Data Source / EHR contains Raw Data

**A Method to Formalise Quality Indicators**

A quality indicator is “a measurable element of practice performance for which there is evidence or consensus that it can be used to assess the quality, and hence change in the quality, of care provided.”

(Lawrence 1997)

**Example Patient**

**Example Quality Indicator**

Number of examined lymph-nodes after resection

Numerator: Number of patients who had 10 or more lymph-nodes examined after a resection of a primary colon carcinoma.

Denominator: Number of patients who had lymph-nodes examined after a resection of a primary colon carcinoma.

Exclusion Criteria: Patients with previous radiotherapy, recurrent colon carcinoma.

**Method to formalise Quality Indicators into SPARQL Queries**

**Step 1)**

Encode relevant concepts (diagnoses and procedures) from the indicator by concepts from a terminology.

?colectomy a sct:SCT_23968004 .

**Step 2)**

Define the information model.

?patient schema:hasDisease ?coloncancer .

**Step 3)**

Formalise temporal constraints (FILTER - SPARQL FILTERs restrict solutions to those for which the filter expressions evaluate to true).

FILTER ( ?lymphnodeexaminationdate > ?colectomydate )

**Step 4)**

Formalise numeric constraints (FILTER)

FILTER ( ?numberexaminedlymphnodes ≥ 10 )

**Step 5)**

Formalise boolean constraints (FILTER)

FILTER ( ?deliveredToDSCA = true )

**Step 6)**

Group constraints by boolean connectors (coloncancer AND colectomycode) OR (rectumcancer AND resectionrectum).

**Step 7)**

Mark exclusion criteria.

FILTER ( ?lymphnodeexaminationdate > ?radiotherapydate )

**Step 8)**

Mark constraints that only aim at the numerator.

FILTER ( ?numberexaminedlymphnodes ≥ 10 )

**OWL Schema for Patient Data**

**Problems, Goal and Requirement**

**Problems**

- Indicators that are released in natural language are ambiguous
- Increasing number of indicators makes their manual calculation unfeasible

**Goal**

Ideally, indicators would be calculated automatically based on patient data that is captured during the care process.

**Requirement**

To derive comparable values, a formalisation method is needed to transform indicators from natural language into an unambiguous, machine-processable, formal representation.

**Definition Quality Indicator**

Intelligent Indicator System

**Example Quality Indicator**

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*If you can not measure it, you can not improve it.* Lord Kelvin