



Design of Contextualized Decision Support for Medication

Gaming against medical errors

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Problem and Aim

- **PROBLEM:**

- Medication errors happen often and are sometimes serious.
- CPOE systems diffuse rapidly and often contain CDS – new types of errors will occur.

- **AIM:**

- Improve identification of medication errors in hospitals by systematically mining in patient record data.
- An improved decision support for prescription, dispensing administration and compliance.



Project Partners

1. University Hospital of Lille and University of Lille2 (F)
2. University Hospital of Rouen (F)
3. Denain General Hospital (F)
4. 10 hospitals from the « Capital Region of Copenhagen » (DK)
5. Oracle (Europe)
6. IBM Denmark – division ACURE (DK)
7. Medasys (F)
8. Vidal SA (F)
9. KITE solutions (I)
10. Ideea Advertising (Romania)
11. Aristotle Thessaloniki University (Greece)
12. Aalborg University (DK)
13. UMIT –Innsbruck University (A)

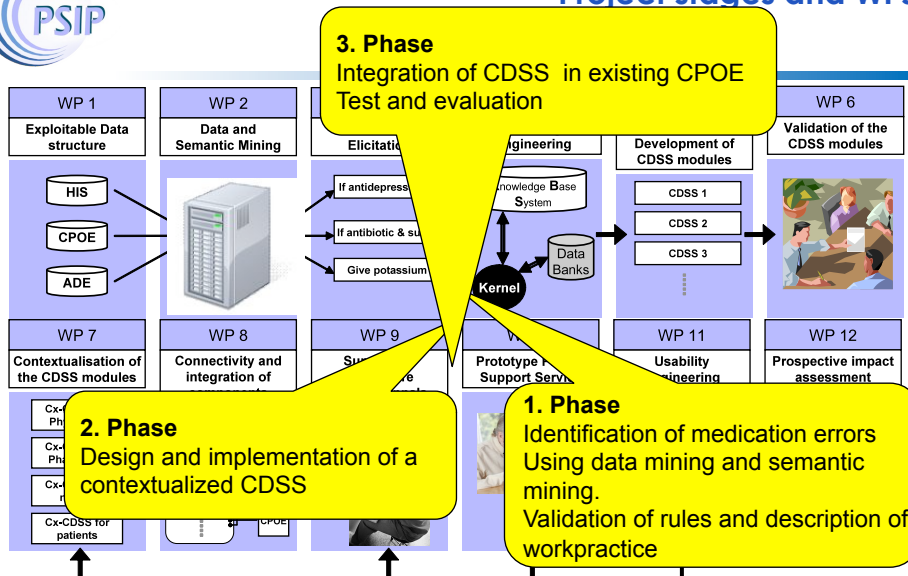
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Project stages and WPs



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Human Factors Engineering is the discipline of applying what is known about human capabilities and limitations to the design of products, processes, systems, and work environments.



User-centered design
challenge: how to understand users' need and design for these needs



Co-operative design
challenge: how to co-operate with users in the design process



User-driven innovation
challenge: how to create space for user innovation, collect and sort out user-innovations and transform these into new products




Participants form two teams:

- **Blue team**
- **Green team**


Each team gets:

- A number of scenarios
- An “empty” machine
- Blanc sheets (**blue** and **green**) for new ideas
- A number of predefined CDSS functionalities

	Incident	The patient is admitted for a suspected joint infection. Instead an attack of gout is diagnosed. NSAID is prescribed which betters the attack of gout. Three days later the patient develops epistaxis and the warfarin dose has to be lowered.
	Patient characteristics	
	Age and sex	55 years, male
	Weight and height	97 kg, 175 cm
	Medical history	
	Medications	Enalapril 20 mg x 1, <i>antihypertensive</i> Methformine 500 mg x 3, <i>antidiabetic</i> Simvastatin 40 mg x 1, at night, <i>cholesterol-lowering</i> Warfarin 7.5/5.0/7.5/5.0/7.5/5.0/5.0 mg x 1, <i>anticoagulant</i>
	Prior diagnoses	I10.9 Hypertension E10.2 Diabetes, type II E78.0 Hypercholesterolemia I48.9B Atrial fibrillation M10.0 Gout (metabolic arthritis)
	Allergies	No allergies
	Current situation	
	Lab values	INR 2.3 [2.0-3.0] Creatinine 157 micromol/L [60-130 micromol/L] Urate 0.721 mmol/L [0.20-0.45 mmol/L]
	Working diagnosis and clinical problem	M10.0 Gout (metabolic arthritis)
	Department	Department of internal medicine; admitted from home.
	Triggers	<ul style="list-style-type: none"> Warfarin/NSAID interaction Class effect, i.e. interaction between <i>all</i> NSAID's and warfarin Concurrent prescription of enalapril and NSAID in the presence of elevated creatinine in a diabetic patient presents a risk of aggravating the patient's slight renal insufficiency



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Decision Support

- Base level categorized information that requires further processing and analysis by users before a decision could be arrived at.
- Trends of patients changing clinical status and alerts about out of range assessment results and intervention strategies.
- Deductive inference engines to operate on some knowledge base and automatically generate diagnostic or intervention recommendations based on changing patient clinical condition and the knowledge and inference engines stored in the knowledge base.
- Complex knowledge management and inference models. Self-learning capabilities, fuzzy set formalism, similarity measures, confidence level computation.



