Modelling the Social Practices of an Emergency Room to Ensure Staff and Patient Wellbeing

Rijk Mercuur, John Bruntse Larsen and Virginia Dignum

Delft University of Technology

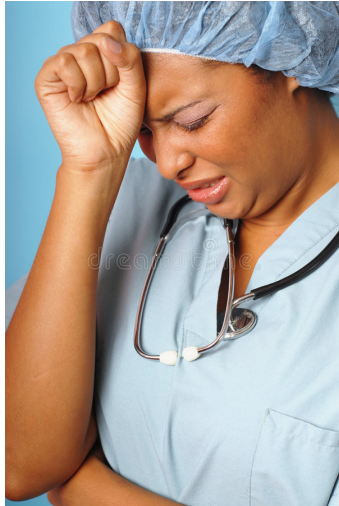Technical University of Denmark

Herlev Hospital Denmark

My doctor didn't look at me during my last visit

The emergency room suffers from social problems

There has been a succession of incidents…

Patients and staff take up more time, become unsatisfied and counterproductive.
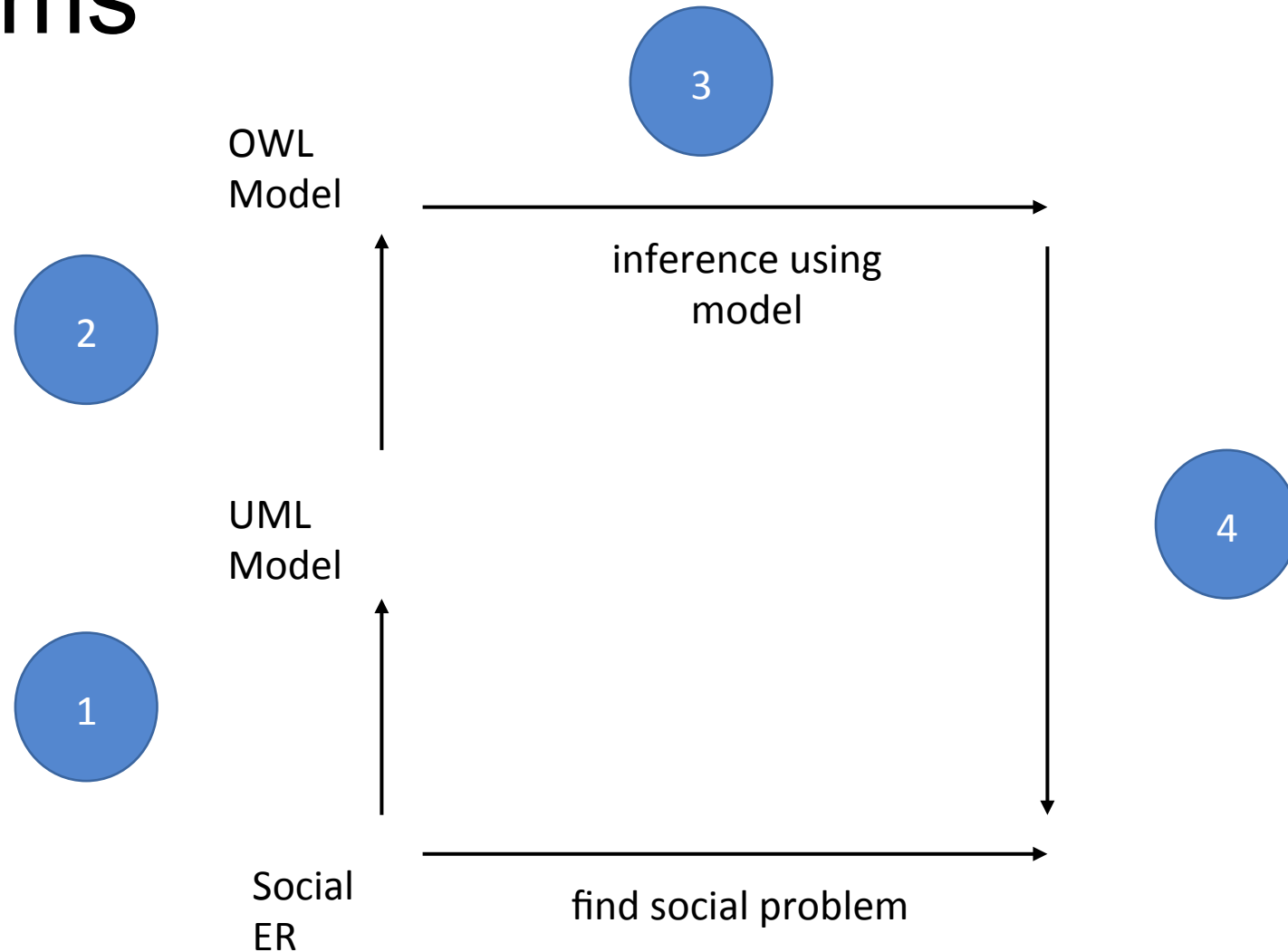

Healthy Body + Healthy Mind = Happy Human

Patient and Staff are healthier, cooperative and are more satisfied

The emergency room suffers from social problems… how to keep track of this complex system?

There has been a succession of incidents…

Our formal model of the social ER can help management in finding social problems

OWL Model

UML Model

Social ER

inference using model

find social problem

3

2

4

1

Modelling the ER is split in three task: a meta-model, model and modelling desirable social properties

1

UML
Model

↑

Social
ER

=

UML
Meta-
Model

↑

Social

UML
Domain Model

↑

Social
ER

UML
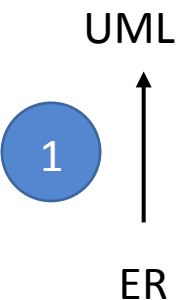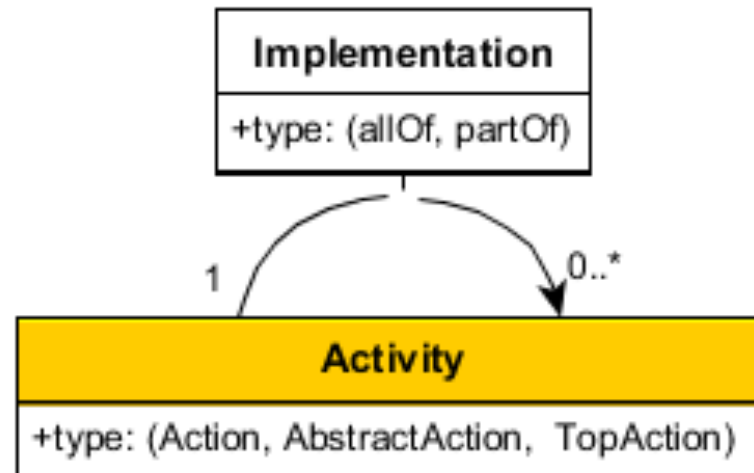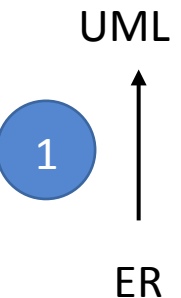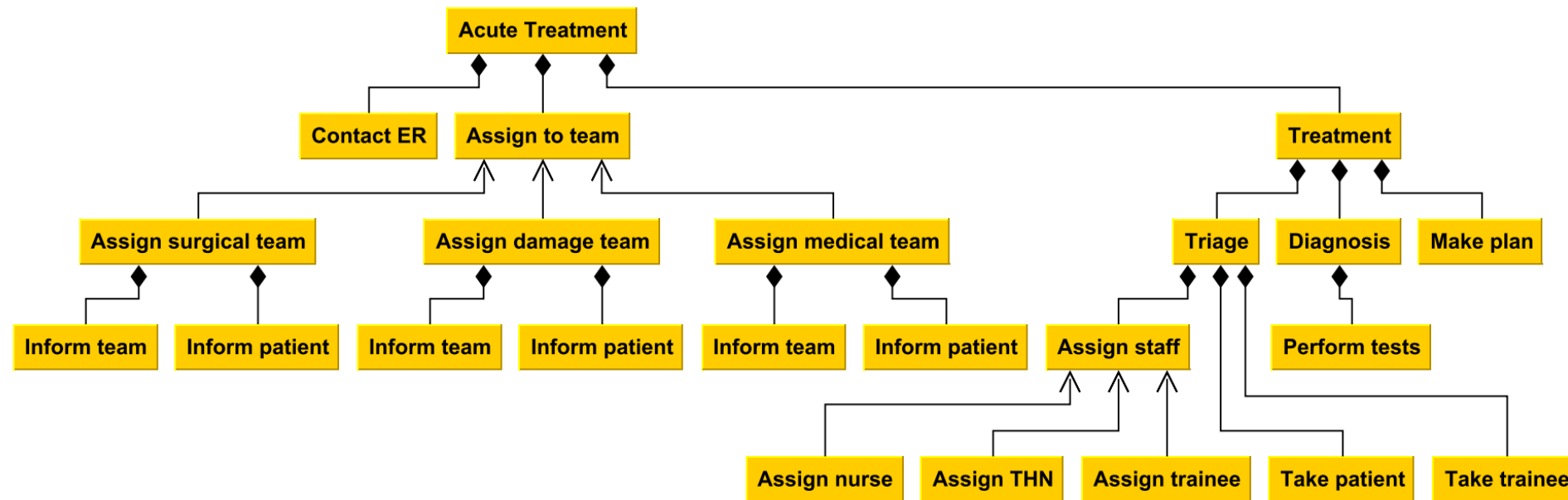Social Properties

