semantic nature of hieral links are not specified

Subclass or is-a relation:

a class B is a subclass

of a class A

if and only if

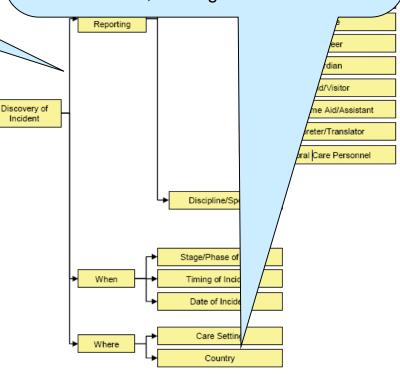
all members of B are

also members of A

(ENV 12264:2005, Horrocks 2003)

A member of the class *Country* is not a member of the class *Where* and no member of Discovery of Incident. No taxonomic link!

But: for every member of the class Discovery of Incident" there is some member of the class Country as a location: non-taxonomic, ontological relation



ICPS is not yet...

... a classification (ISO 17115:2007, Ingenerf MIM 1998,

Discovery of

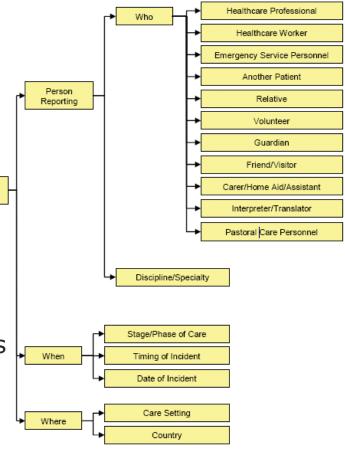
Incident

Madden [WHO-FIC] 2007)

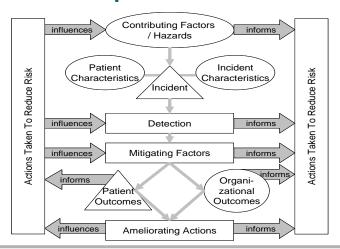
 Criterion of mutually disjoint, exhaustive classes not fulfilled

more than hundred
 ICPS concepts occur
 more than once in different
 hierarchies

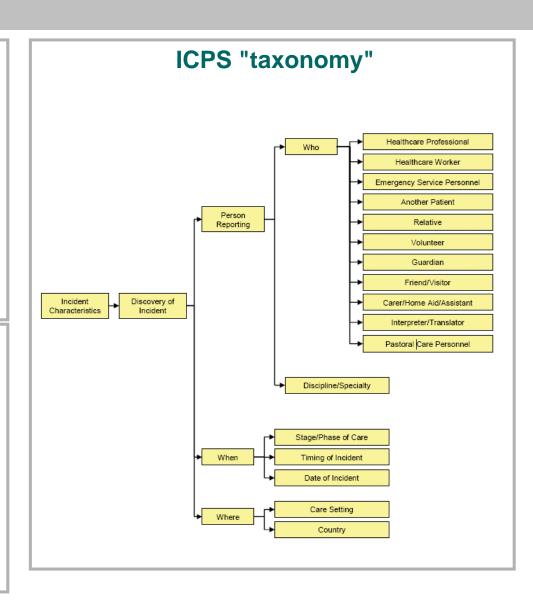
 Healthcare Professional occurs both as a child of People Involved and Person Reporting

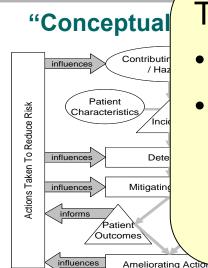


"Conceptual Framework"



