# CDA-CH II: SPECIFICATION FOR CREATING TEMPLATES FOR THE HEALTH LEVEL 7 CLINICAL DOCUMENT ARCHITECTURE

**Based on the HL7 Clinical Document Architecture (CDA), Release 2**

Phase 2, Version 1.2a (approved)

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# Impression

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# Contents

# 1 Management Summary

**Motivation**

With this specification, the HL7 User Group Switzerland intends to reach a further milestone in the implementation of the eHealth Strategy Switzerland. Using standardized document content for the initial forms, numerous reusable templates and related Schematron rules, which permit the automated validation of CDA document contents, the CDA-CH Specification on which they are based is being extended by effective elements.

**Objectives and delineation**

The Working Group has developed and generated these results from concrete use cases. Using CDA documents, key processes such as the exchange of medication and emergency case data or accident insurance forms can be significantly improved in terms of interoperability. Figure 1 on page 8 shows how individual components from different use cases can be summarized into common templates.

**Normative part of the specification**

The normative specification is based on proven international standards and norms such as HL7 V3, Clinical Document Architecture, IHE Patient Care Coordination and Schematron (rule-based XML validation). Consequently it is cross-border compatible.

This specification defines how CDA templates, which are based on CDA-CH, must be implemented. Specified in particular is that Schematron rules must be available for every CDA template and how these are to be implemented.

Observing this specification means that the automated validation of CDA documents can be executed by the software developers according to identical rules. Consequently, responsibility for the rules set lies with the publisher of the respective CDA template and not with the various software developers who integrate such templates into their systems.

**Case study „rear-end collision“**

Based on the case study of an accident involving a ”rear-end collision“, a model process is shown, based on which an exchange of available CDA templates is demonstrated. The HL7 CDA sample documents and the matching Schematron rules are publicly and readily accessible in the SVN Repository of the HL7 User Group Switzerland.

**Supporting material**

A Schematron Tutorial, plus a number of references to Schematron Best Practices (incl. Ant Task and C# Source Code), and an introduction to the IHE Profile Patient Care Coordination (PCC) complement this documentation.

# 2 Introduction

## 2.1 Motivation and principles

The HL7 User Group Switzerland is actively participating in the national efforts relating to the ”eHealth“ Switzerland strategy, which was approved by the Federal Council in the summer of 2007. The ”eHealth“ Switzerland strategy incorporates a number of objectives which, from our perspective, can be efficiently, sustainably and internationally realized by applying the principles of HL7. In August 2009, the initial recommendations on standards & architecture were published by eHealthSuisse. These standardization recommendations relate primarily to technical interoperability within the framework of process-oriented use cases based on the IHE Initiative. They generated important impetus for the ongoing effort in accordance with the overall ”eHealth“ Switzerland strategy, thereby promoting the exchange of treatment-relevant data from personal medical records.

With this specification, the HL7 User Group Switzerland is intent on reaching another milestone towards achieving the above objective. The participating stakeholders have defined use cases from everyday life, the electronic implementation of which eliminates numerous disruptions, leading to greater efficiency and enhanced patient safety. The project plan is based on an iterative project procedure model. The current project planning relates to preparatory work and experience gained from the project ”CDA-CH Specification for the Electronic Exchange of Medical Documents in Switzerland“ carried out by the same working group. All generated specifications are based on the HL7 Standard, Version 3 and use the HL7 Basic Technologies Reference Information Model (RIM) and Clinical Document Architecture (CDA R2), whereby the basis for semantic interoperability is ensured.

## 2.2 Status and purpose of this document

This document contains the authorized, official and final text that was approved by the working group on 17/08/2010. The results of the consultation process were discussed by the working group and incorporated into the specification as far as possible.

The HL7 User Group Switzerland will apply to the eCH Association to have the normative part of the document (Section 5) approved as a Standard (eCH-0121). As soon as eCH approval is obtained, the specification will be recommended to the e-Health Coordination Confederation-Cantons for implementation within the framework of the eHealth Strategy Switzerland.

This document contains a further specification which is intended to expand the electronic exchange of medical records in Switzerland, based on application of the HL7 Clinical Document Architecture.

In this second phase, the document complements the basic infrastructure with a number of key standards.

## 2.3 Target readership

The target readership for this specification includes software developers, consultants and decision makers in equal measure. However, depending on their specific functions, not every reader wishes to receive the same information. Therefore, we have attempted to facilitate the selection process with the following indications:

Decision makers will be primarily involved with the contents of Sections "1 Management Summary" on page 5, "3 Objectives and Delineations" on page 7 and “7 Case study “Rear-End Collision”” on page 23.

Consultants will find important information relating to their assignments in the following Section: “3 Objectives and delineations” on page 7, “6 Recommendations” on page 22, “7 Case study “Rear-End Collision” on page 23, “8 Schematron Tutorial” on page 40 and “10 Introduction to IHE Patient Care Coordination (PCC)” on page 50.

Given their technical tasking, software developers will focus essentially on the specification itself and the supporting documentation in the following Sections: “5 Specification (normative)” on page 11, “9 Schematron Best Practices” on page 46 and “11 Supporting Documents” on page 54.

# 3 Objectives and delineations

Fundamentally, the same considerations on objectives and delineations apply as in the document „CDA-CH: SPECIFICATION ON ELECTRONIC EXCHANGE OF MEDICAL RECORDS IN SWITZERLAND„ dated 1st April 2008. This present document is complementary, i.e. a further reaching publication aimed at improving interoperability within the Swiss public health system using [CDA-CH] documents.

Projects depend on and progress through realistic use cases. The working group derived and generated the present results from concrete case studies. In terms of interoperability, it is possible to significantly improve key processes such as the exchange of medication and emergency case data or accident insurance forms using CDA documents.

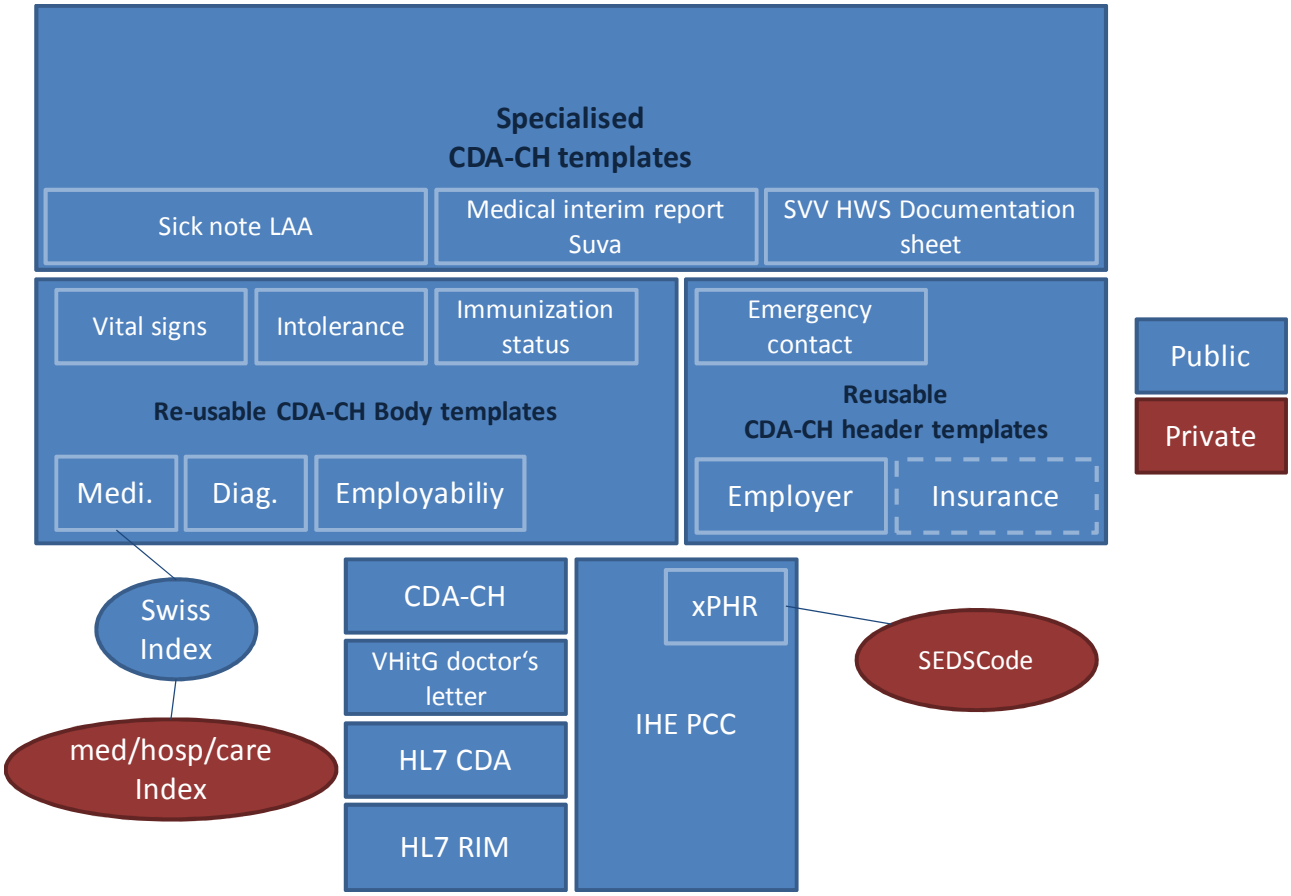


*Figure 1: CDA-CH components, Phase II*

The illustration shows which elements are of general interest (blue) and those which are not to be addressed or specified within the project (red). The upper section lists the key documents types of the accident insurer (certificate of disability, interim medical report and whiplash injury accident report), the lower left section shows those of a data provider offering the master data for prescribing the medication, and at the right, the domain of an emergency contact who depends of the emergency data from an xPHR (lower right). The bases for all these considerations are the HL7 RIM (Reference Information Model) and the HL7 CDA (Clinical Document Architecture). This served the VHitG (Association of Manufacturers of IT Solutions for the Public Health Service in Germany) as a basis for designing a CDA medical certificate, which in turn, was the model for the already generated Swiss [CDA-CH] documents. Those documents form the basis for these newly developed document types.

In Section “7 Case study “rear-end collision”” on page 23, a fictional storyboard was developed which, inter alia, contains the CDA-CH documents to be defined here. Even though the documents defined here only contain selected specific process steps of the use case, the “overal entirety” has to be taken into consideration. The aim is to ensure exchange of data without corss-sector media disruption along the patient pathway.

The scope of the specification of the [CDA-CH] documents to be generated here is delineated as follows:

- CDA Header fulfils interoperability level 4 (structured reports, standardized content)
- CDA Body fulfils interoperability level 4 (structured reports, standardized content)

# 4 Formal provisions

## 4.1 Structure of this specification

The specification is pursuant to the following objectives and is structured accordingly:

1. Illustration of the current environment and the selected principles and basic technologies.
   This information is to be found primarily in [CDA-CH] and in Section "3 Objectives and Delineations" on page 8. The principles have been consciously assigned to the Appendix (from Section 8 onwards) because their description will only be of interest to those readers for whom these issues are new.
2. Reference to basic concepts
   From Section "8 Schematron Tutorial" on page 41 (Schematron, [CDA-CH] and IHE PCC)
3. Giving recommendations
   See Section "6 Recommendations" on page 23
4. Description of use cases with concrete indications on implementation
   See Section "7 Case study “Rear-End Collision" on page 24 and "11 Supporting Documents" on page 55.

## 4.2 Notation

In this document, the following abbreviated notations and visual orientation aids have been used:

| Notation | Relevance | Example |
|---|---|---|
| XXXX | Alphanumerical placeholder | |
| N/A | Not available | |
| [XXXX] | Indication of referenced documents | [VHitG Arztbrief] |
| <XXXX> | CDA Regulation designation according to German [VHitG Medical Report] | <TURS> |
| <CH-XXXX> | Designation of additional, Swiss CDA Regulations | <CH-TELC> |

*Table 1: Notations in this document*

## 4.3 Reference to eCH standards

### 4.3.1 eCH-0089

The normative section of the [CDA-CH] specification was standardized via the standardization process of eCH (E-Government Standards) and published under the eCH number eCH-0089.

### 4.3.2 eCH-0121

The normative section of the present specification is to be found in the standardization process of eCH (E-Government Standards). The content of eCH-0121 is essentially equivalent to section "5 Specification (normative)" starting on page 12.

## 4.4 Translations

This version of the document is available in German, French, Italian and English.

## 4.5 Disclaimer

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HL7 Inc. has no entitlement to implementation descriptions such as this present document. The HL7 User Group Switzerland is also free to publish it on the Internet, provided no extracts from the CDA Standard document are published within it.

Equally, some content is based on IHE integration profiles which are publicly and freely accessible. The intellectual property rights of these integration profiles are held by IHE International (see http://www.ihe.net/governance/patent_disclosure.cfm).

# 5 Specification (normative)

The section covers the effective and normative specification. This specification is limited to documenting concrete implementation indications, field contents and supplements, based in order of priority on the following fundamentals:

1. HL7 Version 3
   http://www.hl7.org/implement/standards/v3messages.cfm

2. HL7 Clinical Document Architecture, Release 2.0
   http://www.hl7.org/implement/standards/cda.cfm

3. VHitG Medical Report Doctor's Letter V1.5
   http://download.vhitg.de/Leitfaden-VHitG-Arztbrief-v150.pdf

4. Specification [CDA-CH]
   http://www.hl7.ch/fileadmin/docs/CDA-CH_V1.2.zip

5. IHE Patient Care Coordination Technical Framework
   http://www.ihe.net/Technical_Framework/index.cfm#PCC

6. IHE PHR Extract and PHR Update Specification
   http://wiki.ihe.net/index.php?title=1.3.6.1.4.1.19376.1.5.3.1.1.5
   http://wiki.ihe.net/index.php?title=1.3.6.1.4.1.19376.1.5.3.1.1.6

Implementation of the Schematron Rules is based on ISO Schematron:
http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=40833

## 5.1 General

A CDA document is a defined and complete information object that can contain texts, images and other multimedia objects. CDA documents related to a patient and comprise administrative (Header) and medical (Body) data. They are coded in the eXtensible Markup Language (XML).

Fundamentally, the data from the specification [CDA-CH] apply. CDA-CH only generated templates for the CDA Header and largely leaves the configuration of the CDA Body open. This present specification was drawn up to allow dedicated CDA templates (Schematron rules set) for various applications (e.g. hospital discharge reports, X-ray diagnosis, …) to be generated without software developers having to program individual validation routines for every single template.

This specification defines how CDA templates based on CDA-CH must be created and implemented. It specifies in particular that, for every CDA template, Schematron rules must be available and, how these are to be implemented.

Adhering to this specification ensures that the automated validation of CDA templates can be executed by the software developers using the same rules. Hence, responsibility for the rules set lies with the issuer of a CDA template and not with the various software developers who will integrate such templates into their systems.

