



OUTLINE FOR LECTURE 6

★ OUTCOME 2: *EMPOWERMENT AND AUTONOMY*

- MOTIVES
- ADAPTABILITY VS. ADAPTIVITY

★ OUTCOME 1: *BEHAVIOURAL CHANGE - DESIGNING PERSUASIVE TECHNOLOGY*

★ METHODS:

- FORMAL METHODS IN HCI
- FORMALISING USER MODELS:
 - ★ FORMALISATION FOR PERSONALISATION
- FORMALISING DIALOGUE AND TASKS:
 - ★ FORMAL ARGUMENTATION FOR (PERSUASIVE) DIALOGUES



LECTURE 6A:

OUTCOME 2: EMPOWERMENT AND AUTONOMY

Helena Lindgren

**CONSIDER AN OLDER ADULT IN THEIR HOME
ENVIRONMENT**

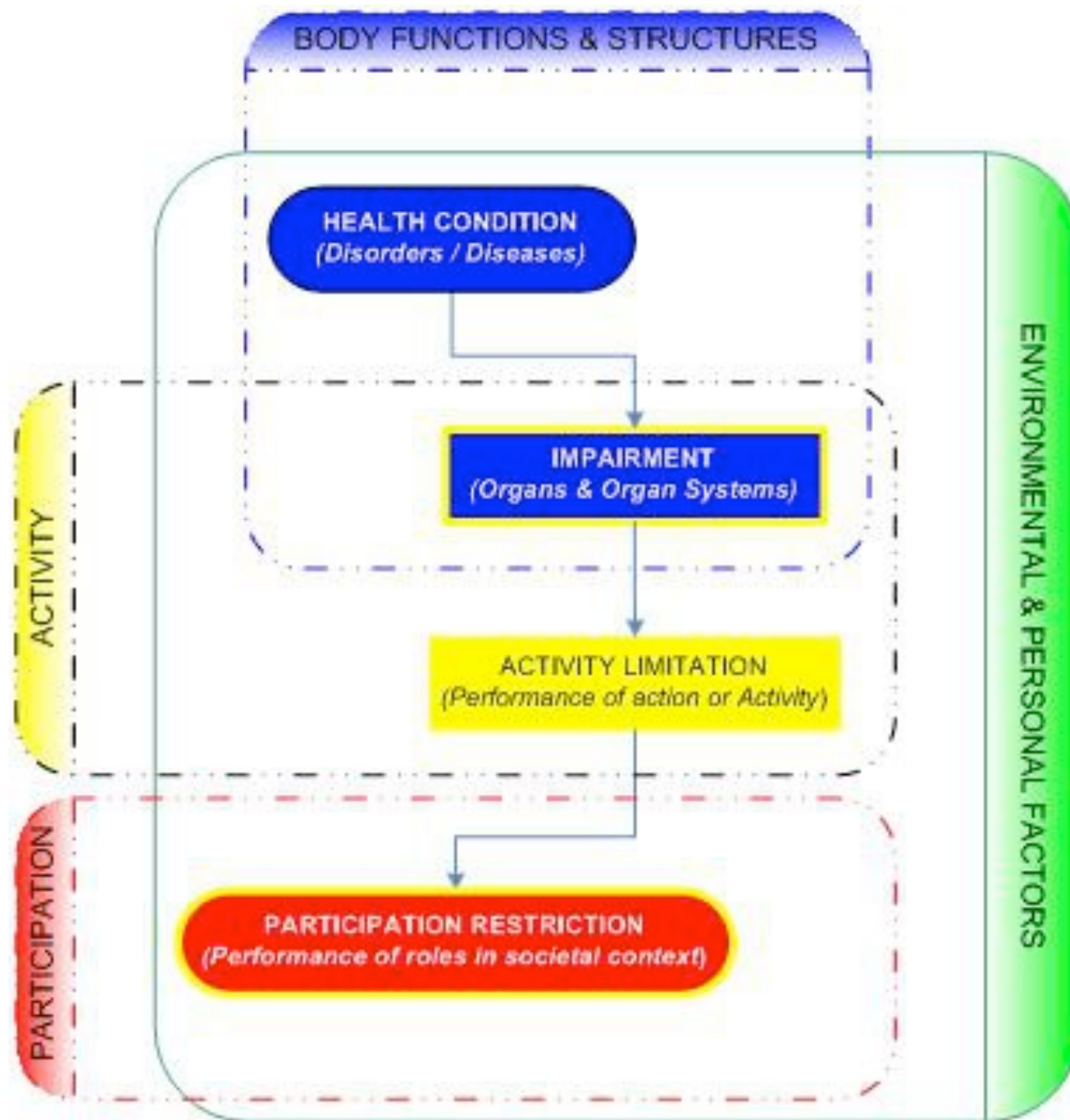
HOW TO CREATE A SMART HOME ENVIRONMENT?



