

# **Towards a Fully Machine-Readable Protocol: The New ODM Extension for Trial Design / Protocol**

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# The ODM Extension for Trial Design - Status

- Developed by Jan Kratky and Peter Villiers
- Currently in beta
- Reviewed / tested by the ODM Team
- Publication expected end 2010
- Scope: Design, not Execution

# The ODM Extension for Trial Design - Contents

- Trial Summary and Parameters
- Inclusion / Exclusion Criteria
- Structural Elements: Arms, Epochs, Cells, Segments
- Activities
- Workflows between Activities
- Timings between Activities

# Trial Summary and Parameters

```
<sdm:Summary>
  <!-- Indication -->
  <sdm:Parameter
    OID="PARM.001" Term="Indication" ShortName="INDIC">
    <sdm:Value>ASTHMA</sdm:Value>
  </sdm:Parameter>
  <!-- Age Span -->
  <sdm:Parameter
    OID="PARM.002" Term="Age span"
    ShortName="AGESPAN" >
    <sdm:Value>Adult (18-65)</sdm:Value>
    <sdm:Value>Elderly (&gt;65)</sdm:Value>
  </sdm:Parameter>
  ...
</sdm:Summary>
```

Information may go into SDTM domain TS

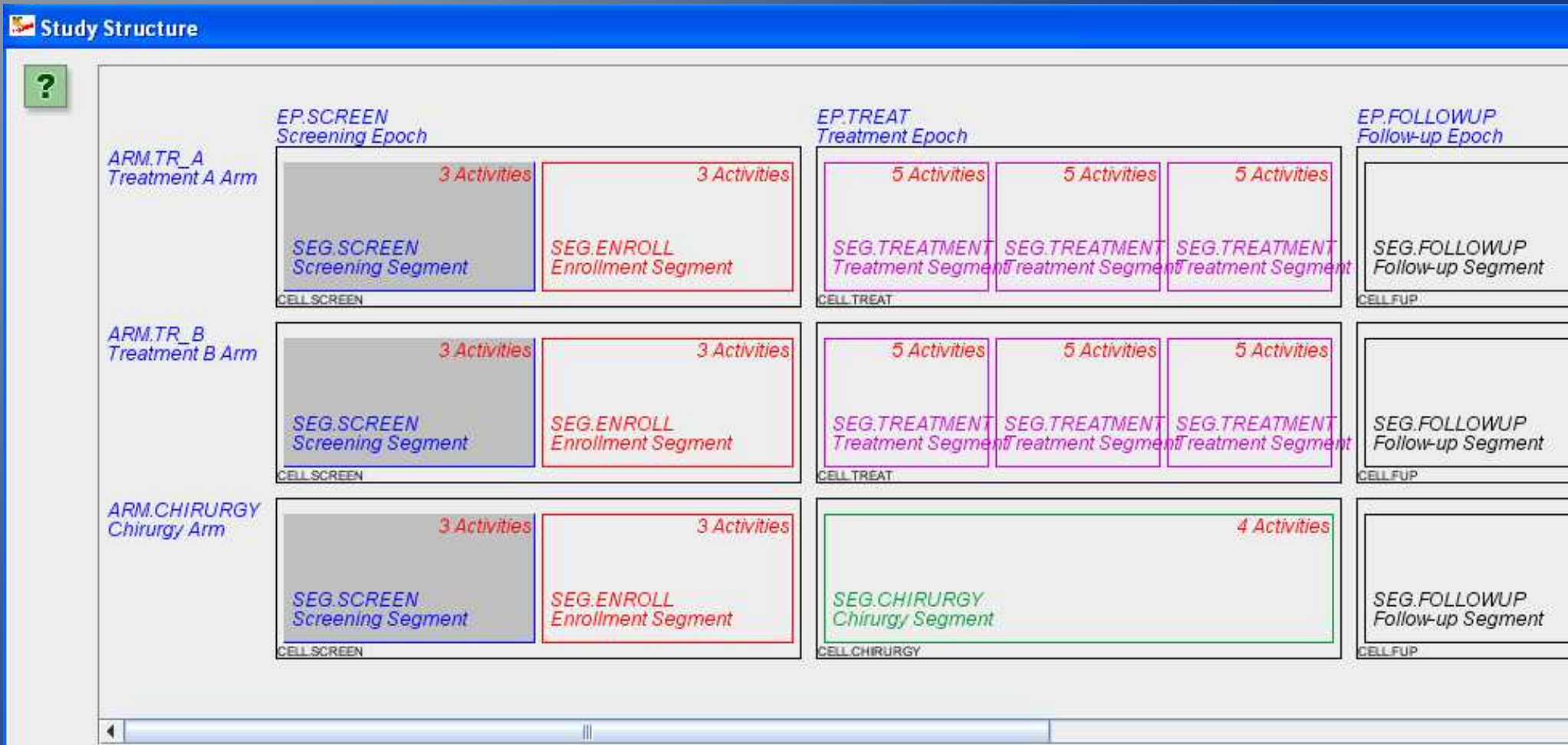
# Inclusion / Exclusion Criteria

```
<sdm:InclusionExclusionCriteria>  
  <sdm:Criterion OID="CRIT00" Category="INCLUSION"  
    ConditionOID="COND.AGE" Name="age condition" />  
</sdm:InclusionExclusionCriteria>
```



```
<ConditionDef Name="Minimum Age" OID="COND.AGE">  
  <Description>  
    <TranslatedText xml:lang="en">Over Age 21</TranslatedText>  
  </Description>  
  <!-- 'computer-executable' -->  
  <FormalExpression Context="xpath">Age > 21</FormalExpression>  
</ConditionDef>
```