## 5.2 CDA structure

The document structure must validate against the XML schematic CDA.xsd from the Supporting Documents (see Section "11 Supporting Documents" on page 55). The document has the following XML structure (example from an IHE XPHR update):

```
<?xml version="1.0" encoding="UTF-8"?>
<?xml-stylesheet type="text/xsl" href="vhitg-cda-v3.xsl"?>
<ClinicalDocument
         xmlns="urn:hl7-org:v3"
         xmlns:voc="urn:hl7-org:v3/voc"
         xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
         xsi:schemaLocation="urn:hl7-org:v3 CDA.xsd">

  <!--
  ********************************************************
   CDA Header
  ********************************************************
  -->
  <component>
    <structuredBody>
      <!--
      ********************************************************
       CDA Body contains several sections
      ********************************************************
      -->
      <component>
        <section>
          <title>Titel</title>
          <text>
            <!--
            ************************************************************
             free text per PHR element (mandatory in each CDA document)
            ************************************************************
            -->
          </text>
          <entry>
            <substanceAdministration>
              <!--
              ************************************************************
               structured information per PHR element
              ************************************************************
              -->
            </substanceAdministration>
          </entry>
        </section>
      </component>
    </structuredBody>
  </component>
</ClinicalDocument>
```

### 5.2.1 General rules

| Rule | Description | References |
|---|---|---|
| **<CH-SCHT1>** | A set of Schematron rules must be provided together with each standardized CDA Body template. | Decision of HL7 Working Group xEPR on 14/10/2009 |
| **<CH-SVN>** | The Schematron rules must conform to Section „5.5 Schematron rules“ on page 16 of this specification and be deposited in the dedicated SourceForge Repository (hereafter SVN) for publicly and freely available dissemination by the HL7 User Group Switzerland. The SVN Repository is managed by the HL7 User Group Switzerland. The Technical Committee of the HL7 User Group Switzerland is responsible for the content of the Repository. The issuer of a CDA template does not have any write authorisation within the SVN Repository.<br>SVN Repository: https://hl7ch.svn.sourceforge.net/svnroot/hl7ch<br>SourceForge Project: http://www.sourceforge.com/projects/hl7ch | Decision HL7 Working Group xEPR on 29/03/2010 |
| **<CH-VERS>** | Versioning the Schematron rules is the responsibility of the issuer of a CDA template. Stating one each main and sub-version per file in the form of a natural number (major.minor) is permissible. Example: 2.11<br>Revision numbers are assigned by the SVN Repository. | |
| **<CH-CONTI>** | HL7 CDA document template (Templates; Schematron rules set) must be implemented backward compatible.<br>Disruptions in backward compatibility must be avoided wherever possible. If a disruption in backward compatibility is unavoidable, this is only permissible in the new major version. | |
| **<CH-META>** | The issuer of a CDA template must state the Schematron rules with a main and sub-category.<br>These inputs are needed to initialize the tree structure in the SVN Repository and may not contain more than 20 characters. Special characters _ and – are permissible. Spaces are not permitted.<br>The information must be explicit within the specific branch of the SVN Repository. In the event of disputes, the Executive Board of the HL7 User Group Switzerland or its nominated appointee has the final word.<br>Examples:<br>• Company\Product<br>• Project\Form | |
| **<CH-PATH>** | If reusable entities are referenced in the Schematron files, the path indication must be declared via relative paths and conform to the directory structure in the SVN Repository. | |

| | | |
|---|---|---|
| **<CH-TREE>** | Initialization of the tree structure in the SVN Repository takes place as follows:<br>\Schematron\Main-category\Sub-category\Version\<br>Below this category, issuers of CDA templates are free to define sub-directories as they wish.<br>Examples:<br>\HL7.ch\CDA-CH\v1.2\cda-ch.sch<br>\VHitG\Arztbrief\v1.5\vhitg-ruleset.sch<br>\IHE\PCC\v5.0\xphrExtract.sch<br>\IHE\PCC\v5.0\templates\1.3.6.1.4.1.19376.1.5.3.1.1.5.3.1.ent | |
| **<CH-SMEEX>** | CDA Body elements (as soon as available) should be expanded with SMEEX identifiers to allow transformation between HL7 CDA documents and SMEEX data containers in both directions. The required Schematron rules will be provided by SMEEX.<br>SMEEX identifiers are filed as template IDs in the CDA Body. If individual values have to be translated according to Smeex, use the translation element.<br>Entry:<br>`<entry>`<br>`  <observation typeCode='OBS' moodCode='EVN'>`<br>`  <!– Platzhalter für div. IHE und SEDS Template IDs -->`<br>`  <!-- smeex Template ID for blood group -->`<br>`  <templateId root="2.16.756.5.30.1.106.100" extension="ASmeexId"/>`<br>`  <code code='882-1' displayName='ABO+RH GROUP' codeSystem='2.16.840.1.113883.6.1' codeSystemName='LOINC'/>`<br>`  <statusCode code='completed'/>`<br>`  <effectiveTime value='20091127'/>`<br>`  <!– structured information blood group -->`<br>`  <value xsi:type='CE' code='ICD10:D50-D77_BA' displayName='A' codeSystem='2.16.756.5.30.2.7.2' codeSystemName='SEDS Code' codeSystemVersion='v2.0'>`<br>`  <!-- smeex translation for blood group -->`<br>`  <translation codeSystem='2.16.756.5.30.1.106.100' code='ASmeexId' />`<br>`  </value>`<br>`  <!– structured information rhesus -->`<br>`  <value xsi:type='CE' code='ICD10:D50-D77_RP' displayName='A' codeSystem='2.16.756.5.30.2.7.2' codeSystemName=' SEDS Code ' codeSystemVersion='v2.0'>`<br>`  <!-- smeex translation for rhesus factor -->`<br>`  <translation codeSystem='2.16.756.5.30.1.106.100' code='ASmeexId' />`<br>`  </value>`<br>`  </observation>`<br>`</entry>` | www.smeex.ch |

## 5.3 CDA header

Declaration of the Header Elements in CDA documents is done as specified in [CDA-CH].

## 5.4 CDA body

Structuring of the CDA Body is in accordance with [CDA-CH] and is not defined in greater detail in this specification. The CDA Body Sections are oriented towards the requirements of the corresponding documents and are therefore primarily defined by the issuers of CDA templates.

Issuers of CDA templates are required to observe the following rules:

| Rule | Description | References |
|---|---|---|
| **<CH-REUSE>** | Existing HL7 CDA document templates (Body Section templates in particular) are reusable. Each new template for similar content should use existing HL7 CDA Body Section templates (see rule <CH-SVN> of SVN Repository in Section "5.2.1 General RulesGeneral rules" on page 14).<br>Issuers of CDA templates should generate Body Section templates in such a way that these can be reused in other HL7 CDA Document templates.<br>If specific requirements cannot be realised using existing HL7 CDA Body Section templates, an extension (new version) or a derivative (new template, exploiting the already existing functionality as far as possible) can be created. | |

The HL7 User Group Switzerland retains the right to reject contents that are not in conformance with the specifications of the standard or the spirit of existing templates.

## 5.5 Schematron rules

For each template based on [CDA-CH], a corresponding set of Schematron files must be available. This Section describes the parameters that must be observed in this regard.

### 5.5.1 Files and directory structure

In order to submit HL7 CDA document templates (templates; set of Schematron rules) as a standardization proposal, the provisions for the directory structure according to rule <CH-TREE> in Section "5.2.1 General rules" on page 14 must be observed.

The following files are to be submitted with a Schematron rule set:

| File | Content |
|---|---|
| **Main-category\Sub-category** | Contains the project-specific rule files and vocabulary XML files. |
| **Main-category\Sub-category\readme.txt** | Contains information on the version and status of the Supporting Documents |
| **Main-category\Sub-category\samples** | Contains CDA samples (XML sample files) and possibly referenced and supporting documents. |
| **Main-category\Sub-category\stylesheets** | Contains project-specific style sheets, CSS details, logos and possible other referenced resources needed for rendering. |

Following Schematron rule sets are administered and made available by the HL7 User Group Switzerland:

| File | Content |
|---|---|
| \HL7\CDA\v2.0\schemas\CDA.xsd | Access schematic for CDA documents, refers to POCD_MT000040.xsd |
| \HL7\CDA\v2.0\schemas\POCD_MT000040.xsd | Contains the Header and Body schematics (CDA Release 2) and refers to the core schematics. |
| \HL7\CDA\v2.0\schemas\coreschemas | Contains general HL7 V3 schematics such as data type definition, vocabularies and definitions for the narrative text portion. |
| \HL7.ch\CDA-CH\v1.2 | cda-ch.ent is the Schematron master file against which all HL7 CDA document templates based on [CDA-CH] must be validated.<br>Also included are the individual, reusable Schematron rules, as well as all necessary vocabulary tables. |
| \HL7.ch\CDA-CH\stylesheets | Sample style sheet, and CSS that can be used to visualise a CDA documents, plus a style sheet with which the documentation can be generated from the Schematron rules. |
| \VHitG\Arztbrief\v1.5 | vhitg-ruleset.sch is the Schematron master file for the English doctor's letter, against which all HL7 CDA document templates based on [CDA-CH] must be validated. Also included are the individual, reusable Schematron rules (vhitg-ruleset.ent),as well as all necessary vocabulary tables (vhitg-ruleset-voc.xml). |
| \IHE\misc\v5.0\ | ihe-voc.xml contains the vocabulary that can be used across several IHE domains. Other generally valid IHE rules can be filed here. |
| \IHE\<Technical Framework>\<Version> | Reusable IHE Schematron rules are filed under a corresponding profile directory. This also contains all necessary vocabulary tables.<br>Sample: \IHE\PCC\v5.0 |

## 5.6 General Schematron rules

| Rule | Description |
|---|---|
| **<CH-SCHHE> Namespace and Schematron Version** | Schematron rules must be based on ISO Schematron and support xhtml. The Namespace in the Master Schematron must read as follows:<br>`<schema xmlns='http://purl.oclc.org/dsdl/schematron' xmlns:xhtml="http://www.w3.org/1999/xhtml">`<br>Currently, the necessary ISO Schematron files can be accessed at:<br>http://www.schematron.com/tmp/iso-schematron-xslt1.zip<br>(Release Candidate dated 18/05/2009) |
| **<CH-SCHFE> File endings** | .sch = Schematron Master<br>.ent = Schematron Entity (reusable in several .sch)<br>.xml = Schematron Vocabulary (vocabulary tables for Schematron entities) or sample letters as CDA documents |
| **<CH-SCHUTF8> Coding in utf-8** | All files and Schematron rules are saved in utf-8 format.<br>The .xml and .sch files are preceded by the appropriate declaration:<br>**<?xml version='1.0' encoding='utf-8'?>** |

| | |
|---|---|
| **<CH-SCHMAR> Schematron Master without rules** | Schematron master files do not contain any rules. They only include references to the Schematron Entities used.<br>For entity name assignment, the file name including the path should be used (beginning with 'ent-' and replacing from / or \ with -).<br>Beispiel:<br><!ENTITY ent-Demo SYSTEM '../schematrons/demo.ent'> |
| **<CH-SCHMAD> Schematron Master Documentation** | A title must be given for each Schematron master document, plus a list of the referenced entity files.<br>The title must be assigned as **xhtml:h1** and is set as a title by the attribute 'class'. The attribute 'lang' can also be used to define the language of the title.<br>Listing the entities is started with an **xhtml:h2** element and set to 'reference' with the attribute 'class'. Listing the individual elements follows in a list which is indicated with the attribute 'id' reference.<br>The entity filename must then be stated for each list element.<br><br>Sample: |

```
<schema xmlns='http://purl.oclc.org/dsdl/schematron'
          xmlns:xhtml="http://www.w3.org/1999/xhtml">
  <xhtml:h1 class="title" lang="de_ch">demo de</xhtml:h1>
  <xhtml:h1 class="title" lang="fr_ch">demo fr</xhtml:h1>
  <xhtml:h1 class="title" lang="it_ch">demo it</xhtml:h1>
  <xhtml:h1 class="title" lang="en">demo en</xhtml:h1>
  <ns  prefix='cda' uri='urn:hl7-org:v3'/>
  <ns  prefix='sdtc' uri='urn:hl7-org:sdtc'/>
  <ns  prefix='xsi'
       uri='http://www.w3.org/2001/XMLSchema-instance'/>
  <!-- documentation of external references -->
  <xhtml:h2 class="reference" lang="de_ch">
    Referenzierte Entities
  </xhtml:h2>
  <xhtml:h2 class="reference" lang="fr_ch">
    Entités référencées
  </xhtml:h2>
  <xhtml:h2 class="reference" lang="it_ch">
    Entities referenziate
  </xhtml:h2>
  <xhtml:h2 class="reference" lang="en">
    Referenced entities
  </xhtml:h2>
  <xhtml:ul id="reference">
    <xhtml:li>demo.ent</xhtml:li>
    <xhtml:li>
      cda-ch-1.2_medication-section.ent
    </xhtml:li>
    <xhtml:li>cda-ch.ent</xhtml:li>
    <xhtml:li>vhitg-ruleset.ent</xhtml:li>
  </xhtml:ul>
…
</schema>
```

| | |
|---|---|
| **<CH-SCHEND> Schematron Entity Documentation** | In the Header, a list that is identified by a distinct id attribute is expected for each entity file. Within each list, the file name with its version is expected, invariably identified by the attribute 'class'.<br>Sample:<br>`<xhtml:ul id="entity_demo">`<br>`  <xhtml:li class="filename">demo.ent</xhtml:li>`<br>`  <xhtml:li class="version">1.0</xhtml:li>`<br>`</xhtml:ul>` |
| **<CH-SCHRUD> Schematron Rule Documentation** | Per Schematron Rule, a rule title with the xhtml:h3 element must be assigned, including the 'lang' attribute indicating the language of the title. Subsequent xhtml elements appear within the documentation.<br>Each Assert must be assigned a dedicated 'id' (proposal: sequential number with Entity ID as a basis).<br>The error message per rule must be denoted in the assertion with the xhtml:p element. The attribute 'lang' identifies the language in which the error message is formulated.<br>Sample:<br>`<rule context='cda:ClinicalDocument'>`<br>`  <xhtml:h3 lang="de_ch">Header prüfen</xhtml:h3>`<br>`  <xhtml:h3 lang="fr_ch">Vérifier header</xhtml:h3>`<br>`  <xhtml:h3 lang="it_ch">Controllare header</xhtml:h3>`<br>`  <xhtml:h3 lang="en">Verify header</xhtml:h3>`<br>`  <xhtml:p lang="de_ch">`<br>`  Dieser Text erscheint nur in der Dokumentation`<br>`  </xhtml:p>`<br>`  <xhtml:p lang="fr_ch">`<br>`  Ce texte ne s'affiche que dans la documentation`<br>`  </xhtml:p>`<br>`  <xhtml:p lang="it_ch">`<br>`  Questo testo appare solo nella documentazione`<br>`  </xhtml:p>`<br>`  <xhtml:p lang="en">`<br>`  This text does only appear in the documentation`<br>`  </xhtml:p>`<br>`  <asserttest='//cda:templateId/@root="2.16…"'`<br>`  id="entity_demo_001">`<br>`  <xhtml:p lang="de_ch">Fehlermeldung</xhtml:p>`<br>`  <xhtml:p lang="fr_ch">Message d'erreur</xhtml:p>`<br>`  <xhtml:p lang="it_ch">Message d'erreur</xhtml:p>`<br>`  <xhtml:p lang="en">Messaggio di errore</xhtml:p>`<br>`  </assert>`<br>`</rule>` |

| | |
|---|---|
| **<CH-SCHROL> Error or other information** | The 'assert' attribute ‚role' is to be used for automated case differentiation, i.e. whether a failed assert is an error, a warning, an information or debug message. The following texts must be used exclusively (observe upper/lower case usage):<br>**error:** error<br>**warning:** warning<br>**information:** information<br>**debug:** test information for developers<br><br>If the 'role' attribute is omitted, a failed assert will be interpreted as an error.<br>In the event of an error, the CDA document is invalid and cannot be processed. In other cases, the CDA document is valid (in the case of warnings with the corresponding provisos). |
| **<CH-SCHDIR> Referrals to .ent and .xml** | Based on experience to date with the Java and .Net environments, the following definition has been selected: the execution directory with validators (in .Net: Environment.CurrentDirectory) must be assigned to the path of the Master Schematrons. All referenced files must be located from this execution directory via relative path indications.<br>Sample:<br>1. c:\temp\schematrontests\project_test\project_schematrons\test_master.sch refers to test.ent in the same directory.<br>2. test_master.sch also refers to c:\temp\schematrontests\ schematrons\hl7\vhitg-ruleset.sch<br>3. vhitg-ruleset.ent in turn refers to c:\temp\schematrontests\ schematrons\hl7\vhitg-ruleset-voc.xml<br>Hence, the execution directory is:<br>c:\temp\schematrontests\project_test\project_schematrons<br><br>**test_master.sch** therefore contains the following entries:<br>`<!ENTITY ent-hl7-vhitg-ruleset-150 SYSTEM '../../schematrons/hl7/vhitg-ruleset.ent'>`<br>`<!ENTITY ent-test SYSTEM 'test.ent'>`<br><br>**vhitg-ruleset.ent** contains:<br>`<assert test="substring(@code,1,2) = document('../../schematrons/hl7/vhitg-ruleset-voc.xml')/systems/system[@codeSystemName='ISO639-1']/code/@value">` |