↑

Desirable
Social
Properties
in ER
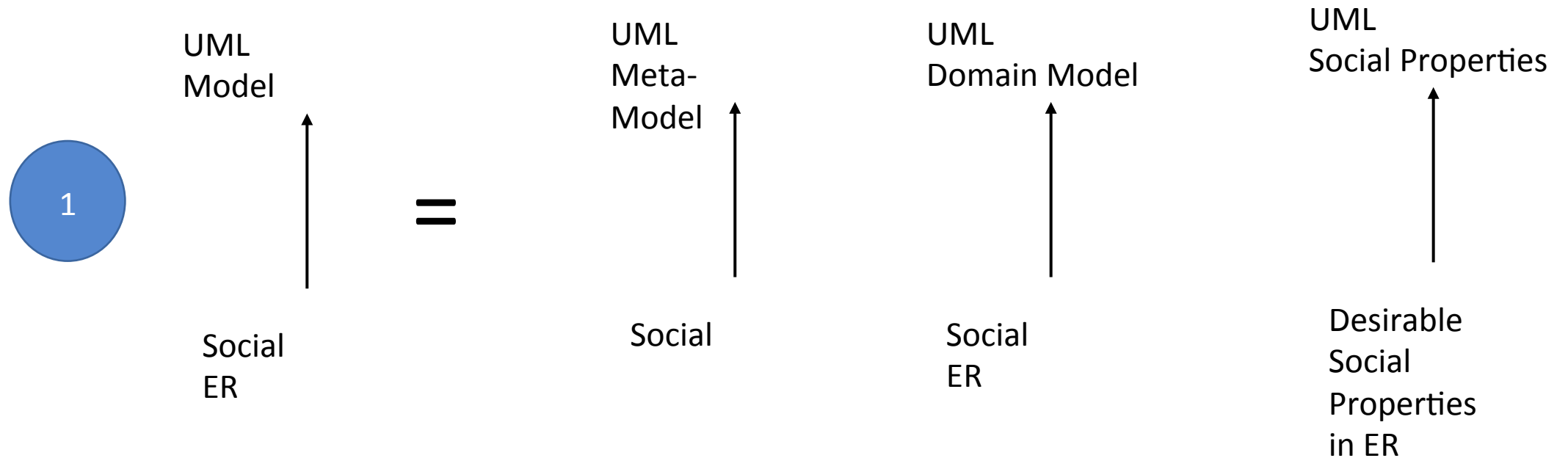
Our model aims to capture the social dimension by using the concept of social practices
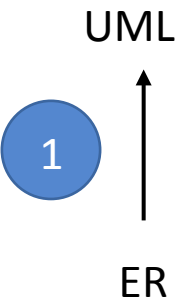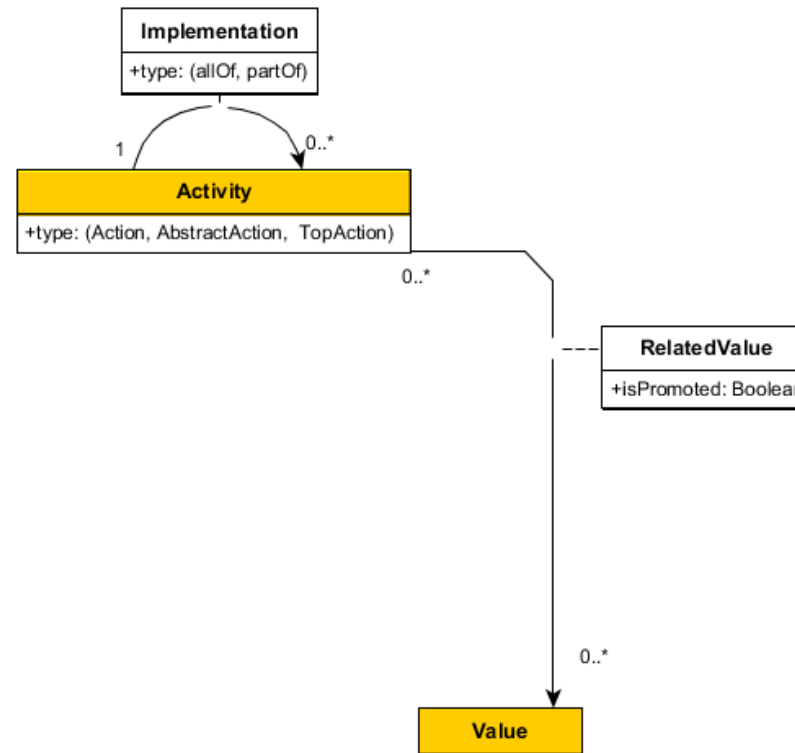
UML

1

ER
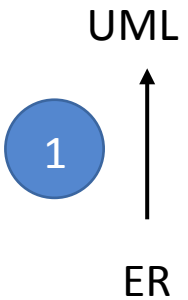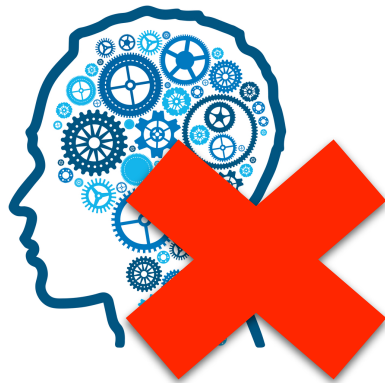
The Social Practice Agent (SoPrA) meta-model focuses on activities as the core of a social system
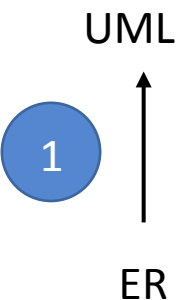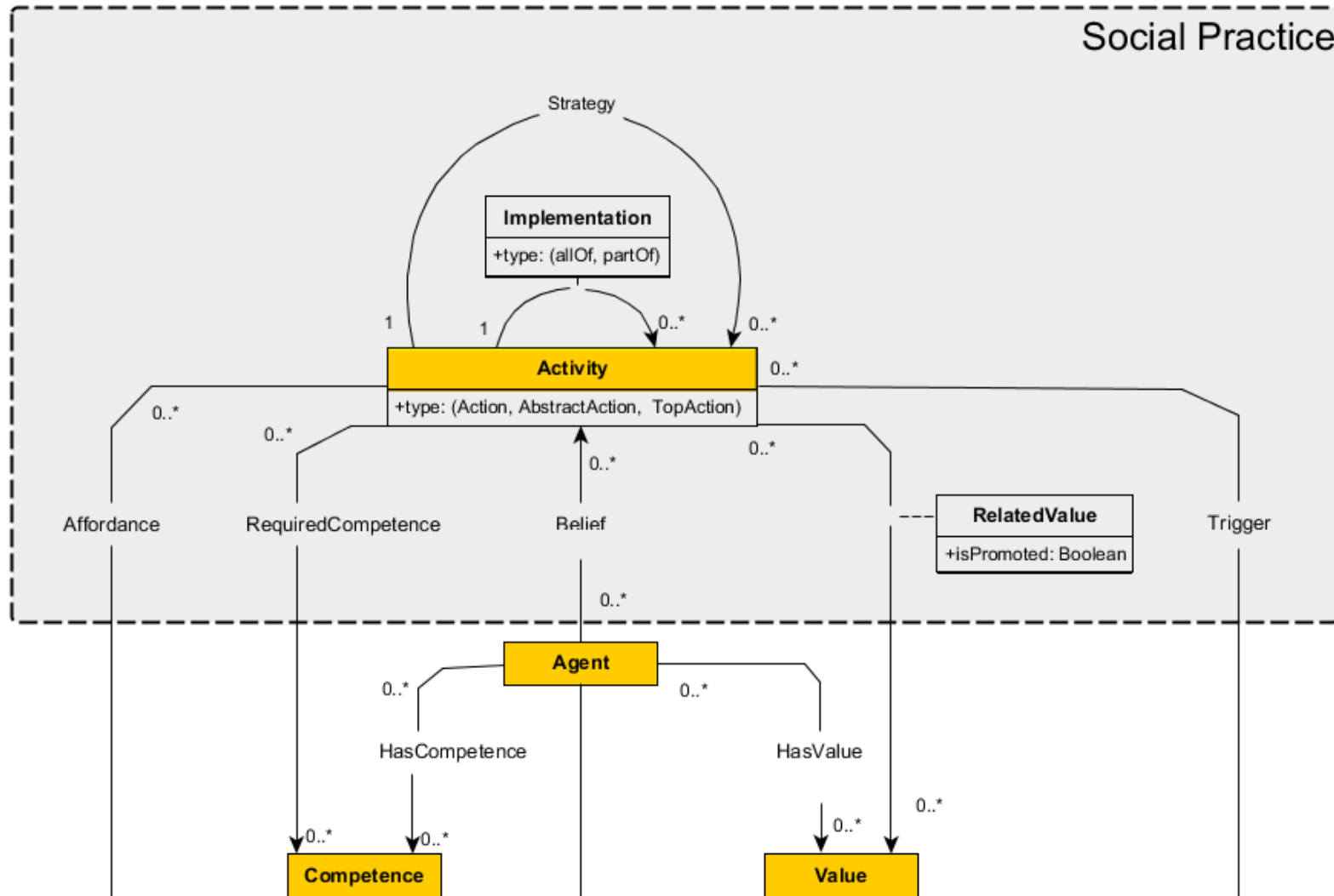