# Structural Elements: Arms, Epochs, Cells, Segments



# Cells and Segments

- A **Cell** is a crossing between an **Arm** and an **Epoch**
- A **Cell** can contain one or more **Segments**
- **Segments** are the basic building blocks:
  - Can contain Activities
  - There can be no gaps between segments
- Remark that in ODM, Segments and Activities are reusable  
(Definition – Reference mechanism)

# Activities

- Different types:
  - Study Start
  - Study Finish
  - Non-data-collection (e.g. intervention)
  - Data Collection
  - Scheduling
    - “milestones”
- An Activity can (but is not required to) use a Form

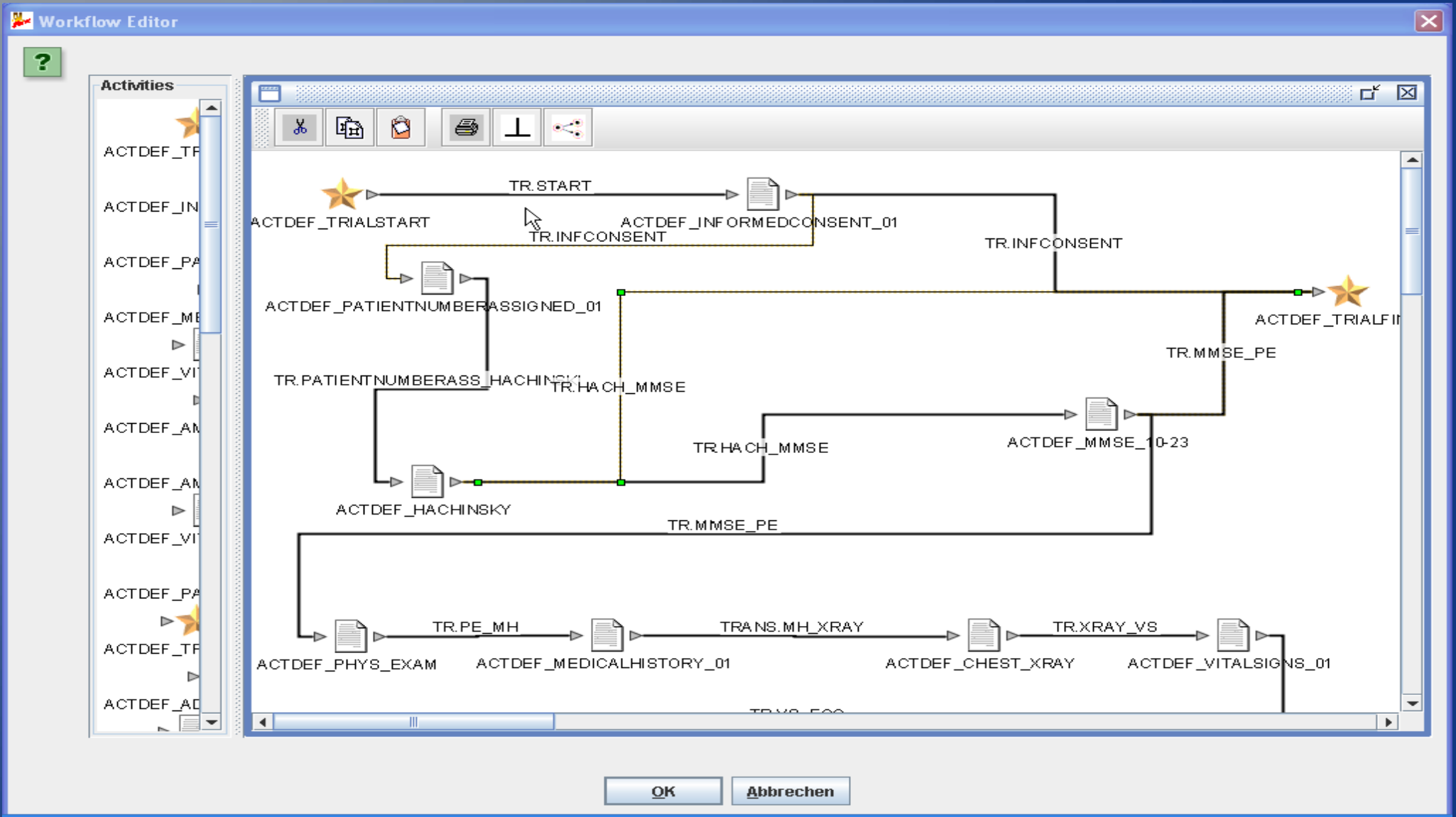


# Workflows

- Entry & Exit Criteria for
  - Epochs
  - Cells
  - Segments
  - StudyEvents (visits)
  - Activities
  - ... using the ODM ConditionDef
    - Human-readable
    - Machine-executable