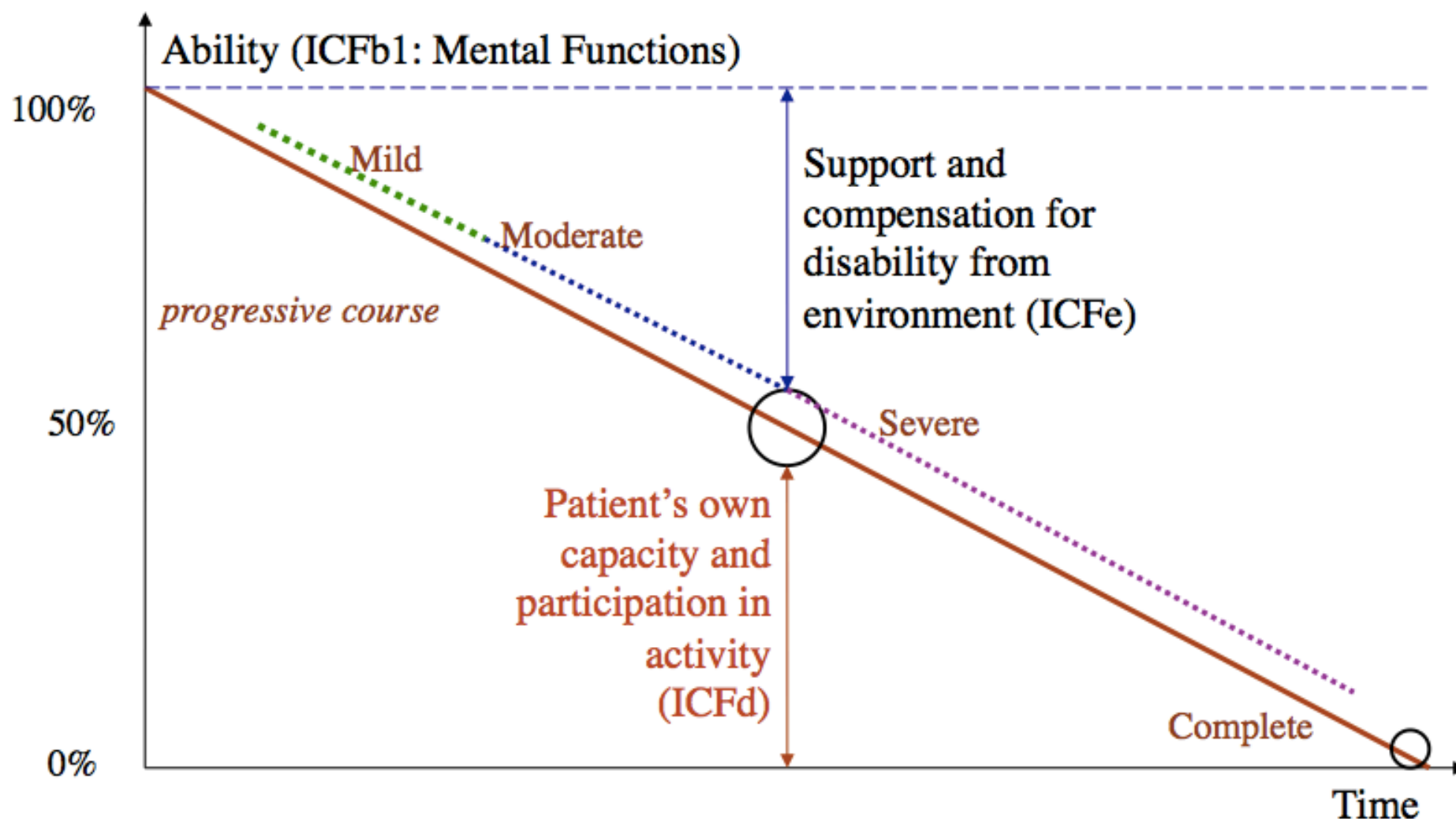
How do you build in control into something you don't see?



