Ubiquitous Clinical Support: Providing Support at the Point of Care

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Outline

- Clinical workflow
- Requirements for a CDSS
- Model-based architecture (MDA)
- Ubiquitous framework for a CDSS
- Implementation of the framework - MET
- Discussion
Clinical Workflow

- Prioritization
  - Registration
    - Physician’s Assessment
      - Nursing
        - Admission
        - Discharge
- Closure
Clinical Workflow

- Several different functions are provided simultaneously by different staff members.
- Different staff members require different levels of support – from general to patient-specific.
- Different staff members require support in different places and at different times – from the point of care to the office, from on-line to off-line.
- Ubiquitous clinical decision support.
Requirements for a uCDSS

- A uCDSS should offer simultaneous and diversified support for multiple users and multiple patient management problems.
- A uCDSS should run on different access platforms – depending on the problem it supports, its location and nature.
- A uCDSS should offer support in „the background” and in conjunction with electronic patient records.
Design Requirements for a uCDSS

- Developing a specific DSS for each possible combination of problem, user and platform is not feasible (too many possibilities)

- The solution is anytime & anywhere architecture
  - A specific DSS created temporarily on user’s request for a specific problem and a specific platform
**Anytime & Anywhere Architecture (3A)**

- A way of writing specifications and developing DSS, based on models of system components

- It consists of problem models (domain model, interface model, decision model, DM model) and platform models. Specific DSS (problem/platform) is rendered from these logical models

- Other architectures are generally tied to a particular problem and platform. With 3A, functionality and behavior are modeled only once.
3A for a uCDSS

- Model of a decision problem contains a platform-independent description.

- There are different problem models for different clinical decision problems.

- Problem models together with platform models are used to render specific DSS.
3A for a uCDSS

Request for a DSS (problem-, platform-, and DM-specific)

- **Problem models**
- **Platform models**
- **Runtime components**
- **Renderer**
- **Integrator**

**Creator**

**Executor**

- **Domain model**
- **Decision subsystem**
- **Interface subsystem**
- **Database subsystem**

Electronic health records
MET System

- uCDSS for supporting triage of acute conditions at the point of care
  - Acute pain (abdominal, scrotal, hip)
  - Asthma

- Runs on a variety of platforms (handheld, tablet and desktop computers)

- Successfully tested in hospital setting during a clinical trial
MET Architecture

Request for a CDSS (triage of scrotal pain on a handheld by a resident)

Problem models
- AP
- SP
- HP
- AT

Platform models
- Handheld
- Tablet
- Desktop

Runtime components
- Solvers
- Interface objects

Renderer

Integrator

Database subsystem

SP rule-based solver

SP domain model

SP/handheld interface

Electronic health records

Creator

Executor

Server

Thick client
MET Implementation

Protege for ontological editing of problem models

MET server

Database / XML

SOAP

Wireless or wired synchronization

HL7 protocol

Electronic health records

MET clients

Desktop

Pocket PC

Smartphone

Palm
MET Hospital Trial

- Prospective ED cohort study at CHEO recruiting patients 24/7 with acute abdominal pain
- More than 100 users (staff physicians and residents) utilizing MET for over 7 months
- 574 patients evaluated using MET
- Positive feedback from users and patients
Discussion

- Clinical workflow requires ubiquitous decision support for many users and many problems.
- 3A is required for truly ubiquitous support.
- 3A involves “mobility of code” and adaptability of the interface.
- MET is a successful implementation of 3A, tested in a hospital.
Acknowledgements
Thank You

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