

Modelling clinical goals

A corpus of examples and a tentative ontology

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Modelling clinical goals

- Models of goals: why and how
- Goals in PRO*forma*
- Armchair ontology of goals
- Some proposals for goal models
- A corpus of examples (breast cancer)
- Revised ontology & goal model
- Conclusions

“ A simple, flexible model”

(with apologies to Gunther Schadow)

The screenshot displays the PROforma software interface. The main window shows a task model diagram with the following components and connections:

- History** (green diamond) and **Test results** (green diamond) both point to a central **Decision** (pink circle).
- The **Decision** points to two parallel paths: **Pathway 1** (red rounded rectangle) and **Pathway 2** (red rounded rectangle).
- Both **Pathway 1** and **Pathway 2** point to a final **Keystone** (yellow inverted triangle).

The left sidebar shows a tree view of the model structure:

- Guideline
 - History
 - Decision
 - Pathway 1
 - enquiry_309838
 - action_100100
 - Pathway 2
 - Test results
 - Keystone

The bottom section of the interface is titled **PROforma** and is divided into **Common Task Attributes** and **Keystone Specific Attributes**.

Common Attrib	Proforma	Context
Instance Name	Keystone	
Caption	Keystone	
Goal		...
Description		...
State trigger		...
Event trigger		
Precondition		...
Postcondition		...
Parameters		...

Why are goals important?

- Understanding the clinical process
 - Rationale of clinical tasks (Shahar)
 - Critiquing, quality assessment (Advani)
- Management of clinical workflow
 - Recovery from task failure
 - Tasks become irrelevant/inappropriate
- Defractalisation of acts

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The bottom section of the interface is divided into two panels:

- PROforma Common Task Attributes:** A table with columns for Common Attrib, Proforma, and Context.
- Keystone Keystone Specific Attributes:** A panel for defining specific attributes for the Keystone task.

Common Attrib	Proforma	Context
Instance Name	Keystone	
Caption	Keystone	
Goal		...
Description		...
State trigger		...
Event trigger		
Precondition		...
Postcondition		...
Parameters		...

Goal ontology (version 1)



□ Knowledge goals

Decide between alternative hypotheses about world

- Detect *e.g. presence/absence an abnormality*
- Classify *e.g. which of N possible conditions is present*
- Stratify *e.g. level of risk*
- Predict: *e.g. diagnosis, prognosis*

Acquire information about setting

□ Action goals

Achieve

- Eradicate *e.g. eradicate an infectious organism*
- Create *e.g. create a sterile site*

Control

- Prevent *e.g. prevent side-effect of a treatment*
- Limit *e.g. maintain physiological parameter within limits*

Communicate

- Enquire *e.g. request an appointment*
- Inform *e.g. tell colleague results of test*

Properties of goals

Shahar (1998)

- Whether the intention is to *achieve, maintain* or *avoid* a situation;
- Whether the intention refers to a clinical *state* or *action*;
- Whether the intention holds during care (*intermediate*) or after it has been completed (*overall*)

Properties of goals

Hashmi, Boxwala et al (2004)

- *Context* in which goal is relevant
- *Target* e.g. state of disease or disorder
- *Verb* that specifies whether the target is to be achieved, avoided, etc
- *Temporal constraints.*
- *Priority* of the goal

