A Multi-Agent System for Early Triage of Pediatric Asthma Patients in the Emergency Department

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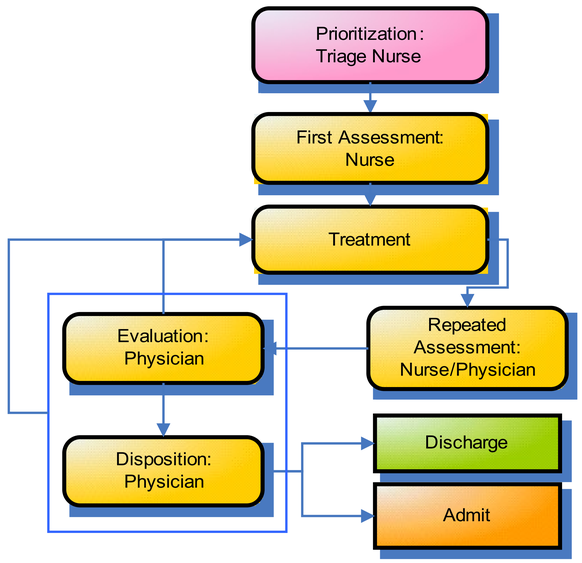
Emergency Triage for Asthma Exacerbation

- Asthma is the most common chronic disease in children (10% of Canadian population) and asthma exacerbations are the most common reasons for children to visit the emergency department (ED)
- Asthma is expensive - asthmatic children use 3 times more prescriptions and require twice as many ambulatory care / ED visits as other pediatric patients

Categories of Asthma Exacerbation Severities

Importance of Early Prediction of Severity

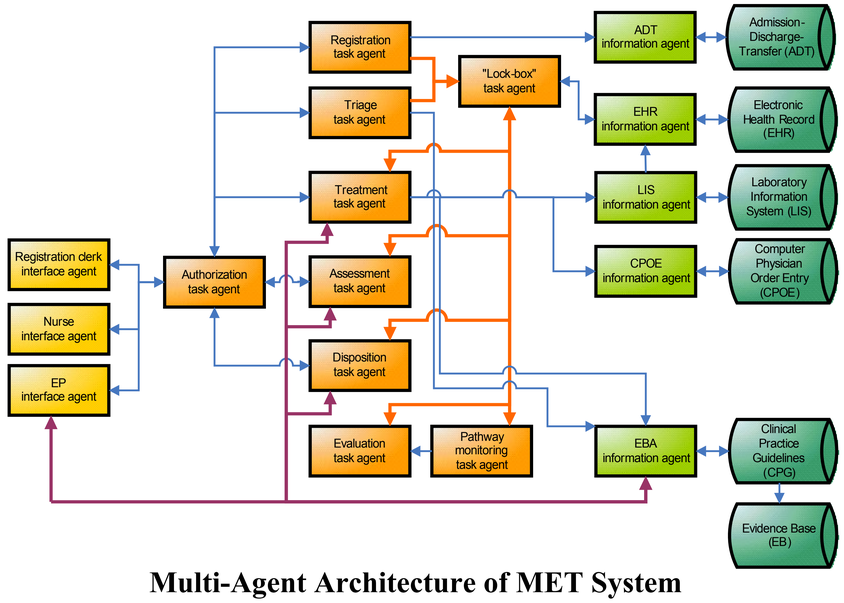
- Three categories of exacerbation severities: mild, moderate, and severe.
- Important that severity is determined as soon as possible, so that appropriate therapies are prescribed and provided in a timely fashion.
- Underestimation of the severity results in premature discharge and a possible return visit
- Overestimation of the severity results in patients unnecessarily occupying beds and clinical resources



ED Workflow Management for Pediatric Asthma

Aligning with Asthma Management Workflow

- Each user group has corresponding interface agent
- Each management task has corresponding task agent
- Each HIS has corresponding information agent



Multi-Agent Architecture of MET System

The Ubiquitous MET-Asthma Application

- The MET-Asthma application provides point of care clinical decision support (CDSS) for managing asthma exacerbations
- It predicts severity of asthma exacerbation using a decision model and patient clinical information from a number of electronic hospital information systems (HIS) including:
  - Electronic health record (EHR)
  - Laboratory information system (LIS)
  - Computer physician order entry (CPOE)
  - Admission-discharge-transfer (ADT)

Services Oriented Architecture

- Paradigm that has been applied in the business community for interconnecting on demand loosely coupled legacy systems
- SOA services have self-describing platform independent interfaces which communicate via formally defined messages
- Model MET where each HIS acts as a service provider according to defined information provider roles
- MET CDSS is a service requestor that invokes provided services by sending appropriate messages (HL7)
- Service registry maps services to providers to ensure location transparency

Ongoing Research

- Agent Communication using ACL
- Agent Collaboration using Mediator Agents e.g. Blackboard Architecture
- Ontology Driven Design using shared clinical ontologies for standard nomenclature
- Integration of MET CDSS with existing hospital systems and data exchange methods
- Implement security and privacy solutions by incorporating legal framework provided by PHIPA – Personal Health Information Protection Act
- Prospective Data Collection for training and testing prediction algorithms
- Provision of meaningful evidence for decision support at the point of care
- Prospective evaluation of clinical performance