### 5.6.1 Example Schematron rule

The following example (extract from the Medication Template) shows how the Schematron rules should be implemented and documented:

```
<?xml version='1.0' encoding='utf-8'?>
<!--
************************************************************
Medikamentenliste
************************************************************
-->
<pattern>
   <!-- Entity Information -->
   <xhtml:ul id="cda-ch_medication-section">
      <xhtml:li class="filename">cda-ch_medication-section.ent</xhtml:li>
      <xhtml:li class="version">1.2</xhtml:li>
   </xhtml:ul>
   <rule context="*[cda:templateId/@root=&quot;2.16.756.5.30.1.1.1.1.1&quot; and
      cda:templateId/@extension=&quot;CDA-CH.Body.MediList&quot;]">
      <!-- Rule Documentation -->
      <xhtml:h3 lang="de_ch">CDA-CH Medication Section</xhtml:h3>
      <xhtml:p lang="de_ch">Die nachfolgenden Regeln beschreiben die Prüfungen zu den CDA-CH
         Medication Section Templates</xhtml:p>
      <xhtml:h3 lang="fr_ch">CDA-CH Medication Section</xhtml:h3>
      <xhtml:p lang="fr_ch">Les règles suivantes décrivent les contrôles effectués sur les CDA-CH
         Medication Section Templates</xhtml:p>
      <xhtml:h3 lang='it_ch'>CDA-CH Medication Section</xhtml:h3>
      <xhtml:p lang='it_ch'>Le regole seguenti descrivono i controlli per i CDA-CH
         Medication Section Templates</xhtml:p>
      <xhtml:h3 lang='en'>CDA-CH Medication Section</xhtml:h3>
      <xhtml:p lang='en'>The following rules describe the tests on the CDA-CH
         Medication Section Templates</xhtml:p>

      <assert id="cda-ch_medication-section-0101" test="self::cda:section">
         <xhtml:p lang="de_ch">Medikationsdaten müssen als 'section' im CDA Body deklariert
            werden</xhtml:p>
         <xhtml:p lang="fr_ch">Les données de médication doivent être déclarées comme 'section'
            dans le CDA Body</xhtml:p>
         <xhtml:p lang='it_ch'>I dati delle medicazioni devono essere dichiarati come 'section'
            nel CDA Body</xhtml:p>
         <xhtml:p lang='en'>Medication data must be declared as 'section' in the
            CDA Body</xhtml:p>
      </assert>

      <assert id="cda-ch_medication-section-0102" test="cda:text">
         <xhtml:p lang="de_ch">Medikationsdaten müssen einen narrativen Text enthalten</xhtml:p>
         <xhtml:p lang="fr_ch">Les données de médication doivent contenir un texte
            narratif</xhtml:p>
         <xhtml:p lang='it_ch'>I dati delle medicazioni devono contenere un testo
            narrativo</xhtml:p>
         <xhtml:p lang='en'>Medication data must contain a narrative text</xhtml:p>
      </assert>

      <assert id="cda-ch_medication-section-0103" test="cda:title">
         <xhtml:p lang="de_ch">Medikationsdaten müssen einen narrativen Titel enthalten</xhtml:p>
         <xhtml:p lang="fr_ch">Les données de médication doivent contenir un titre
            narratif</xhtml:p>
         <xhtml:p lang='it_ch'>I dati delle medicazioni devono contenere un titolo
            narrativo</xhtml:p>
         <xhtml:p lang='en'>Medication data must contain a narrative title</xhtml:p>
      </assert>
   </rule>
</pattern>
```

### 5.6.2 Example Schematron documentation

The following screenshot shows how the embedded Schematron rules documentation is rendered visible via the stylesheet:

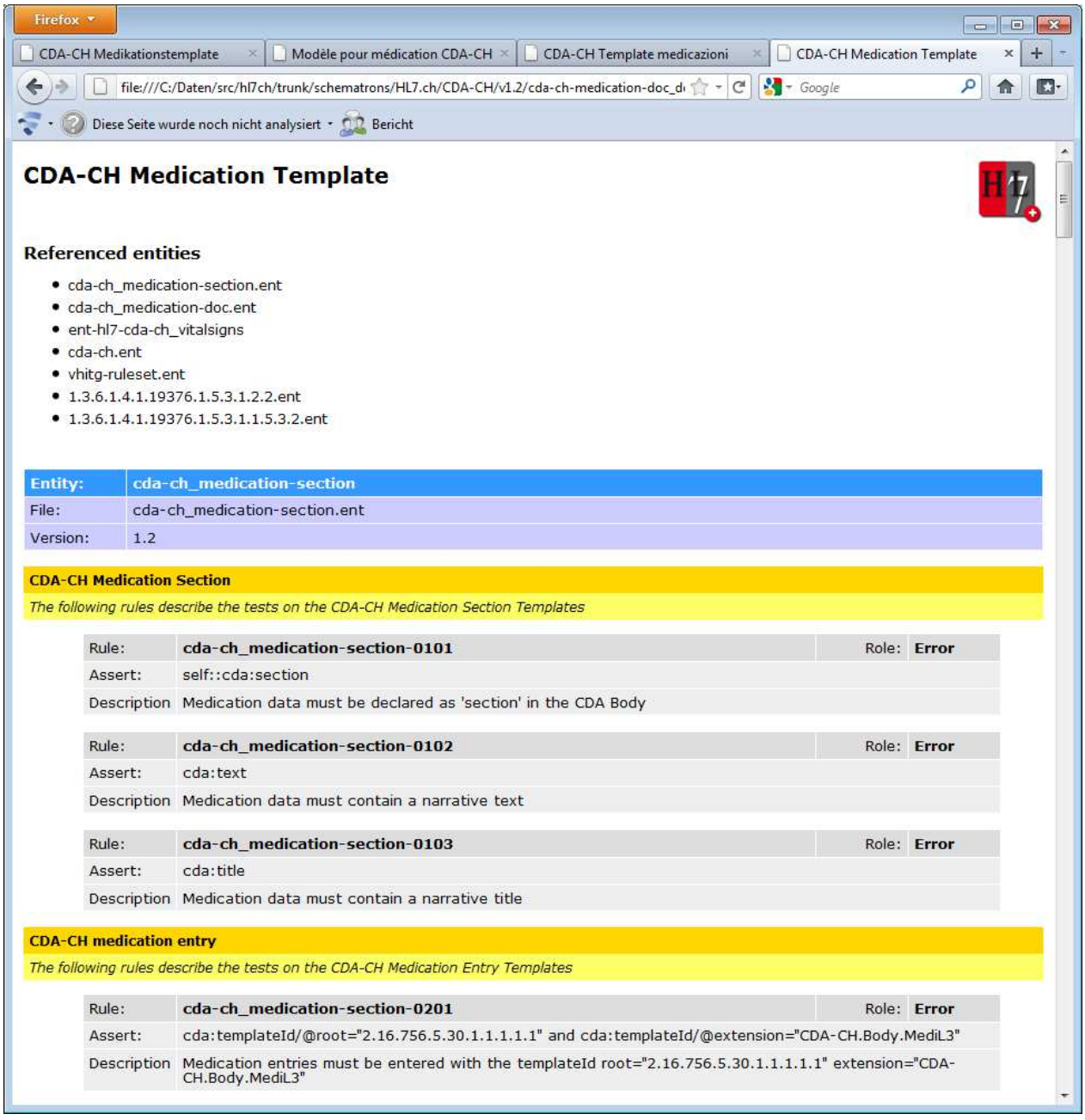



*Figure 2: Sample of Schematron documentation*

# 6 Recommendations

This document takes into account the desire for interoperability by expressly jointly managing the potentially independent specifications of three processes – exchange of medication data, SUVA forms and exchange of data from and into a Personal Health Record. The storyboard of the case study ”rear-end collision“ also addresses this principle.

It is also recommended that, during the implementation of individual specific process steps, never to lose sight of the “overall picture”. Within a given heterogeneous system landscape, this allows an exchange of data without media interruption to be generated along the patient path, involving various service providers, and right up to cost reimbursement.

In future, elements that were hitherto missing in the process chain will be added to complement this present specification.

# 7 Case study “rear-end collision”

## 7.1 Storyboard

| Actors | Function |
|---|---|
| John Doe, 11/06/1948<br>10 suffering avenue<br>9876 Specimentown | Patient |
| Dr Always Ready<br>2 doctors street<br>8888 Sampletown | GP, family doctor of John Doe |
| Dr E. Mergency | Emergency department doctor, Cantonal Hospital |
| Dr A. Orta | Cardiology |
| Ms F. Ile-stack | Case handler at Suva |

### 7.1.1 Accident

01/02/2010, 2.30 p.m.: While driving with a friend, Mr John Doe is suddenly overcome by dizziness, malaise and tachycardia. He brakes, but before he can reach the side of the road the car behind him runs into the rear of his car (rear-end collision).

The rear-end accident is not very violent and the feeling of dizziness has also already started to recede. However, because Mr Doe still feels a nagging pain in the back of his neck, his companion insists that he attends the emergency department of the nearby Cantonal Hospital for examination.

### 7.1.2 Emergency treatment at the hospital

01/02/2010, 3.30 p.m.: The emergency doctor at the Cantonal Hospital, Dr E. Mergency, has John Doe describe the accident to him precisely. As he cannot help but assume that the mechanism of the accident have caused a whiplash injury with a sprain of the cervical spine, he completes the relevant documentation form for the accident insurance during the examination[1].

To be on the safe side he has taken an X-ray of the cervical spine, which shows a slight right convex scoliosis, but fortunately no evidence of injuries in this area. Because of the clinical and radiological findings Dr E. Mergency establishes a provisional diagnosis of a grade 2 sprain of the cervical column under the QTF classification. He treats the moderately severe neck pain with a simple and well tolerated analgesic and a muscle relaxant (paracetamol 1000 mg 3 times daily; tizanidine 4 mg 3 times daily). He also prescribes 6 physiotherapy sessions with the aim of restoring the previous active mobility.

Mr Doe mentions that he has been taking a medication for high blood pressure for some years but cannot remember the name. From the patient’s electronic patient record (PHR)[2] Dr E. Mergency sees that Mr Doe is being treated with the antihypertensive agent Lisinopril HCT 10/12.5 mg daily. It is also apparent that he has a history of hyperthyroidism, in other words thyroid hyperfunction, which up until 6 months ago had been treated with the active substance carbimazole 5 mg once daily.

Mr Doe has not told the duty doctor anything about this, as he sees no connection with the current situation and therefore does not consider it necessary to mention it. Dr Mergency suspects that the dizziness and malaise that resulted in to the rear-end collision were due to a heart rhythm disorder, as occasionally happens in patients with hyperthyroidism.

Although the doctor finds no evidence of this on physical examination, he has an ECG taken, which duly shows normal findings.

[1] Documentation form for the first consultation after whiplash injury
[2] xPHR Extract emergency admission Cant. Hospital

He recommends that Mr Doe visits his family doctor, Dr A. Ready. He sends the latter an outpatient discharge report via the Internet for information[3], in which he describes his suspicions, attaches the ECG and requests further investigation.

Finally, Dr E. Mergency issues an electronic treatment note[4] and a work incapacity note[5] for the attention of Suva, in which he signs the patient off work until his follow-up visit to his family doctor.

### 7.1.3 Consultation with family doctor

03/02/2010: Two days after the car accident Mr Doe visits his family doctor, Dr A. Ready. The pain in his neck is still present and in fact has increased in severity, but it can be controlled to some extent by the analgesic medication prescribed by the hospital.

Dr Ready issues a doctor's note in accordance with AIL stating that the patient is fit for work for 4 hours a day beginning 08/02/2010[6] and sends it to Ms F. Ile-stack at the relevant Suva Agency.

Dr Ready takes a blood sample to test for thyroid hormone levels in the patient's serum.

In view of the previous hyperthyroidism and the episodic tachycardia, Dr Ready considers the possibility of paroxysmal atrial fibrillation and refers Mr Doe to the cardiologist Dr A. Orta for further investigation. As a precaution, he institutes anticoagulation with an acetylsalicylic acid product to prevent a cerebral embolism. This referral is also done electronically[7].

Finally, Dr Ready transfers the examination findings from the Cantonal Hospital, including the assessment of the ECG and the X-ray examination of the cervical spine together with the drug prescriptions, directly from the practice software into the patient's digital patient record in the patient's presence[8].

### 7.1.4 Consultation with cardiologist

11/02/2010: The resting ECG does not need to be repeated by the cardiologist; Mr Doe allows Dr A. Orta to access his digital patient record and to look at the ECG recorded in the Cantonal Hospital that has been saved as a PDF file[9].

Dr Orta then performs a long-term ECG examination (known as an R test) in order to identify any sporadically occurring heart rhythm disorders. In fact, signs of intermittent episodes with a rapid and arrhythmic pulse are found.

Dr Orta establishes the diagnosis of "paroxysmal tachycardiac atrial fibrillation" and prescribes Marcoumar tablets for anticoagulation.

Dr Orta forwards the findings and prescription to Dr Ready electronically[10].

### 7.1.5 Further consultation with family doctor

15/02/2010: Mr Doe visits his family doctor, Dr Ready, again. In the meanwhile the laboratory findings have confirmed the suspicion of another episode of thyroid hyperfunction. This is highly likely to have been the cause of the patient's heart symptoms. Dr Ready informs his patient about the findings that are now available from the consultation with the cardiologist.

The anticoagulation must be continued until the heart rhythm has definitely stabilized and Mr Doe will also be treated with medication for the thyroid hyperfunction (carbimazole tablets). Medication with Dafalgan und Sirdalud tablets will be continued.

These prescriptions are transferred to the electronic patient record[11].

As the neck symptoms are still present, Dr Ready informs Suva by way of an interim medical report[12], which he transmits electronically.

[3] Outpatient hospital discharge according to [CDA-CH] plus medication template CDA-CH-II
[4] Notification of treatment to Suva by Cant. Hospital
[5] Notification of incapacity for work to Suva by Cant. Hospital
[6] Doctor's note in accordance with AIL to Suva through family doctor
[7] CDA-CH examination note to cardiologist plus medication template CDA-CH-II
[8] xPHR Update by family doctor
[9] xPHR Extract by cardiologist
[10] [CDA-CH] report of findings by cardiologist to family doctor
[11] xPHR Update by family doctor
[12] Interim medical report in accordance with AIL to Suva

### 7.1.6 Happy ending

Under medical treatment with carbimazole thyroid levels gradually normalize and Mr Doe also has no further attacks of dizziness or episodes of palpitations or tachycardia.