UML

ER

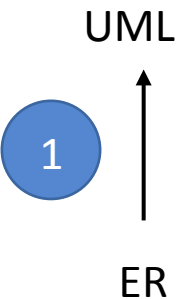# The social practice of acute treatment is captured in an activity tree

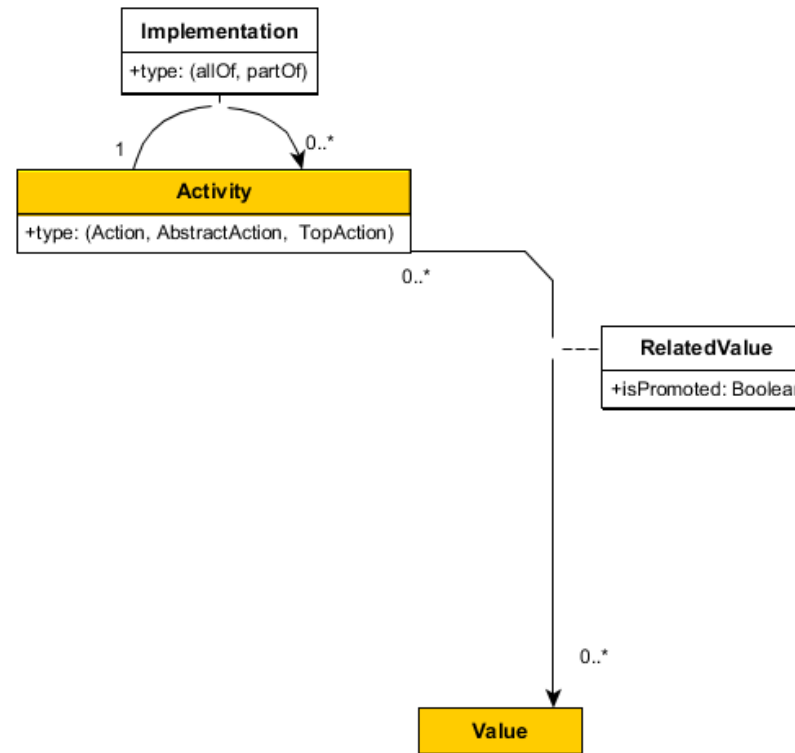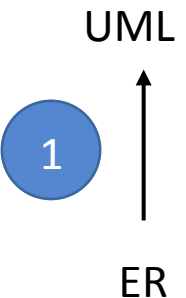# SoPrA models associations with these activities such as human values

UML

ER

1

SoPrA models associations with these activities such as human values

UML

1

ER

13

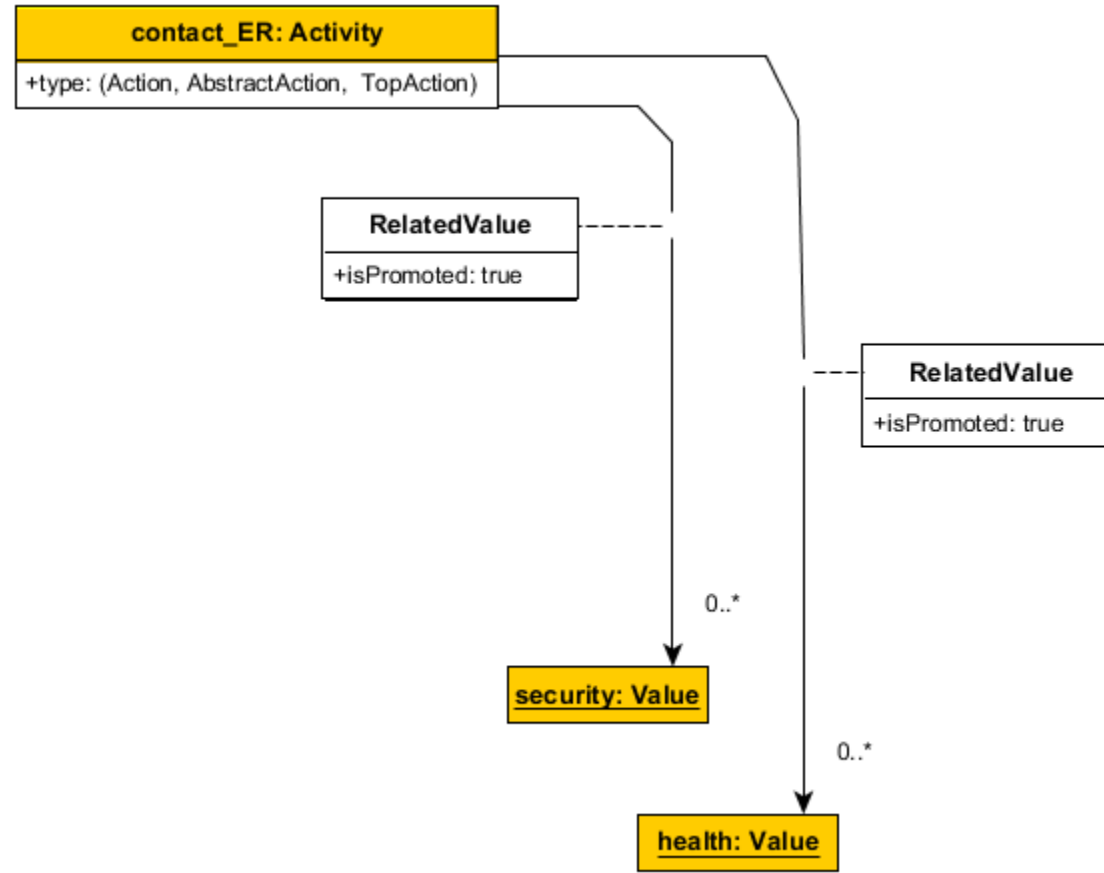# SoPrA models associations with these activities such as human values