MOTIVATION

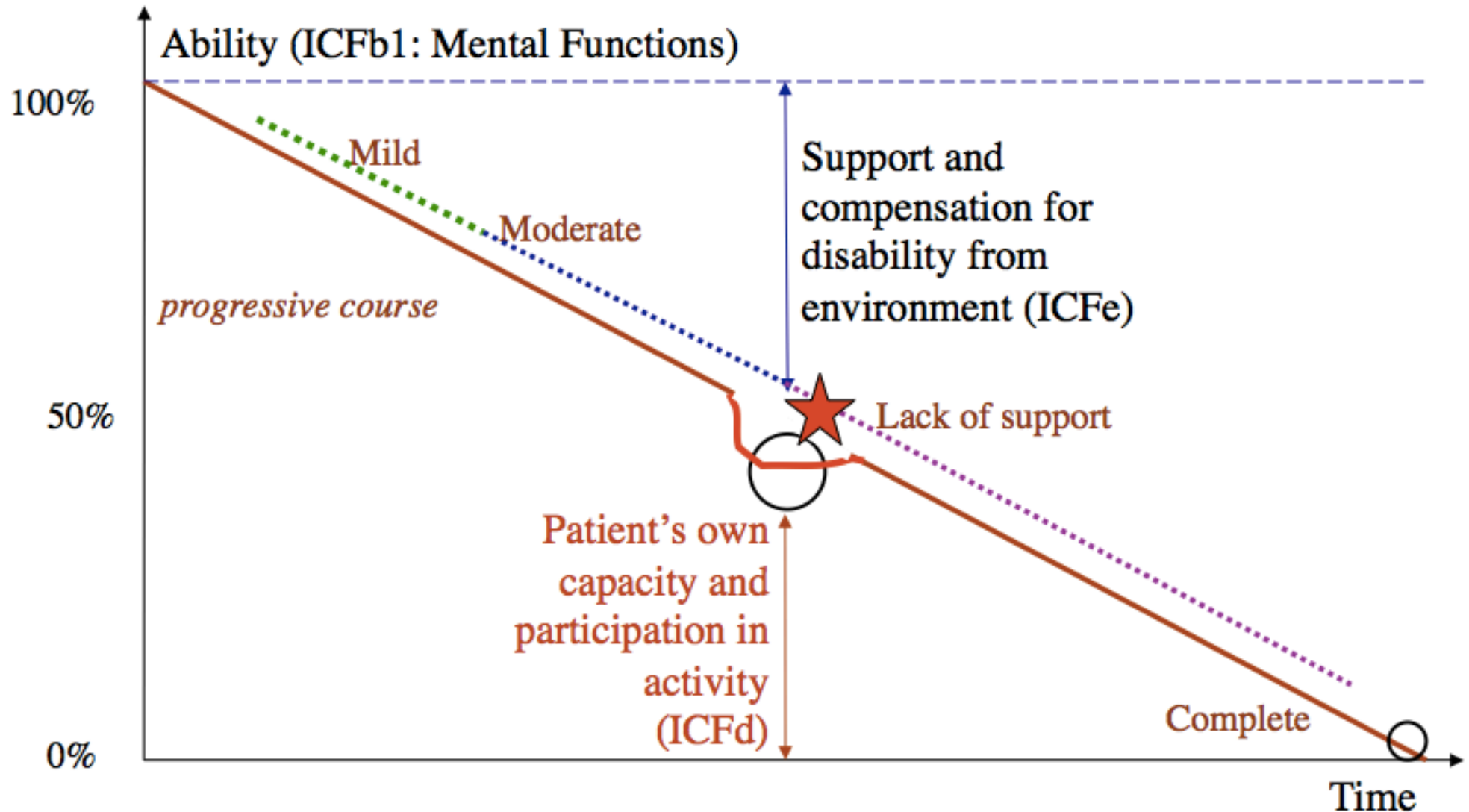


MOTIVE – CONTINUOUS AND ADJUSTED SUPPORT



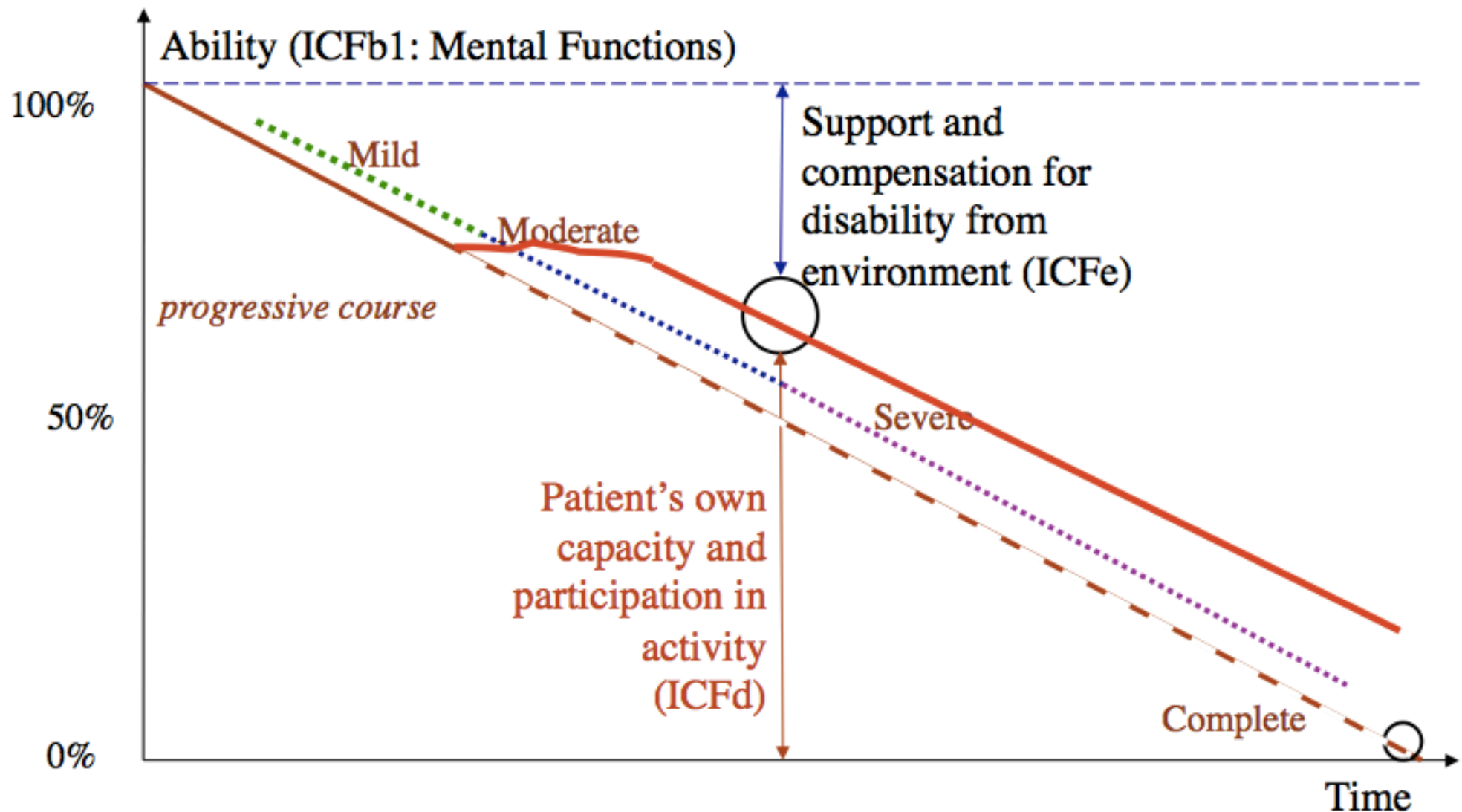
View of a progressive course of a cognitive disease in an individual, affecting the domain defined in ICF (WHO's International classification of function, ability and health) as Mental functions (b1).

MOTIVE – INSTANT SUPPORT



Critical phases and situations.

MOTIVE – EARLY DEMENTIA TREATMENT



Key task: Assessing the patient's life situation.

Rut Scenario

Initial Assessment. Our persona is a woman, Rut who is 84 years old. The OT has visited her home, made interviews and assessments using I-Rehab, which includes domain-specific assessment instruments. Rut's son was also present to tell his view on Rut's life situation. The assessment shows among other things that Rut has a mild episodic memory deficit and possibly other mildly decreased cognitive functions, and has a mild depressive state with worries about falling and not being able to get help. She does not feel that the memory deficit affects her ability. Her son has a different view, and has noticed increasing difficulties in remembering taking medication and eating meals.

Referral. After the visit by the OT, Rut visited a physician together with her son for investigating a possible evolving dementia, which generated more detailed information about her mild cognitive deficits. However, at this time point she did not meet the criteria for dementia.