A further cardiological follow-up after 2 months shows no further rhythm disorders in the R test. In addition, no thrombus formation is found on transoesophageal ultrasound. As a result the anticoagulant medication can also be stopped. The neck pain has now improved markedly as well and fortunately no further therapy is necessary.

## 7.2 List of medications

| Generic name | Dosage [mg] | Administration | ATC | Beginning | End |
|---|---|---|---|---|---|
| Lisinopril HCT® | 10/12.5 mg | daily in the morning | C09BA03 | 01/01/2004 | |
| Paracetamol (Dafalgan®) | 1000 mg | three times a day | N02BE01 | 01/02/2010 | |
| Tizanidine (Sirdalud®) | 4 mg | three times a day | M03BX02 | 01/02/2010 | |
| Carbimazole (Neo-Mercazol®) | 5 mg | daily | H03BB01 | 13/04/2009 | 31/08/2009 |
| Carbimazole (Neo-Mercazol®) | 5 mg | three times a day | H03BB01 | 15/02/2010 | |
| Phenprocoumon (Marcoumar®) | | | B01AA04 | 11/02/2010 | |
| Acetylsalicylate (Aspirin cardio®) | 100 mg | three times a day | B01AC06 | 03/02/2010 | |

## 7.3 List of diagnoses

| Description | Synonym | ICD-10 | Survey |
|---|---|---|---|
| Coxarthrosis<br>Status post left hip replacement July 2009 | Osteoarthritis of the hip | M16.0 | |
| Arterial hypertension | High blood pressure | I10.0 | 30/10/2003 |
| Hyperthyroidism | Thyroid hyperfunction | E05.9 | 24/06/2008 |
| Sprain of cervical spine | Cervical sprain | S13.4 | 01/02/2010 |
| Paroxysmal atrial fibrillation | Episodic heart rhythm disorder | I48.10 | 11/02/2010 |

## 7.4 Capacity to work

| Prescriber | Work intensity [%] | Hours per day | From | Until |
|---|---|---|---|---|
| E. Mergency | 100 | 0 | 01/02/2010 | 03/02/2010 |
| A. Ready | 100 | 0 | 03/02/2010 | 07/02/2010 |
| A. Ready | 100 | 4 | 08/02/2010 | 19/02/2010 |
| A. Ready | 100 | 6 | 16/02/2010 | 28/02/2010 |

## 7.5 Document flow

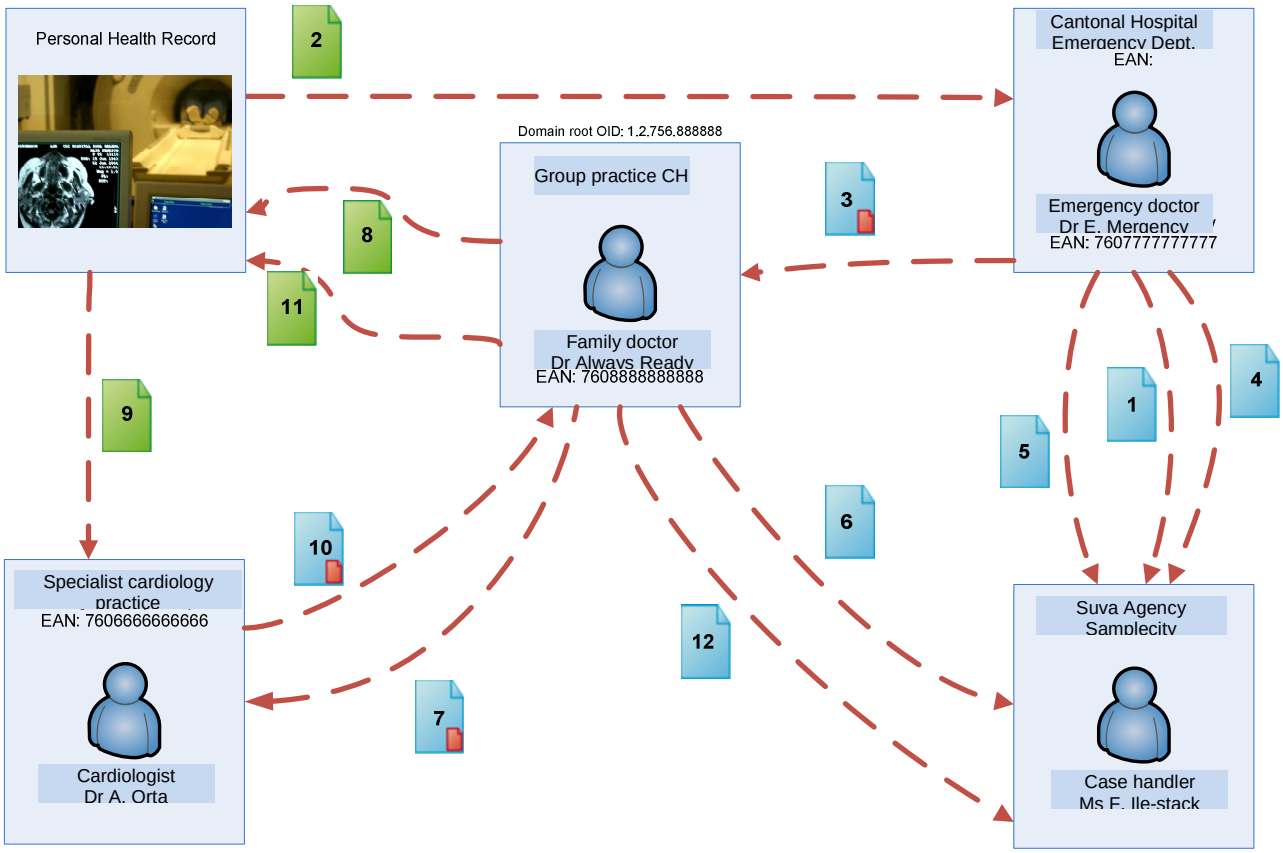



*Illustration 3: Document workflow case study rear-end collision*

Caption:

: xPHR Extract from Personal Health Record

: CDA-CH Document (XML)

: CDA-CH Document with medications (XML)

## 7.6 Specimen documents

The following subsections contain printouts of example documents as might have been exchanged in the above case example. The contents of the forms have been adapted to match the case example and could actually happen in this way. The example is invented and makes no claim to being didactic. It serves purely to illustrate the situation.

## 7.6.1 Document sheet first consultation following whiplash injury

**Dokumentationsbogen für Erstkonsultation nach kranio-zervikalem Beschleunigungstrauma** — **Bitte alle Fragen beantworten!**

Unfall- / Versicherten- / Referenz- / Schadennr.
Versicherungsgesellschaft Suva Luzern

**1 | Angaben zum Patient**

Name Muster Vorname Hans
Geburtsdatum (dd.mm.jjjj) 11.6.1948 ☐ weiblich ☐ männlich
**Unfallzeitpunkt** Datum 1.2.2010 Zeit 14.30
**Erstuntersuchung** Datum 1.2.2010 Zeit 15.30
**Einweisung per Ambulanz?** ☐ nein ☐ ja. Bitte Kopie des Ambulanzprotokolls beilegen.
**Weiterbehandlung bei** Name Dr. Allzeit bereit
Ort Musterhausen

**2a | Freie Schilderung des Unfallherganges in chronologischer Abfolge durch den Patienten**

Ich war mit meinem Personenwagen unterwegs von Specimendorf nach Musterhausen, als ein plötzlich aufgetretenes Unwohlsein, Schwindel und Herzrasen mich veranlassten, meinen Wagen anzuhalten. Ich hatte etwas abrupt gebremst, und das nachfolgende Fahrzeug ist in das Heck meines Wagens geprallt.

**2b | Unfallhergang**

**Angaben** ☒ durch Patient ☐ Fremdangabe. Wer?
**Unfallart** ☒ Heckkollision ☐ Seitenkollision ☐ Frontalkollision
☐ Andere Unfallart. Welche:
☒ Fahrer ☐ Beifahrer ☐ Rücksitz
**Kopfanprall** ☐ nein ☒ ja, an Kopfstütze.
☐ ja, ausserhalb Kopfstütze. Wo?
**Auf Kollision gefasst** ☐ ja ☒ nein
**Kopfstellung** ☒ gerade (gilt auch für Blick in den Rückspiegel) ☐ flektiert
☐ rotiert rechts / links (gilt nicht für Rückspiegel) ☐ nicht bekannt
**Körperhaltung** ☒ aufrechte Sitzposition ☐ nach vorne gebeugt
☐ nach rechts / links gebeugt
**Kopfstütze vorhanden** ☒ ja ☐ nein
**Sicherheitsgurt getragen** ☒ ja ☐ nein
**Airbag ausgelöst** ☐ ja ☒ nein ☐ nicht vorhanden

**2c | Befragung zum Unfallablauf ergibt Anhaltspunkte für**

**Bewusstlosigkeit** ☒ nein ☐ ja, Dauer:
**Gedächtnislücke** ☒ nein ☐ ja, für das Ereignis
☐ ja, für nach dem Ereignis. Dauer?
☐ ja, für vor dem Ereignis. Dauer?
**Angst- und / oder Schreckreaktion** ☐ nein ☒ ja

**3 | Tätigkeiten nach dem Unfallereignis**

**Konnte PatientIn nach dem Unfallereignis als LenkerIn mit dem Unfallauto weiterfahren?**
☒ ja ☐ nein, weil:
**Konnte PatientIn nach dem Unfallereignis als BeifahrerIn mit dem Unfallauto weiterfahren?**
☐ ja ☒ nein, weil:
**Konnte PatientIn nach dem Unfallereignis die geplanten Tätigkeiten verrichten?**
☒ ja ☐ nein, weil:

**4 | Angaben des Patienten zum Beschwerdeverlauf seit dem Unfallzeitpunkt**

| | nein | ja, sofort | ja, nach ... Stunden | spontan erzählt | erfragt | Schmerzintensität (0 = kein ... 10 = unerträglich) | Schmerzausstrahlung wohin? |
|---|---|---|---|---|---|---|---|
| Kopfschmerzen | ☐ | ☐ | 1 | ☒ | ☐ | 3 | |
| Nackenschmerzen | ☐ | ☒ | | ☒ | ☐ | 5 | Hinterkopf |
| Schwindel | ☐ | ☐ | 1 | ☐ | ☒ | | |
| Übelkeit | ☐ | ☐ | 1 | ☐ | ☒ | | |
| Erbrechen | ☒ | ☐ | | ☐ | ☒ | | |
| Hörstörungen | ☒ | ☐ | | ☐ | ☒ | | |
| Sehstörungen | ☒ | ☐ | | ☐ | ☒ | | |
| Schlafstörungen | ☒ | ☐ | | ☐ | ☒ | | |

**Andere Symptome** ☒ nein ☐ ja, sofort ☐ ja, nach Stunden
Welche?
**Andere Symptome wurden** ☐ spontan erzählt ☒ erfragt

**5 | Frühere Anamnese**

**Früherer Unfall** ☒ nein ☐ ja. Wann?
**mit HWS-Beteiligung** ☒ nein ☐ ja. Wann?
**mit Kopf-Beteiligung** ☒ nein ☐ ja. Wann?

**Behandlungsbedürftige Beschwerden vor dem Unfall / Medikamente vor dem Unfall**

**Kopf** (inkl. Migräne) ☒ nein ☐ ja
**Nacken** ☒ nein ☐ ja
**Rücken** ☒ nein ☐ ja
**Augen** ☒ nein ☐ ja
**Gehör** ☒ nein ☐ ja
**Psyche** (z.B. Psychotherapie) ☒ nein ☐ ja
**Andere** ☒ nein ☐ ja, nämlich:
**Aktuelle Medikamente** ☒ nein ☐ ja, nämlich:

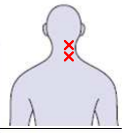
**6 | Untersuchungsbefunde**

**Grösse** 178 cm **Gewicht** 72 kg

**a) Schmerzen/Beweglichkeit der HWS (aktive, durch den Patienten ausgeführte Bewegungen)**

| | Beweglichkeit | | | Schmerz nein | Schmerz ja |
|---|---|---|---|---|---|
| Flexion | Kinn-Sternum-Abstand | 5 | cm | ☒ | ☐ |
| Extension | Kinn-Sternum-Abstand | 12 | cm | ☒ | ☐ |
| Rechtsdrehung | | 60 | Grad | ☐ | ☒ |
| Linksdrehung | | 80 | Grad | ☒ | ☐ |
| Seitneigung rechts | | 25 | Grad | ☐ | ☒ |
| Seitneigung links | | 40 | Grad | ☒ | ☐ |

**Druckschmerz** ☐ nein
☒ ja. Lokalisation(en) bitte in Skizze einzeichnen:
Bemerkungen:



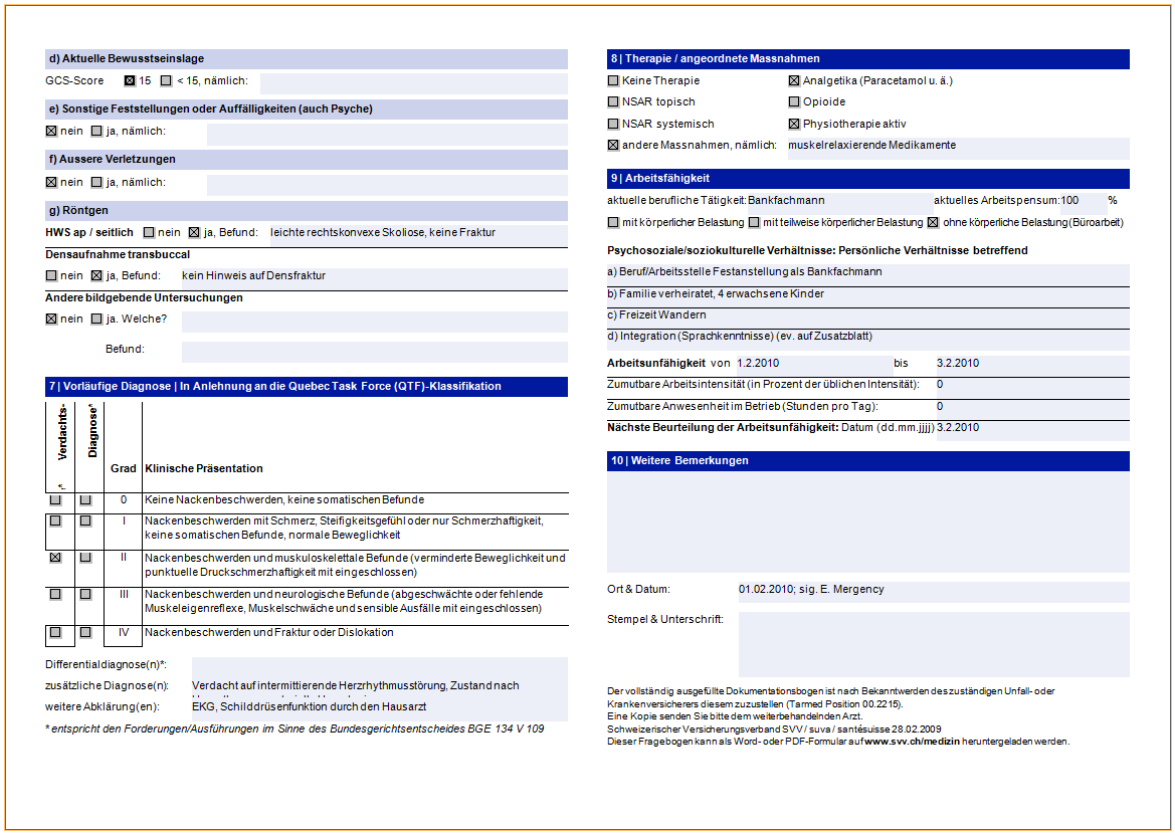
**Ruheschmerzen** ☒ nein ☐ ja
**Stauchungsschmerz** ☒ nein ☐ ja, ohne Ausstrahlung
☐ ja, mit Ausstrahlung. Wohin?