UML

ER

One might associate the value of security and health to contact an ER

UML

1

ER

Agents belief certain activities

UML

1

ER
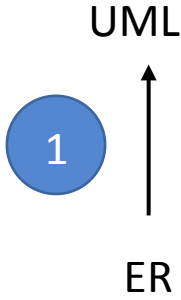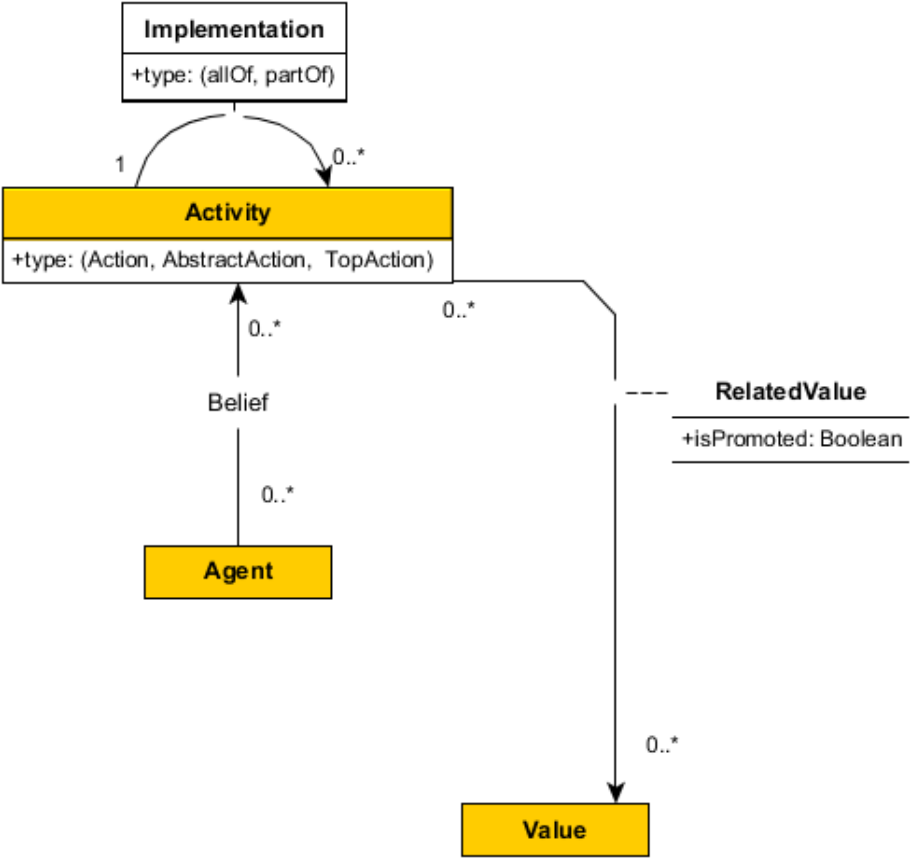
Patient1 beliefs (one view one) contact_ER

UML

1

ER

17
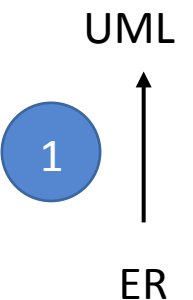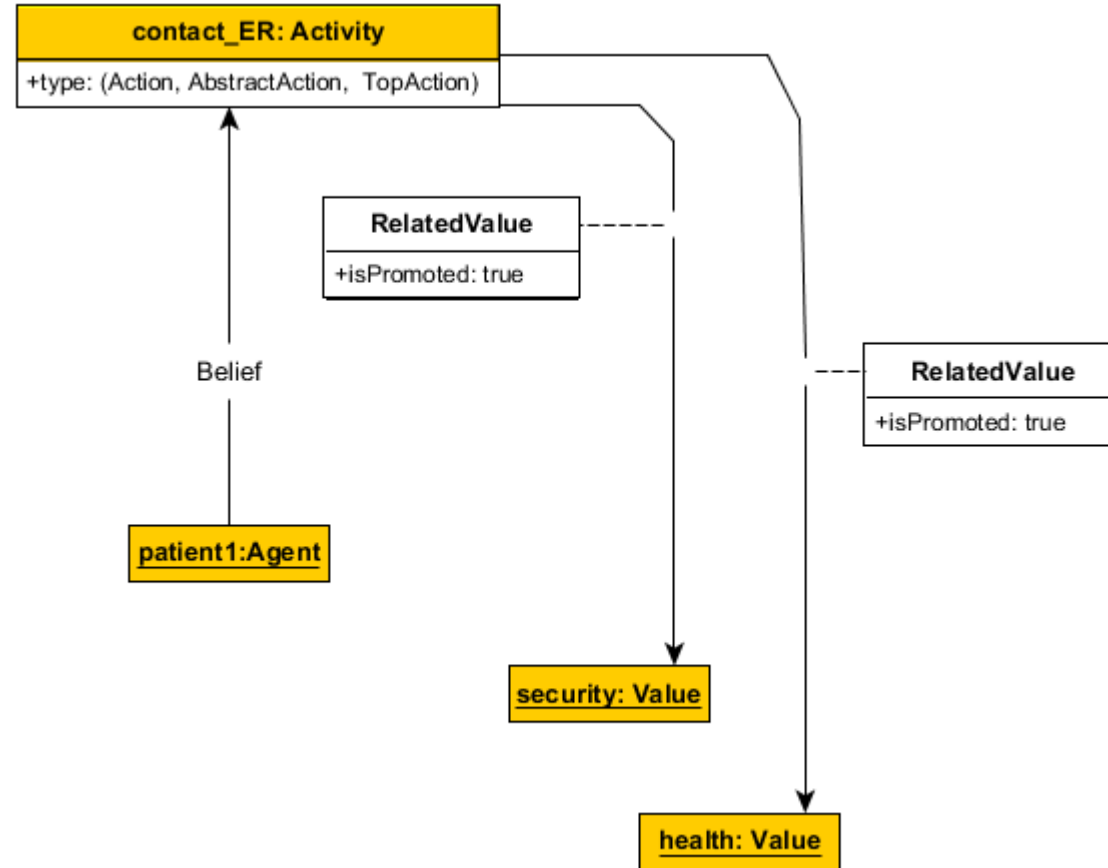
Doctor beliefs a different view on contact_ER
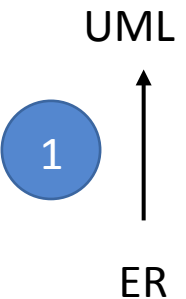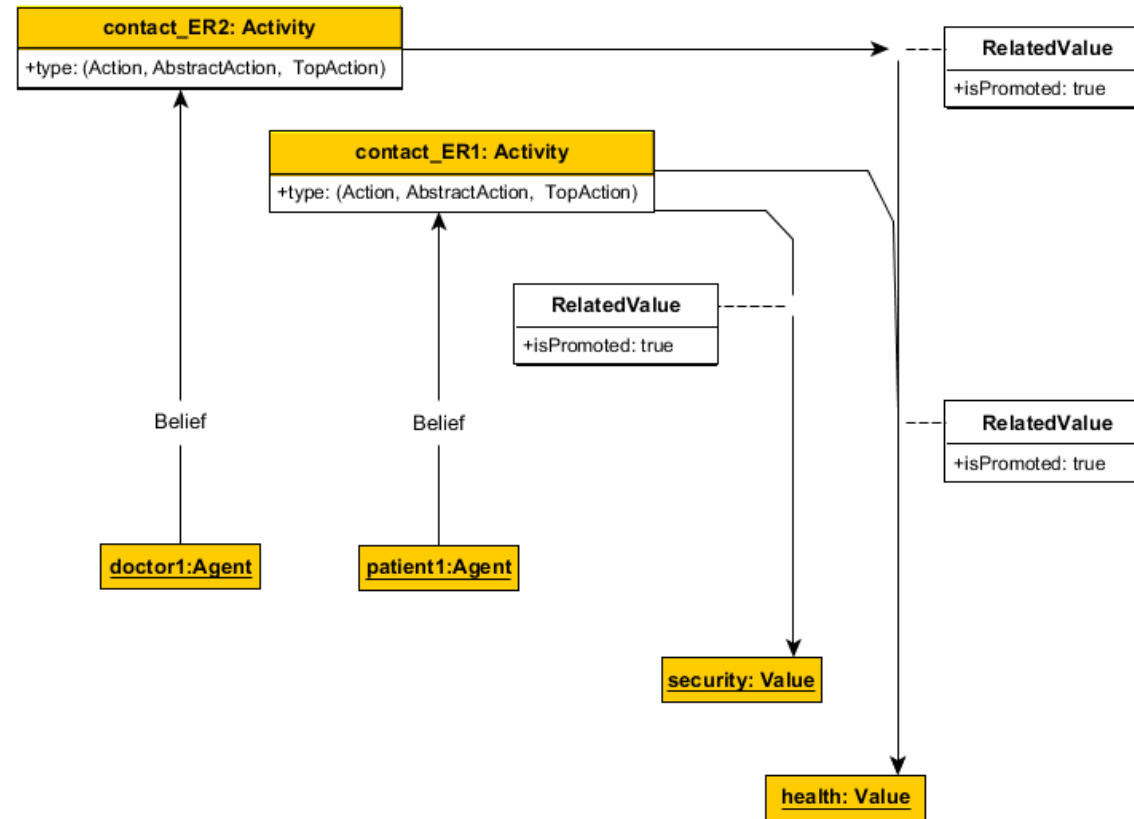
Agent differ in what human values they adhere to
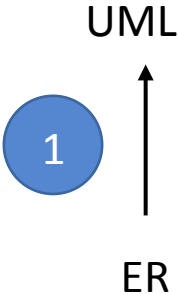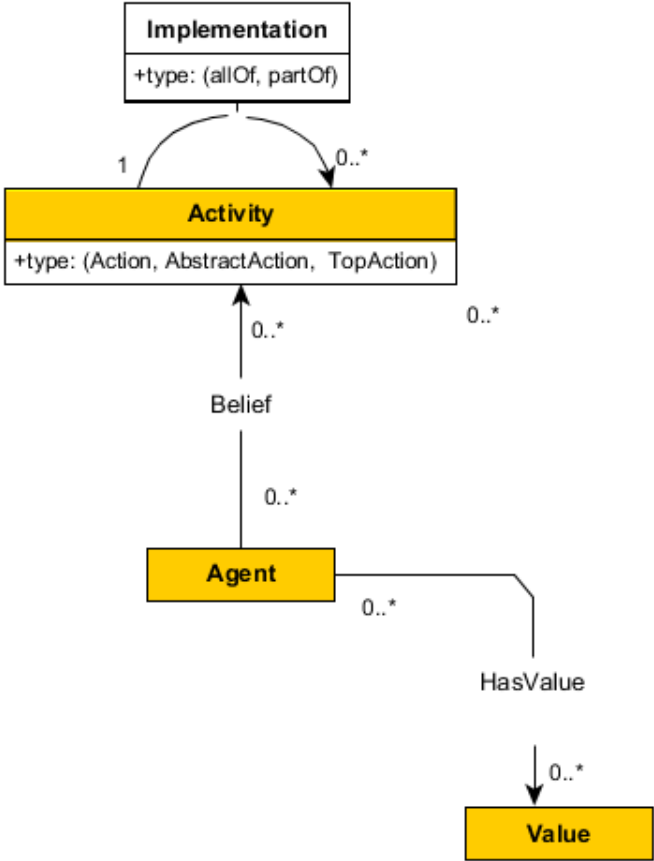
A patient adheres to the value security and health
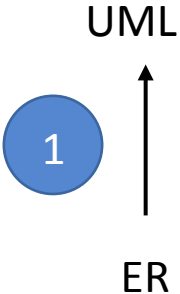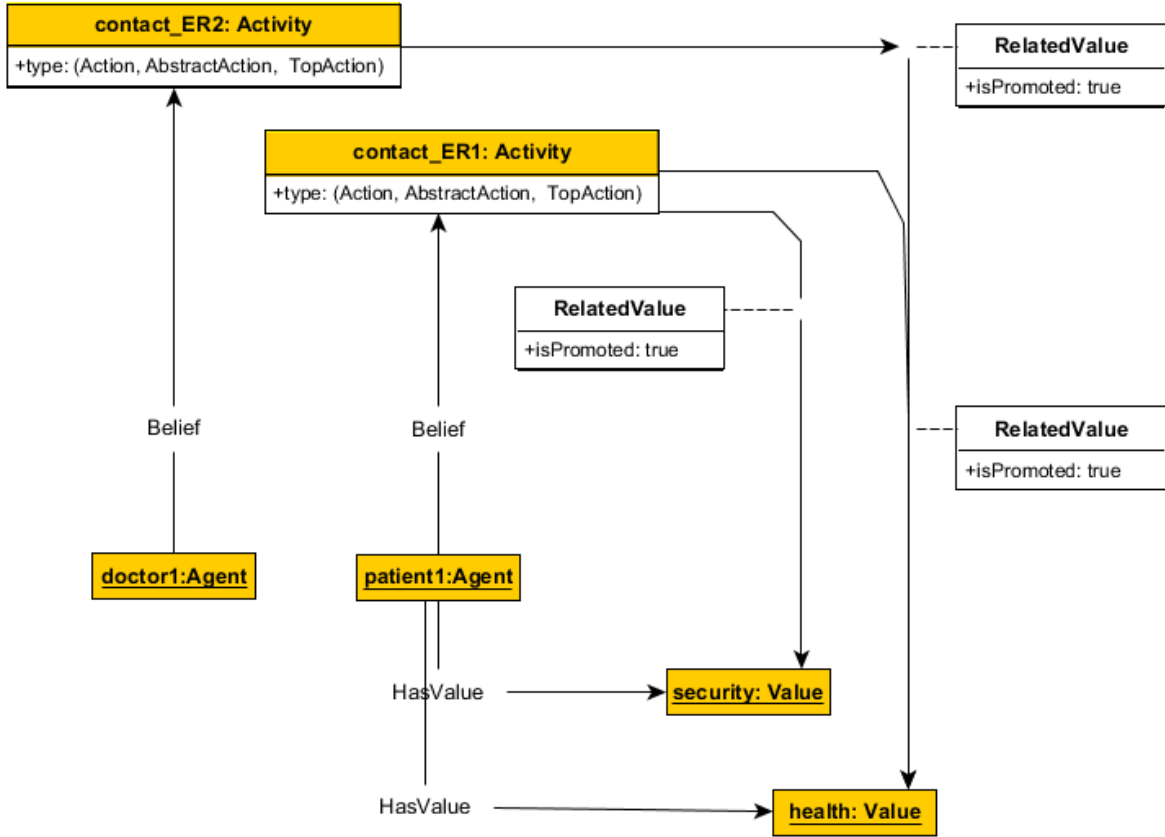
Modelling the ER is split in three task: a meta-model, model and modelling desirable social properties

