MET3-Asthma

A Mobile CDSS for Integrative and Personalized Management of Paediatric Asthma Exacerbations at the Point of Care

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Asthma in Children and Its Management

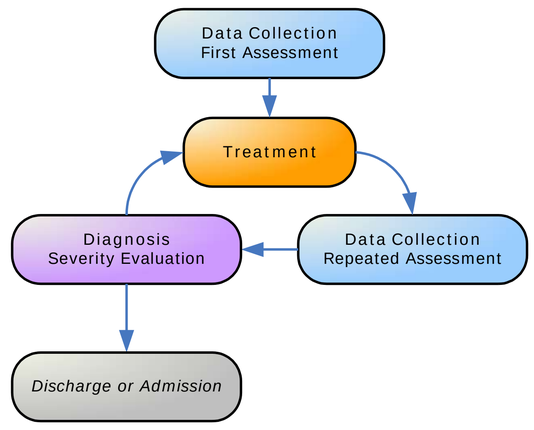
- Asthma is the most common chronic disease in children (10% of Canadian population) and asthma exacerbations are the most common reasons for visits to the emergency department (ED)
- Asthma is expensive – children with asthma use 3 times more prescriptions, and require 2 times as many ambulatory care and ED visits as other pediatric patients
- Clinical practice guidelines define three levels of exacerbation severity and corresponding treatment plans: mild (a brief course of mild treatment), moderate (more aggressive treatment over an extended observation) and severe (maximal therapy before admission as in-patient)
- Severity of asthma exacerbation should be determined as soon as possible, so that appropriate treatment is prescribed and provided in a timely fashion

Asthmatic Patients at CHEO

- CHEO (Children's Hospital of Eastern Ontario) is a tertiary-care pediatric teaching hospital affiliated with the University of Ottawa
- The ED has 53,000 annual patient visits, approximately 2,800 of them are visits for asthma exacerbations (2005/06 data)

Management Workflow at CHEO

- Asthma management includes a critical pathway that outlines the standardized assessments and treatments patients should undergo
- Medical directives allow the nurse to initiate bronchodilator treatments prior to repeated assessment and severity evaluation by the physician

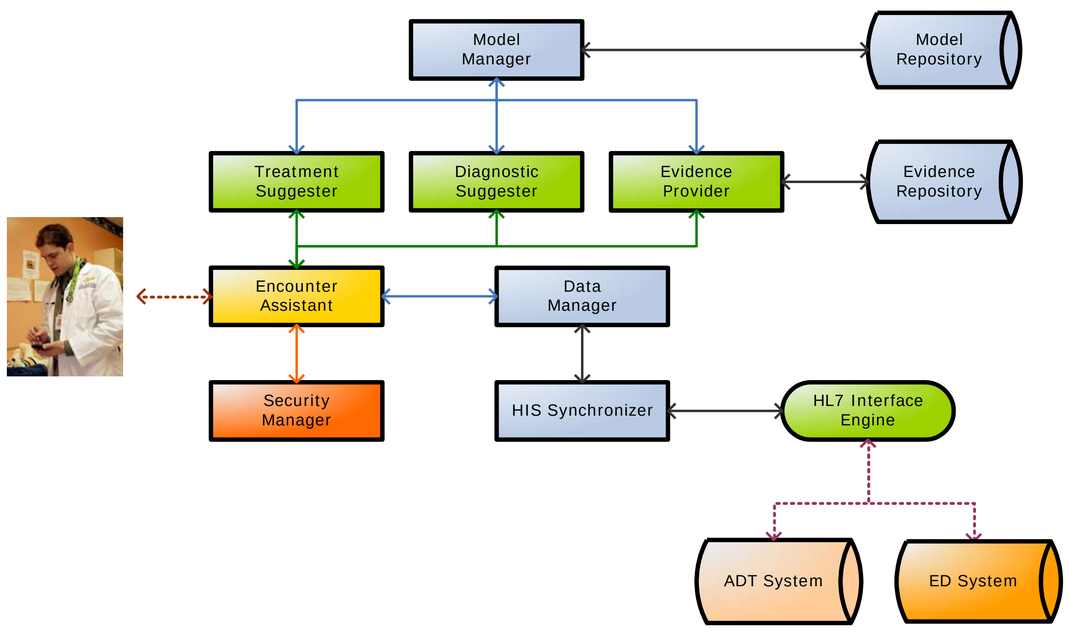


Current IT Infrastructure at CHEO

- ADT system (EPIC) for administrative management, and ED system (Sunrise ED Manager) for clinical management, including triage and patient tracking (no explicit support for clinical decision making)
- ED system accessed by clinicians (nurses and physicians) on mobile clients (Motion Computing C5 tablet PCs)
- Communication between both systems via HL7 interface engine (eGate)

MET3-Asthma System

- A mobile CDSS that provides integrative and personalized support for clinical management of pediatric asthma exacerbations
- Addresses the need for decision support at the point of care and for integrating data and knowledge of different types and coming from different sources
- Assists clinicians in all tasks from the clinical workflow (data collection, diagnosis, treatment) by bringing together patient data, providing diagnostic and treatment recommendations, and summarizing evidence for these recommendations
- Provides personalized support that is patient-specific and that may be clinician-specific (e.g., by matching the level of support with the level of expertise)
- Runs on various mobile computing devices (tablet and handheld computers, mobile phones) for improved availability at the point of care and integrates with the existing IT infrastructure
- Follows the recent paradigm of service model architecture for clinical decision support and has been designed and implemented as a multi-agent system (with complex functionality distributed among autonomous entities)



MET3-**Asthma from the Clinician's Perspective**

Abstract Models in MET3-Asthma

- MET3-Asthma relies on abstract ontological models representing various types of clinical knowledge (factual, conceptual and procedural) to support specific tasks from the management workflow
- Explicit representation of clinical knowledge enhances maintainability and extensibility of the system

Data Model

- Defines the structure of data analyzed and processed by the system
- Follows the entity-attribute-value approach for improved flexibility

User Interface Model

- Guides structured data collection and presentation
- Constructed according to user-centered and task-centered principles

Diagnostic Model

- Provides diagnostic suggestions by predicting the level of exacerbation severity
- Represented as a decision tree and discovered from preprocessed retrospective clinical data using knowledge discovery techniques

Treatment Model

- Provides treatment suggestions given the level of severity
- Represented as a set of expert-based rules established on the basis of asthma guidelines published by the Canadian Association of Emergency Physicians

Evidence Model

- Defines mappings of patient data into index terms used for retrieving evidence (systematic reviews of clinical trials) from The Cochrane Library
- Established with the help of UMLS Metathesaurus, content of reviews processed with the MetaMap system

Clinical Trial of MET3-Asthma

- Conducted in the ED at CHEO as a pilot study including the team of physicians, residents and nurses
- The major goal is to evaluate and compare predictive accuracy of physicians, PRAM score and the system
- The secondary goal is to verify the acceptance of clinicians for advanced clinical decision support technology in the ED

Acknowledgment

Research on MET3-Asthma has been supported by the grants from NSERC-CIHR Collaborative Health Research Program

http://www.mobiledss.uottawa.ca