**b) Schmerz / Funktionseinschränkung an anderer Lokalisation**

☒ nein ☐ ja, nämlich:

**c) Neurologische Untersuchung**

**Sehnenreflexe** ☒ normal ☐ pathologisch. Welche?
**Muskelkraft** ☒ normal ☐ Paresen. Welche?
**Parästhesien** ☒ nein ☐ ja. Welche?
**Sensible Defizite** ☒ nein ☐ ja. Welche?
**Romberg-Versuch** ☒ sicher ☐ schwanken ☐ Ausfallschritt nach rechts ☐ Ausfallschritt nach links
**Unterberger Tretversuch** ☒ normal ☐ pathologisch nach rechts ☐ pathologisch nach links
Definition pathologisch = Abweichung > 45° nach 50 Schritten
**Andere pathologische neurologische Befunde (z.B. Hirnnerven):**
keine



**d) Aktuelle Bewusstseinslage**

GCS-Score ☒ 15 ☐ < 15, nämlich:

**e) Sonstige Feststellungen oder Auffälligkeiten (auch Psyche)**

☒ nein ☐ ja, nämlich:

**f) Aussere Verletzungen**

☒ nein ☐ ja, nämlich:

**g) Röntgen**

**HWS ap / seitlich** ☐ nein ☒ ja, Befund: leichte rechtskonvexe Skoliose, keine Fraktur

**Densaufnahme transbuccal**

☐ nein ☒ ja, Befund: kein Hinweis auf Densfraktur

**Andere bildgebende Untersuchungen**

☒ nein ☐ ja. Welche?

Befund:

**7 | Vorläufige Diagnose | In Anlehnung an die Quebec Task Force (QTF)-Klassifikation**

| Verdachts-Diagnose* | Diagnose* | Grad | Klinische Präsentation |
|---|---|---|---|
| ☐ | ☐ | 0 | Keine Nackenbeschwerden, keine somatischen Befunde |
| ☐ | ☐ | I | Nackenbeschwerden mit Schmerz, Steifigkeitsgefühl oder nur Schmerzhaftigkeit, keine somatischen Befunde, normale Beweglichkeit |
| ☒ | ☐ | II | Nackenbeschwerden und muskuloskelettale Befunde (verminderte Beweglichkeit und punktuelle Druckschmerzhaftigkeit mit eingeschlossen) |
| ☐ | ☐ | III | Nackenbeschwerden und neurologische Befunde (abgeschwächte oder fehlende Muskeleigenreflexe, Muskelschwäche und sensible Ausfälle mit eingeschlossen) |
| ☐ | ☐ | IV | Nackenbeschwerden und Fraktur oder Dislokation |

Differentialdiagnose(n)*:

zusätzliche Diagnose(n): Verdacht auf intermittierende Herzrhythmusstörung, Zustand nach

weitere Abklärung(en): EKG, Schilddrüsenfunktion durch den Hausarzt

** entspricht den Forderungen/Ausführungen im Sinne des Bundesgerichtsentscheides BGE 134 V 109*

**8 | Therapie / angeordnete Massnahmen**

☐ Keine Therapie ☒ Analgetika (Paracetamol u. ä.)
☐ NSAR topisch ☐ Opioide
☐ NSAR systemisch ☒ Physiotherapie aktiv
☒ andere Massnahmen, nämlich: muskelrelaxierende Medikamente

**9 | Arbeitsfähigkeit**

aktuelle berufliche Tätigkeit: Bankfachmann — aktuelles Arbeitspensum: 100 %

☐ mit körperlicher Belastung ☐ mit teilweise körperlicher Belastung ☒ ohne körperliche Belastung (Büroarbeit)

**Psychosoziale/soziokulturelle Verhältnisse: Persönliche Verhältnisse betreffend**

a) Beruf/Arbeitsstelle Feststanstellung als Bankfachmann
b) Familie verheiratet, 4 erwachsene Kinder
c) Freizeit Wandern
d) Integration (Sprachkenntnisse) (ev. auf Zusatzblatt)

**Arbeitsunfähigkeit** von 1.2.2010 bis 3.2.2010

Zumutbare Arbeitsintensität (in Prozent der üblichen Intensität): 0

Zumutbare Anwesenheit im Betrieb (Stunden pro Tag): 0

**Nächste Beurteilung der Arbeitsunfähigkeit:** Datum (dd.mm.jjjj) 3.2.2010

**10 | Weitere Bemerkungen**

Ort & Datum: 01.02.2010; sig. E. Mergency

Stempel & Unterschrift:

Der vollständig ausgefüllte Dokumentationsbogen ist nach Bekanntwerden des zuständigen Unfall- oder Krankenversicherers diesem zuzustellen (Tarmed Position 00.2215).
Eine Kopie senden Sie bitte dem weiterbehandelnden Arzt.
Schweizerischer Versicherungsverband SVV / suva / santésuisse 28.02.2009
Dieser Fragebogen kann als Word- oder PDF-Formular auf **www.svv.ch/medizin** heruntergeladen werden.

## 7.6.2 xPHR Extract from emergency admission at the Cantonal Hospital

| **Patient:** | **John Doe** | Date of birth: | 11 June 1948 | |
|---|---|---|---|---|
| | 10 suffering avenue<br>9876 Specimentown<br>Tel home: +41.32.685.12.34<br>Tel work: +41.32.123.77.88 | Patient ID: | Old Swiss SSN:<br>New Swiss SSN: | 123.71.332.115<br>1234567891234 |
| Created: | 01/02/2010 | Sex: | Male | |

**List of diagnoses**

- Status post left hip replacement July 2009 for primary coxarthrosis of left hip
- Essential hypertension
- History of symptomatic hyperthyroidism
- with paroxysmal tachycardiac atrial fibrillation
  - o Carbimazole 5 mg/day until July 2009, since then no treatment

**Allergies and incompatibilities**

Allergy to penicillin
generalised drug exanthema following penicillin treatment in 1986

**Blood group**

Blood group A, Rh pos.

**Medications**

| Product name | Dosage | Dosage form | ATC | Dosing schedule | Beginning of administration | End of administration |
|---|---|---|---|---|---|---|
| **Carbimazole** | 5 mg | Tab | H03BB01 | daily in the morning | 13/04/2009 | 31/08/2009 |
| **Lisinopril HCT** | 10/12.5 mg | Tab | C09BA03 | daily in the morning | 01/01/2004 | |

**Immunizations**

DiTePe in childhood

**Imaging procedures**

***Pelvis overview of 06/06/2009 (Institute of Radiology RoDiag, Dr. X. Ray):***
Significant bilateral osteoarthritic changes in the hip joints, more on the right than on the left, significant reduction in the joint space and subchondral sclerosis with formation of osteophytes at the edge of the joint socket.

**Further instrumental diagnosis**

***ECG of 11/07/2009 (Cantonal Hospital):***
Normal sinus rhythm, left-sided, no repolarization disorders, isolated SVES

**Laboratory values**

| Date of analysis | Analysis | Normal range | Unit | Value |
|---|---|---|---|---|
| 12/12/2009 | **Prothrombin ratio** | 70-120 | % | 117 |
| | **Haemoglobin** | 120-160 | g/l | 121 |
| | **MCV** | 79-95 | fl | 89 |
| | **Leucocytes** | 3.5-10 10^9 | /l | 7 |
| | **Platelets** | 150-450 10^9 | /l | 338 |
| 12/12/2009 | **Sodium** | 136 - 145 | mmol/l | 139 |
| | **Potassium** | 3.6 - 5.1 | mmol/l | 4.5 |
| | **Calcium** | 2.10 - 2.55 | mmol/l | 2.3 |
| | **Phosphate** | 0.87 - 1.45 | mmol/l | 0.9 |
| | **Creatinine** | 45 - 84 | umol/l | 79 |
| 02/07/2009 | **TSH** | 0.34 - 5.60 | mU/l | 0.87 |
| | **FT4** | 9.0 - 20.0 | pmol/l | 18.6 |

| | | | | |
|---|---|---|---|---|
| 12/03/2009 | **TSH** | 0.34 - 5.60 | mU/l | 0.27 |
| | **FT4** | 9.0 - 20.0 | pmol/l | 22.3 |
| 09/02/2009 | **TSH** | 0.34 - 5.60 | mU/l | 0.17 |
| | **FT4** | 9.0 - 20.0 | pmol/l | 33.2 |

### 7.6.3 Outpatient hospital discharge report to CDA-CH plus medication template CDA-CH-II

Cantonal Hospital
Surgical Clinic
1234 Samplecity 01/02/2010

**Abridged outpatient consultation report**

John Doe
11 June 1948
10 suffering avenue
9876 Specimentown

**Diagnosis**
Sprain of cervical spine with status post rear-end collision following episode of dizziness and malaise.
Known history of paroxysmal atrial fibrillation with hyperthyroidism; no therapy since July 09.
Known history of penicillin allergy (generalized drug exanthema following penicillin therapy in 1986)
Status post left hip replacement July 2009 with primary coxarthrosis of left hip

**History of presenting complaint**

While driving on the motorway between Specimentown and Samplecity, sudden incident involving malaise, dizziness and tachycardia. The patient attempted to pull over to the pavement; the vehicle following him however was unable to brake in time; there was a low-speed rear-end collision.

No amnesia, according to passenger no loss of consciousness.

According to EPR obviously hyperthyroidism, treated with carbimazole 5 mg/day until 6 months ago. Was confirmed by patient on prompting.

**Status on admission**

Oriented to time, space and person.

Pain in area of back of neck radiating to head area. Mobility of cervical spine slightly restricted due to pain. Neurologically unremarkable, in particular no radicular symptoms.

Cardiopulmonary status unremarkable. BP 135/83; pulse 86 regular. No other pathological findings.

**ECG**

Normal SR, 85/min.; unremarkable excitation process

**X-ray of cervical spine AP/lateral, dens transbuccal**

No evidence of bone lesions. Slight right convex scoliosis.

**Procedure**
Dafalgan tab. 500 mg, 2 x three times a day
Sirdalud tab. 4 mg, 1 x three times a day
Lisinopril HCT tab. 10/12.5 mg once daily in the morning
Physiotherapy
GP follow-up on 04/02/2010 involving monitoring of thyroid levels, R test with question of paroxysmal AF.
100% incapacity for work until 04/02/2010

**Remarks**

In view of the known history of hyperthyroidism with atrial fibrillation a new episode of atrial fibrillation could have been the cause of the episode of malaise, dizziness and palpitations. We therefore recommend the measurement of thyroid parameters and the performance of an R test.

Best regards

| | |
|---|---|
| Vis. Dr S. Uperior | E. Mergency, MD |
| Senior Physician Surgery | Registrar |

### 7.6.4 Treatment note for the attention of Suva from Cantonal Hospital

**Patient**

Surname, first name: John Doe

Date of birth: 11/06/1948

Address: 10 suffering avenue, 9876 Specimentown

Sex: male

Created on: 01/02/2010

**Reason for treatment**

Date of accident: 01/02/2010

Date of treatment: 01/02/2010

Observation: sprain of cervical spine

| | |
|---|---|
| Declaration of consent: | Patient agrees with Suva being informed. |
| Employer: | Bank Rake In & Co., Duckburg |
| Medical practice: | Emergency department, Cantonal Hospital |
| Doctor in charge: | E. Mergency, MD |
| Recipient: | Suva Agency Sampletown |

### 7.6.5 Medical certificate for the attention of Suva from Cantonal Hospital

**Patient**

Surname, first name: John Doe
Date of birth: 11/06/1948
Address: 10 suffering avenue, 9876 Specimentown
Sex: male
Created on: 01/02/2010

**Assessment history:**

Consultation: 01/02/2010
Presence: 0 hrs.
Work intensity: 0%
Next evaluation: 03/02/2010

**Current assessment:**

Valid from/until: 01/02/2010 – 03/02/2010
Case filed as: accident

**Request to employer:**
Contact the treating doctor.

**Remarks:**
None

| | |
|---|---|
| Declaration of consent: | Patient agrees with Suva being informed. |
| Medical practice: | Emergency department, Cantonal Hospital |
| Doctor in charge: | E. Mergency, MD |
| Recipient: | Suva Agency Sampletown |

### 7.6.6 Doctor's note in accordance with AIL to Suva from family doctor

**Patient**
John Doe
Date of birth: 11/06/1948
Old Swiss SSN: 123.73.423.123
10 suffering avenue
9876 Specimentown
Sex: male

**Accident information**
Accident data: 01/02/2010
First treatment 01/02/2010

**Information from the patient**
On 1/02/2010, while driving on the motorway between Specimentown and Samplecity, sudden onset of malaise, dizziness and palpitations. Consequently sudden braking manoeuvre resulting in a rear-end collision with the following vehicle.
Initially only nagging neck pain and dizziness, but over the course of the past few days increasing pain in the back of the neck area radiating to the rear of the head.

**General condition**
Particular observations (mood, alcohol, drugs, etc.): impaired general state of health, no evidence of alcohol or drug consumption
Sequelae of diseases and accidents as well as physical abnormalities: none

**Findings**
Local findings: pain-related restriction of mobility of cervical spine with end-phase pain on rotation to the right. No abnormal neurological findings.
X-ray findings: conventional X-ray examination of cervical spine in the Cantonal Hospital on 01/02/2010: slight right convex scoliosis, no fracture.