1

UML
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=

Social
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UML
Meta-
Model

Social

UML
Domain Model

Social
ER

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Social Properties

Desirable
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in ER
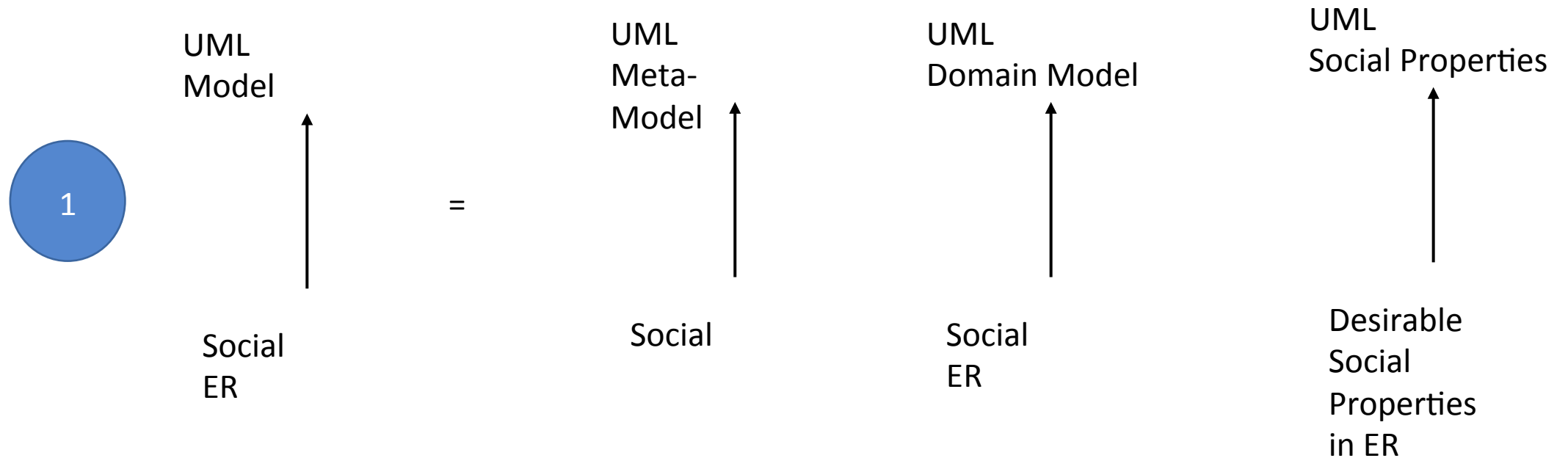
Based on empirical observations we formulated social properties management could desire

- **The staff understand the needs of the patients.**

- A head nurse can cover some of the necessary tasks of the secretary.

- The staff can help each other out, because they know the equipment the others need.

UML

1

ER
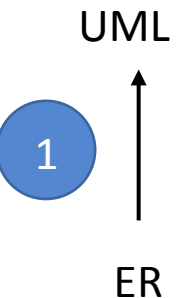
The desirable properties are modelled in terms of the SoPrA meta-model
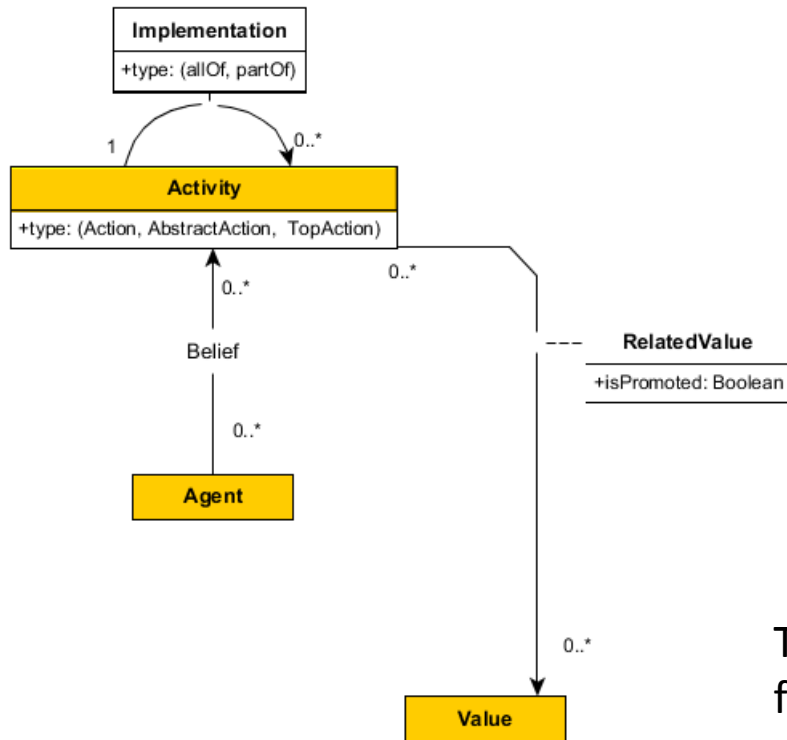
The staff understand the needs of the patients.