“Formal” properties of goals

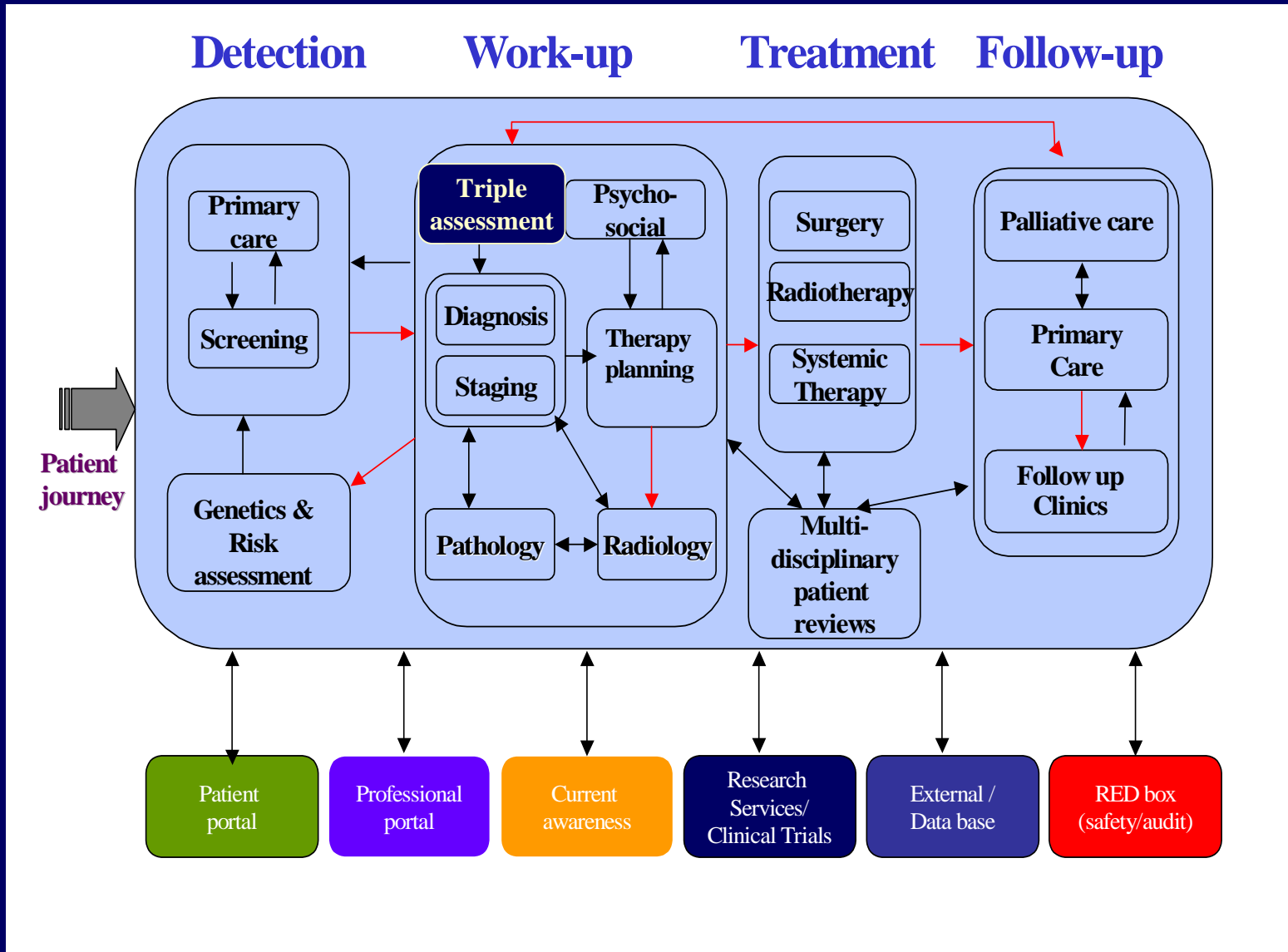
Winikoff et al (2002)

- *Known*, goals must be explicit
- *Consistent*, goals must not conflict
- *Persistent*, while success conditions not satisfied
- *Unachieved*, drop as soon as satisfied
- *Possible*, abandon if impossible

Improving the ontology

- A large corpus of examples would help to identify the range of functions supported by goals
- Systematic classification of the examples would help to understand the main goal types and semantics
- CREDO provides one domain for developing such a corpus

CREDO model of cancer care



CREDO service description: triple assessment

- **Clinical services**

- Decision support (investigations, follow up, genetic risk)
- Tracking results and investigations.
- Management of follow up or discharge

- **Patient services**

- Personalised schedules

- **Communication services**

- Notifying physician of results, management, discharge plan
- Notifying patient of results and management plan.
- Inviting patients for follow up and investigations.

Review of CREDO corpus against Shahar model

State	Achieve	Intermediate
67	24	47
Action	Maintain	Overall
155	24	175
	Avoid	
	3	

Review of CREDO corpus against Hashmi, Boxwala model

Context	Verb	Target	Temporal	Priority
222	222	48	47	0

Revised ontology



Knowledge goals

- Acquire knowledge about specific setting [*15 instances*]
 - § ...
- Decide between alternative hypotheses about the world [*52 instances*]
 - § Detect
 - § Classify
 - § ...
 - § Predict
 - § ...

Action goals

- Achieve some state of world [*65 instances*]
 - § Limit changes to current state
 - § Bring about required future state
 - § ...
 - § Decide between alternative interventions
 - § ...
- Enact tasks [*90 instances*]
 - § Arrange service
 - § Investigate
 - § Communicate

Consensus model?

<Situation>

- Context (Hashmi)
- Scenarios (e.g. Prodigy)
- Triggers and preconditions (e.g. PROforma)

<Verb phrase><Noun phrase>

- Task, Focus (Huang et al)
- Verb, Object (Fox et al)
- Verb, Target (Hashmi et al)
- Verb phrase, Noun phrase (Kelly, safety goals)
- Performative, message (KQML, FIPA)

<Constraints>

- Temporal (Shahar, Hashmi)
- Scheduling (Peleg et al)
- Cost and other resources?
- Other requirements?

<Control>

- Priority (Hashmi)
- Urgency, importance, deontic

Example

“if a patient presents with symptoms of possible breast cancer then it is obligatory that the patient is referred to see a specialist oncologist within two weeks”

Example

<Situation>

if patient presents with
symptoms of possible
breast cancer

<Verb phrase>

refer patient

<Noun phrase>

specialist oncologist

<Constraints>

within two weeks

<Priority>

obligatory

Conclusions

- Guideline enactment systems should explicitly support clinical goals and intentions
- Several existing attempts to model goals have yielded proposals for possible structures and semantics
- Analysis of a corpus of examples in the domain of breast cancer suggests further refinements
- Analysis of other typical corpora would yield further refinements