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Functionalities for CDSS

Provide information from the record
(diagnosis test results, clinical notes, ...)

Provide information from the
laboratory system

Present graphics of
(temperature, blood pressure, series of lab values, ...)

Calculate a variable
(Dosage, BMI, ...)

Show potential adverse effects

Warning for interaction

Propose prescription of a drug

Propose a particular
examination or test

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The Incredible PSIP Machine Rules of the game:

Each team work at the same scenario

The task is to build a machine that could
have prevented the ADE in the scenario

The Game Master keep the time:

- 10 minutes to construct the machine
- 3 minutes to present the machine
- 1 minute to give point

The Point Master keep the score:

- 1 point for a predefined functionality
- 5 points for a new idea

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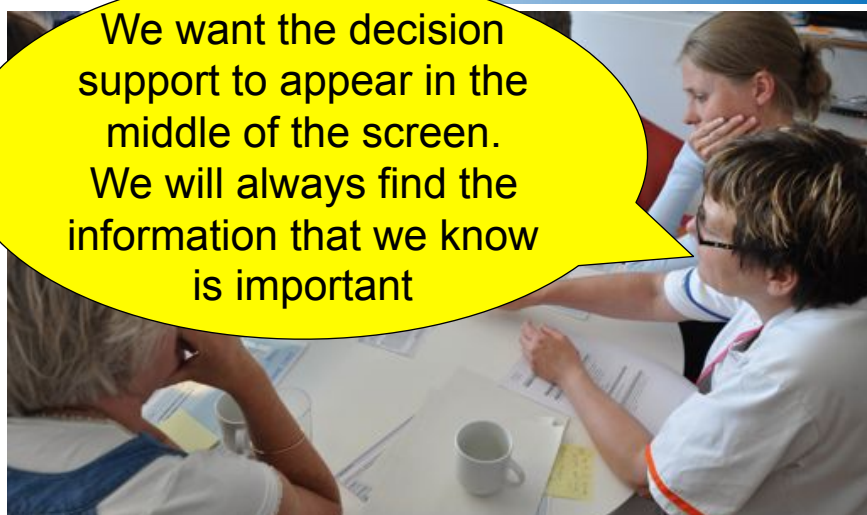
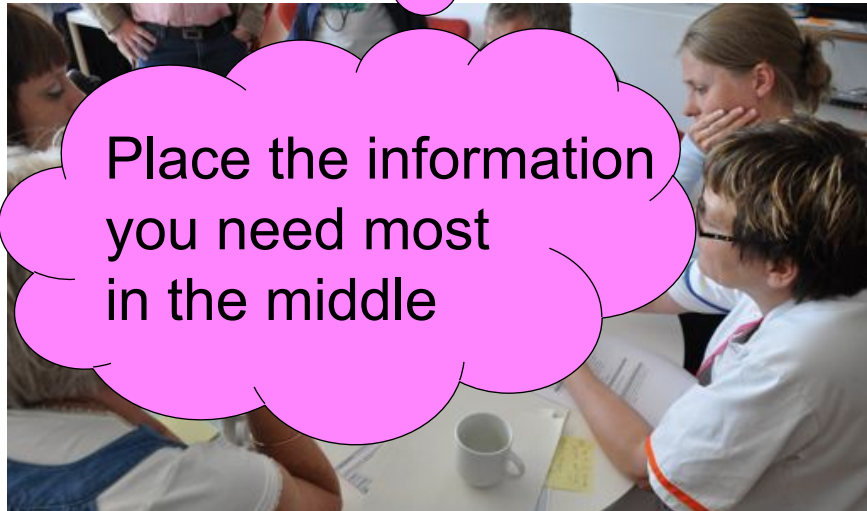


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Scenario 1

Provide information from the laboratory system	Enalapril/NSAID – Creatinin Enalapril/NSAID – antidiabeticum
Present graphics of (temperature, blood pressure, series of lab values, ...)	INR and creatinin
Warning for interaction	NSAID / Warfarin
Diagnostic flowchart	For nosebleeding in combination with specific drugs and diagnosis
Diagnostic flowchart	Change the NSAID drug, suggestions for alternatives





PSIP prototype

Wagner, Karl
INTERN MEDICINE ABTEILUNG

CPR: 020142-2177 Alter: 67 år
Sex: 00-06-2009 Vægt: 85 kg

CAVE
Lægemiddelinteraktioner
Indholdsstoffer: Paracetamol

Diagnose
Anamnese
N10.9 Akut pyelonephritis
N18.9 Kronisk insufficiens
Tidligere diagnoser
I10.0 Hypertension

Laboratoriske Resultater

Undersøgelse	Ergebnis	08.06.09	06.07.09
Urea	2,2 - 7,8		
Creatinin	60 - 130	108	
Urat	0,20 - 0,45		
Hemoglobin	8,0 - 11,0		
Hæmatokrit	24 - 34	23	
Leukocyter	3,0 - 9,0	27	
Neutrophiler (NEU)	4,0 - 7,7		
PLT	4 - 10 mg	267	
Protein			
Reagenstestresultater			
Temperatur			

Mediciner

Item	Stat	Type	Lægemiddel	Dosis	Adm. Veg
08/06/09	Fast	Intermittent	Paracetamol	10 mg x 4	PO
08/06/09	Fast	Intermittent	Paracetamol	20 mg x 1	PO

Ordre

Prototype build by IBM/ACURE www.psip-project.eu



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Simulation with the PSIP prototype



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