# Workflows

- (Conditional) transitions between Activities



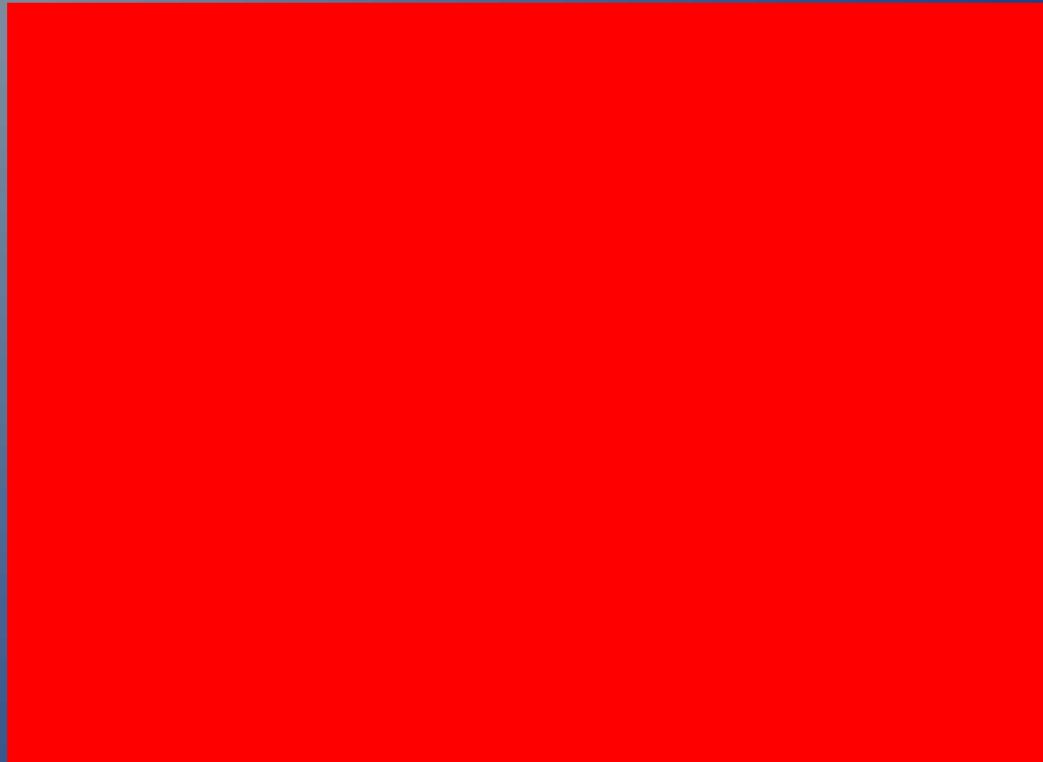
# Workflow

- Does not describe timings between Activities
  - “Separation of concerns”
- Can be easily translated / transformed into more common machine-executable instruction sets such as:
  - BPEL
  - Windows Workflow Foundation
  - XPDL, YAWL, ...

# Timings

- Essentially between Activities
- Absolute or relative timings
- Time Windows
  - +1 day, -2 days window
  - “within the same month”

The proof of the pudding  
is in the eating



- Can we use the ODM extension to set up a caBIG Patient Study Calendar ?

# The caBIG Patient Study Calendar

- Web application (open source)
- Sets up a study calendar for a group of patients
- Claimed to be an implementation of PRM v.1.0

The screenshot displays the 'Epochs and study segments' interface. It features three main sections: 'Screening', 'Treatment', and 'Observation'. Each section has an 'Add segment' button and a 'Set name' button. The 'Treatment' section is currently expanded to show 'Cycles 1-3' and 'Cycles 4+ (three cycles worth)'. Below this, the 'Treatment: Cycles 1-3' view is shown, including a 'Cycle length' input field set to 28 days and an 'Update' button. The main calendar grid shows a sequence of days from C1D1 to D28. The 'Cycle 1' row has 'x' marks for days C1D1 through C1D28. The 'Cycle 2-3' row has 'x' marks for days D1 through D28. The 'Daily drugs' row has 'x' marks for every day from C1D1 to D28. Each row has an 'Edit' button on the left and a 'Delete' button on the right.

# The proof of the pudding is in the interoperability

- PSC knows epochs, segments, activities
- Has XML export and import

**Good !**

- Segments have one or more Periods
- Periods have a time “duration”
- Activity Timings are relative to start of Period
- Smallest time unit is “day”
  - No order of Activities within a day
- Uses GUIDs