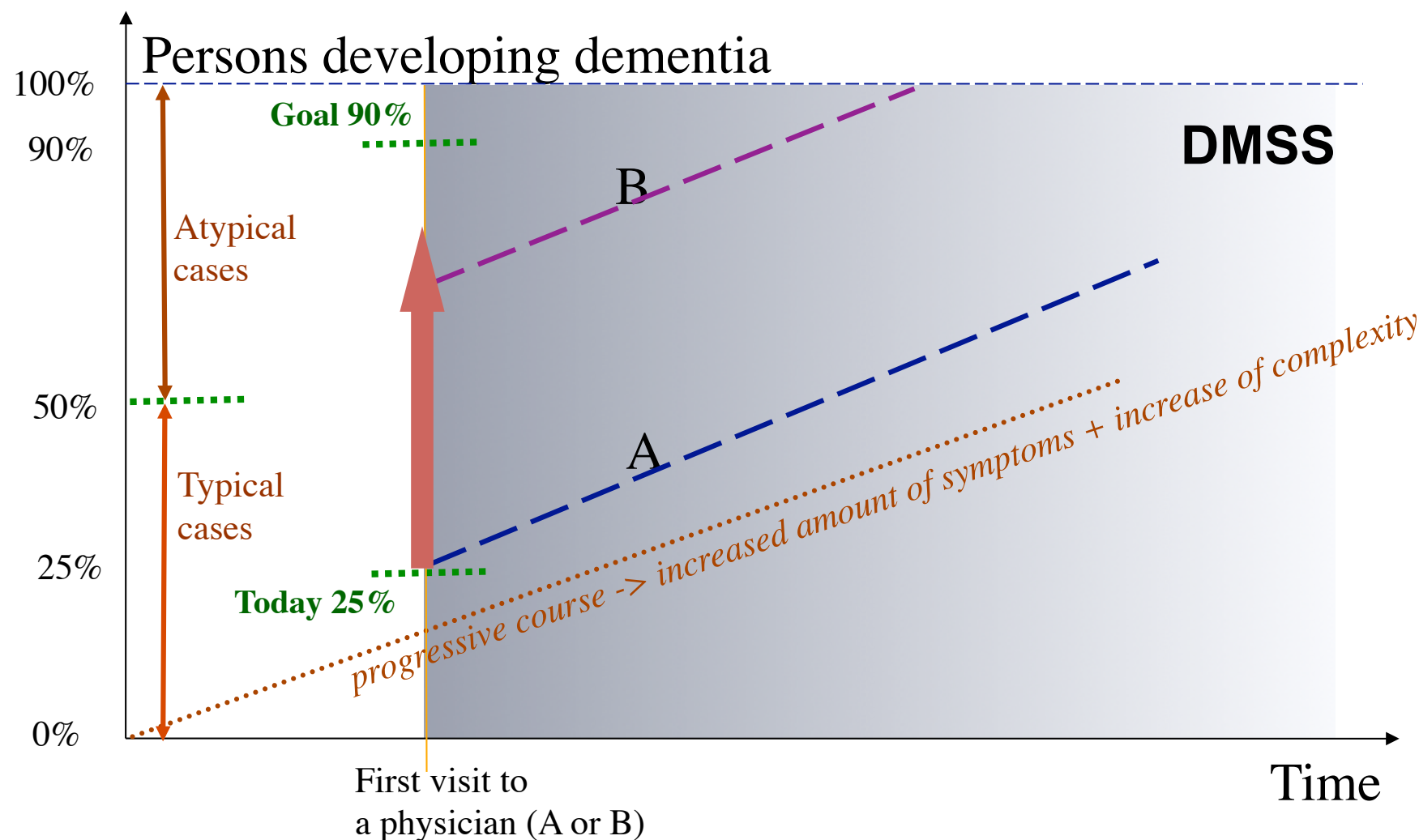
Determine Interventions. Based on goals for interventions formulated together with Rut and her son, the OT creates an I-Help profile for Rut with the assessment information about activity, participation, cognitive ability, interests, etc. as underlying the application, and composes the content by selecting appropriate functionalities. For the purpose of following up the intervention, the OT composes a set of questions about how the different activities are going, forming a base for a follow-up dialogue between Rut and the CA (Coach Agent).

Renewed Assessment. Eight months later, the CA notices a change of pattern in Rut's activities. She has begun to visit the bathroom a couple of hours after she has went to bed. The CA has older information that Rut sleeps well the whole night with the help from the sleeping pills she is prescribed. This contradictory information together with the knowledge about Rut's fear of falling when walking makes the CA initiate a dialogue with the DAs (Knowledge Domain Agents) and with Rut to resolve the contradictions in the information. CA also inform the nurse with Rut's approval, and the nurse makes a new assessment as base for changes in interventions.

Applying Interventions. After a period with the system integrated a pattern of activity has emerged, detected by the activity recognition system. Based on this pattern, the CA can act upon changes that may affect Rut's health.

