MET3-AE System to Support Management of Pediatric Asthma Exacerbation in the Emergency Department

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Outline

- Asthma ED management process
- MET3 functional model
- MET3 architecture and implementation
- MET3-AE
- Conclusions
ED Asthma Management

Asthma exacerbation

Data collection task

Diagnosis formulation task

Treatment planning task

Follow-up
Implications for Decision Support

- Provide support for all tasks of ED asthma management
- Access and integrate all patient data
- Be available at the point of care
## MET3-AE Functional Layout

<table>
<thead>
<tr>
<th>Task</th>
<th>Function</th>
<th>Abstract model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data collection</td>
<td>Support for structured data collection</td>
<td>Data model; User interface model</td>
</tr>
<tr>
<td>Diagnosis formulation</td>
<td>Support for predicting severity of the exacerbation</td>
<td>Diagnostic model</td>
</tr>
<tr>
<td>Treatment planning</td>
<td>Support for asthma pathways; Provision of evidence</td>
<td>Treatment model; Evidence model</td>
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</tbody>
</table>
MET3-AE Architecture

Model Manager Agent
- Provides abstract models

Treatment Suggester Agent
- Suggests treatment plan

Diagnosis Suggester Agent
- Suggests exacerbation severity

Evidence Provider Agent
- Provides clinical evidence

Data Manager Agent
- Manages patient data

HIS Synchronizer Agent
- Synchronizes patient data

Model Repository

Evidence Repository

Data Repository

HL7 Integration Engine

Client device

Encounter Assistant Agent
- Assists with data collection
- Assists with diagnosis
- Assists with treatment

HIS (EHR, ADT...)
MET3-AE Abstract Models

- **Data model**: specifies asthma clinical attributes
- **User interface model**: specifies components of user interface
- **Diagnostic model**: specifies prediction algorithm for a severity of asthma exacerbation
- **Treatment model**: specifies relationships between severity of exacerbation and a treatment plan
- **Evidence model**: specifies mappings between the attributes and indexing terms for the reviews in The Cochrane Library
MET3-AE Technological Infrastructure

MET3-AE

Model Repository (Protege)

Data Repository (Protege)

Diagnosis Models and Solvers (WEKA)

Treatment Models and Solvers (WEKA)

HL7 Integration Engine (Mirth Connect)

Evidence Repository (Lucene)

Multi-Agent System (JADE)

HIS

HL7 messages

MET3-AE

JADE

protégé

WEKA

Lucene

mirth
Physician collects and records patient data

- *Encounter assistant agent* sends new data item to *data manager agent*
- *Data manager agent* updates patient data in data repository and notifies *HIS synchronizer agent*
- *HIS synchronizer agent* passes the update notification to HIS via a proper HL7 message
Physician asks for a diagnostic advice
- *Encounter assistant agent* passes request to *diagnosis suggester agent*
- *Diagnosis suggester agent* gets a diagnostic model from *model manager agent* and applies it to patient’s data
- *Encounter assistant agent* reports the advice to physician
MET3-AE in Action – Treatment Planning

Physician asks for supporting evidence
- *Encounter assistant agent* passes request to *evidence provider agent*
- *Evidence provider agent* gets an evidence model from *model manager agent* and applies it to retrieve systematic reviews from evidence repository
- *Encounter assistant agent* presents ranked reviews to physician
MET3-AE Interface - Examples
Conclusions

- Integrative decision support at the point of care
- Available on any Java-enabled computing platform
- Software engineering and development with open source software
- Successful pilot implementation in the Emergency Department
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