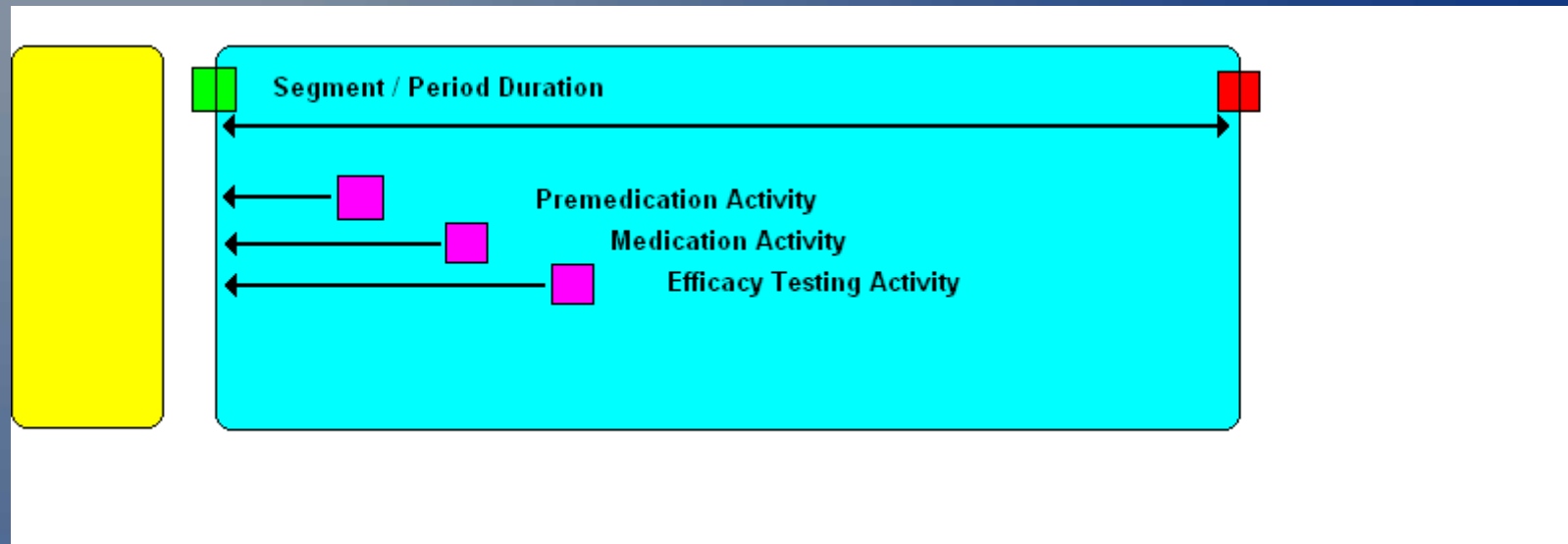
**Woops..**

# ODM for PSC import

- 1 Segment = 1 Period
- Add “scheduling” activities to each Segment
  - Segment Start + Segment Finish
  - Add a Timing between these two “scheduling activities” => Period duration
- Define other “normal” activities
- Add timings for each activity relative to start-of-segment “scheduling” activity