**CONSIDER THE PROFESSIONAL, E.G. THE
PHYSICIAN**

MOTIVE – NATIONAL GOALS FOR IMPROVING DEMENTIA CARE



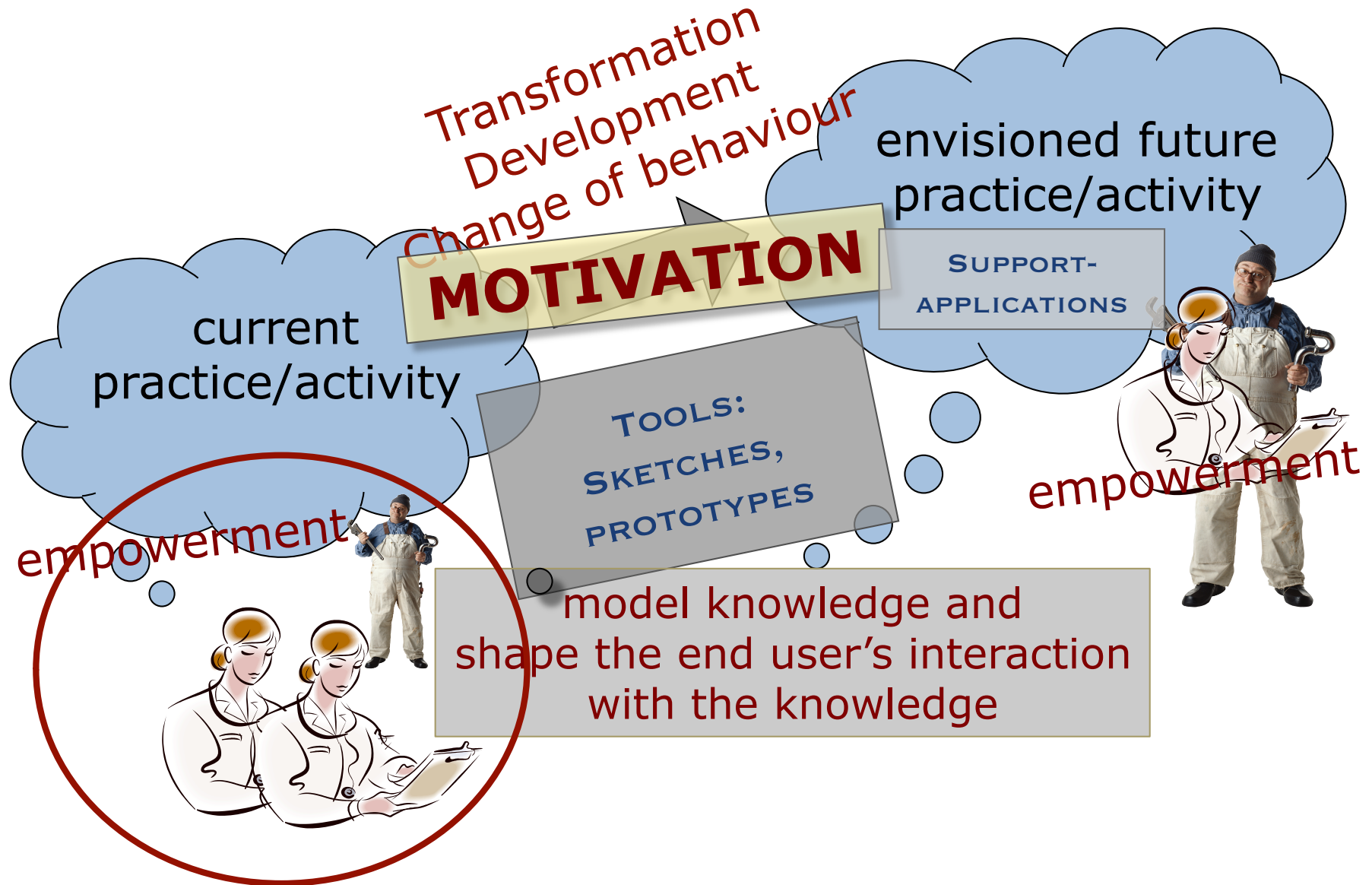
National effort in improving dementia care. *Example:*

Jan -04: Experts defined measurable goals for improving dementia care in Sweden.

Example of related goals:

- increase the amount of patients receiving a correct dementia diagnosis from 25% to 90%,
- increase level of knowledge in care actors

PURPOSE OF KNOWLEDGE-BASED SYSTEMS



MODELING AND USING A “LIVING DEMENTIA KNOWLEDGE REPOSITORY”

PURPOSE:

CONTINUING MEDICAL EDUCATION (PERSONALISED)

DISSEMINATION OF RESEARCH RESULTS AND CLINICAL/
BEST PRACTICE GUIDELINES

MULTI-PROFESSIONAL COLLABORATIVE TOOL FOR ISSUES

RELATING TO:

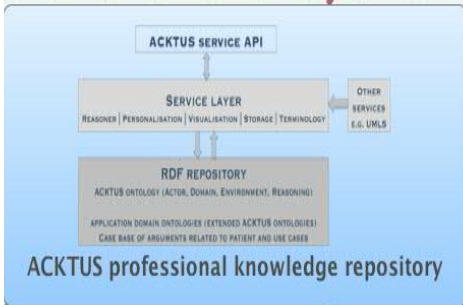
- DEMENTIA CARE IN GENERAL**
- SPECIFIC PATIENT CASES (TAILORED ADVICE)**

LIVING DEMENTIA KNOWLEDGE

Research: Knowledge modeling tool

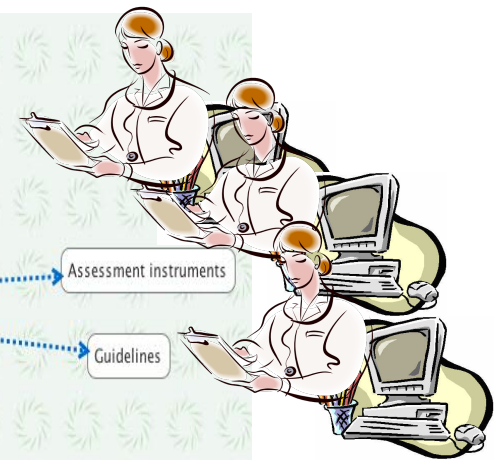
Domain expert (PH, PS, Nurse, OT)