The staff and patients belief the same perspective on an activity, for all activities which promote values that the patient has

We can express possible models that satisfy this property
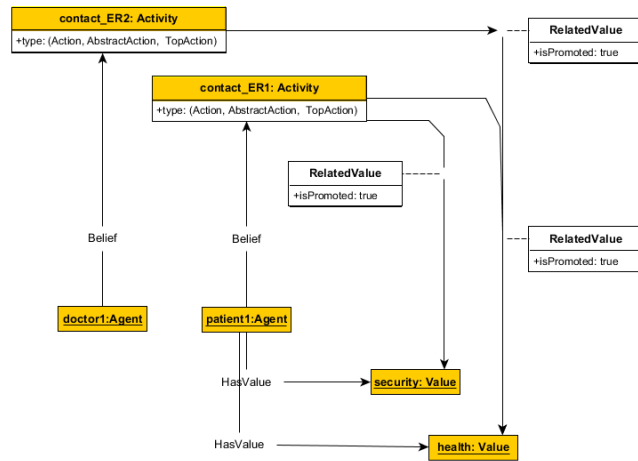
The doctor has a different view on contact_ER   The doctor has the same view on contact_ER

UML

1

ER

24

Our formal model of the social ER can help management in finding social problems

OWL
Model

UML
Model

Social
ER

inference using
model

find social problem

(3)

(2)

(4)

(1)

To be able to make inferences we formalize the model in OWL

OWL
Model

2
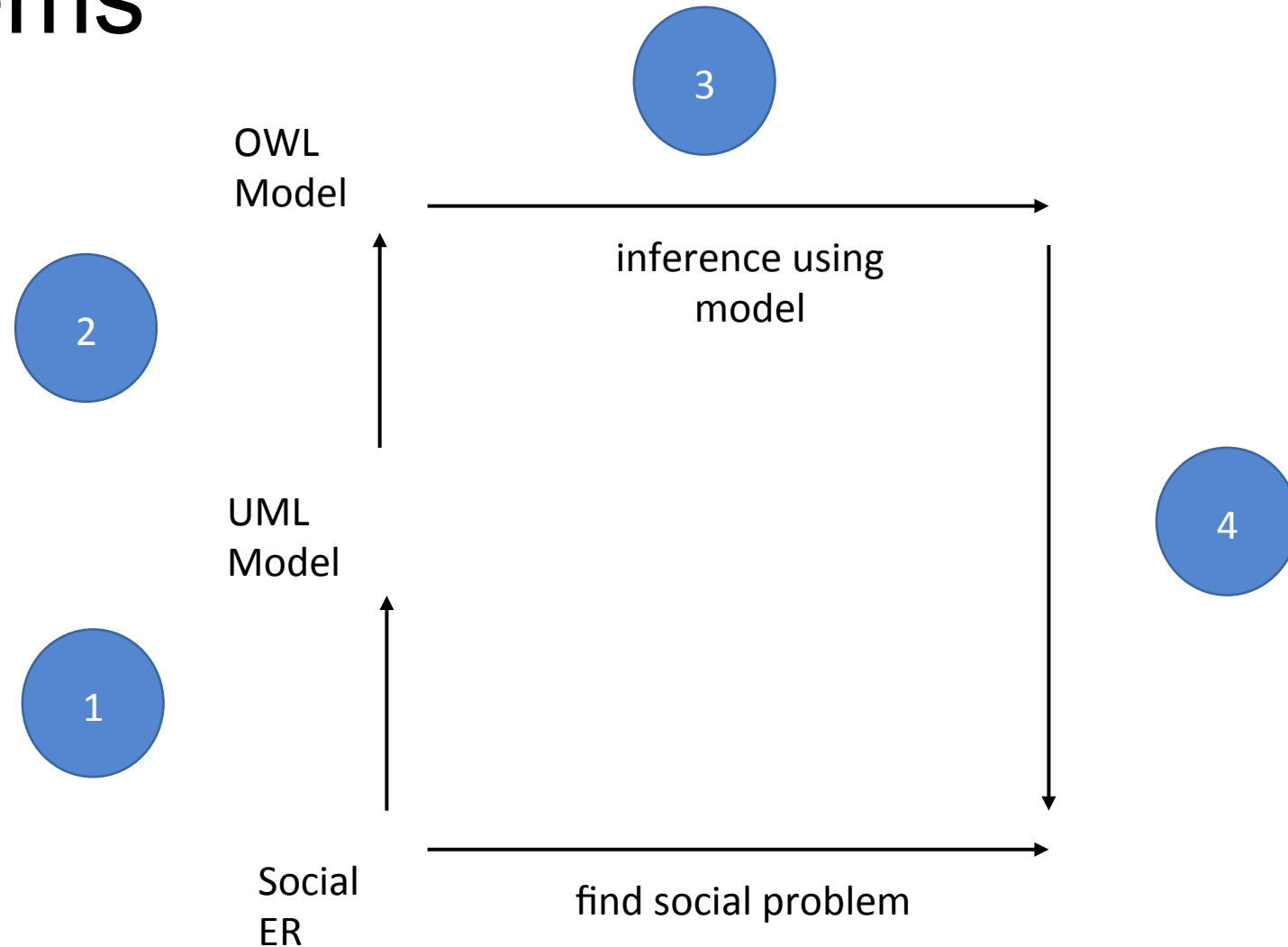
UML
Model
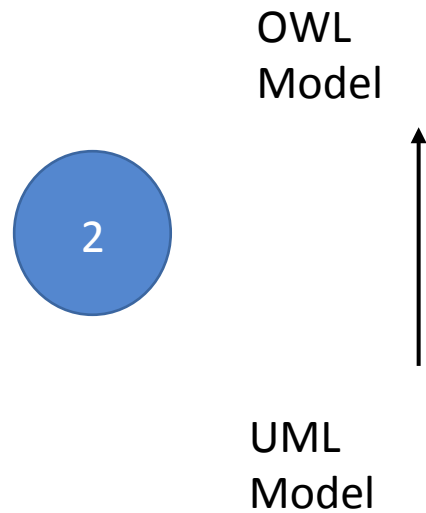
To be able to make inferences we formalize the model in OWL using Protege

OWL Model

OWL Meta-Model (Tbox)

OWL Model (Abox)

SPARQL Queries

(2)

