Usability Evaluation of a Computerized Physician Order Entry for Medication Ordering

R. Khajouei, D. de Jongh, M.W. Jaspers

Department of Medical Informatics
University of Amsterdam
The Netherlands
CPOE

Reducing Medication errors

Leading to

Improving patient safety

- Alerting interactions
- Checking inappropriate orders
- Reminding required tasks
- Elimination of eligibility
- Suggesting recommended dosages

But

- New kind of errors
- Ordering Prolongation
- User dissatisfaction
- User reluctance
- Miscommunication

Poor usability and User friendliness

Cause

Medicator

- In 15 hospitals in the Netherlands
- AMC the first
  - Started in 1997
  - Completed in 2001
  - In 27 wards
  - Communicates with HIS
  - Single orders, order sets
In AMC

User complaints

Usability problems?!

How this could be changed?
Research questions

What are the potential usability problems related to Medicator system?

– Type
– Number
– Severity
– Potential for medication errors
Methods

• Cognitive walkthrough (CW)

What:
– Usability inspection
– Evaluation of design

How:
– Simulate cognitive process
– Analyze interaction
Study process

Designing of clinical scenario

Validation of scenario

Framework of action sequences and system responses

CW evaluation

Primary List of usability problems

Clustering
Action seq. coding
Potential for errors
Severity rating

Final list of usability problems
Clinical scenario

A 19 year old patient with acute promyelocytic leukemia is admitted to the hematology department. This 86 kg man is 185 cm long and has been under treatment using Hovon 79 protocol, induction phase. Prescribe consolidation phase of chemotherapy for this patient.
Framework

- **Task A: log in to the system** (3 actions)
- **Task B: selecting a patient** (6 actions)
- **Task C: Entering medication data Type 1**
  - **C1:** open “nieuwe medicatie opdracht” (12 actions)
  - **C2:** correct medication dose selection (13 actions)
  - **C3:** adjusting medication frequency (3 actions)
  - **C4:** defining start and stop date/time (5 actions)
- **Task D: Entering medication data Type 2**
  - **D1:** open “nieuwe medicatie opdracht” (8 actions)
  - **D2:** correct medication dose selection (5 actions)
  - **D3:** adjusting medication frequency (2 actions)
  - **D4:** defining start and stop date/time (4 actions)
  - **D5:** Defining motivation for this protocol (5 actions)
Results

Total usability problems (n=56)

Recurring problems (n=15)

- 17 → User confusion and frustration
- 15 → Prolonged medication orders
- 5 → Miscommunication and increasing phone calls
- 14 → Medication errors
Severities of usability problems
Two examples of Major and Catastrophic problems
Discussion

- 56 usability problems
- 18 major and catastrophic
- 15 recurring problems

- Easy to be fixed
- Preventable in the design
- High priority to be fixed
- Should be validated by the end users test

- A human centered design process
- Application of knowledge from human factors engineering