**Diagnosis**
Sprain of the cervical spine following a rear-end collision on 01/02/2010 (Code system: ICD-10: Code: S13.4)

**Causality**
Are the consequences solely due to the accident: Yes
Reason: <blank>

**Therapy**
Measures: analgesics, physiotherapy
Patient hospitalized: No
If yes, where: <blank>
Particular circumstances that might adversely affect the healing process:
<blank>

**Capacity to work**

| | | |
|---|---|---|
| Valid from | Date of consultation | 03/02/2010 |
| Presence | Reasonable number of hours at work | 0 |
| Work intensity | % of usual work intensity | 0 |
| Valid until | 07/02/2010 | |
| Assessed by | A. Ready, MD | |

**End of treatment**
End of treatment:
[ ] yes, on <Date>
[X] no, expected in 4 weeks

**Remarks**
None

| Place, Date | Stamp |
|---|---|
| 8888 Sampletown, 03/02/2010 | Always Ready, MD |

### 7.6.7 xPHR Update by the family doctor

| **Patient:** | **John Doe** | Date of birth: | 11 June 1948 | |
|---|---|---|---|---|
| | 10 suffering avenue<br>9876 Specimentown<br>Tel home: +41.32.685.12.34<br>Tel work: +41.32.123.77.88 | Patient ID: | Old Swiss SSN:<br>New Swiss SSN: | 123.71.332.115<br>1234567891234 |
| Created: | 03 February 2010 | Sex: | Male | |

**List of diagnoses**

- Suspected recurrence of previously known symptomatic hyperthyroidism
  - with paroxysmal tachycardiac atrial fibrillation
  - Carbimazole 5 mg/day until July 2009, since when without treatment
- Essential hypertension
- Sprain of cervical spine following
  - whiplash injury in car accident on 01/02/2010
  - no X-ray findings of bone lesions
- Status post left hip replacement July 2009 with primary coxarthrosis of left hip

**Medications**

| Product name | Dosage | Dosage form | ATC | Dosing schedule | Beginning of administration | End of administration |
|---|---|---|---|---|---|---|
| **Aspirin cardio** | 100 mg | Tab | B01AC06 | twice a day in the morning and evening | 03/02/2010 | |
| **Dafalgan** | 1000 mg | Tab | N02BE01 | three times a day | 03/02/2010 | |

| | |
|---|---|
| **Administrative organization:** | Dr Always Ready<br>2 doctors street<br>8888 Sampletown<br>Tel work: +41.32.234.55.66 |
| **Author:** | Prof. Always Ready, Sampletown<br>Dr Always Ready, General practitioner on 3 February 2010 |
| **Authorized signature:** | Dr Always Ready on 4 February 2010 |

### 7.6.8 xPHR Extract from cardiologist

| | | | | |
|---|---|---|---|---|
| **Patient:** | **John Doe** | Date of birth: | 11 June 1948 | |
| | 10 suffering avenue<br>9876 Specimentown<br>Tel home: +41.32.685.12.34<br>Tel work: +41.32.123.77.88 | Patient ID: | Old Swiss SSN:<br>New Swiss SSN: | 123.71.332.115<br>1234567891234 |
| Issued: | 11/02/2010 | Sex: | Male | |

**List of diagnoses**

- Suspected recurrence of previously known symptomatic hyperthyroidism
  - with paroxysmal tachycardiac atrial fibrillation
  - Carbimazole 5 mg/day until August 2009, since then without treatment
- Essential hypertension
- Sprain of cervical spine following
  - whiplash injury in car accident on 01/02/2010
  - no X-ray findings of bone lesions
- Status post left hip replacement July 2009 with primary coxarthrosis of left hip

**Allergies and incompatibilities**

Allergy to penicillin

- generalised drug exanthema following penicillin treatment in 1986

**Blood group**

Blood group A, Rh pos.

**Immunisation**

DiTePe in childhood

**Imaging procedures**

***Pelvic overview of 06/06/2009 (Institute of Radiology RoDiag, Dr. X. Ray)***
Significant bilateral osteoarthritic changes in the hip joints, more on the right than on the left., significant reduction in the joint space and subchondral sclerosis with formation of osteophytes at the edge of the joint socket.

***Whiplash AP/lateral, dens transbuccal of 01/02/2010 (Cantonal Hospital)***
No indication of bone lesions. Slight right convex scoliosis.

**Further instrumental diagnosis**

***ECG dated 11/07/2009 (Cantonal Hospital):***
Normal sinus rhythm, left-sided, no repolarization disorders, isolated SVES

***ECG dated 11/02/2010 (Cantonal Hospital):***
Normal sinus rhythm, left-sided, diffuse repolarization disorders, isolated SVES

**Medications**

| Product name | Dosage | Dosage form | ATC | Dosing schedule | Beginning of administration | End of administration |
|---|---|---|---|---|---|---|
| **Aspirin cardio** | 100 mg | Tab | B01AC06 | twice a day in the morning and evening | 03/02/2010 | |
| **Dafalgan** | 1000 mg | Tab | N02BE01 | three times a day | 03/02/2010 | |
| **Dafalgan** | 500 mg | Tab | N02BE01 | 2 tabs three times a day | 01/02/2010 | 03/02/2010 |
| **Sirdalud** | 4 mg | Tab | M03BX02 | four times a day | 01/02/2010 | |
| **Lisinopril HCT** | 10/12.5 mg | Tab | C09BA03 | daily in the morning | 01/01/2004 | |
| **Carbimazole** | 5mg | Tab | H03BB01 | daily in the morning | 13/04/2009 | 31/08/2009 |

**Laboratory values**

| Date of analysis | Analysis | Normal range | Unit | Value |
|---|---|---|---|---|
| 12/12/2009 | **Prothrombin ratio** | 70-120 | % | 117 |
| | **Haemoglobin** | 120-160 | g/l | 121 |
| | **MCV** | 79-95 | fl | 89 |
| | **Leucocytes** | 3.5-10 10^9 | /l | 7 |
| | **Platelets** | 150-450 10^9 | /l | 338 |
| 12/12/2009 | **Sodium** | 136 - 145 | mmol/l | 139 |
| | **Potassium** | 3.6 - 5.1 | mmol/l | 4.5 |
| | **Calcium** | 2.10 - 2.55 | mmol/l | 2.3 |
| | **Phosphate** | 0.87 - 1.45 | mmol/l | 0.9 |
| | **Creatinine** | 45 - 84 | umol/l | 79 |
| 02/07/2009 | **TSH** | 0.34 - 5.60 | mU/l | 0.87 |
| | **FT4** | 9.0 - 20.0 | pmol/l | 18.6 |
| 12/03/2009 | **TSH** | 0.34 - 5.60 | mU/l | 0.27 |
| | **FT4** | 9.0 - 20.0 | pmol/l | 22.3 |
| 09/02/2009 | **TSH** | 0.34 - 5.60 | mU/l | 0.17 |
| | **FT4** | 9.0 - 20.0 | pmol/l | 33.2 |

| | |
|---|---|
| **Administrative organisation:** | Dr Always Ready<br>2 doctors street<br>8888 Sampletown<br>Tel work: +41.32.234.55.66 |
| **Author:** | Prof. Always Ready, Sampletown<br>Dr. med. Always Ready, Specialist in Internal Medicine, on 11/02/2010 |
| **Authorised signature:** | Dr Always Ready on 11/02/2010 |
| **Entered by:** | cf 11/02/2010 |

### 7.6.9 xPHR update by the family doctor

| | | | | | |
|---|---|---|---|---|---|
| **Patient:** | **John Doe** | | Date of birth | 11 June 1948 | |
| | 10 suffering avenue<br>9876 Specimentown<br>Tel home: +41.32.685.12.34<br>Tel work: +41.32.123.77.88 | | Patient ID: | Old Swiss SSN:<br>New Swiss SSN: | 123.71.332.115<br>1234567891234 |
| Created: | 15/02/2010 | | Sex: | Male | |

**List of diagnoses**

- Recurrence of previously known symptomatic hyperthyroidism
  - with paroxysmal tachycardiac atrial fibrillation
  - Carbimazole 5 mg/day until August 2009, since then without treatment
- Essential hypertension
- Sprain of cervical spine following
  - whiplash injury in car accident on 01/02/2010
  - no X-ray findings of bone lesions
- Status post left hip replacement July 2009 for primary coxarthrosis of left hip

**Medications**

| Product name | Dosage | Dosage form | ATC | Dosing schedule | Beginning of administration | End of administration |
|---|---|---|---|---|---|---|
| **Aspirin cardio** | 100 mg | Tab | B01AC06 | twice a day in the morning and evening | 04/02/2010 | 15/02/2010 |

**Laboratory values**

| Date of analysis | Analysis | Normal range | Unit | Value |
|---|---|---|---|---|
| 03/02/2010 | **TSH** | 0.34 - 5.60 | mU/l | 0.11 |
| | **FT4** | 9.0 - 20.0 | pmol/l | 27.9 |

| | |
|---|---|
| **Administrative organisation:** | Dr Always Ready<br>2 doctors street<br>8888 Sampletown<br>Tel work: +41.32.234.55.66 |
| **Author:** | Prof. Always Ready, Sampletown<br>Dr Always Ready, General practitioner on 15th February 2010 |
| **Authorised signature:** | Dr Always Ready on 15th February 2010 |

| Entered by: | cf 15th February 2010 |
|---|---|

### 7.6.10 Interim medical report in accordance with AIL to Suva

**Interim medical report**

**Patient: John Doe**

Date of birth: 11 June 1948

10 suffering avenue

9876 Specimentown

Sex: male

**Information regarding the accident**

Date of accident: 01/02/2010

**Diagnosis**

- Sprain of cervical spine following rear-end collision (ICD-10, S13.4)
- Hyperthyroidism (ICD-10, E05.9)
- Paroxysmal atrial fibrillation (ICD-10, I48.10)
- Arterial hypertension (ICD-10, I10.0)
- Primary coxarthrosis (ICD-10, M16.0)

- Status post left hip replacement July 2009

**Course of events**

Rear-end collision accident occurred on 1 January 2010 at around 2.30 p.m. on the motorway between Specimentown and Samplecity: the patient had to stop his vehicle due to malaise, possibly as a result of the sudden onset of tachycardiac atrial fibrillation. Outpatient treatment was administered at the Cantonal Hospital. A conventional X-ray examination revealed no indication of fractures in the area of the cervical spine.

Subjectively, the patient is still not yet asymptomatic, he experiences neck pain irrespective of movement (mainly end-phase pain on rotation to the right) and after long periods of sitting. Objectively, cervical spine movement slightly restricted. Remaining physical status without pathological findings.

***Factors unrelated to the accident***

[X] Yes, cardiac comorbidity, hyperthyroidism [ ] No

**Therapy**

***Current treatment***

Tizanidine 4 mg 3 times daily; paracetamol 1000 mg as needed up to 3 times daily.

Supportive physiotherapy: analgesic, improvement of mobility, muscle development

***Suggestions (further treatment, X-rays, medical examination by district physician)***

<empty>

***At what intervals do consultations take place?***

2 – 10 days

***Assumed treatment duration***

4 weeks

**Start of work**

***Resumption of work***

50% (half-day) since 03/02/2010 75% scheduled for 15/02/2010

***Assignment of appropriate duties at work***
[ ] Yes [X] No

***Permanent disadvantage, if yes, what kind***
[ ] Yes [X] No

***Remarks***
<blank>

| Place, Date | Stamp |
|---|---|
| 8888 Sampletown, 15/02/2010 | Always Ready, MD |
| | Dr. Always Ready |

# 8 Schematron Tutorial

This Tutorial is a brief introduction to Schematron and demonstrates how an XML file can be validated against a Schematron schematic in order to verify whether all rules have been satisfied. It also explains how the rules must be documented so that an HTML documentation can be generated and the language-dependent error messages can be selected.

## 8.1 Introduction to Schematron

Certain use cases (e.g. “VHitG Arztbrief” or “CDA-CH”) complement the HL7 CDA R2 standard and are standardised in corresponding implementation guidelines including rules. However, the underlying XML schematic only allows validation of the message structure, i.e. additional application-specific rule cannot be automatically verified. Schematron permits such message contents or templates to be checked automatically.

Sample rules from CDA-CH:

| | |
|---|---|
| **<CH-TPLT>** | For documents which were generated in accordance with this present specification, the following templateId is to be used:<br><templateId extension="CDA-CH" root="2.16.756.5.30.1.1.1.1"/> |

Schematron[13] is a schema language for validating content and structure of XML documents. Implementation of the language, however, is realized via XSL transformations. Hence, no special implementation is required. Since May 2006, Schematron is an official ISO/IEC Standard registered under number 19757-3:2006. A Schematron schema consists essentially of an XML document with various validation rules in which a context node is defined, upon which asserts and reports are formulated that are to be verified later. XPath[14] and XML are the basis for Schematron. XPath (XML Path Language) is a query language developed by the W3 Consortium used to address sections of XML documents. Xpath expressions are used to form so-called assertions.

The above sample rule can now be illustrated in a Schematron schema
(see also file project_tutorial/minimal.sch):

```
<?xml version='1.0' encoding='utf-8'?>
<schema xmlns='http://purl.oclc.org/dsdl/schematron'>
 <title>minimal schematron</title>
 <ns prefix='cda' uri='urn:hl7-org:v3'/>
 <pattern>
  <rule context="cda:ClinicalDocument">
   <assert test="cda:templateId[@root='2.16.756.5.30.1.1.1.1' and
                 @extension='CDA-CH']">
    For documents which were generated in accordance with this present
    Specification the following template ID is be used:
    templateId extension="CDA-CH" root="2.16.756.5.30.1.1.1.1"
   </assert>
  </rule>
  <rule context="/*">
   <assert test="self::cda:ClinicalDocument">
    ClinicalDocument must be taken from urn:hl7-org-v3 namespace.
   </assert>
  </rule>
 </pattern>
</schema>
```

The first rule tests the rule described above, while the second rule verifies whether a Clinical Document exists at all.

[13] http://de.wikipedia.org/wiki/Schematron
[14] http://de.wikipedia.org/wiki/XPath

## 8.2 Executing Schematron tests

To execute the test formulated in the schema it is necessary to use a Schematron implementation.

A possible implementation is nothing more than an XSL stylesheet, which in turn generates an XSL stylesheet from the given schema, with which the document to be verified is transformed:

1. From the Tutorial Schematron file (minimal.sch) the minimal.xsl is generated via XSL.
2. minimal.xsl is used to validate the xml document. The successful `<report>` tests and the failed `<assert>` tests are displayed via XSL transformation.

Subsequently, operating is done with the ISO Schematron implementation published under www.schematron.com[15]. Item 1 above requires 3 xsl transformations. This can be accomplished automatically with the sample Ant Task[16]. Required are a Java and an Ant installation, plus the ISO Schematron implementation.

The schema file can be found in the directory project_tutorial. From this one, the stylesheet for the validation minimal.xsl can be created with:

```
cd projects/HL7.ch/de-SchematronTutorial/anttask
ant generateValidator -Dsch=minimal
generateValidator:
   [xslt] Processing minimal.sch to minimal1.sch
   [xslt] Processing minimal1.sch to minimal2.sch
   [xslt] Processing minimal2.sch to minimal.xsl
```

Validation of the document minimal_ok.xml is as follows:

```
ant validate -Dsch=minimal -Dxml=minimal_ok
validate:
   [xslt] Processing minimal_ok.xml to validations\minimal_ok.svrlt
```

In this implementation, the output is displayed as xml in validations\minimal_ok.svrlt:

```
<svrl:active-pattern document="file:/ minimal_ok.xml"/>
<svrl:fired-rule context="cda:ClinicalDocument"/>
```

We recognize that the rule with context:cda:ClinicalDocument was called. In the event that the rule was not complied with, the following output appears (validation mint minmal_fails.xml):

```
ant validate -Dsch=minimal -Dxml=minimal_fails
```

```
<svrl:fired-rule context="cda:ClinicalDocument"/>
<svrl:failed-assert test="cda:templateId[@root='2.16.756.5.30.1.1.1.1' and
@extension='CDA-CH']" location="/*[local-name()='ClinicalDocument']">
  <svrl:text>
       Für Dokumente, welche anhand der vorliegenden Spezifikation erstellt wur-
       den soll folgende template ID verwendet werden: templateId extensi-
       on="CDA-CH" root="2.16.756.5.30.1.1.1.1"
  </svrl:text>
</svrl:failed-assert>
```

The above message shows that this concept does not yet allow multilingual error messages; moreover that the error messages cannot be formatted.

[15] http://www.schematron.com/tmp/iso-schematron-xslt1.zip
[16] Siehe SVN Repository: https://hl7ch.svn.sourceforge.net/svnroot/hl7ch

## 8.3 Documenting the Schematron files

When documenting Schematron files, there are various problems/requirements, e.g.:

- If the documentation is separate from the schema rules: risk of errors through lack of documentation post-processing
- How is the multilingual issue resolved: translation of the error messages/documentation in various languages (different files, or in one file)?
- How can the documentation be versioned?
- Is it possible to generate an extract for websites or Wikis?