=

UML Model

UML MetaModel

UML Model

UML Social Properties
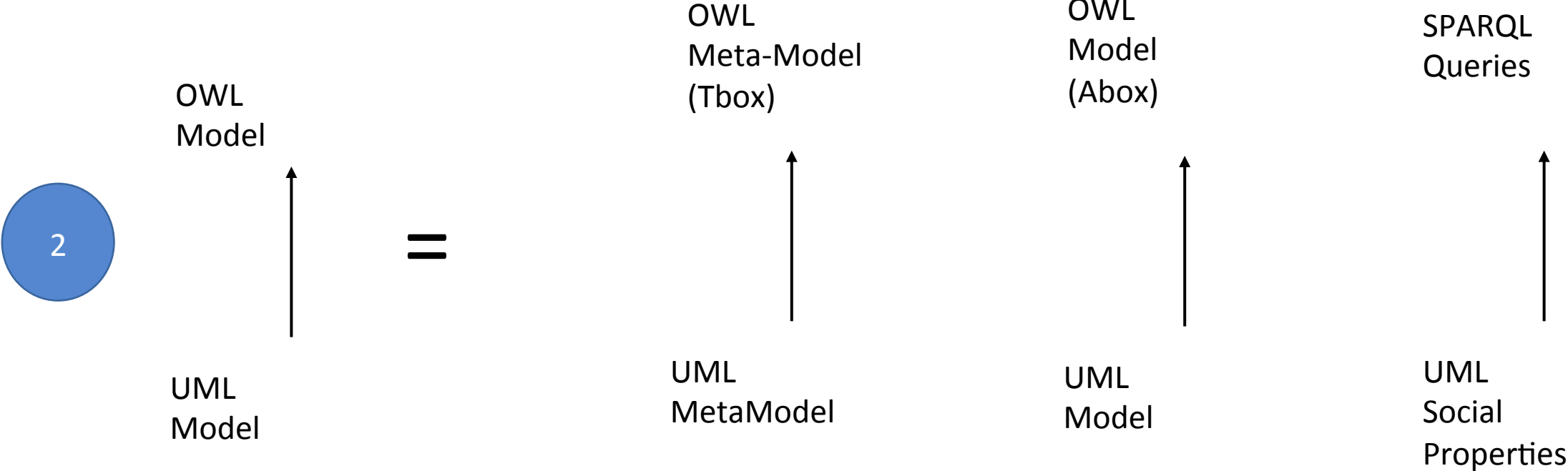
By using OWL we can state rules about the relation of concepts: e.g. the inheritance of values
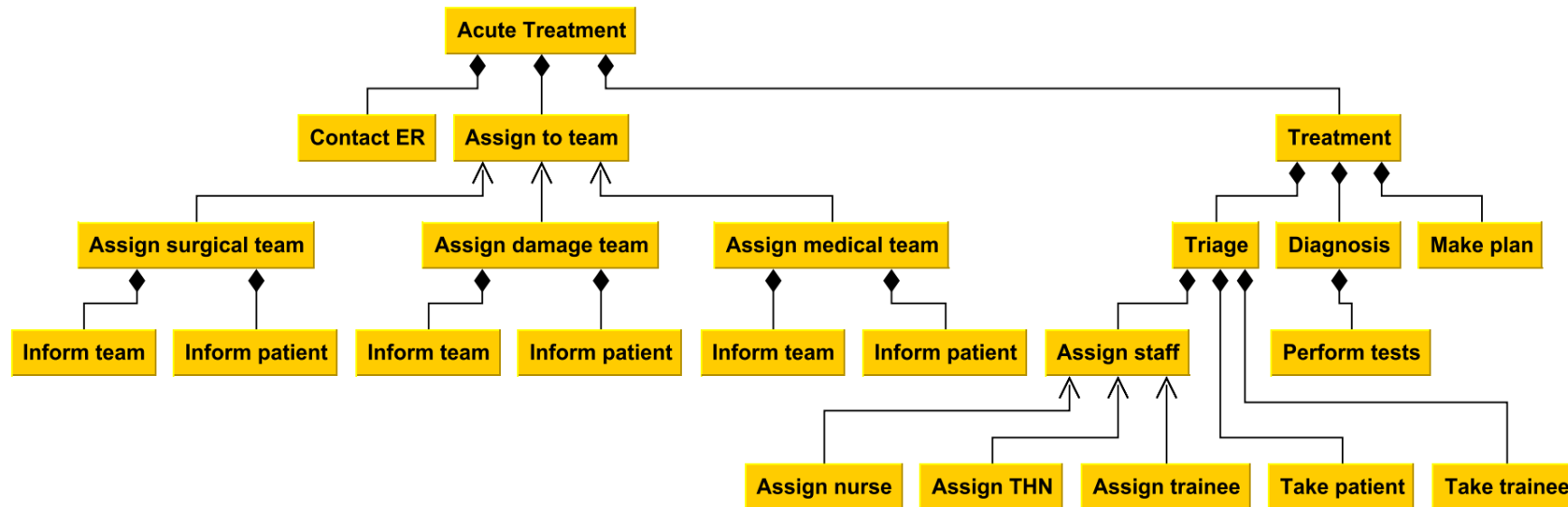
belief(?ag, ?pp), promotedValue(?pp, ?val), partOf(?pp, ?p),
partOf(?pc, ?c), implementationOf(?sc, ?p), belief(?ag, ?pc),
Personal(?pp), Activity(?p), Activity(?c), partOf(?sc, ?c),
Personal(?pc), Shared(?sc) -> promotedValue(?pc, ?val)

Modelling the social properties in SPARQL-queries
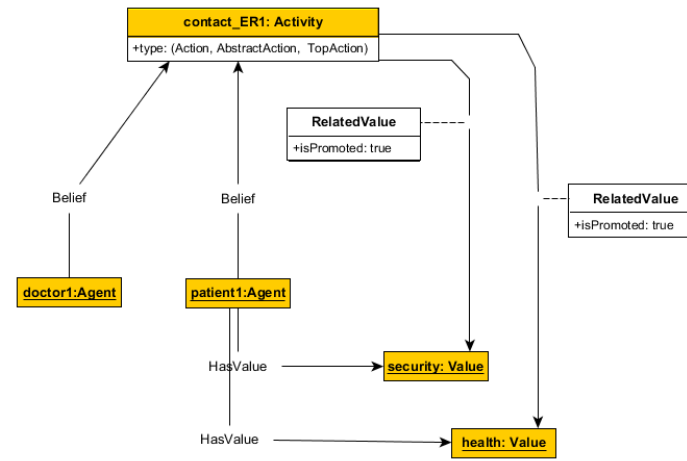
The staff and patients belief the same perspective on an activity,
for all activities which promote values that the patient has

```
SELECT ?agent ?value ?activity
WHERE {
    ?agent a:belief ?activity.
    a:Patient a:HasValue ?value.
    ?activity a:promotedValue ?value}
```
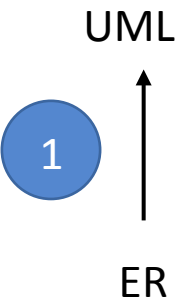
Our formal model of the social ER can help management in finding social problems

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OWL
Model

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inference using
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1

Social
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find social problem
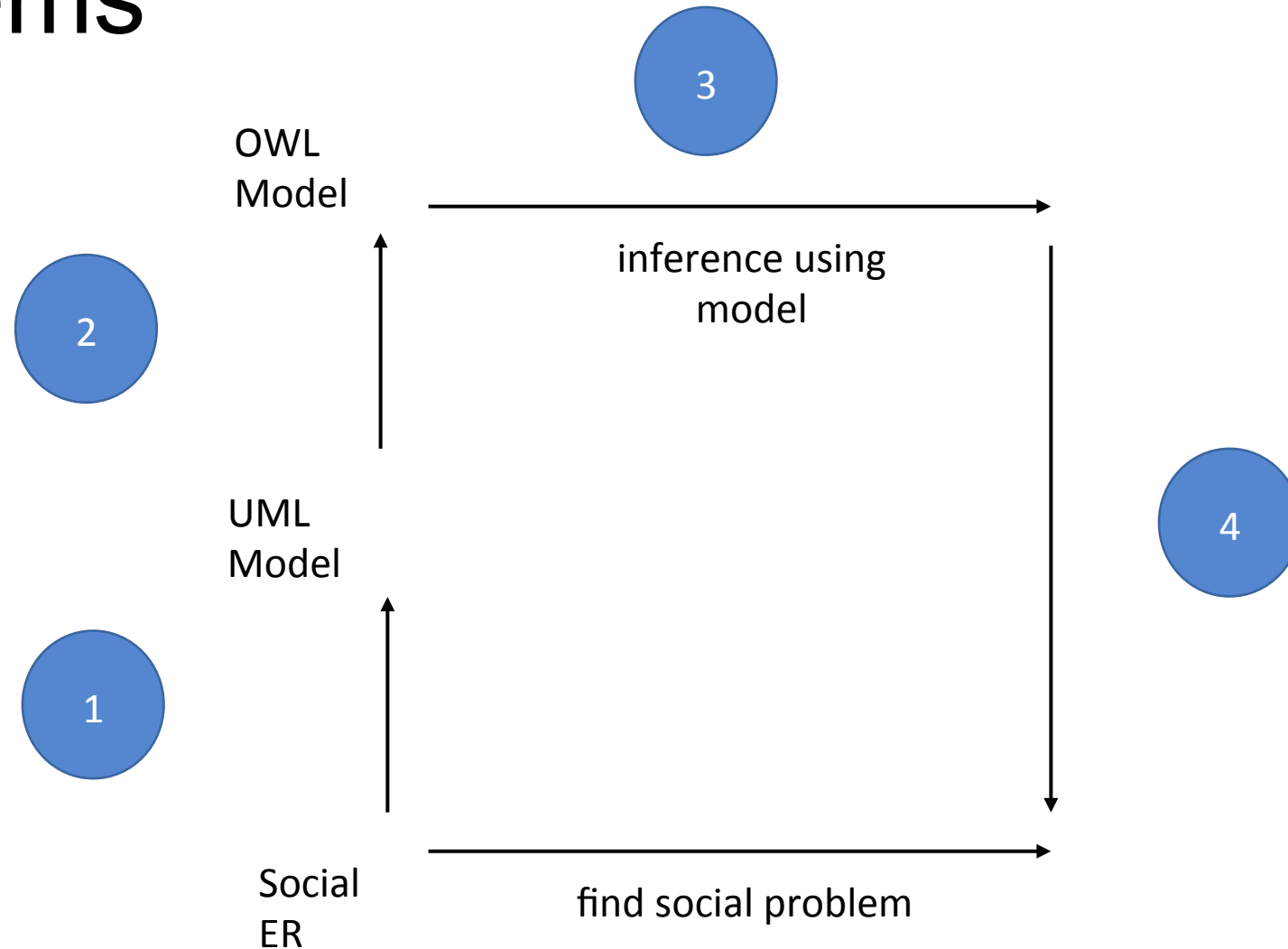
Using SPARQL you can query the database and get back a table of possible instances that satisfy the query

```
SELECT ?agent ?value ?valuedActivity
WHERE {
    ?agent a:belief ? valuedActivity.
    a:Patient a:HasValue ?value.
    ? valuedActivity a:promotedValue ?value}
```