Physician
Nurse
Occupational therapist
Psychologist



Daily practice: Learning, collaboration tool

Physician
Nurse
Occupational therapist
Psychologist



Assessment instruments

Guidelines

Patient cases

Cognitive diseases	Types of dementia	Confirm/assess diagnose(s):	Results of DMS5 analyses:
<input type="checkbox"/>	<input type="checkbox"/>	(Alzheimer's disease (DSM-IV	<input type="checkbox"/> - <input type="checkbox"/> + UNKNOWN
<input type="checkbox"/>	<input type="checkbox"/>	Alzheimer's disease (NINCDS (ADDDA	<input type="checkbox"/> - <input type="checkbox"/> + POSSIBLE
<input type="checkbox"/>	<input type="checkbox"/>	Alzheimer's disease (Dubois (criteria	<input type="checkbox"/> - <input type="checkbox"/> + UNKNOWN
<input type="checkbox"/>	<input type="checkbox"/>	(Vascular dementia (DSM-IV	<input type="checkbox"/> - <input type="checkbox"/> + PRESENT
<input type="checkbox"/>	<input type="checkbox"/>	Vascular dementia (NINCDS (AIREN	<input type="checkbox"/> - <input type="checkbox"/> + POSSIBLE
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Lewy body dementia	<input type="checkbox"/> - <input type="checkbox"/> + PROBABLE
<input type="checkbox"/>	<input type="checkbox"/>	Frontotemporal dementia	<input type="checkbox"/> - <input type="checkbox"/> + UNKNOWN
<input type="checkbox"/>	<input type="checkbox"/>	Corticobasal degeneration	<input type="checkbox"/> - <input type="checkbox"/> + UNKNOWN
<input type="checkbox"/>	<input type="checkbox"/>	Semantic dementia	<input type="checkbox"/> - <input type="checkbox"/> + UNKNOWN
<input type="checkbox"/>	<input type="checkbox"/>	FTD MND	<input type="checkbox"/> - <input type="checkbox"/> + UNKNOWN
Dementias due to:			
<input type="checkbox"/>	<input type="checkbox"/>	Parkinson's disease	<input type="checkbox"/> - <input type="checkbox"/> + UNKNOWN
<input type="checkbox"/>	<input type="checkbox"/>	PSP	<input type="checkbox"/> - <input type="checkbox"/> + UNKNOWN
<input type="checkbox"/>	<input type="checkbox"/>	Normal pressure hydrocephalus	<input type="checkbox"/> - <input type="checkbox"/> + UNKNOWN
<input type="checkbox"/>	<input type="checkbox"/>	Creutzfeldt-Jacob disease	<input type="checkbox"/> - <input type="checkbox"/> + UNKNOWN
<input type="checkbox"/>	<input type="checkbox"/>	MS	<input type="checkbox"/> - <input type="checkbox"/> + UNKNOWN
<input type="checkbox"/>	<input type="checkbox"/>	ALS	<input type="checkbox"/> - <input type="checkbox"/> + UNKNOWN
<input type="checkbox"/>	<input type="checkbox"/>	Huntington Chorea	<input type="checkbox"/> - <input type="checkbox"/> + UNKNOWN
<input type="checkbox"/>	<input type="checkbox"/>	Other condition or disease	<input type="checkbox"/> - <input type="checkbox"/> + UNKNOWN

Lewy body dementia

absent unknown present

Lewy body dementia: the symptoms support the syndrome or diagnosis to a certain degree.

Base for diagnosis

CORE DIAGNOSTIC FEATURES:
State of dementia is present
Extrapyramidal symptoms
Fluctuating cognitive ability
Visual hallucinations
SUPPORTIVE FEATURES:
Hallucinations (other modalities)
Emphasized delusions

CONTRAINDICATIVE FEATURES:
Focal signs and/or vascular disease evident on radiology exam makes DLB less likely.
Evidence fulfils the requirements for DLB according to consensusGL.

Degree of reliability

Probable
 Possible
 Uncertain
 Unlikely
 Excluded

Example of physician's view of integrated knowledge and support interpreted in a patient case

Modeling tool

Researcher



Potential future patient...

Professional



Cognition

Cognitive functions		
Memory functions		(-) / (+)
Mental functions of language - aphasia		(-) / (+)
Interpretation of sensory impressions-agnosia		(-) / (+)
Performing practical tasks - apraxia		(-) / (+)
Ability to plan and organize executive functions		(-) / (+)
Judgement		(-) / (+)
standing of instructions		(-) / (+)
Orientation to time		(-) / (+)
Orientation to place		(-) / (+)

Characteristics of the cognitive deterioration

	<input checked="" type="radio"/> Rapid onset -hours -days
	<input type="radio"/> Insidious onset -months
	<input type="radio"/> Onset unknown
re deterioration during > 6	(-) / (+)



MEDICAL KNOWLEDGE

SCHEME

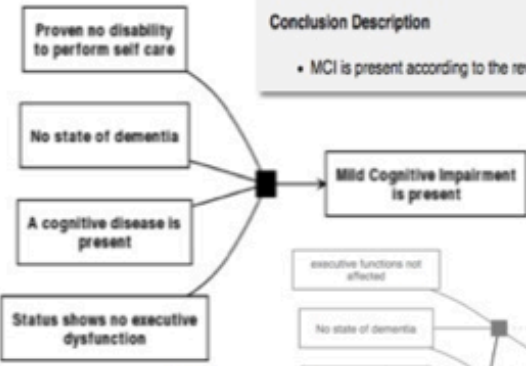
Premise Descriptions

- Minor or none disturbance of executive functioning
- Preserved ADL
- Objectively measured cognitive decline over time OR objective cognitive deficits in combination with subjective report of decline by self or informant
- Not demented
- Not normal

Conclusion Description

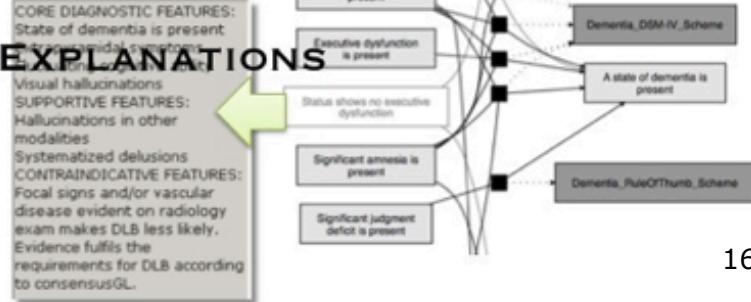
- MCI is present according to the revised criteria