For these Schematron Guidelines, the approach of J. Lubell[17] was selected:

Lubell, Joshua. "Documenting and Implementing Guidelines with Schematron." Presented at Balisage: The Markup Conference 2009, Montréal, Canada, August 11 - 14, 2009. In *Proceedings of Balisage: The Markup Conference 2009*. Balisage Series on Markup Technologies, vol. 3 (2009). doi:10.4242/BalisageVol3.Lubell01.

This concept proposes using xhtml Markup instead of pure text files in order to format the Schematron output, as well as generating the rule documentation. This would provide the following benefits:

- Language-dependent text in one file, not distributed across several files, optionally with one or all languages
- The entire documentation can be generated from a Schematron file with an XSL transformation
- language-dependent application of error messages

To generate the documentation from our Tutorial Schematron mimimal.sch, we first have to extend the schema with the necessary xhtml markup:

1. We integrate the xhtml Namespace into the schema Declaration
2. Instead of the title element we use an xhtml:h1 element, with attribute class="title" and the attribute lang for the language (de_ch for German, fr_ch for French, it_ch for Italian and en for English)

```
<schema xmlns='http://purl.oclc.org/dsdl/schematron'
        xmlns:xhtml='http://www.w3.org/1999/xhtml'>
<xhtml:h1 class="title" lang="de_ch">tutorial minimal schematron de</xhtml:h1>
<xhtml:h1 class="title" lang="fr_ch">tutorial minimal schematron fr</xhtml:h1>
<xhtml:h1 class="title" lang="it_ch">tutorial minimal schematron it</xhtml:h1>
<xhtml:h1 class="title" lang="en">tutorial minimal schematron en</xhtml:h1>
```

3. Per entity file (in this case the Schematron file itself), the file and its version must be given below the pattern element:

```
<xhtml:ul id="minimal_docu">
   <xhtml:li class="filename">mimimal_docu.sch</xhtml:li>
   <xhtml:li class="version">1.0</xhtml:li>
</xhtml:ul>
```

4. For each Schematron rule, a rule title with the xhtml:h3 element must be assigned, including the lang attribute showing in which language the title is:

```
<xhtml:h3 lang="de_ch">Regel CH-TPLT</xhtml:h3>
<xhtml:h3 lang="fr_ch">Règle CH-TPLT</xhtml:h3>
<xhtml:h3 lang="it_ch">Regola CH-TPLT</xhtml:h3>
<xhtml:h3 lang="en">Rule CH-TPLT</xhtml:h3>
```

5. Each assertation must be assigned a dedicated id

```
<assert test="cda:templateId[@root='2.16.756.5.30.1.1.1.1' and @extension='CDA-CH']"
id="minimal_docu_001">
```

[17] http://www.balisage.net/Proceedings/vol3/html/Lubell01/BalisageVol3-Lubell01.html

6. The error message for each rule must be stated in the assertion with xhtml:p element. The attribute lang identifies the language in which the error message is displayed.

```
<xhtml:p lang="de_ch">Für Dokumente, welche anhand der vorliegenden Spezifikation er-
stellt wurden soll folgende template ID verwendet werden: templateId extension="CDA-
CH" root="2.16.756.5.30.1.1.1.1"</xhtml:p>
<xhtml:p lang="fr_ch">Le modèle d'identifiant suivant doit être utilisé pour les
documents produits au moyen de la présente spécification: templateId extension="CDA-
CH" root="2.16.756.5.30.1.1.1.1"</xhtml:p>
<xhtml:p lang="it_ch"> Per i documenti, che sono stati creati sulla base della presente
specifica bisogna impiegare il seguente template ID: templateId extension="CDA-CH"
root="2.16.756.5.30.1.1.1.1"</xhtml:p>
<xhtml:p lang="en"> For documents which were generated in accordance with the present
specification the following template ID is to be used: templateId extension="CDA-CH"
root="2.16.756.5.30.1.1.1.1"</xhtml:p>
```

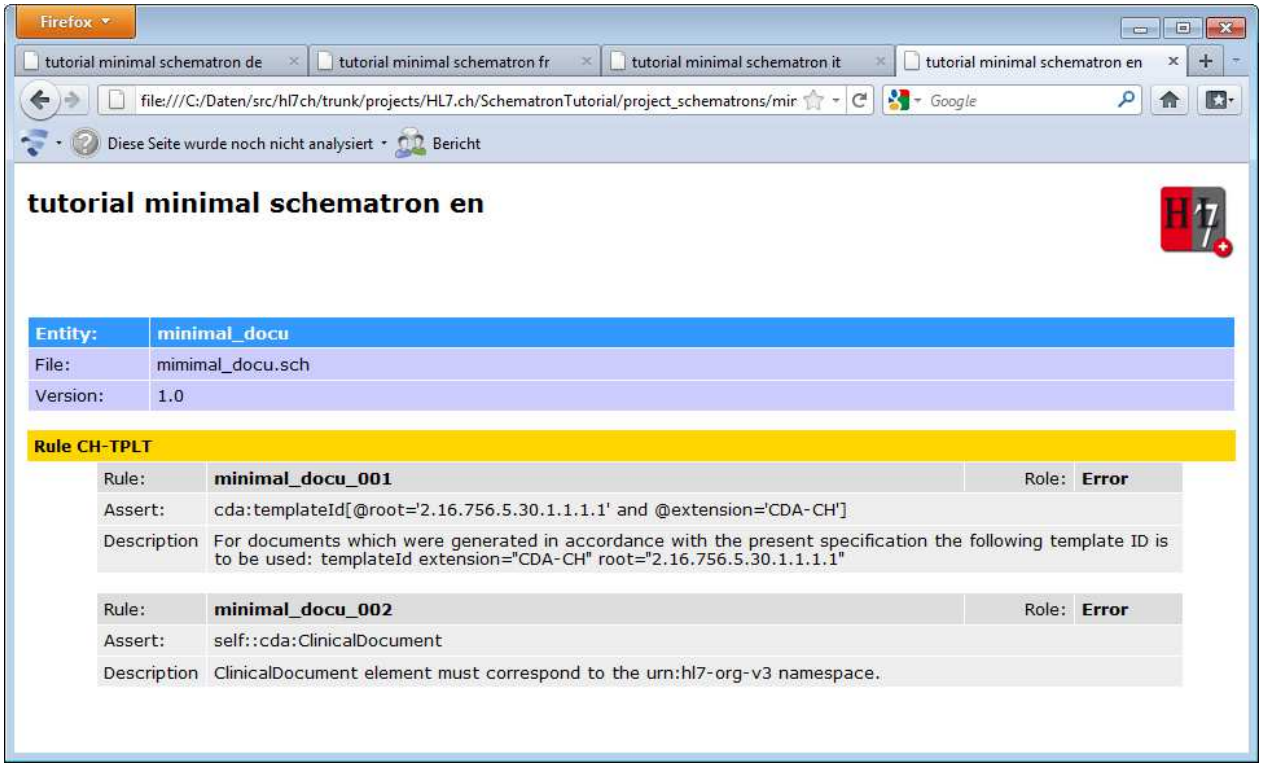
If a specific user group is to be alerted to an error message (users, developers), this should be mentioned in the class attribute. Where no class attribute is mentioned, developers are intended implicitly:

```
<xhtml:p class="user" lang="en">invalid document</xhtml:p>
```

The documentation of this schema file (minimal_docu.sch) can now be generated as follows:

```
ant document -Dsch=minimal_docu -Dlang=en
document:
    [xslt] Processing minimal_docu.sch to minimal_docu_doc_de_ch.html
    [xslt] ../../../stylesheets/HL7.ch/CDA-CH/v1.2/cda-ch-doc.xsl
```

and resulting in the HTML document (minimal_docu_doc_en.html) below:




The desired language can be selected using the parameter 'lang'.

This sample schema does not yet satisfy all the requirements of the Schematron Guidelines: No rules are permitted inside a Schematron file, but only indications of Entity files in which the rules reside. Hence, the individual Entity files must also be documented accordingly within the Schematron file.

From minimal_doc.sch, minimal_docu.ent with only the pattern element incorporated and tutorial.sch, which now integrates mimimal_docu.doc, are created so that our Schematron file conforms to the rules:

```
<?xml version='1.0' encoding='utf-8'?>
<!DOCTYPE schema
[
<!ENTITY ent-project-schematrons-minimal-Docu SYSTEM 'minimal_docu.ent'>
]
>
<schema xmlns='http://purl.oclc.org/dsdl/schematron'
      xmlns:xhtml='http://www.w3.org/1999/xhtml'>
  <xhtml:h1 class="title" lang="de_ch">
    tutorial minimal schematron de</xhtml:h1>
  <xhtml:h1 class="title" lang="fr_ch">
    tutorial minimal schematron fr</xhtml:h1>
  <xhtml:h1 class="title" lang="it_ch">
    tutorial minimal schematron it</xhtml:h1>
  <xhtml:h1 class="title" lang="en">
    tutorial minimal schematron en</xhtml:h1>
  <ns prefix='cda' uri='urn:hl7-org:v3'/>
  <xhtml:h2 class="reference" lang="de_ch">Referenzierte Entities</xhtml:h2>
  <xhtml:h2 class="reference" lang="fr_ch">Entities référencées</xhtml:h2>
  <xhtml:h2 class="reference" lang="it_ch">Entities referenziate</xhtml:h2>
  <xhtml:h2 class="reference" lang="en">Referenced entities</xhtml:h2>
  <xhtml:ul id="reference">
    <xhtml:li>minimal_docu.ent</xhtml:li>
  </xhtml:ul>
  &ent-project-schematrons-minimal-Docu;
</schema>
```

## 8.4 Schematron validation with xhtml output

With the above tutorial schema xml documents can now be validated and the language-dependent error messages can be selected:

**`ant generateValidator -Dsch=tutorial`**

NB: For the xhtml output to appear, the parameter allow-foreign must be set to true during the final transformation (mit iso_svrl_for_xslt1.xsl).

**`ant validate -Dsch=tutorial -Dxml=minimal_fails`**

results in:

```
<svrl:failed-assert test="cda:templateId[@root='2.16.756.5.30.1.1.1.1' and
@extension='CDA-CH']" id="minimal_docu_001" location="/*[local-
name()='ClinicalDocument']">
   <svrl:text>
     <xhtml:p xmlns="http://purl.oclc.org/dsdl/schematron" lang="de_ch">
       Für Dokumente, welche anhand der vorliegenden Spezifikation erstellt
       wurden soll folgende templateId verwendet werden:
       templateId extension="CDA-CH" root="2.16.756.5.30.1.1.1.1"</xhtml:p>
     <xhtml:p xmlns="http://purl.oclc.org/dsdl/schematron" lang="fr_ch">
       Le modèle d'identifiant suivant doit être utilisé pour les documents
       produits au moyen de la présente spécification:
       templateId extension="CDA-CH" root="2.16.756.5.30.1.1.1.1"</xhtml:p>
     <xhtml:p xmlns="http://purl.oclc.org/dsdl/schematron" lang="it_ch">
```

```
      Per i documenti, che sono stati creati sulla base della presente
      specifica bisogna impiegare il seguente template ID:
      templateId extension="CDA-CH" root="2.16.756.5.30.1.1.1.1"
    </xhtml:p>
    <xhtml:p xmlns="http://purl.oclc.org/dsdl/schematron" lang="en">
      For documents which were generated in accordance with the present
      specification the following template ID is to be used:
      templateId extension="CDA-CH" root="2.16.756.5.30.1.1.1.1"
    </xhtml:p>
  </svrl:text>
</svrl:failed-assert>
```

The corresponding language version can now be directly displayed via XPath by observing the xhtml:p element containing the lang attribute.

## 8.5 Summary

Schematron validation of HL7 CDA document templates offers the following benefits:

- The contents of HL7 CDA documents can be validated via Schematron rules (can be automated for each entity)
- Conformity can be verified for each document entity with a minimum of effort
- Rules do not have to be programmed, leading to uniform application among a diversity of software companies (no scope of interpretation for developers)

# 9 Schematron Best Practices

The following code fragments are for illustration purposes only.

## 9.1 Sample Ant Task for XSLT using Saxon

```
<?xml version="1.0" encoding="UTF-8"?>
<project name="schematron" default="validate" basedir="..">
  <target name="init">
    <tstamp />
    <!-- put 1 or 2 -->
    <property name="xsltversion" value="2" />
    <!-- schematron path put also saxon9he.jar in there -->
    <property name="schematronpath"
              value="../../../iso-schematron-xslt${xsltversion}" />
    <property name="xml" value="" />
    <property name="sch" value="" />
    <property name="lang" value="" />
  </target>
  <target name="generateValidator"
          description="generates xsl File used for validation" depends="init">
    <delete file="project_schematrons/${sch}.xsl" />
    <!-- expand inclusions -->
    <xslt style="${schematronpath}/iso_dsdl_include.xsl"
          in="project_schematrons/${sch}.sch"
          out="project_schematrons/${sch}1.sch">
      <classpath>
        <pathelement location="${schematronpath}/saxon9he.jar" />
      </classpath>
    </xslt>
    <!-- expand abstract patterns -->
    <xslt style="${schematronpath}/iso_abstract_expand.xsl"
          in="project_schematrons/${sch}1.sch"
          out="project_schematrons/${sch}2.sch">
      <classpath>
        <pathelement location="${schematronpath}/saxon9he.jar" />
      </classpath>
    </xslt>
    <delete file="project_schematrons/${sch}1.sch" />
    <!-- compile it -->
    <xslt style="${schematronpath}/iso_svrl_for_xslt${xsltversion}.xsl"
          in="project_schematrons/${sch}2.sch"
          out="project_schematrons/${sch}.xsl">
      <param name="allow-foreign" expression="true" />
      <classpath>
        <pathelement location="${schematronpath}/saxon9he.jar" />
      </classpath>
    </xslt>
    <delete file="project_schematrons/${sch}2.sch" />
  </target>
  <target name="validate" depends="init">
    <delete file="validations/${xml}.svrlt" failonerror="false"/>
    <!-- validate -->
    <xslt style="project_schematrons/${sch}.xsl"
          in="${xml}.xml"
          out="validations/${xml}.svrlt">
      <classpath>
        <pathelement location="${schematronpath}/saxon9he.jar" />
      </classpath>
```

```
    </xslt>
  </target>
  <target name="document"
          description="document schema files with rule" depends="init">
    <delete file="project_schematrons/${sch}_doc_${lang}.html"
            failonerror="false"/>
    <!-- expand inclusions -->
    <xslt style="../../../stylesheets/HL7.ch/CDA-CH/v1.2/cda-ch-doc.xsl"
          in="project_schematrons/${sch}.sch"
          out="project_schematrons/${sch}_doc_${lang}.html">
      <param name="language" expression="${lang}" />
      <classpath>
        <pathelement location="${schematronpath}/saxon9he.jar" />
      </classpath>
    </xslt>
  </target>
</project>
```

