MET: Mobile Emergency Triage Decision Support for the Clinical Environment

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Outline

- Clinical workflow
- Ubiquitous computing
- **MET** Clinical Support Environment
- Clinical trial of **MET-AP**
- Discussion
Clinical Workflow in the ED

- Prioritization
- Registration
- Nursing Assessment
- Physician’s Assessment
- Admission
- Investigation/Observation
- Discharge
- Closure of Visit
Clinical Workflow: Implications

- Different members of clinical staff have different functions – prioritization, assessment, treatment
- Different members of clinical staff require different levels of support – general to patient-specific
- Different members of clinical staff require support in different locations and at different times – from the bedside to the office, from on-line to off-line
- Ubiquitous Clinical Decision Support Systems (uCDSS)
Requirements

- Simultaneous and diversified support for multiple users and multiple patient management problems
- Different access platforms – depending on the clinical presentation, location of the user, and nature of support
- Seamless integration with hospital IS
Specifications

Developing a customized system for each possible combination of:

- clinical problem
- end-user
- platform

is not an answer

*Anytime & Anywhere Architecture (A³)*

- Allows to create a temporal, customized software module to match the user’s need for specific support of a particular clinical problem, regardless of the platform or location
A³ – *Anytime & Anywhere* Architecture

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

- It consists of problem models (domain model, interface model, decision model, DM model) and platform models. Customized support system (problem/platform) is rendered from these logical models
**MET Clinical Support Environment**

- Supports triage of different acute conditions
  - Acute pain (abdominal, scrotal, hip)
  - Asthma

- Provides support at the bedside

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

- Successfully tested in hospital during a clinical trial
Request to support triage of scrotal pain (SP) coming from a physician using handheld
**MET** Implementation

- **MET server**
- **Wireless or wired synchronization**
- **Electronic health records**
- **Protege for ontological editing of problem models**

**MET clients**

- **SOAP**
- **Database / XML**
- **HL7 protocol**

**Platforms**
- Desktop
- Pocket PC
- Smartphone
- Palm
MET Interactions: Aligning With Workflow
MET Interactions: Natural Mappings #1
MET Interactions: Natural Mappings #2
MET-AP: Abdominal Pain in Children

- Common presenting complaint
  - 6-7% of all patients
  - 3300 patient visits per year or 8-10 patients/day
  - other patients presenting with other complaints
    - significant abdominal pain found during assessment
  - Large number of outside referrals “R/O Appendicitis”
**MET-AP**: Abdominal Pain in Children

- Large degree of uncertainty
  - Children/parents don’t describe/localize pain well
  - Parental anxiety
  - Experts/medical literature description of patterns is subjective
    - “often”, “sometimes”, “mostly”
- Large list of possible diagnoses
  - Constipation and gas pains most common
  - Associated “tummy ache” with most viral illnesses
  - Appendicitis most common surgical problem
- No definitive, cost-effective, non-invasive test to assess all patients
MET-AP: Abdominal Pain in Children

- Time-consuming process
  - average arrival to MD 60-90 minutes
  - average MD to disposition 150-180 minutes
  - 55% have lab, 26% have imaging
**MET-AP Clinical Trial**

- Prospective ED cohort study at CHEO recruiting patients 24/7 with acute abdominal pain
- About 150 users (staff physicians and residents) utilizing MET-AP for 8 months
- Evaluation of MET-AP with 574 patients
- Positive feedback from users and patients
Integrating with Hospital’s IS

- EPIC Hospital IS
  - DataGate (HL7 broker)
    - HL7 messages
  - Hospital System 1
    - HL7 messages
  - Hospital System 2
    - HL7 messages
    - Audit and follow-up web-based applications
    - Integration subsystem
      - Sync subsystem
      - Database
      - Mobile client
      - Mobile client
      - Mobile client
      - Audit and follow-up web-based applications

- Database
  - Management subsystem
    - Mobile client
Trial Results

- Analysis of 574 patients with complete F/U
  - Overall accuracy
    - Physicians: 70.2%
    - MET: 67.2%

Other successes

- Integration with hospital IS
- Structured and real-time data collection by physicians
Discussion: mHealth Systems

- Compliance with clinical workflow is essential
- Limited bandwidth of mobile devices
- Legal framework (HIPAA, PIPEDA, Bill 31)
- Security and privacy
- Wireless but not everywhere
- Interference with medical devices
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