- Hazard: a circumstance, agent or action with the potential to cause harm.
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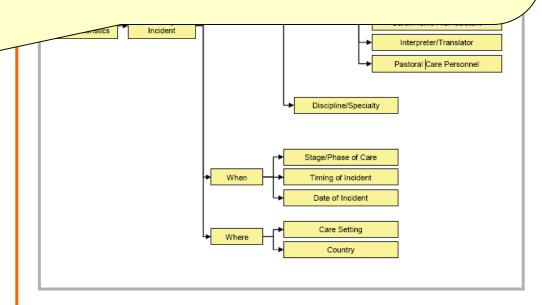
This is a rudimentary, informal ontology

- describes terms by their generic properties
- close to upper-level ontologies (e.g. BioTop):

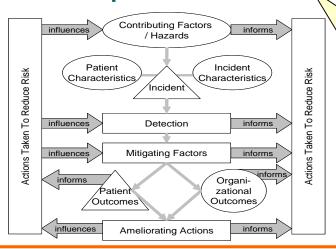
"state", "substance", "event", "agent", "object",

"action", "quality".

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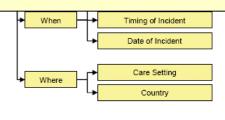
"Key Concepts"

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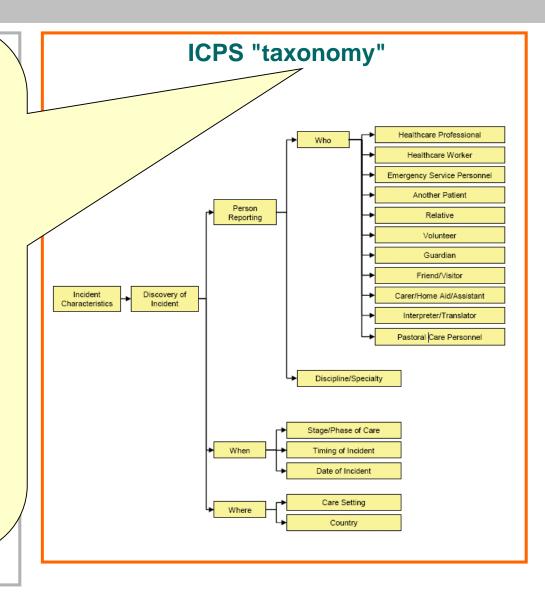
ICPS "tayonomy"

This is a complex patient safety model

- Similarity with
 - workflows
 - business models
- Ontologically:
 - complex event type



This is a structured data acquisition template consisting of (mostly) binary fields Can be described as information model Hierarchical parents provide context information for fields (but are not superclasses) It is not meant to arrange classes of entities by their inherent properties (ontology), but gives a framework for acquiring what a reporting person knows (information model)



15. Patient safety incident: an event or circumstance which could have resulted, or did result, in unnecessary harm to a patient.

Ontologies

Formal descriptions

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Textual descriptions

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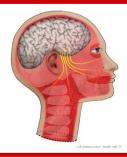
(Stanford Encyclopedia of Philosophy)



Information Models

Methicillin resistance

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- artifacts in which information is recorded
 - A. Rector, SemanticHealth D6.1

Structure of the Talk

- ICPS: How does it look like?
- ICPS: What it isn't
- ICPS: What it is now
- ICPS: What it may be in the future

What ICPS may be in the future

- After finishing, ICPS has the potential to be universally accepted as a reporting standard
- The ICPS "key concepts" may become a fully-fledged formal ontology rooted in existing upper-level ontologies and using Semantic Web standards (OWL) and being linked to ontological / terminological standards like SNOMED CT
- The ICPS "conceptual framework" can be enhanced by formal descriptions
- The ICPS reporting template ("taxonomy") may then be fully described in terms of ICPS's ontological core
- but...

Open issues

- The needs for semantically interoperable patient-safety relevant event reporting is essentially different from the reporting of diseases
- For the latter, the format of a statistical classification is adequate (ICD-10)
- Is the format of a reporting template adequate for the purpose ICPS is devised for?
- Is it necessary to transform the ICPS tree into a real taxonomy or classification structure?
- Terms like "taxonomy", "classification" should be used thoughtfully