RULE



PATIENT CASE

EXPLANATIONS



Knowledge Sources

Name	Type	Scheme
AD Criteria, Dubois 2007	General Medical Literature	1
Dementia, O'Brien et al. 2000	General Medical Literature	2
DLB consensus, McKeith et al. 2005	Consensus Guideline	7
DSM-IV-R	Clinical Practice Guideline	12
Evidence-based Dementia Practice, Qizilbash et al. 2002	General Medical Literature	2
Expert physician	Rule of Thumb	1
FTD consensus, Neary et al. 1998	Consensus Guideline	2
MCI consensus, Petersen et al. 1999	Clinical Practice Guideline	1
MCI-Revised criteria, Windblad et al. 2001	Consensus Guideline	3
NINCDS-ADRDA	Clinical Practice Guideline	3
NINCDS-ADRDA	Clinical Practice Guideline	3
Walton	Rule of Thumb	1

1

2

Status: Under discussion

[Förändra](#)

Knowledge Sources

- DLB consensus, McKeith et al. 2005

Premise Descriptions

- [Förändra](#) Dementia is present
- [Förändra](#) ONE OF the following core features: fluctuating cognition, visual hallucinations or extrapyramidal symptoms must be present AND ONE OF the following suggestive features: sensitivity to neuroleptica, REM sleep disorder or typical signs on DAT-SCAN

Conclusion Description

- [Förändra](#) Evidence supports a PROBABLE DLB according to consensus

[Knowledge Sources](#) [Premises](#) [Conclusion](#)

DLB McKeith2005_PROB2 Scheme

Status: Under discussion

Knowledge Sources

- DLB consensus, McKeith et al. 2005

Premise Descriptions

- Dementia is present
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- Evidence supports a PROBABLE DLB according to consensus

3

ACKTUS DEMENTIA Logged in as: Helena Lindgren

Home Knowledge Sources Schemes Rules Patient Cases Administration

Reasoning Context

Context: Are there additional supportive features? [Select](#) [Remove](#)

Create new context

Critical Question: [Create](#)

Critical Question: In the case of a typical case of dementia, which type?

Description:

Previous context: Is it a case of a typical dementia disease? [Save](#)

4

Example of a knowledge modeling environment

PILOT PROJECT (NOV 2011): ALLOWING HEALTH PROFESSIONALS MODEL KNOWLEDGE AND DESIGN INTERACTION

- Physician and occupational therapists
- Based on the Rut scenario
- Focus on dialogues
- ACKTUS used to model content and interactivity
- Simple web user interfaces to envision and test the results

Rut Scenario

Initial Assessment. Our persona is a woman, Rut who is 84 years old. The OT has visited her home, made interviews and assessments using I-Rehab, which includes domain-specific assessment instruments. Rut's son was also present to tell his view on Rut's life situation. The assessment shows among other things that Rut has a mild episodic memory deficit and possibly other mildly decreased cognitive functions, and has a mild depressive state with worries about falling and not being able to get help. She does not feel that the memory deficit affects her ability. Her son has a different view, and has noticed increasing difficulties in remembering taking medication and eating meals.

Referral. After the visit by the OT, Rut visited a physician together with her son for investigating a possible evolving dementia, which generated more detailed information about her mild cognitive deficits. However, at this time point she did not meet the criteria for dementia.

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DEMENTIA INVESTIGATION DIALOGUE


AVSLUTA ✕

SUMMERING

◀ ÄNDRA SKRIV UT

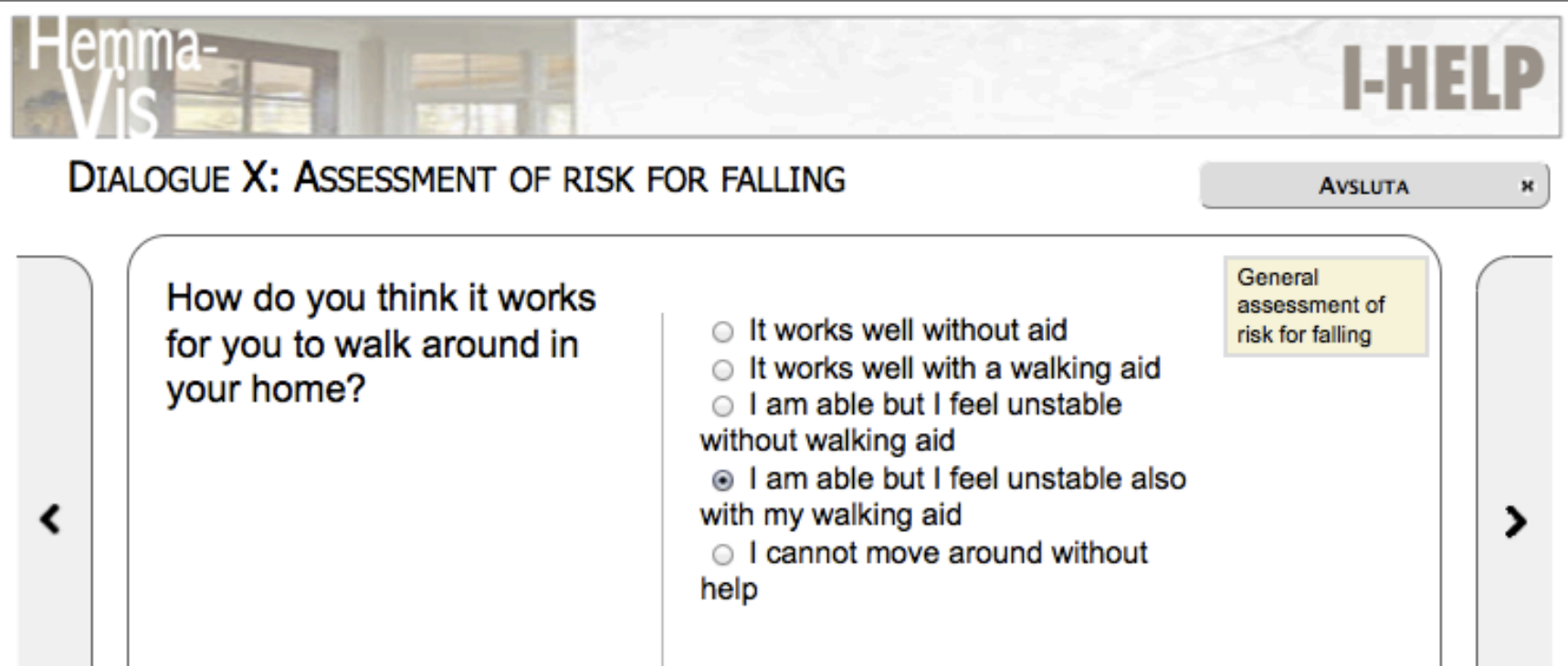
Is there a cognitive disorder?	Yes
Does relatives describe decreased memory for e.g., events?	Yes
Is there a state of dementia?	No
Proven disability to perform self care early in the course	absent
4. Decreased ability to perform complex tasks (e.g., planning dinner for guests; handling finances; marketing).	No