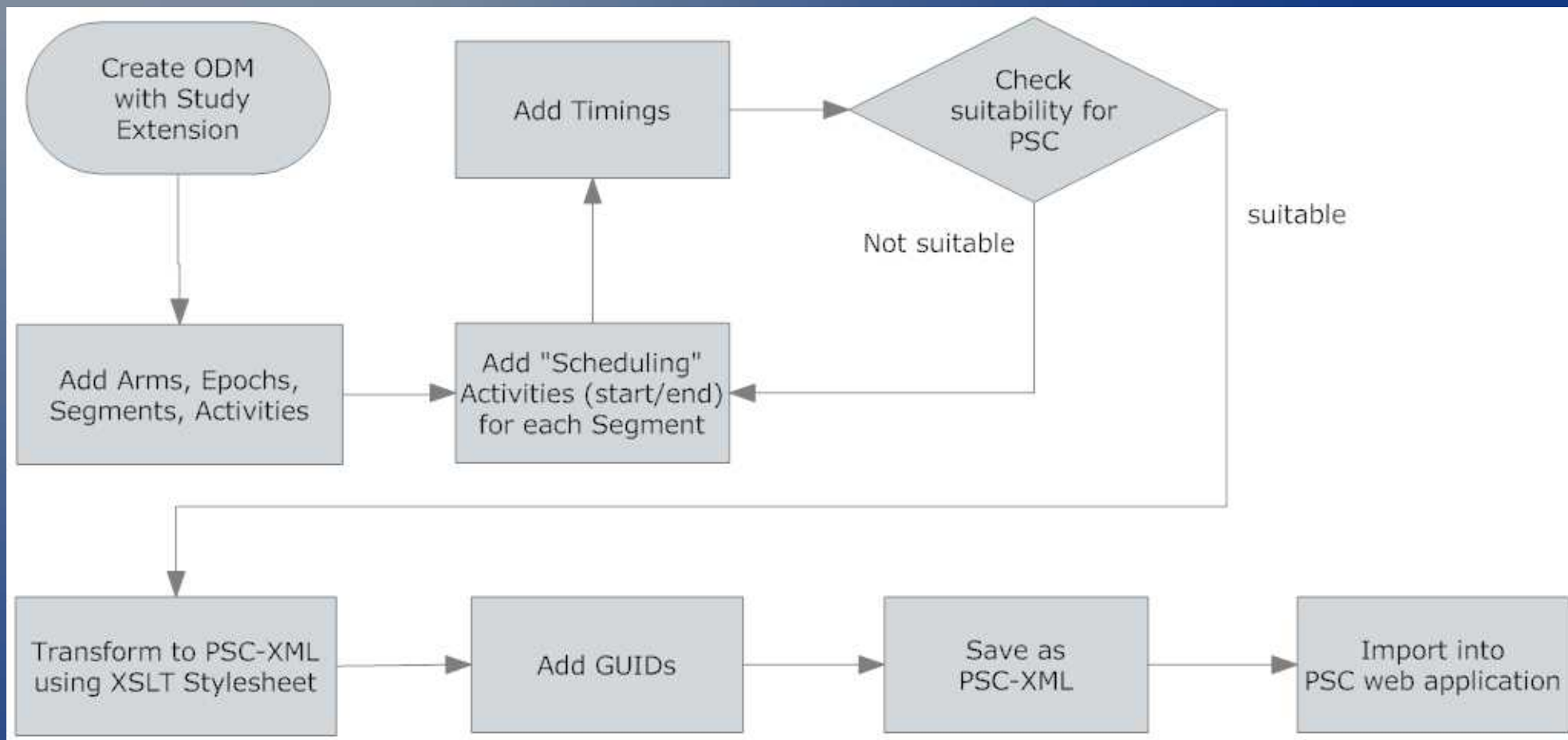


# ODM for PSC import using “scheduling” activities



- Start- and end “scheduling” activity allow to define a segment duration
- All other activities get a timing relative to “start-of-segment” “scheduling” activity

# ODM for PSC import: the process



# Import into PSC: the result

Screening Epoch	Treatment Epoch	Follow-up Epoch
<input type="button" value="Add segment"/> <input type="button" value="Set name"/> <input type="button" value="Delete"/> <input type="button" value="▶"/>	<input type="button" value="◀"/> <input type="button" value="Add segment"/> <input type="button" value="Set name"/> <input type="button" value="Delete"/> <input type="button" value="▶"/>	<input type="button" value="◀"/> <input type="button" value="Add segment"/> <input type="button" value="Set name"/> <input type="button" value="Delete"/>
Screening Segment <input type="button" value="Set name"/> <input type="button" value="Delete"/> ▼	Treatment Segment <input type="button" value="Set name"/> <input type="button" value="Delete"/> ▼	Follow-up Segment
Enrollment Segment ▲ <input type="button" value="Set name"/> <input type="button" value="Delete"/>	Treatment Segment ▲ <input type="button" value="Set name"/> <input type="button" value="Delete"/> ▼	
	Treatment Segment ▲ <input type="button" value="Set name"/> <input type="button" value="Delete"/>	

psCalendar [Dashboard](#) [Calendars](#) [Activities](#) [Adminis](#)

Tasks: [Existing templates](#) [New template](#)

