Mobile Emergency Triage: Lessons from a Clinical Trial

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Outline

- Medical disposition and assessment
- Ubiquitous decision support
- **MET** clinical support environment
- Clinical trial of **MET-AP**
- Conclusions and challenges
Prioritization and Triage in the ED

Prioritization

CTAS score

Medical assessment and disposition

Triage

Consult

Investigate/Observe

FD follow-up
Challenges for Triage Decision Support

- Different caregivers have different roles and responsibilities → simultaneous support for diversified users’ group

- Different caregivers require decision support in different locations and at different times (nursing station, bedside, or the office) → different access platforms and different access modes

Ubiquitous clinical decision support that fits the workflow
New Paradigm for DSS Design: A³

A³ = Anytime & Anywhere Architecture

- Allows the creation of a temporal, customized software module to match the user’s needs

- Follows a model-based design separating logical models of all system components from physical customized implementation

- Consists of problem models (domain model, interface model, decision model, user model) and platform models. Customized DSS (problem/user/platform) is rendered from these logical models
MET Clinical Support Environment

- Supports triage of different clinical conditions
  - Acute pain (abdominal, scrotal, hip)
  - Asthma
- Provides support anytime and anywhere
- Runs on a variety of access devices (handheld, tablet and desktop computers)
Request to support triage of abdominal pain (AP) coming from a physician using handheld

**Problem models**
- SP
- AP
- HP
- AE

**Platform models**
- Handheld
- Tablet
- Desktop

**Solvers**

**Runtime components**

**Interface objects**

**Renderer**

**Integrator**

**AP rule-based solver**

**AP handheld interface**

**AP domain model**

**Executor**

**Database subsystem**

**Electronic health records**

**Customized system for AP**
MET Implementation

- MET server
  - HL7 protocol
  - Wireless or wired synchronization
  - Protege for ontological editing of problem models
  - Database / XML
- Electronic health records
- MET clients
  - Desktop
  - Pocket PC
  - Smartphone
  - Palm

SOAP
MET: Using Basic Function
MET: Integrating with HIS and Interpreting the Results

Hospital system #1

Hospital system #2

DataGate
HL7 broker

MET server

MET client #1

MET client #2

EPIC
Hospital IS

HL7 messages

HL7 broker

HL7 messages

Quin, Yi
Abdominal Pain

Suggested class: DISCHARGE (strong)

CONSULT:

DISCHARGE: strong

OBSERVATION: weak

Recalculate

Patients list
Synchronize

Application
MET-AP Clinical Trial

- Prospective ED cohort study at Children’s Hospital of Eastern Ontario 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
MET-AP Clinical Trial Goals

- Comparative triage accuracy
- Interobserver agreement
- Data quality: retrospective vs prospective
- Fit with the workflow
Trial Design

Registration and prioritization

Abdominal pain?

no

Exclusion from the trial

yes

Consent and eligibility?

no

Inclusion into the trial

yes

Triage (assessment and disposition)

Follow-up and chart audit
Trial Results

Analysis of 574 patients with complete F/U

<table>
<thead>
<tr>
<th>Accuracy</th>
<th>Physicians</th>
<th>MET</th>
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</thead>
<tbody>
<tr>
<td>Overall</td>
<td>70.2%</td>
<td>67.2%</td>
</tr>
<tr>
<td>FD follow-up</td>
<td>71.3%</td>
<td>75.3%</td>
</tr>
<tr>
<td>Investigate / observe</td>
<td>63.9%</td>
<td>18.0%</td>
</tr>
<tr>
<td>Consult</td>
<td>70.8%</td>
<td>70.8%</td>
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</table>

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Retrospective</th>
<th>Prospective</th>
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</thead>
<tbody>
<tr>
<td>Localized guarding</td>
<td>25.2%</td>
<td>0.7%</td>
</tr>
<tr>
<td>Rebound tenderness</td>
<td>35.0%</td>
<td>1.1%</td>
</tr>
<tr>
<td>Site of pain</td>
<td>2.6%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Site of tenderness</td>
<td>13.0%</td>
<td>12.0%</td>
</tr>
<tr>
<td>Type of pain</td>
<td>10.8%</td>
<td>0.9%</td>
</tr>
<tr>
<td>Duration of pain</td>
<td>1.0%</td>
<td>0.2%</td>
</tr>
</tbody>
</table>

Missing values (%)

Other successes

- Integration with hospital IS
- Structured and real-time data collection by physicians
Conclusions and Challenges

- Compliance with clinical workflow is essential
- Structured data collection improves overall data quality
- Comparable triage accuracy

- Compliance with a legal framework (HIPAA, PIPEDA, Bill 31)
- Security and privacy
- Wireless but not everywhere
Acknowledgements

CHeo
- Rhonda Correll, Emergency Research Coordinator
- Greg Forestell, Information Services
- John Pike, Division of Urology
- Joanne Ross, Information Services
- Steven Rubin, Division of Surgery

MET Research Team
- Jerzy Blaszczynski
- Mathieu Chiasson
- Lisa Dutil
- Nataliya Milman
- Roksana Mottahedi
- Bernard Plouffe
- Leticia Troppman
- David Weiss
Thank You

Please visit us at:

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