?agent	?valuedActivity
patient1	Contact_ER1
secretary1	Contact_ER2
doctor1	Contact_ER1

Our formal model of the social ER can help management in finding social problems

OWL Model

UML Model

Social ER

inference using model

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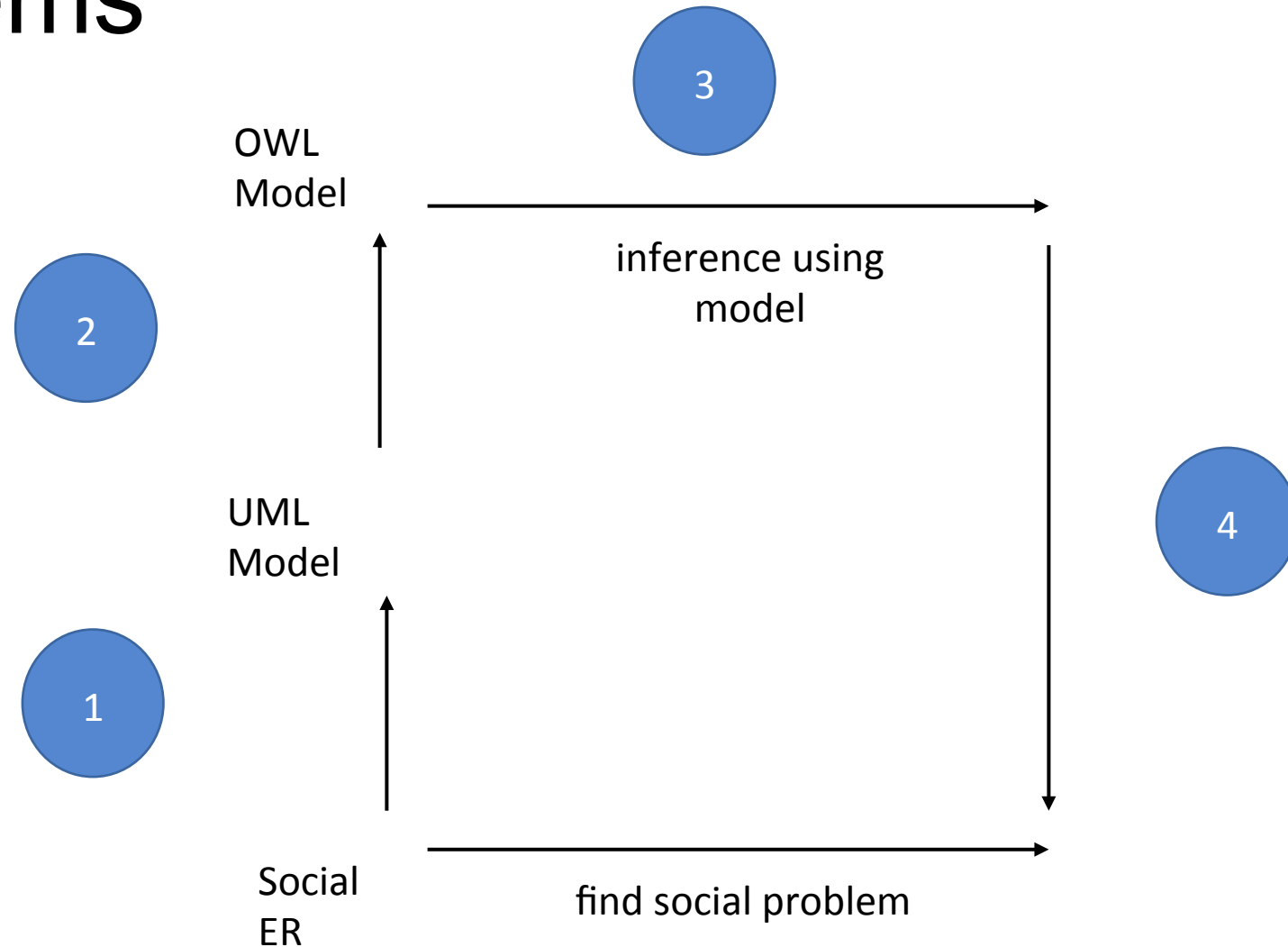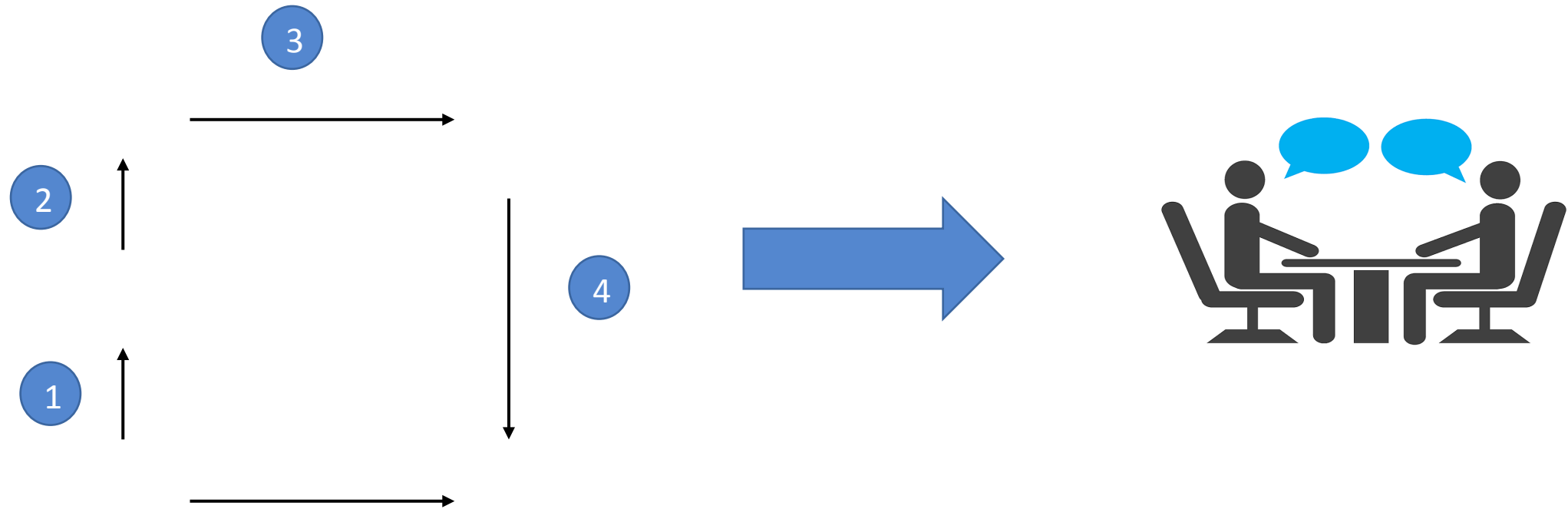
Using the result we infer that the desirable social property is not satisfied in this case

?agent	?valuedActivity
patient1	Contact_ER1
secretary1	Contact_ER2
doctor1	Contact_ER1

The staff understand the needs of the patients.

The resulting findings can be used as a hypotheses on where to direct intention of management to solve social problems in the ER

Future Work

- To cross-validate our model we need to ground both the model as well as check the resulting conclusions against empirical data

- We focused on a rough empirical grounding from observations on the ER at Herlev Hospital Denmark, extend this by more rigorous emprical work
  - Process Mining
  - Protocols
  - Interviews

SoPrA differs from other social agent frameworks by capturing the social dimension in shared action assocations

The staff can help each other out, because they know the equipment the others need

OperA

Consumat

MAIA