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### Import Template

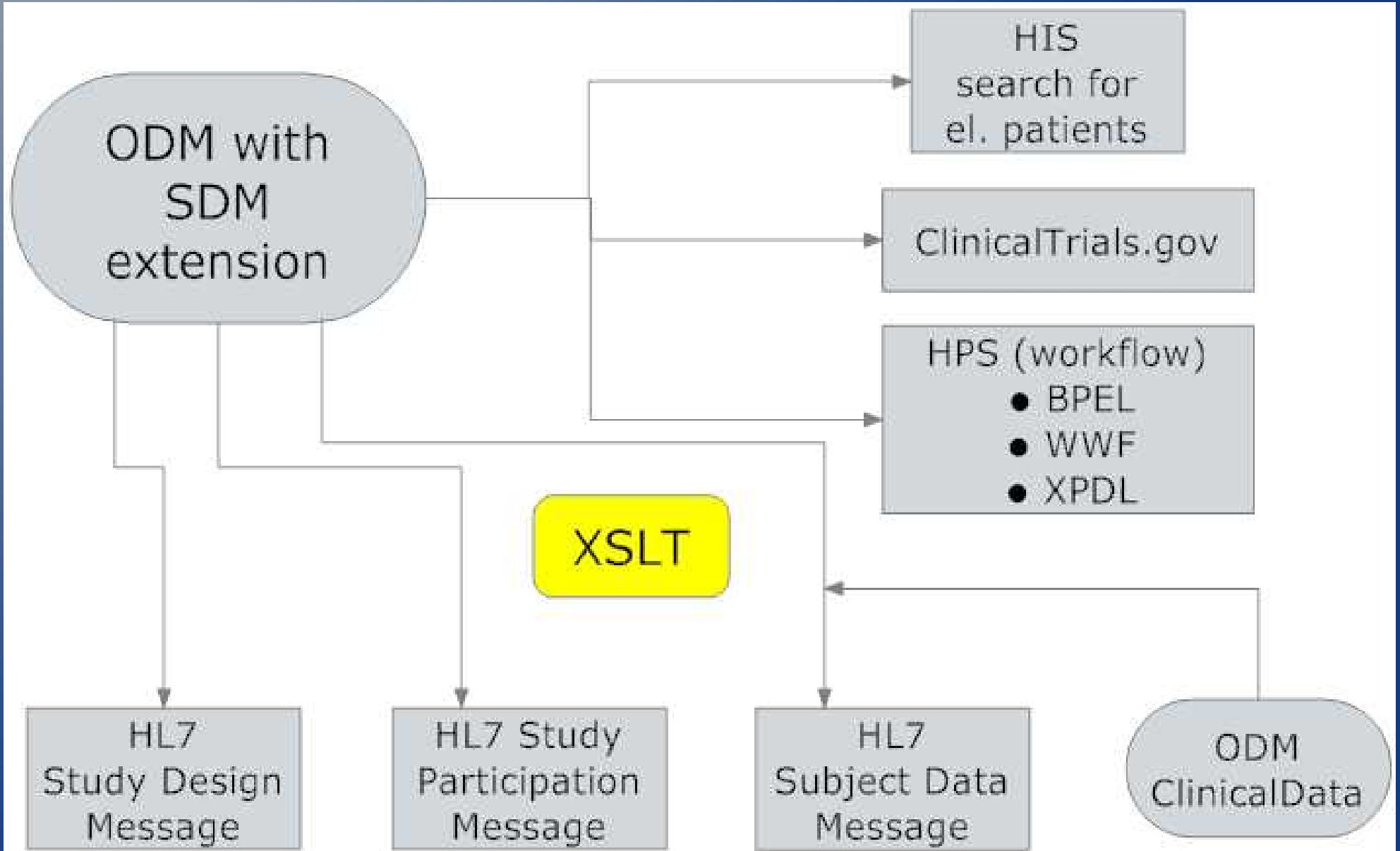
Template File (xml):

### Treatment Epoch: Treatment Segment

Cycle length  days

Day	1	2	3	4	5	6	7
<input type="button" value="Edit"/> <b>single period</b>	x	x	x				
	-	-	-				
Day 2		<a href="#">Premedication Activity</a>					
Day 3			<a href="#">Medication Activity</a>				
Day 4				<a href="#">Medication Efficacy Test</a>			

# The (bright) future



# Tools used

- XML4Pharma ODM StudyDesigner R2010
  - Extended for ODM-SDM (prototype)
  - Extended for PSC-XML generation

[www.xml4pharma.com/CDISC\\_Products/ODMDesigner.html](http://www.xml4pharma.com/CDISC_Products/ODMDesigner.html)

- CaBIG Patient Study Calendar v.2.6  
<https://cabig.nci.nih.gov/tools/PatientStudyCalendar>

# Conclusions

- The (prototype) ODM extension for trial design is in pretty good shape
- Some improvements still need to be made
- Some extra testing is necessary
- Allows to generate a caBIG Patient Study Calendar
  - But only when a strict procedure is followed

# Conclusions

- PRM is the basis for the ODM-extension
- PRM is a “domain analysis model” (DAM)
  - Not an implementation model
- Different implementations of PRM are not necessarily interoperable !
  - DAM allows different interpretations
  - DAM does not contain any “how to”
- Transformations possible for
  - Subject search systems, Workflow engines
  - SDTM, FDA messages, ClinicalTrials.gov, ...