KONTAKTA OSS



When the severity of the cognitive decline does not significantly affect social and work ability, MCI - Mild Cognitive Impairment is the probable diagnosis.

to resolve the contradictions in the information. CA also inform the nurse with Rut's approval, and the nurse makes a new assessment as base for changes in interventions.



Initial Assessment. Rut is 84 years old and has visited her doctor for several interviews. She is using I-Reh, a domain-specific instrument. The instrument also presents information on Rut's life assessment. Other things that have happened are mild episodes and possibly other mildly decreased cognitive functions, and has a mild depressive state with worries about falling and not being able to get help. She does not feel that the memory deficit affects her ability. Her son has a different view, and has noticed increasing difficulties in remembering taking medication and eating meals.

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DIALOGUE X: ASSESSMENT OF RISK FOR

AVSLUTA ✕

FALLING
SUMMERING

◀ ÄNDRA

SKRIV UT

Are you sleeping well all night?	Yes, with the help from my sleeping pills
Do you want me to send this summary to the nurse?	Yes
Have you had incidents of falling in your home the past months?	No
Do you want to discuss the pills and your sleep with the nurse?	Yes
How do you think it works for you to walk around in your home?	I am able but I feel unstable also with my walking aid
Do you hear well?	Yes
Do you have visual impairments?	Yes, but I see fine with my glasses
Do you take any of the following medicines?	Sleeping pills
Do you use good shoes when you walk around?	Yes

I-HELP KONTAKTA OSS



As you wished, the nurse is not informed about the summary now. But you can let me know if you change your mind.

Since you think it is okay, I will send this summary to the nurse.

Since you think it is okay I will let the nurse know about this, and I will ask her to contact you!

Initial Ass

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ADAPTABILITY VS. ADAPTIVITY

ADAPTIVITY X ADAPTABILITY

- Adaptivity
 - Automatic
 - Adaptive systems
- Adaptability
 - Manually
 - Adaptable systems
- Complementary approaches

ADAPTIVE SYSTEMS

- Problem
 - User must be able to control
 - Accept or reject the adaptation
 - Understand the changes

PERSONALIZATION X CUSTOMIZATION

- Personalization
 - Occurs when the system is adapted regarding user characteristics
- Customization
 - Occurs when the users are able to modify the application according to their needs
- Both concepts can be considered as a subset of adaptation

CONTEXT INFORMATION

- A formal definition
 - Relevant characteristics to the interaction, such as: **the user, the environment, and the available devices**
- How to
 - Sense it
 - Model it
 - Use it efficiently

CONTEXT INFORMATION

- Gather
 - Automatic (e.g. GPS) or manually
- Model
 - UML, OWL, OO, Key-value, Markup
- Assess quality
- Use it effectively

CONTEXT AWARENESS

- Ubiquitous Applications
- Systems able to sense their context and react accordingly
- Goal
 - Improve the usability by adapting the system behavior
- Main issue
 - Privacy

ADAPTATION: RESOURCES

- Many different resources can be subject to adaptation
 - Content
 - Images
 - Audio
 - Video
 - Text
 - Widgets
 - Presentation
 - Navigation

ADAPTATION GRANULARITY

- A web application can be adapted in different levels
 - The complete application can be adapted or
 - Frames, contents
 - Interaction
 - Text
 - ...

MODELING THE CONTEXT

- Many different models
 - Key-value, Markup scheme, Graphical, Object oriented, Logic based
 - Taxonomies
 - UML
 - MOF
 - Ontology
 - Pointed as the **best** approach

PERSONALIZATION TECHNIQUES - OVERVIEW

INTERACTIVE PERSONALIZATION TECHNIQUES

- User Acknowledgment
- Personalized Interface
 - Site Morphing
 - User Configured Interface
- Content Filtering
 - Personalized Information
 - Collaborative filtering
 - Contextual Interferences
 - What's New
- Configured Process or Fastpath
- Pre-filled Forms and Information
- Personal Assistant

NON - INTERACTIVE PERSONALIZATION TECHNIQUES

- Server-push
 - Event Reminders
 - Information Delivery

SOME INFORMATION CAPTURE TECHNIQUES FOR PROFILING

EXPLICIT PROFILING:

The individual profile is mostly built through information explicitly provided by the customer

- Registration forms
- Feedback forms
- Static or Dynamic Questionnaire(s)
- Rating Interface
- Configuration Interface

IMPLICIT PROFILING:

The individual profile is built automatically tracking the user behavior and preferences

- Click stream analysis