## 9.2 Sample C# Code for XSLT using .Net

```
public bool ValidateSchematron(bool errs, bool warns, bool notes, bool
detailedOutput)
{
  var assembly = typeof(SchematronValidatorISO).Assembly;
  var iso_dsdl_include =
     XmlReader.Create(Path.Combine(_SchXslPath, "iso_dsdl_include.xsl"));
  var iso_abstract_expand =
     XmlReader.Create(Path.Combine(_SchXslPath, "iso_abstract_expand.xsl"));
  var iso_svrl_for_xslt1 =
     XmlReader.Create(Path.Combine(_SchXslPath, "iso_svrl_for_xslt1.xsl"));
  var stage1 = new StringBuilder();
  var stage2 = new StringBuilder();
  var stage3 = new StringBuilder();
  var result = new StringBuilder();
  try
  {
   //1) First, preprocess your Schematron schema with iso_dsdl_include.xsl.
   //This is a macro processor to assemble the schema from various parts.
   //If your schema is not in separate parts, you can skip this stage.
   XslTransform(_SchReader, iso_dsdl_include, XmlWriter.Create(stage1));

   //2) Second, preprocess the output from stage 1 with
   //iso_abstract_expand.xsl.
   //This is a macro processor to convert abstract patterns to real patterns.
   //If your schema does not use abstract patterns, you can skip this
   //stage.
   XslTransform(XmlReader.Create(new StringReader(stage1.ToString())),
          iso_abstract_expand, XmlWriter.Create(stage2));

   //3) Third, compile the Schematron schema into an XSLT script.
   //This will typically use iso_svrl_for_xslt1.xsl or iso_svrl_for_xslt2.xsl
   //(which in turn invoke iso_schematron_skeleton_for_xslt1.xsl or
   //iso_schematron_skeleton_for_saxon.xsl) However, other "meta-styleseets"
   //are also in common use; the principle of operation is the same. If your
   //schema uses Schematron phases, supply these as command line/invocation
   //parameters to this process.
   XslTransform(XmlReader.Create(new StringReader(stage2.ToString())),
          iso_svrl_for_xslt1, XmlWriter.Create(stage3));

   //4) Fourth, run the script generated by stage 3 against the document
   //being validated. If you are using the SVRL script, then the output of
   //validation will be an XML document. If your schema uses Schematron
   //parameters, supply these as command line/invocation parameters to this
   //process.
   XslTransform(_XmlReader, XmlReader.Create(
          new StringReader(stage3.ToString()), null, _SchBaseURI),
                 XmlWriter.Create(result));

   var xdoc = new XmlDocument();
   xdoc.Load(new StringReader(result.ToString()));
   AppendErrors(xdoc, errs, warns, notes, detailedOutput);

   return string.IsNullOrEmpty(_SbErrors.ToString());
  }
  catch (XsltException ex)
  {
   if (ex.InnerException != null)
```

```
    {
      _SbErrors.AppendFormat("{0}\n", ex.InnerException);
    }
    else
    {
      _SbErrors.AppendFormat("{0}\n", ex.Message);
    }
    return false;
  }
  catch (Exception ex)
  {
   _SbErrors.AppendFormat("{0}\n", ex.Message);
    return false;
  }
}

private static void XslTransform(XmlReader xml, XmlReader xsl, XmlWriter result)
{
  try
  {
    var args = new XsltArgumentList();
    args.AddParam("allow-foreign", "", "true");
    var sett = new XsltSettings();
    sett.EnableDocumentFunction = true;
    var t = new XslCompiledTransform();
    t.Load(xsl, sett, new SchematronXmlUrlResolver());
    t.Transform(xml, args, result);
  }
  finally
  {
    xml.Close();
    xsl.Close();
    result.Close();
  }
}
```

### 9.2.1 Sample procedure call-up

```
private void btnValidateSchematronISO_Click(object sender, EventArgs e)
{
  Environment.CurrentDirectory = Path.GetDirectoryName(txtSCHFile.Text);
  txtResult.Text = "Processing...";
  Application.DoEvents();

  var validator = new SchematronValidatorISO(txtXMLFile.Text, txtSCHFile.Text,
          Path.Combine(Path.GetDirectoryName(
          System.Reflection.Assembly.GetExecutingAssembly().CodeBase),
          "schematron_xslt1"));

  if (validator.ValidateSchematron(chkErrors.Checked, chkWarnings.Checked,
                  chkNotes.Checked, chkDetails.Checked))
  {
    txtResult.Text = "XML is valid";
  }
  else
  {
    txtResult.Text = validator.Errors.ToString();
  }
}
```

# 10 Implementation of IHE Patient Care Coordination (PCC)

The IHE Patient Care Coordination (PCC) Technical Framework was created in July 2005. Its aim is to process integration aspects across several service providers for various medical indications or across different time periods. Hereby, the focus is more on the medical treatment rather than on the technical infrastructure. PCC handles the exchange of documents, the order processing and the coordination with other departments. PCC also addresses the issue of cross-departmental processes and the needs of specialist fields that do not have their own dedicated IHE domains.

This graphic shows all currently available integration profiles of the PCC Technical Frameworks:

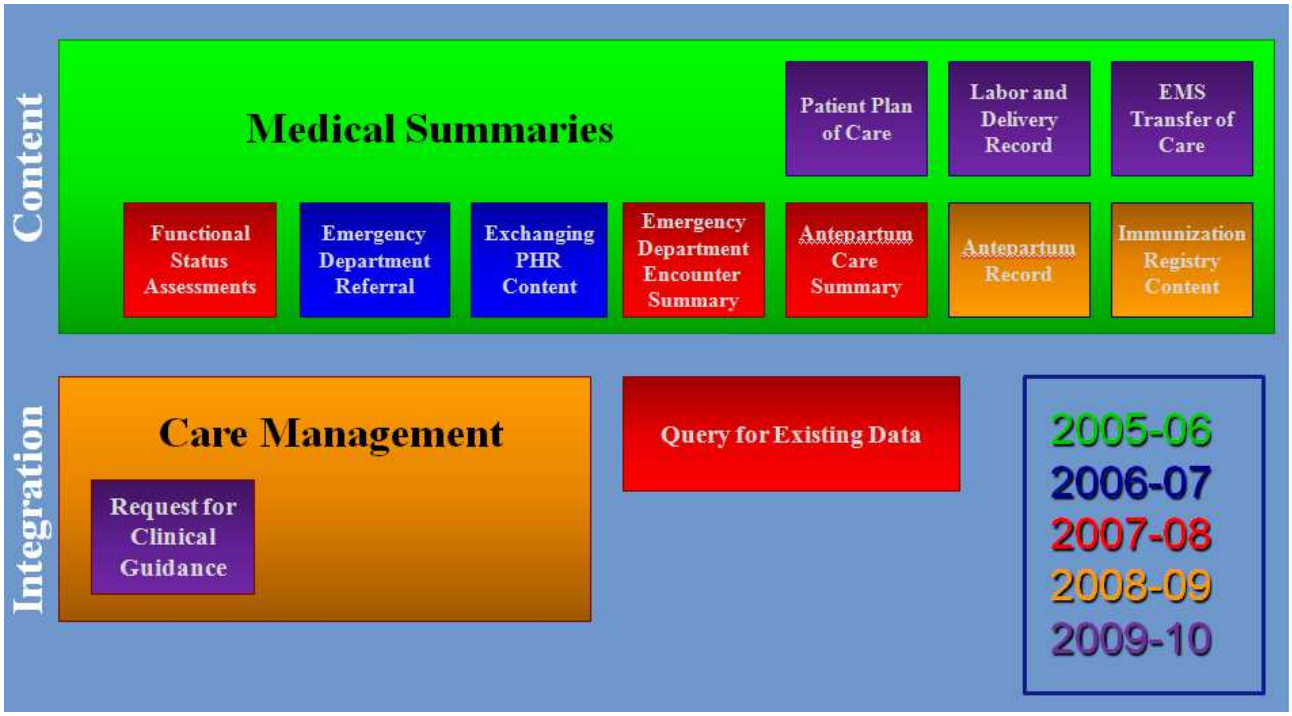



*Figure 4: IHE Patient Care Coordination Content Integration Profiles, Rev. 5.0 (Source: IHE.net)*

Currently PCC Revision 5.0 is available, which was approved in 2009. PCC Revision 5.0 contains three integration profiles that are in the final documentation status:

- Cross-Enterprise Sharing of Medical Summaries Integration Profile (XDS-MS)
  - Medical Summary Document Content (MS)
- Emergency Department Referral (EDR)
- Exchange of Personal Health Record Content (XPHR)

PCC Revision 5.0 also contains the following "Supplements for Trial Implementation". Starting 2010, these can be tested by developers at Connectathons. These profiles are not addressed in this introduction:

- Antepartum Record (APR) Supplement
- Care Management (CM)
- Content Modules Supplement
- Emergency Department Encounter Summary (EDES)
- EMS Transfer of Care (ETC)
- Immunization Content (IC) Supplement
- Labor and Delivery Record Supplement (LDR)
- Patient Plan of Care (PPOC) Supplement
- Query for Existing Data (QED)
- Request for Clinical Guidance (RCG)

In terms of the actors, all the released PCC integration profiles use the same pattern. One actor functions as the „Content Creator“, i.e. the generator of data, which he/she wants to share with „Content Consumers“, i.e. consumers of existing data.


*Figure 5: PCC Actor Diagram for XDS-MS, EDR and XPHR (Source: IHE.net)*

PCC has dependencies to the following additional IHE profiles:

- Audit Trail and Node Authentication (**ATNA**)
  Each Content Creator and each Content Consumer must be combined with an IHE ATNA Secure Node Actor. This is required so that an Audit Trail can be established to the transferred data and, at the same time, the authentication of the participating IHE actors and the encryption of the data along the forwarding route are ensured.
- Consistent Time (**CT**)
  Each Content Creator and each Content Consumer must be combined with an IHE Time Client Actor. This is required for overcoming and solving conflicts in updates (chronological sequence).

IHE PCC allows communicable data sets to be exchanged. IHE PCC differentiates between the following options:

- Within a healthcare network (using integration profiles: XDS, PIX/PDQ, NAV)
- Via media or USB devices (using integration profile: XDM)
- Via secure messaging / point-to-point (using integration profile: XDR)

The data content that can be exchanged between actors via the IHE transactions is defined in so-called „Content Profiles“. The following standards are used for this purpose:

- CDA Release 2.0
  Basis for XDS-MS contents and contents in XPHR Extracts/Updates
- HL7 Care Record Summary
  Supplements to CDA in accordance with HL7 PHR Conformance Criteria
- ASTM/HL7 Continuity of Care Document
  Supplements to CDA in accordance with HL7 PHR Conformance Criteria
- Notification of Document Availability
  For active information of other systems (XDS-MS)
- Document Digital Signature (DSG)
  For signing documents in a Submission Set by the document source actor
- XHTML/XSLT
  Document sources should have stylesheets available, which render the contents of HL7 V3 Content Modules, so that such content can be presented to users in human readable form.

## 10.1 Cross-enterprise sharing of medical summaries (XDS-MS) integration profiles

The cross-enterprise sharing of medical summaries supports the coordination of patient care, and the XDS-MS integration profile was designed specifically for that purpose.

XDS-MS defines precisely how the secure sharing of relevant patient data across enterprises is possible. In this regard, the integration of emergency data (e.g. most recent diagnoses, allergies, medication) is foreseen.

Through XDS and XDS-MS, IHE offers integration profiles that support physicians in medical practice networks and cross-enterprise sharing of data between hospitals and medical practices.

### 10.1.1 Content modules

XDS-MS supports the following content modules:

- Referral summaries
- Discharge summaries

These can contain in structured form elements such as allergies and intolerances, anamneses, vaccinations, diagnoses, therapies, medications, treatment schedules etc.

Contents are converted using the standards HL7 CDA Release 2.0, HL7 Care Record Summary, ASTM/HL7 Continuity of Care Document, and are described in detail in Sections 6.3.1.3 and 6.3.1.4 of the [IHE PCC] Technical Framework, Volume 2.

### 10.1.2 Security aspects

The XDS-MS integration profile assumes that an environment with a minimum of security and data protection is involved. The corresponding measures must be implemented by all participants. Security guidelines addressing issues such as agreements, risk management, business continuity and network security must exist. These security guidelines must be put into place before beginning with the implementation XDS-MS.

The integration of IHE ITI **ATNA** is mandatory for participating XDS-MS actors. It ensures secure communication of transactions as well as an audit trail of the exchanged data.

If, in addition to the security measures relating to ATNA, digital signatures are required for the legally valid signing of documents, the document source actor can also include the Document Digital Signature (**DSG**). This allows a Document Consumer Actor to verify in the XDS-MS Integration Profile whether the signature matches the signed content.

## 10.2 Exchange of personal health record content (XPHR)

XPHR defines an exchange format for transferring data between personal health records (PHR) and medical primary systems.

XPHR describes the exchange of documents between a personal patient record and a different medical data system, supports several transfer routes and offers update functions. XPHR allows demographic data, insurance details, medication, problems, allergies, anamneses and other information to be exchanged in a structured manner.

In common with almost all IHE profiles, XPHR uses existing standards for this purpose:

- CDA Release 2.0
- HL7 Care Record Summary
- ASTM Continuity of Care (CCR) Data Set
- ASTM/HL7 Continuity of Care Document (CCD)
- AHIMA PHR Common Data Elements
- XDS, XDR/XDM
- Document Digital Signature

### 10.2.1 Content modules

XPHR supports the following content modules:

- PHR Extract Modules
- PHR Update Modules

### 10.2.2 Security aspects

See "10.1.2 Security Aspects on page 53

## 10.3 Emergency department referral (EDR) integration Profiles

EDR is a content extension of XDS-MS for referrals to emergency departments by general practitioners, including the return exchange of updated data by the hospital involved.

In addition to XDS-MS, other emergency specific data can be exchanged in structured form using EDR. Typical examples are: transporting the patient to the emergency station (method of transport, estimated time of arrival) or proposals to the emergency station personnel.

Over and above this, the EDR Profile is largely identical with XDS-MS.

# 11 Supporting Documents

## 11.1 CDA documents for case study „Rear-end collision“

The CDA conversions of the documents relating to case study „Rear-End Collision“ are filed in the SVN Repository:

https://hl7ch.svn.sourceforge.net/svnroot/hl7ch/projects/HL7.ch/de-AuffahrUnfall/v1.0

## 11.2 Schematron rules

The current Schematron rules are filed in the SVN Repository:

https://hl7ch.svn.sourceforge.net/svnroot/hl7ch

# 12 Referenced Documents

[CDA-CH]: German Title: CDA-CH: Spezifikation zum elektronischen Austausch von medizinischen Dokumenten in der Schweiz
Etappe 1, Version 1.2 (genehmigt), Stand: 27. Januar 2009
http://www.hl7.ch/fileadmin/docs/CDA-CH_V1.2.zip
Also available in French but unfortunately not in English.

[IHE PCC]: IHE Patient Care Coordination (PCC), Technical Framework
Revision 5.0, Final Text, August 10, 2009
http://www.ihe.net/Technical_Framework/index.cfm#pcc

[ISO Schematron] ISO/IEC 19757-3:2006
Information technology — Document Schema Definition Languages (DSDL) — Part 3: Rule-based validation — Schematron
http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=40833

# 13 Appendix

## 13.1 Currently available templates

The following CDA-CH templates, generated on the basis of this present specification, are currently available. They are recommendatory in nature and their current versions can be accessed from the SVN Repository.

The following list shows the status on 20/05/2010. Other templates can be found under www.hl7.ch (heading Publications).

| Schematron Master | Description | Issuer |
|---|---|---|
| **cda-ch.sch** | Master for all HL7 CDA-CH templates | HL7.ch |
| **cda-ch-medication-doc.sch** | CDA-CH Medication template | HL7.ch |
| **xphrExtract.sch** | Schematron Master for IHE PCC PHR Extract | IHE |
| **xphrUpdate.sch** | Schematron Master for IHE PCC PHR Update | IHE |
| **2927.sch** | Medical Report UVG | Suva |
| **2928.sch** | Interim Medical Report | Suva |
| **svv-kzbt.sch** | Documentation questionnaire for initial medical consultation following a whiplash injury (KZBT[18]; whiplash injury form) | SVV |
| **vhitg-ruleset.sch** | Schematron Master for VHitG Schematron rules | VHitG |

[18] German abbreviation