Development of a Clinical Algorithm for Emergency Abdominal Pain Management in Childhood

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Outline

- Problem statement.
- Objectives.
- Patients and methods.
- Clinical algorithm.
- What next.
**Current ER Management**

**Initial Assessment**
- History
- Physical examination
- Blood test

**Management Decision**
- In hospital observation
- Surgical consultation
- Discharge
  - Urine test
  - Possible intravenous fluid management
  - Possible X-ray
  - Possible U/S

**ER Physician**

**Triage Nurse**
Objectives

- To create a simplified *clinical algorithm* for the triage of children with abdominal pain;

- To establish a minimal set of clinical attributes and signs required for effective triage of acute appendicitis.
Patients

• Retrospective chart study at CHEO in Ottawa;

• Classification of each case as:
  appendicitis
  resolution (no pathological diagnosis and no operative procedure)
### Patients (cont.)

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>Patient's age</td>
</tr>
<tr>
<td>Sex</td>
<td>Gender</td>
</tr>
<tr>
<td>AbdPainDur</td>
<td>Duration of pain</td>
</tr>
<tr>
<td>AbdPainSite</td>
<td>Location of pain</td>
</tr>
<tr>
<td>AbdPainType</td>
<td>Type of pain</td>
</tr>
<tr>
<td>Vomiting</td>
<td>Number of times vomiting occurred</td>
</tr>
<tr>
<td>Vombile</td>
<td>Bilious vomit</td>
</tr>
<tr>
<td>PrevVis</td>
<td>Previous visit to ER in last 48 hours</td>
</tr>
<tr>
<td>Temp</td>
<td>Fever</td>
</tr>
<tr>
<td>AbdTend</td>
<td>Site tenderness</td>
</tr>
<tr>
<td>AbdMass</td>
<td>RLQ mass</td>
</tr>
<tr>
<td>WBC</td>
<td>White blood cell count</td>
</tr>
</tbody>
</table>
Method

**Rough sets (RS) analysis:**

- a method to deal with imprecise information;
- characterizes classifications through lower and upper approximation sets;
- allows to identify a minimal subset of the attributes - a *reduct*;
- followed by generation of the rules with desired properties - *interesting rules*. 
Clinical algorithm

Initial reduced set of clinical symptoms and signs that was used in developing a clinical algorithm includes:

- age;
- gender;
- duration of pain;
- location of pain;
- type of pain;
- number of times vomiting occurred;
- previous visit to ER in last 48 hours;
- fever;
- white blood cell count.
Clinical algorithm (cont.)

Clinical attributes and signs "to look at" during triage:

♦ location of abdominal pain  (AbdPainSite)
♦ white blood cell count   (WBC)
♦ type of abdominal pain  (AbdPainType)

Frequencies of attributes in the *interesting rules* generated during the reclassification tests
Clinical algorithm (cont.)

An example:

The triage is *appendicitis* and the management is *surgical consult* when one of the following occurs:

- A male patient experiences right lower quadrant abdominal pain and his white blood cell count is above 20000/mm$^3$;
- A male patient experiences right lower quadrant abdominal pain lasting between 4h and 24h, combined with frequent (more than 3 times) vomiting;
- ÉÉÉÉ

The triage is *resolution* and the management is *discharge* when one of the following occurs:

- A patient experiences abdominal pain (neither right lower quadrant nor suprapubic) lasting between 4h and 24h;
- A patient experiences abdominal pain (neither right lower quadrant nor suprapubic) of intermittent character;
- ÉÉÉ.
Our Postulate for ER Management

- **Triage Nurse**
  - History
  - Physical examination
  - Blood test
  - Clinical Algorithm

- **ER Physician**
  - Urine test
  - Possible intravenous fluid management
  - Possible X-ray
  - Possible U/S

- **Management Decision**

- **In hospital observation**
- **Surgical consultation**

- **Discharge**
Future Work

A prospective assessment of the clinical algorithm at two teaching hospitals in Canada.

Use by the admitting ER Nurse Practitioner in determining the priority with which each patient should be assessed by the ER physician.

Development of a Web-based triage facilitator to be accessed by primary care providers in referring medical centers.
Proposed Implementation

- Reduced pressure for the ER services.
- Effective triage at remote sites.