TimeWrap -

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Motivation

• Guideline execution
• Guideline modeling
• Time, (money), knowledge, nerves, …
• Tool that supports modeling process as automated as possible
• Modeling flows and processes
The Idea

clinical guidelines and protocols
(plain text, tables, ...)

intermediate representations

(semi-)formal representation, e.g., Asbru
The Idea

information extraction

information integration

information transformation

clinical guidelines and processes
intermediate representations
(semi-)formal representation, e.g., ABox
K. Kaiser, S. Miksch
Asbru: Temporal Aspects

Definition:
[[ESS, LSS], [EFS, LFS], [MinDur, MaxDur], Reference]

- Uncertainty
- Incompleteness
- Special plan types: cyclical plan, iterative plan,...
**TimeWrap: The Method**

1. Structuring information
   a. Relevant information
   b. Formal base representation

2. Extracting information
   a. Synonyms, numeric values
   b. Temporal information: duration, frequency
   c. Leftover data

3. Integrating information into an intermediate format
<table>
<thead>
<tr>
<th>cause</th>
<th>drug of choice</th>
<th>dosage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adults</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gonococcus</td>
<td>Ceftriaxone 1g IM, single dose</td>
</tr>
<tr>
<td></td>
<td></td>
<td>lavage infected eye</td>
</tr>
<tr>
<td></td>
<td>Chlamydia</td>
<td>Azithromycin 1g orally single dose</td>
</tr>
<tr>
<td></td>
<td></td>
<td>or</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Doxycycline 100 mg orally twice a day for 7 days</td>
</tr>
<tr>
<td>Children</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gonococcus</td>
<td>Ceftriaxone 125 mg IM, single dose</td>
</tr>
<tr>
<td></td>
<td></td>
<td>same treatment as adults</td>
</tr>
<tr>
<td></td>
<td>Children who</td>
<td>Erythromycin 50 mg/kg/day orally in 4 divided doses for 10-14 days</td>
</tr>
<tr>
<td></td>
<td>weigh &lt; 45 kg</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Children who</td>
<td>Azithromycin 1 gm orally, single dose</td>
</tr>
<tr>
<td></td>
<td>weigh &gt; 45 kg</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chlamydia</td>
<td>Children under 8 years old who weigh &gt; 45 kg</td>
</tr>
<tr>
<td></td>
<td>Children 8</td>
<td>Azithromycin 1 gm orally, single dose</td>
</tr>
<tr>
<td></td>
<td>years old or</td>
<td>or</td>
</tr>
<tr>
<td></td>
<td>older</td>
<td>Doxycycline 100 mg orally, twice a day for 7 days</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Example: Drug Administration (2)

```xml
<cause name="Gonococcus" person="adult">
  <drug dosage="1g IM, single dose"
       name="Ceftriaxone"/>
</cause>

• Synonyms, numeric values: ‘single’ -> ‘1’

• Temporal information:
  Duration, frequency?

• ‘1 dose’ -> nonrecurring plan
```

```xml
<plan name="Ceftriaxone: 1g IM, single dose"
      plan-id="plan55131512"/>
```
**Example: Drug Administration**

```
<cause name="Chlamydia" person="adult">
  <drug dosage="100 mg orally twice a day for 7 days" name="Doxycycline"/>
</cause>
```

- **Synonyms, numeric values:** ‘twice’ -> ‘2/’,
  ‘days’ -> ‘day’

- **Temporal information:**
  Duration: 7 day
  Frequency: 2/ day -> 12 hour

- **Dose rate:** 100 mg orally
Example: Drug Administration

<plan name="Doxycycline: 100 mg orally twice a day for 7 days"
plan-id="plan52769441">
  <cyclical-plan plan-id="plan54675512">
    <frequency value="12" unit="hour"/>
  </cyclical-plan>
  <duration>
    <min value="7" unit="day"/>
    <max value="7" unit="day"/>
  </duration>
</plan>

<plan name="Doxycycline: 100 mg orally"
plan-id="plan54675512"/>
Example: Drug Administration

<?xml version="1.0" encoding="UTF-8"?>
<plan-library>
  <plans>
    <plan-group>
      <plan name="Ceftriaxone: 1g IM, single dose">
        <plan-body>
          <user-performed/>
        </plan-body>
      </plan>
      <plan name="Doxycycline: 100 mg orally twice a day for 7 days">
        <defaults>
          <time-annotation>
            <time-range>
              <duration>
                <minimum>
                  <numerical-constant value="7" unit="day"/>
                </minimum>
                <maximum>
                  <numerical-constant value="7" unit="day"/>
                </maximum>
              </duration>
            </time-range>
            <now/>
          </time-annotation>
        </defaults>
        <plan-body>
          <cyclical-plan>
            <start-time>
              <time-annotation>
                <now/>
              </time-annotation>
            </start-time>
            <cyclical-plan-body>
              <plan-activation>
                <plan-schema name="Doxycycline: 100 mg orally"/>
              </plan-activation>
            </cyclical-plan-body>
          </cyclical-plan>
        </plan-body>
      </plan>
    </plan-group>
  </plans>
</plan-library>
Results, Benefits, Limitations

• Semi-automatic method for modeling simple processes

• Easy transformation into Asbru

• Better structuring, overview, and comprehension

• Prevention of troublesome and time-consuming generation of Asbru plans

• Generation of components, not of the entire plan

• Complex processes, parameters, … ?